Examining the Perceived Risks of Contactless Card Acceptance in the New Zealand Market

By James McMillan

This thesis is submitted in partial fulfilment
of the requirements for the degree of

Master of Commerce in Marketing

Department of Management, Marketing and Entrepreneurship

University of Canterbury

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

2018

Abstract

Contactless payment is a modern addition to transaction technology and has gained traction in New Zealand through the advent of contactless bank cards. Consumers no longer require security PINs for low value transactions which creates faster payments and reduces queuing times. However, reduced security has given rise to card theft, fraudulent transactions and criticism from consumers who feel they have little control over payment instruments. Despite ample academic attention given towards contactless pay via smartphones, few studies have explored contactless cards which are a drain on global economies due to interchange fees. Policy makers, retailing unions and global payment networks are debating the merits of fee regulations that are dependent on consumer acceptance. Hence, this study empirically measures consumer acceptance of contactless cards which informs stakeholders of their likely trajectory and highlights potential for prospective markets. Partial least squares structural equation modelling is used in conjunction with technology acceptance and risk perception theories to formulate a proposed model fit for measuring intent to use. A questionnaire is constructed using repurposed measures reflecting latent perceptions that possess demonstrated relevance in relation to contactless pay technologies. Results from 587 respondents show that acceptance is strongly influenced by perceived security, overall risk, trust and usefulness. New Zealand consumers are largely positive towards use whilst younger cohorts are the most likely to accept. The proposed model is suitable for reapplication in prospective markets which aids scholars in measuring market receptivity of contactless cards.

Contents

Tables and Figures

Glossary

App	- Smartphone Application
AVE	- Average Variance Extracted
CB	- Covariance Based
CR	- Composite Reliability
EFTPOS	- Electronic Funds Transfer at Point of Sale
E-Wallet	- Electronic Wallet (Mobile Wallet)
GDP	- Gross Domestic Product
GPN	- Global Payment Network
HTMT	- Heterotrait-Monotrait Ratio
IS	- Information Systems
IT	- Information Technology
MBIE	- The New Zealand Ministry of Business, Innovation & Employment
MPRI	- Mobile Payments Readiness Index
NFC	- Near-Field Communication
OECD	- The Organisation for Economic Co-operation and Development
PIN	- Personal Identification Number
PLS	- Partial Least Squares
RFID	- Radio Frequency Identification
SD	- Standard Deviation
SEM	- Structural Equation Modelling
TAM	- Technology Acceptance Model
UTAUT	- Unified Theory of Acceptance and Use of Technology
VIF	- Variance Inflation Factor

Chapter 1: Introduction

1.1 Introduction

Contactless payment is an emerging technology which completes low-value transactions by waving smartphones, key fobs or bank cards near payment terminals in order to make instant purchases (Türkmen & Değerli, 2015). This technology employs Near-Field Communication (NFC) whereby payment terminals emit an electromagnetic field which is able to exchange data with NFC chips that are brought within 4-5 centimetres (Azhari, 2014; Türkmen & Değerli, 2015). Developed in 2002 through a collaboration between Sony and Philips, this latest innovation extends upon Radio Frequency Identification (RFID) technology which has similar core features (Coskun, Ozdenizci, & Ok, 2015). The key difference being that NFC involves short-range communication making it ideal for securely transmitting sensitive information (NFC Today, 2017). Typical uses include controlling access to buildings, computer networks or payment for public transport as seen by New Zealand's Metro and Snapper cards which allow passengers to pay transit fare within one-third of a second (Currie, Scott, & Tivendale, 2013; Lomax, 2005). Put simply, NFC technology replaces the need for payment cards to make physical contact with transaction terminals which eliminates the wear-and-tear associated with swiping and inserting (Fiedler & Öztüren, 2014).

Current research highlights resistance towards this technology due to various risk and security weaknesses (Debajyoti, Vanijja, & Borworn, 2015; Madureira, 2017; Zarrin-kafsh, 2015); primarily, the lack of need for Personal Identification Numbers (PINs) (Coskun et al., 2015). NFC chips embedded into bank cards allow consumers to conduct low-value transactions without requiring a PIN (Olsen, 2008a). Payment thresholds for PIN-free transactions vary by country with some typical examples shown in Table 1.

Table 1: Contactless Payment Limits by Country (2017)

Country	**Limit before PIN is required**		**Cited by**
New Zealand	NZD80	USD59	(MBIE, 2016)
Australia	AUD100	USD78	(Jones, 2016)
Canada	CAD100	USD79	(Jones, 2016)
United Kingdom	GBP30	USD39	(Jones, 2016)
Hong Kong	HKD1000	USD128	(Visa, 2017)

PIN-free transactions are problematic in New Zealand as stolen NFC bank cards have given rise to fraudulent transactions which creates time and revenue losses for consumers, banking providers and law enforcement (Dawson, 2016). Hence, the main objective of this study is measuring consumer perceptions towards this technology is light of these weaknesses.

1.2 Background

The primary proponents of contactless bank cards are MasterCard and Visa who bridge the gaps between consumers, merchants and banking authorities by providing payment technology in exchange for transaction fees (Widjaja, 2016). In 2005, both of these Global Payment Networks (GPNs) agreed to share an NFC payment protocol which enables both Visa payWave and MasterCard PayPass cards to be accepted using compatible terminals (Carter, 2005). PayPass debuted in 2003 followed by payWave in 2007 allowing merchants and consumers to exploit the benefits of faster transactions (Dewan & Chen, 2005; Timetric, 2013). However, attached to each of these transactions are interchange fees charged by GPNs in exchange for providing the technology (MBIE, 2016). Similar to PIN-free payment thresholds, interchange fees vary by country allowing GPNs to adjust fees based on variable factors in each country. Some typical examples of interchange fees by payment types are shown in Table 2.

Table 2: Interchange Fees per Transaction by Payment Type

Transaction Type	New Zealand	United Kingdom	Australia
EFTPOS	0.00%	0.32%	AUD 0.09
Debit (swipe or inserted)	0.00%	0.36%	AUD 0.12
Debit (Contactless)	1.00%	0.36%	AUD 0.12
Credit (Visa & MasterCard)	1.70%	0.89%	0.78%

Note. Retrieved from Ministry of Business, Innovation and Employment (MBIE), Retail Payment Systems in New Zealand: Issues Paper (2016) and Retail NZ, Towards Fairer Payments Fees, (2015).

Unlike New Zealand, countries such as the United Kingdom, Australia, Turkey and Poland have fixed and regulated interchange fees, preventing GPNs from exploiting their fee structure (Stock, 2015). Merchants are expected to bear this cost which creates hostility towards banks and GPNs as interchange fees fetch an increasing NZ$461 million annually (MBIE, 2016). In 2006, the New Zealand Commerce Commission brought proceedings against Visa and

MasterCard for suspected fee-fixing which resulted in merchants gaining the right to pass interchange fees onto consumers, or raise their prices to recover costs (OECD, 2012). Many retailers have yet to adopt, or have outright rejected NFC payment due to an unwillingness to pass fees onto valued customers or bear the cost themselves (Gibson, 2015). What this demonstrates is that GPNs have financial incentives to encourage contactless card acceptance and that the rising interchange fees drawn from New Zealand merchants are higher than other nations due to non-existent fee regulations.

Current NFC literature has largely focussed on consumer attitudes and behaviour towards contactless payment via smartphones (Bailey, Pentina, Mishra, & Mimoun, 2017; Khalilzadeh, Ozturk, & Bilgihan, 2017; Madureira, 2017). Phone manufacturers, GPNs and banks are collaborating by embedding NFC chips into the latest smartphones whilst retailers are designing phone applications (apps) which support contactless transactions (Hernandez, 2016). These apps, copy and emulate credit/debit cards allowing consumers to conduct contactless transactions without the need to carry physical payment cards (Coskun et al., 2015). Although researchers refer to these phones as "*Mobile Wallets*", for the sake of this study, a smartphone capable of contactless pay will be referred to as an Electronic Wallet, or E-Wallet (Amoroso & Magnier-Watanabe, 2012). Global uptake and consumer intent towards E-Wallets has been weak across many nations (Warner & Wright, 2017). To estimate market receptivity, MasterCard created a measure, called the Mobile Payments Readiness Index (MPRI). This metric considers domestic variables (such as technological infrastructure and regulatory conditions) to score countries on a 1-100 scale of E-Wallet readiness (MasterCard, 2012a). A score of 60 is considered an inflection point where E-Wallets have the potential to be a mainstream payment choice. However, amongst the 34 countries that were scored, none reached an inflection score of 60 while the 33.2 average suggests that none consider E-Wallets a typical payment choice (MasterCard, 2012a).

Upon this scale, New Zealand scored just below the average at 32.7, suggesting acceptance rates, optimal conditions and consumer confidence are lacking (MasterCard, 2012b). This was demonstrated during 2012-2016 by the introduction and collapse of Semble; an E-Wallet app capable of paying for transit-fare and low-value purchases throughout New Zealand (Keall, 2016). Semble's collapse involved a variety of factors, including slow consumer uptake despite smartphone usage increasing. In 2015, smartphones reached a 70% penetration rate after a 43% increase in just 3 years (Research New Zealand, 2015). Usage was not age bias as 94% of users, aged 18-54, used their smartphones daily whilst 79% of users, aged 55+, reported the same

(Research New Zealand, 2015). Additionally, 76% of those who identified smartphones as their leading electronic device used it for online banking which means New Zealanders will use smartphones to manage finances; just not as a payment instrument. In terms of payment instruments, in 2015, electronic card transactions accounted for 69.3% of all retail spending and was evenly split between debit and credit cards (Statistics New Zealand, 2016). When compared globally, New Zealand's card usage is second only to Denmark amongst all nations belonging to the European Union (European Central Bank, 2016). This demonstrates that credit and debit cards are currently the dominant payment method in New Zealand.

What is clear thus far is that New Zealand is a suitable candidate for NFC bank cards due to limited interchange fee regulation, the weak uptake of E-Wallets and EFTPOS/debit cards reaching 93.8% saturation amongst adult consumers. These findings are coupled with boasts by the Ministry of Business, Innovation and Employment that New Zealand possesses one of the lowest proportions of circulating cash to Gross Domestic Product (GDP) in the world (MBIE, 2016). Since their debut in 2011, adoption rates of contactless credit and debit cards have been exponential (Kerr, 2014) and are gradually displacing the use of existing payment cards (Figure 1).

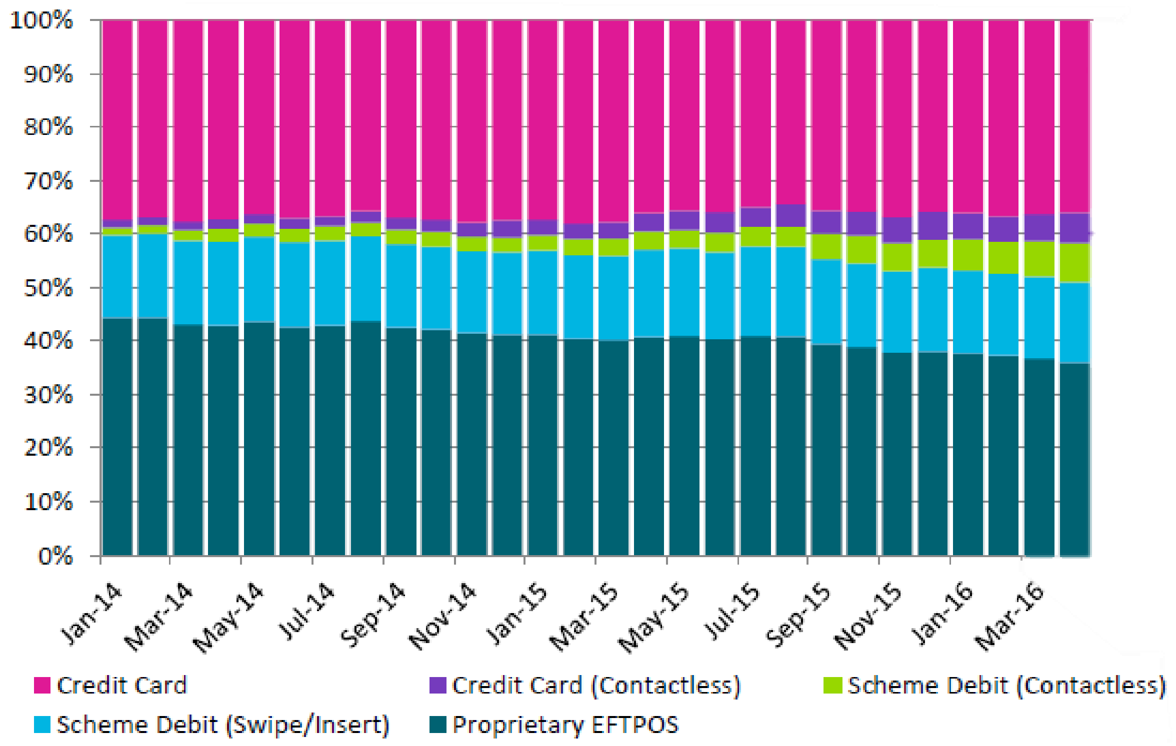

Figure 1: Frequency of Usage by Card Type 2014-2016 *(MBIE, 2016)*

Paymark; New Zealand's long standing technology and network provider for card transactions, claims contactless pay accounts for 11% of all transactions processed through their terminals (Paymark, 2016). Paymark currently manages 75% of all card transactions using a fee-free scheme called EFTPOS (Electronic Funds Transfer at Point of Sale) (Paymark, 2017). Use of contactless cards grew by 96.18% from 2015-2016 to reach 12.7 million transactions in September alone (Paymark, 2016). This follows claims in 2015 that New Zealand is leading the world with one of the highest growth rates of contactless card ownership and usage (Boden, 2015). Needless to say, a 1% fee attached to 12.7 million monthly transactions has created financial stress for retailers and has prompted an investigation into policy change.

Currently, the MBIE is leading an investigation into the efficiency of New Zealand's payment system through a collaboration with GPNs, banks and Retail NZ (a nationwide association of over 5000 retailers) (Retail NZ, 2017). Retail NZ instigated this investigation after claiming industry controlled interchange fees prevent governments from regulating a transparent and efficient payment system which benefits that nation, rather than profiting banks and foreign GPNs (Retail NZ, 2015). They estimate that by 2024, unregulated interchange fees will extract NZ$711 million from merchants and consumers annually (Retail NZ, 2015). The MBIE's investigation added that interchange fees are passed onto consumers through higher merchandise prices, regardless of their choice of payment instrument (MBIE, 2016). They explain that contactless interchange fees are put towards inducements to incentivise continued use, which EFTPOS is unable to do as it operates using a fee-free scheme (MBIE, 2016). Hence, despite the existing EFTPOS scheme providing financial advantages for merchants and consumers, it is quickly becoming displaced due to inducements set by GPNs and banks. A recent example is MasterCard's use of celebrity endorsements, whereby users gain entry into prize draws that offer activities and interactions with renowned athletes for conducting contactless card transactions (StopPress NZ, 2014a).

MasterCard responded to the MBIE stating that they do not directly earn revenue from interchange fees and that they have no incentive for setting rates which negatively impact NFC acceptance (MasterCard, 2017a). They argue is that GPNs earn revenue by charging interchange fees to banks who facilitate transactions, but not by charging merchants or consumers directly (MasterCard, 2017a). However, this begs the question of where banks should source the revenue necessary to cover these fees, other than passing them onto merchants who in-turn, pass them onto consumers. Merchants are able to charge fees at point-of-sale (OECD, 2012); however, studies have shown that 93% of consumers disapprove of surcharging whilst 43% claim fees leave them with a bad impression of the business (MBIE, 2016). Therefore, merchants are reluctant to pass fees onto consumers which forces them to raise prices or bear the cost themselves (Gibson, 2015). MasterCard demonstrated that consumers will spend more with greater frequency by using contactless payment, which they use to incentivise merchant participation (MasterCard, 2011). They also condemn interchange fee regulation claiming market forces (GPNs) should determine rates, while citing several nations where regulated fees lead to higher banking costs and less generous reward programs for consumers (MasterCard, 2017a). The MBIE acknowledges that the need for government intervention largely depends on consumer demand for contactless cards (MBIE, 2016).

1.3 Research Rationale

1.3.1 Research Gap

As discussed, the parties debating the merits and weaknesses of contactless cards include banks, GPNs (Visa & MasterCard), retailing unions (Retail NZ), policy makers (MBIE) and payment technology providers (Paymark). What is absent from this discussion is an examination of consumer perceptions and behaviour which will ultimately determine its future (Timetric, 2013). Consumers worldwide have criticised the weak security of PIN-free transactions and the inability to opt against having NFC enabled in their bank cards (Collinson, 2015; Devereux, 2014; Kollmorgen, 2015). Additionally, there is reluctance to enter cashless societies whilst disgruntled consumers have criticised the lack of consent or information they received prior to being issued pre-activated cards (O'Connor, 2013; Timetric, 2013). Unverified surveys conducted by periodicals report that more than half of New Zealanders do not consider contactless cards safe, and regard them as "*too risky*" (Coster, 2016). A comprehensive literature review reveals little insight into consumer behaviour regarding contactless cards. This signifies a gap where scholars possess no reputable information outside of trade publications and periodicals.

Credit and debit cards are mainstream payment instruments in developed nations; yet scholars have overlooked their adaptation to NFC despite recurring criticisms in the media (Collinson, 2015; Kollmorgen, 2015; Zolfagharifard, 2015). Researchers have steered their attention towards the next stage in payment technology which is E-Wallets. In doing so, there is a gap in the literature about how consumers perceive NFC payment outside of a smartphone context. Like many markets, New Zealand has accepted contactless payment through the prolific use of reloadable transit cards designed to pay fare (Currie et al., 2013). Despite this, there is strong apprehension towards E-Wallets which reflects the slow uptake present in many nations (Debajyoti et al., 2015; Ossolinski, Lam, & Emery, 2014). Therefore, this study satisfies a research gap regarding consumer perceptions towards contactless cards which contributes to understanding the apprehension towards E-Wallets. It consolidates numerous studies that explore consumer perceptions and extracts the most influential variables to formulate a holistic framework which explains the greatest variance in behaviour. Testing these constructs together helps researchers avoid the trepidation of selecting low value or irrelevant variables in future research.

The following study creates a bedrock for estimating behavioural intent towards using contactless cards. Although some markets show affinity towards E-Wallets, this does not mean they will behave the same towards NFC bank cards. Each country must be assessed separately due to unique regulatory conditions, technological infrastructure and behavioural differences (MasterCard, 2012a). Therefore, this study outlines a simple model to be applied in other markets which helps to formulate a global understanding of consumer perceptions. Secondly, it is one of few to be conducted in an Anglo nation which provides insight into consumer perceptions outside of Asia (Wang, 2008). Finally, it provides a precursor analysis for scholars to measure market receptivity ahead of deployment which helps to infer recommendations for stakeholders.

1.3.2 Research Objectives and Aim

As mentioned, GPNs consider no two global markets are the same as each is influenced by local infrastructure, regulation and consumer behaviour (MasterCard, 2012a). Additionally, scholars are calling for multi-country case analyses as mass adoption in one market is not indicative of success elsewhere (Madureira, 2017). Therefore, the framework used in this study must be easily replicable to aid scholars investigating other markets whilst rendering comparable results. This is achieved by using a reputable framework for estimating behavioural intent, called the Technology Acceptance Model (TAM), in conjunction with Structural Equation Modelling (SEM) (Davis, Bagozzi, & Warshaw, 1989).

The first objective is to empirically measure consumer perceptions and explain behavioural intent towards using contactless cards. This is vital for estimating success in prospective markets ahead of deployment. It focusses on ‘how’ exchange is facilitated which contributes to a broad understanding of consumer purchasing behaviour (Yarrow, 2014). A thorough review of NFC literature reveals the two most common frameworks for measuring perceptions and Behavioural Intent (BI) are Davis et al.'s (1989) TAM and Venkatesh, Morris, Davis and Davis' (2003) Unified Theory of Acceptance and Use of Technology (UTAUT) models. Comparatively, Davis et al.'s (1989) TAM is more popular due to its parsimonious structure and empirical results (Luarn & Juo, 2013). It relies on two constructs (perceived ease-of-use and perceived usefulness) to estimate BI, whilst the UTAUT relies on four constructs along with four moderators (Venkatesh et al., 2003). Although the UTAUT has produced valuable results, the prolific use of TAM provides a stronger basis for discussion, measurement and framework design due to consistent findings across numerous studies.

The second objective is to identify and test the relationships between antecedents that influence intent to use. Doing so demystifies what drives acceptance which helps proponents craft relevant communications that encourage use. This study draws antecedent variables from NFC acceptance studies which extend Davis et al.'s (1989) TAM into a contactless cards context. Three of the antecedents selected are privacy risk, performance risk and perceived security which all possess demonstrated influence towards NFC acceptance (see Table 3 for definitions). Perceived overall risk is included as a fourth construct which accounts for various risks factors not captured by the former three. Trust is introduced as a dependent variable influenced by overall risk, which also acts as an antecedent to endogenous variables drawn from technology acceptance theory. Davis et al.'s, (1989) TAM provides perceived ease-of-use, perceived usefulness and behavioural intent which make up the endogenous components of the proposed model conceived in this study (Figure 2).

The third and final objective is to create a replicable framework which helps scholars explain acceptance in other markets. This satisfies calls for multi-country case analyses (Madureira, 2017) whilst providing stakeholders insight into common barriers that hinder acceptance. Theoretically, a holistic model which includes the most significant drivers and barriers supplements much of the preliminary research spent uncovering what they might be. This enables researchers to shift into data collection and analysis phases using only minor adjustments to account for cultural and contextual differences. Therefore, considering these three objectives, the aim of this study is to:

> Test the antecedent influence that security, trust and various risk factors have on behavioural intent towards using contactless cards. In doing so, create a replicable framework that is capable of estimating acceptance in prospective markets.

The following table contains variables deemed relevant to NFC acceptance and are discussed in greater depth throughout Chapter 2.

Table 3: Constructs with Definitions

Construct	Definition
Privacy Risk	The possibility of personal and confidential information becoming available to others without the user's knowledge or consent
Performance Risk	The possibility of malfunctioning in a way which does not deliver the expected results it was designed or advertised to produce
Perceived Security	Subjective belief that contactless cards can withstand interruption, interception or exploitation made by malevolent parties attempting to defraud the user
Overall Risk	Multifaceted belief that denotes feelings of psychological uncertainty when consumers are unable to predict the outcome of an action
Trust	Subjective belief that the parties and objects involved in an activity can be relied upon to perform in accordance with user expectations
Ease-of-Use	Degree to which consumers believe using contactless cards would be free of physical and mental effort
Usefulness	Degree to which consumers believe using contactless cards will enhance their performance
Behavioural Intent	The strength of intention one has towards performing a specific behaviour

Figure 2 displays the proposed model which is explained in greater detail throughout Chapter 2 and is tested with survey data in Chapter 4. As discussed, the three endogenous constructs displayed on the far right (ease-of-use, usefulness and behavioural intent) are derived from technology acceptance theory whilst their antecedents are drawn from repeated demonstrations throughout NFC literature.

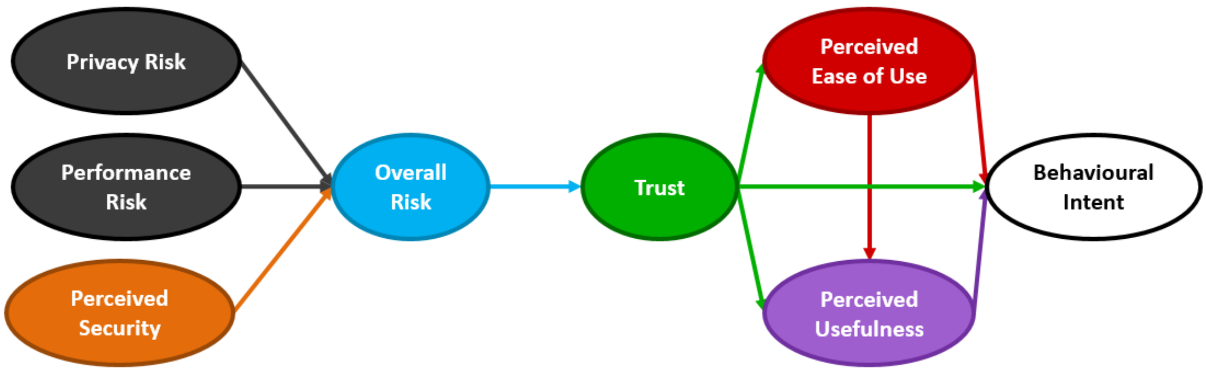

Figure 2: Proposed Model

1.4 Methodology

Chapter 2 concludes with a hypothesis development which details the relationships between constructs shown in the proposed model. These inter-construct relationships are known as pathways in SEM and work together to estimate behavioural intent towards use. Ten pathways are hypothesised which are measured against quantitative data gathered using Likert scales in an online questionnaire. Consumer responses are captured using repurposed measurement indicators taken from NFC literature (Table 4) which satisfy validity and reliability requirements outlined in Chapter 4, section 4.4.

The proposed model is made up of constructs and indicators that have demonstrated relevance towards NFC acceptance, but are yet to be tested holistically. Partial Least Squares (PLS) SEM is a suitable style of analysis as the theory is untested and therefore exploratory, whilst an objective is estimating behavioural intent. This contrasts Covariance Based (CB) SEM which is more appropriate for theory testing and confirmation (Hair, Ringle, & Sarstedt, 2011). Hence, CB-SEM would be more appropriate in follow-up studies attempting to reapply the proposed model to other markets.

A total of 587 usable responses are acquired using an online survey, Facebook advertising, posters, leaflets, recruiting network leaders and snow-ball sampling. This quantity exceeds the necessary thresholds for PLS-SEM which is discussed further in Chapter 3, section 3.7.

1.5 Research Value to Stakeholders

Contactless cards have been met with resistance amongst various markets without necessarily being demanded by consumers (Timetric, 2013). The following study outlines influential variables affecting the use of contactless cards which highlights the greatest barriers to acceptance. Stakeholders who consider and address such barriers will ease the transition towards contactless pay which supports trends toward cashless societies (Niranjan, Saravanan, Patwa, & Reddy, 2016; Polasik, Wisniewski, & Lightfoot, 2010; Warner & Wright, 2017).

Conducting this study also provides insight for policy makers who rely on consumer behaviour in order to justify the introduction of fee regulation (MBIE, 2016). This is highly relevant as contactless transactions operate using the same fee scheme as credit cards (MBIE, 2016). From 2012-2015, New Zealand credit card interchange fees grew by 9%, interchange rates for small retailers grew by 16%, whilst rates for nationwide retailers (e.g. supermarkets, retail chains) fell by 20% due to strong leverage in negotiations (MBIE, 2016). It is hoped that New Zealand policy makers will use this study as empirical evidence of consumer intent which should justify suitable regulatory action that balances cost and benefits for all. Relying on historic consumer data to infer policy may produce time and revenue losses as current policies remain suspended in deliberation.

Discussing and testing consumer perceptions influencing acceptance allows competing technology providers (Paymark) to premeditate key areas of interest ahead of releasing their own NFC technology. Paymark will have the opportunity to incorporate each of the variables into their business strategies in order to stave off competition from GPNs. Additionally, banks managing public relations may retain disgruntled customers by addressing the areas of concern deemed relevant by this study (O'Connor, 2013). Banks are on the forefront of customer engagement which makes them primarily responsible for how consumers perceive the introduction of contactless cards. Finally, retailing unions (Retail NZ) can use this study to estimate the future use of contactless cards which should guide fee negotiations and highlight the likely presence of NFC payment in business models.

1.6 Thesis Structure

Chapter 2 explores current NFC literature which includes popular theoretical frameworks drawn from technology acceptance theory to measure behavioural intent. It discusses E-Wallets, risk perception theory and concludes with a hypotheses development that form the pathways of the proposed model. Chapter 3 discusses SEM, analysis procedures, survey design and countermeasures used to reduce bias. Results after testing the model are outlined in Chapter 4 which also contains the demographic composition of respondents and the degree of influence held by each of the constructs. Chapter 5 revisits the research aim and objectives and provides a discussion, limitations and recommendations.

Chapter 2: Literature Review

2.1 Chapter Overview

The following chapter begins by discussing the benefits and weaknesses of NFC payment followed by a discussion on the barriers of E-Wallet acceptance. These are followed by an overview of popular theoretical frameworks used in technology acceptance theory that provide the endogenous components of the proposed model. This leads into a hypothesis development which covers perceived risk theory and the inter-construct pathways that undergo testing in Chapter 4. This chapter concludes with the proposed model fitted with hypotheses and a brief statement of how this study satisfies several gaps in NFC literature.

2.2 Benefits and Weaknesses of NFC Payment

Hirschman (1979) states that there are two underlying assumptions which explain the lack of research given towards studying different payment methods. Firstly, that there is no substantial difference between payment methods, which leaves little to investigate; and secondly, if a difference does exist, then it has limited influence on purchasing behaviour (Hirschman, 1979). Thankfully, modern insights have unearthed the drastic influence different payment methods have on consumer decision making. For instance, research by Barclays Bank in the United Kingdom discovered that two thirds of consumers are willing to abandon purchases rather than face an extended queuing time (Polasik et al., 2010). To combat this, GPN's distributed NFC bank cards which reduce transaction times by up to 12-18 seconds (Timetric, 2013). They found that around 50% of consumers will avoid stores that do not accept bank cards and that convenience is the most cited reason for paying by debit (Carten, Littman, Schuh, & Stavins, 2007; MasterCard, 2017a). Scholars posit that consumers value speed, ease-of-use; they prefer hassle-free transactions and wish to avoid limiting their purchasing power to the cash they have on-hand (Dewan & Chen, 2005).

Rapid transactions make NFC payment ideal for retailers managing high customer turnover, such as fast-food, bars, supermarkets and gas stations (Timetric, 2013). Additionally, steering customers towards electronic payment has benefits for retailers and banks by reducing their reliance on cash. Cash is troublesome as it carries significant overheads such as labour for handling and security; it requires insurance and is often targeted for theft (Polasik et al., 2010). Furthermore, GPNs claim NFC cardholders will spend 28-42% more per purchase while their frequency of transactions can increase by 33-52% when compared to cash (MasterCard, 2011).

This is linked to a diminishing sense of psychological constraint consumers experience when parting with physical cash (Timetric, 2013). GPNs believe electronic payments provide accuracy and efficiency which cash cannot, along with reducing tax avoidance and inhibiting the growth of shadow economies (MasterCard, 2017a). Also known as black markets, New Zealand's shadow economy was last estimated at 12% of GDP which encourages governments to support electronic payment as a strategy for monitoring illegal transactions (Gorman, Scobie, & Paek, 2013; Polasik et al., 2010). NFC payment can achieve this despite receiving mixed reviews from users. Younger consumers typically receive the technology well, whilst older markets have treated NFC pay with scepticism and suspicion (Timetric, 2013).

Unsurprisingly, bank cards capable of PIN-free transactions have been targeted by malevolent opportunists (Krol, Rahman, Parkin, Cristofaro, & Vasserman, 2016). Information Technology (IT) studies have outlined several theft strategies, such as skimming, eavesdropping and relay attacks, which are used to highjack payment credentials from NFC cardholders (Jensen, O'Meara, & Gouda, 2016). Card theft and fraudulent transactions have prompted banks to offer zero-liability clauses on NFC cards to ease concerns regarding security and privacy (MasterCard, 2017a). In fact, weak security and threats to privacy are the lead inhibitors of acceptance for internet banking, E-Wallets, NFC bank cards and online purchasing (Chung & Paynter, 2002; Nunkoo & Ramkissoon, 2013; Viehland & Leong, 2010). Furthermore, amongst the benefits and risks associated with use, perceived risks yield the greatest influence on consumer intent and behaviour (Lee, 2009). For the former, speed, ease-of-use and requiring less wallet space are cited benefits; however, consumers report needing more information prior to trialling (Van Dyke, 2006; Want, 2011). Reports from the Reserve Bank of Australia show similar displacement effects NFC is having on other payment methods (Ossolinski et al., 2014) whilst contactless is estimated to account for 60% of all New Zealand debit transactions by 2024 (MBIE, 2016). Therefore, New Zealand has a brief opportunity to empirically assess consumer perceptions towards contactless cards during market entry stages.

Although periodicals and industry reports contain insight into consumer perceptions; scholars have failed to explore contactless cards which makes current information cursory. Interestingly, scholars have thoroughly explored consumer perceptions towards E-Wallets which involve similar technology and risks. Therefore, this study draws from IT literature and perceived risk theory to formulate a framework for exploring the principal inhibitors of NFC acceptance in an emerging market. Before discussing results from previous studies, the following section summarises critical barriers to E-Wallet acceptance.

2.3 Barriers to E-Wallet Acceptance

Despite significant advancements in payment technology, E-Wallets have yet to reach widespread popularity or use (Debajyoti et al., 2015; Leong, Hew, Tan, & Ooi, 2013; Ossolinski et al., 2014; Sajid & Haddara, 2016; Tan et al., 2014). Contactless cards are capable of completing transactions within one-third of a second (Lomax, 2005). However, research shows E-Wallets are not as quick, are slower than traditional payment methods (Polasik, et al., 2012) and are perceivably too complicated to operate (Coskun et al., 2015; Tan et al., 2014). One explanation is that the authentication and log-in procedures during transactions diminishes convenience (Kim, Tao, Shin, & Kim, 2010) which is supposed to be a principal incentive for use (Warner & Wright, 2017). Others argue that learning to find, download and operate E-Wallet applications is burdensome (Hayashi, 2012). Users must master their phones, be capable of downloading apps and follow transaction procedures in order to access contactless pay (Hayashi, 2012). This tends to be less difficult for millennials brought up around IT, and more of an issue for older consumers (Aluri & Palakurthi, 2011). Featherman and Pavlou (2003) posit that products or services that require steep learning curves can be perceived as risky and plagued with usability issues.

Davis et al. (1989) posit that if two prospective systems or technologies are equally easy to use, then the option which produces a better outcome will likely be accepted. By that logic, if two competing technologies produce equal outcomes, then the option which is easier to use will likely be accepted. Perceivably, since E-Wallets and contactless cards produce a similar outcome (i.e. contactless transactions) then cards have a higher probability of achieving mass acceptance due to greater ease-of-use. Shifting from traditional payment methods to NFC is difficult, as there are switching costs involved. Yen (2010) defined switching costs as the perceived costs required to terminate and existing relationship and acquire another. Costs may include cognitive and emotional effort which can keep users attached to outdated technologies (Yen, 2010). On a transaction basis, E-Wallets and NFC cards produce the same outcome which is contactless payment. Hence, switching costs are a good indication of why users may prefer the familiarity of cards and are reluctant to adopt to E-Wallets (Yen, 2010). Den Norske Bank in Norway proposed that contactless cards should be introduced ahead of E-Wallets to give consumers a hands-on experience with the technology (Sajid & Haddara, 2016). This adheres to Davis et al.'s (1989) evidence that a one hour interaction with new technology positively influences intent to use. Theoretically, introducing the market to NFC pay through bank cards may mitigate the perceived switching costs associated with E-Wallet acceptance.

Another explanation for slow uptake is that only a fraction of modern smartphones possess NFC capabilities. Willing consumers may need to abandon their existing phones and upgrade to the latest models which tend to be expensive (Hayashi, 2012). Research exploring the barriers to E-Wallet acceptance found that 97% of consumers are not willing to purchase a new device in order to access E-Wallets (Ghosh, Goswami, Mohanty, & Bhattacharyya, 2017). Price is an investment concern and is not considered viable without providing substantial performance-to-price benefits (Yu, 2009). Additionally, one of the reasons Semble failed was due to the wide variety of handsets containing private firmware. Each of these needed to be approved before they could be used on the NFC network which is tiresome and labour intensive for network providers (Madureira, 2017). Forecasts from GPNs, banks and phone providers claim that by 2018, 64% of smartphones shipped globally will possess NFC as a de-facto standard (Coskun et al., 2015). As NFC smartphones become widely available, there is speculation over consumer willingness to accept E-Wallets just to gain access to another payment method (Timetric, 2013). Guido Mangiagalli, head of new channels for Visa, claims E-Wallets are a complement to contactless cards (Balaban, 2008), and both are a substitute for paper based payment (Trütsch, 2016). The presence of both is said to bring about the end of cash usage and a step towards cashless societies (Olsen, 2008b). Therefore, part of the reluctance to accept E-Wallets stems from price sensitivity and an inability due to a high circulation of incapable handsets.

Proponents argue that using E-Wallets is less cumbersome than carrying multiple payment cards (Hayashi & Bradford, 2014; Niranjan et al., 2016; Sajid & Haddara, 2016; Shaw, 2015). However, there is virtually no evidence that carrying payment cards requires an exorbitant effort that consumers seek to resolve. This is how E-Wallets have been dubbed "*a solution in search of a problem*" (Reardon, 2012). There are markets where smartphone payment is prominent, such as Korea, Japan, Taiwan and Singapore (Zhang, Zhu, & Liu, 2012). However, many nations lack the technical infrastructure required for mass acceptance (Timetric, 2013). Thus, extrinsic barriers to E-Wallet acceptance include a lack of technological infrastructure, financial switching costs and very little performance gains when compared to contactless cards. Many technology acceptance studies have focussed on internal barriers that inhibit the adoption of contactless pay. These studies have rendered consistent findings showing that performance and privacy risks (Makki, Ozturk, & Singh, 2016) along with perceived security (Peng, Xiong, & Yang, 2012) and trust (Nunkoo & Ramkissoon, 2013) influence user acceptance. These align with New Zealand consumers who have conveyed their grave concerns over confidentiality, authentication and data integrity with phone payments (Viehland & Leong, 2010). Davis et al. (1989) noted that novice users often evaluate options using abstract and general criteria as they lack the experience to make informed decisions. Therefore, an objective of this study is to discuss these reoccurring abstract barriers and measure their influence on contactless card acceptance. This satisfies calls-to-action from policy makers to assemble detailed insight into the criteria consumers use to select payment instruments (Carten et al., 2007).

Although credit and debit cards account for the dominant share of electronic transactions, E-Wallets are expected to replace them and are often viewed as the next step in payment evolution (Madureira, 2017). GPNs agree that payment cards lead the way in terms of retail transactions but add that inputting card details for online purchasing is "*onerous and insecure*" (Warner & Wright, 2017). E-Wallets only account for 8% of transactions worldwide while the success of NFC payment hinges on addressing perceived barriers and outperforming competing transaction methods (Warner & Wright, 2017). Davis et al. (1989) cautioned researchers not to rely on consumer usage as grounds to develop and advance information technologies. They believe that if a system is not truly useful, even if it is perceived to be, then it should not be marketed to consumers. This section has outlined the extrinsic and internal barriers to E-Wallet acceptance. Internal barriers include perceived privacy and performance risk, perceived security and user trust which will be discussed and applied to a contactless cards context. The following section discusses the theoretical frameworks used in technology acceptance studies to measure behavioural intent towards using NFC payment.

2.4 Theoretical Frameworks

2.4.1 Technology Acceptance Model (TAM)

Information Systems (IS) literature has yielded many competing models designed to measure user acceptance ahead of technology deployment. A popular framework used to estimate behavioural intent towards NFC is an early edition of the Technology Acceptance Model (TAM). Davis et al. (1989) claim the purpose of the TAM is to trace the impact of external factors on internal beliefs and intentions. Specifically, predicting people's use of technology by measuring their intent. Sam, Chatwin and Zhang (2014) posit that behavioural intent is the most important determinant of actual behaviour which allows technology acceptance studies to substitute BI as a proxy for actual use (Nunkoo & Ramkissoon, 2013). Therefore, this study employs behavioural intent as a dependent variable and proxy for actual use which is vital for estimating technology acceptance in prospective markets (Morosan & DeFranco, 2016). As shown, the TAM is made up of four key constructs which are Perceived Usefulness, Perceived Ease-of-Use, Attitude towards using and Behavioural Intention to use.

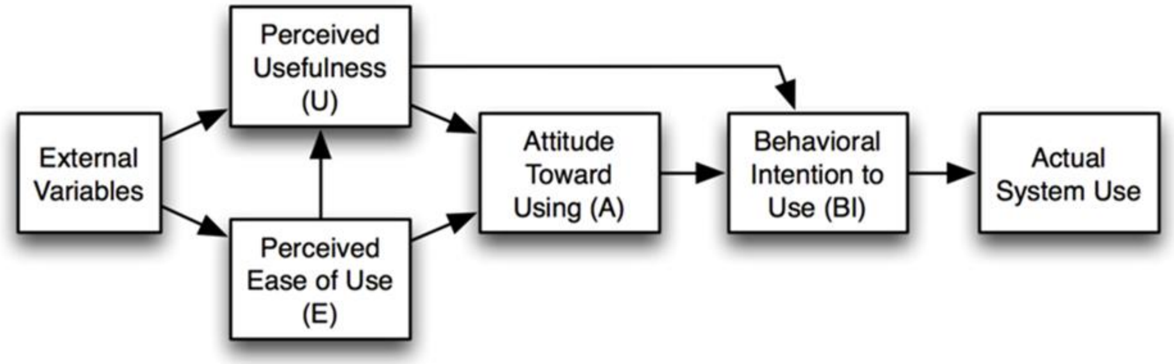

Figure 3: Davis, Bagozzi and Warshaw (1989) Technology Acceptance Model

Attitude is perhaps the easiest construct to omit as it only partially mediates the influence of usefulness and ease-of-use on behavioural intent (Aluri & Palakurthi, 2011). It is defined as an individual's affective reaction towards using a technology and was later discarded by Davis during his work on the UTAUT, and dropped from later editions of the TAM (TAM2 & TAM3) (Wu & Wang, 2005). Empirical testing shows that attitude is accounted for by other constructs and has an insignificant direct influence on BI (Venkatesh et al., 2003). This study emulates existing research by recognising the direct influence ease-of-use and usefulness have on behavioural intent through the omission of attitude (Ozturk, 2016). Doing so keeps this study in-line with the most recent TAM and UTAUT.

The remaining constructs applied in this study are Perceived Usefulness (PU), Perceived Ease-of-Use (PEOU) and Behavioural Intent towards use (BI). The original TAM referred to the likelihood of accepting new technology amongst employees in an organisation (Ooi & Tan, 2016). Accordingly, PU was defined as the degree to which one believes using a new technology will improve their work performance (Trütsch, 2014). Using an organisational setting was a chief criticism of Venkatesh et al. (2003) who collaborated with Davis to theorise the UTAUT. However, the TAM has been applied in non-organisational studies numerous times and shown to be reliable at estimating consumer intent (Leong et al., 2013; Peng et al., 2012; Teo, Tan, Ooi, Hew, & Yew, 2015).

PU has shown to have the greatest influence on BI (Davis et al., 1989) particularly regarding NFC acceptance (Sam et al., 2014). Although ease-of-use is a cited benefit of NFC payment (Arango, Hogg, & Lee, 2015), research shows that users will tolerate a difficult interface assuming the technology offers instrumental benefits (Davis et al., 1989). Benefits include shorter queuing times due to faster transactions, less mental effort recalling PINs and reduced reliance on cash (Krol et al., 2016). However, even a system which is simple to learn and navigate will not compensate for providing few benefits or little purpose.

PEOU should not be underestimated as it serves as the second greatest influence on user BI. Amoroso and Magnier-Watanabe (2012) defined PEOU as the degree to which individuals believe using a technology will be free from physical and mental effort. Its influence on BI is significant, but small; it also subsides overtime as users become experienced and begin seeking instrumental benefits (Karahanna, Straub, & Chervany, 1999). In addition to influencing BI, PEOU is an antecedent to PU, meaning technology that is easy to use has greater propensity to be considered useful (Leong et al., 2013). This relationship has been demonstrated when estimating the acceptance of E-Wallets (Sam et al., 2014) and e-commerce (Leong et al., 2013). Furthermore, PEOU is important issue for technology providers as poor usability depletes user trust and subsequent use (Nunkoo & Ramkissoon, 2013).

The objective of Davis et al.'s (1989) TAM is to estimate the variance in behavioural intent towards using new technologies. Specifically, the strength of one's intention to perform and action which stems from conscious decision-making and precedes a behavioural response (Morosan & DeFranco, 2016). Each edition of the TAM and the UTAUT postulate that BI is greatest determinant of actual behaviour and that any other contributing factors do so indirectly through BI (Davis et al., 1989). Regarding NFC acceptance, PEOU and PU have an indirect influence on actual behaviour through a direct influence on BI (Ozturk, 2016). These three endogenous variables are fundamental to estimating technology acceptance and resurfaced in Venkatesh et al.'s (2003) UTAUT.

2.4.2 Unified Theory of Acceptance and Use of Technology (UTAUT)

Venkatesh et al. (2003) collaborated with Davis to formulate a unified model which integrates essential elements from eight technology acceptance frameworks. Their model extends the TAM by introducing new variables which to attain greater predictive power. It contains four key constructs which are Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Conditions. Their influence on BI and actual behaviour is moderated by Gender, Age, Experience and whether acceptance is Voluntary.

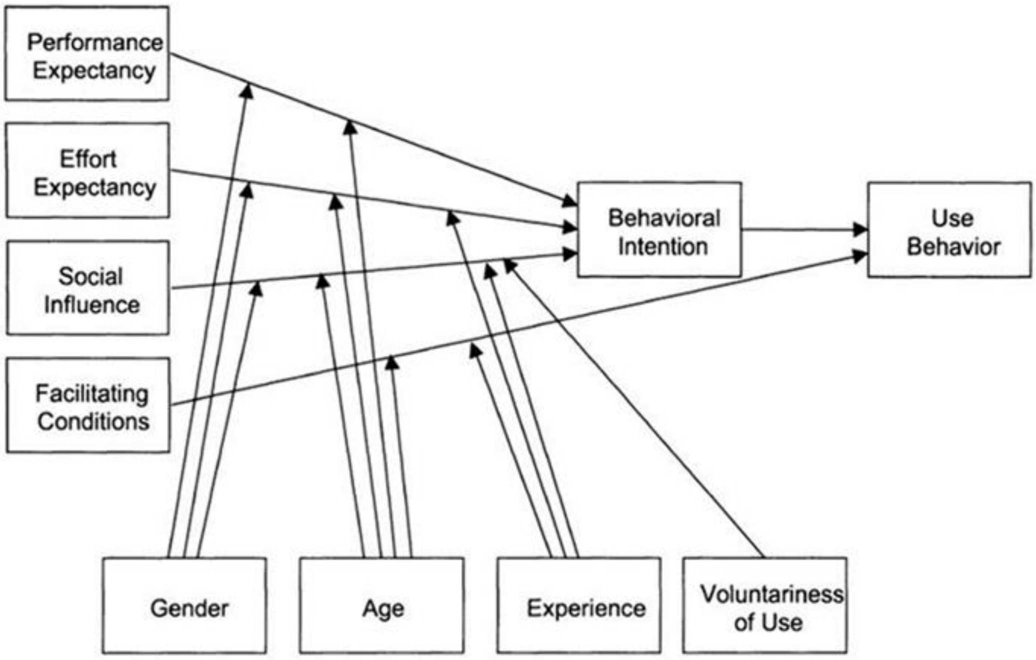

Figure 4: Venkatesh et al.'s, (2003) Unified Theory of Acceptance and Use of Technology

Performance Expectancy (PE) and Effort Expectancy (EE) have the greatest influence on BI and share a striking resemblance to PU and PEOU. PE refers to the degree an individual believes using a technology will improve their work performance (Venkatesh et al., 2003). Venkatesh et al., (2003) claim PE is the most comparable to PU, while both have shown to have the greatest influence on BI in relation to NFC (Trütsch, 2014). Overall, PE and PU are based on the principle that people form intentions towards behaviours that improve their performance above and beyond positive or negative feelings (Davis et al., 1989). This is because performance gains are instrumental to obtaining extrinsic rewards (e.g. greater spare time due to faster transactions). Hence, BI towards NFC is formed through a cognitive appraisal of how acceptance will improve their life, performance and activities (Davis et al., 1989).

The intimacy between PU and PE is repeated with PEOU and Effort Expectancy (EE). EE refers to the degree of ease associated with use, and like PEOU, it diminishes overtime as users become experienced (Venkatesh et al., 2003). Some argue that although E-Wallets provide flexibility and convenience, they are difficult to use; particularly when compared to cash, card or cheque (Tan, Ooi, Chong, & Teck-Soon, 2014). Hence, PU and PE in addition to PEOU and EE are comparative interchangeable constructs that may explain the global hesitation towards E-Wallets in-light of a growing acceptance of contactless cards.

According to the UTAUT, Social Influence (SI) and Facilitating Conditions possess a direct influence on BI and actual use; but not in relation to NFC acceptance (Zarrin-kafsh, 2015).

Denoted as social norm in technology acceptance theory, SI refers to the degree of behaviour triggered by beliefs that significant others will bear as result of use (Bandyopadhyay & Fraccastoro, 2007). Specifically, the impression others will form if one chooses to pay using contactless cards. This construct may be influential towards hedonic purchasing, such as cars or clothing; however, research shows that SI has little influence towards the acceptance of NFC payment (Khalilzadeh et al., 2017; Madureira, 2017; Zarrin-kafsh, 2015). This is linked to the practical benefits consumers expect from payment instruments, not the prospect of social rewards (Trütsch, 2014) or the fear of disapproval (Featherman & Pavlou, 2003).

Logically, Facilitating Conditions (FC) (i.e. the belief that technical infrastructure exists that supports the technology) should be a principal consideration for users (Venkatesh et al., 2003). Without a suitable number of merchants accepting contactless cards, users will have little opportunity to trial the technology (Dutot, 2015). Currently, around 30% of New Zealand merchants accept contactless pay which was far less during the trial and collapse of Semble (MBIE, 2016). Dutot, (2015) claims that perceiving a payment instrument as not widely accepted has a strong negative influence on BI. However, Khalilzadeh et al. (2017) found that FC have no influence on BI, but rather a direct impact on actual use. This is makes sense as consumers who possess strong intent to use will only be capable if merchants are capable of accepting. Venkatesh et al. (2003) claim FC is accounted for by EE, in that, ease-of-use is determined by the presence of ample acceptance which determines usability. They conclude that in the presence of PE and EE, FC becomes non-significant in predicting intention.

The essential variables from the UTAUT are PE and EE which are substituted for PU and PEOU in this study. What remains are moderating factors such as gender, age, experience and voluntariness to use. Gender studies involving technology acceptance theory show that PU is more relevant to males, as task orientation tends to be a priority (Trütsch, 2014). However, numerous studies have provided empirical evidence showing that gender does not influence BI towards using cash, card, E-Wallets or even contactless cards (Arango et al., 2015; Aluri & Palakurthi, 2011; Fiedler & Öztüren, 2014; Tan et al., 2014). Females may experience social pressure to trial NFC payment due to higher affiliations needs when compared to males (Trütsch, 2014). Nevertheless, SI is not a contributing factor, meaning males and females both use a strong cognitive appraisal of usefulness to guide their BI towards use. Leong et al. (2013) posit that gender equality, equal exposure to contactless pay and access to education has eradicated differences in consumer behaviour towards NFC payment.

Venkatesh et al. (2003) warn that researchers should be cautious not to generalise the results of technology acceptance in voluntary settings when compared to mandatory. Davis et al.'s (1989) TAM refers to an organisational setting where the propensity to accept technology was almost entirely dependent on whether users had a choice. If superiors within an organisation deem technology acceptance necessary, then employee BI will likely be certain, regardless of internal drivers or perceived risks and benefits. Thankfully, this study refers only to a voluntary scenario as consumers have dominion over their choice of payment and have a variety of options to choose from (Lee, 2009). Hence, the moderating influence of voluntariness is not applicable to this study.

Venkatesh et al. (2003) posit that Effort Expectancy (EE) becomes insignificant as users become experienced with a technology through sustained use. Logically, users with high knowledge prior to acceptance should perceive greater ease-of-use, whilst users with low prior knowledge will experience anxiety (Aluri & Palakurthi, 2011). According to Innovation Diffusion Theory, users follow sequential decision making towards technology acceptance which begins with knowledge, followed by persuasion, decision and implementation (i.e. actual use) (Rogers, 1995). If users possess, or are able to acquire sufficient knowledge, then they will likely shift towards trialling (actual use) (Jamshidi & Hussin, 2016). Trialling is important as Davis et al. (1989) demonstrated that a one hour "*hands-on*" interaction contributes to PU and subsequent BI. Therefore, users with prior knowledge or experience with NFC payment have the greatest propensity to accept contactless cards (Zarrin-kafsh, 2015). Jamshidi and Hussin (2016) studied credit card adoption and found that awareness above experience was sufficient for influencing acceptance. Using empirical testing, they concluded that a lack of awareness was the leading cause of user reluctance. British GPN Barclaycard surveyed 3,075 cardholders and found that only 16% were aware their cards possessed NFC, of which, 4% had trialled it (Timetric, 2013). This left the majority of respondents unaware of its presence which inhibited the process towards trial and acceptance. New Zealand consumers have been exposed to NFC payment through Semble, payWave, PayPass, mainstream E-Wallets and reusable transit cards available in most cities (Williamson, 2017). Hence, typical consumers which possess awareness of NFC payment will likely have formed perceptions towards contactless cards.

The final construct is age as a moderating factor of BI, which is a standard question in technology acceptance studies (Arango, Hogg, & Lee, 2015). Young consumers, typically millennials, possess strong BI towards accepting contactless cards (Trütsch, 2014) and contactless pay technologies (Garrett, Rodermund, Anderson, Berkowitz, & Robb, 2014; Leong et al., 2013; Warner & Wright, 2017). Aluri and Palakurthi (2011) claim young consumers tend to be early adopters, experienced with new technologies and proactive towards innovation. They demonstrated that as age increases, consumers are less likely to trial and accept NFC pay. Garrett et al. (2014) and Ooi & Tan (2016) attribute this to risk aversion due to a lack of familiarity and the difficulty of navigating complex stimuli as adults get older. Another explanation is that many NFC acceptance studies have used student sampling which contain predominantly young participants who have a greater propensity to trial new technologies (Bailey et al., 2017; Dutot, 2015; Leong et al., 2013; Sam et al., 2014; Teo et al., 2015). Interestingly, usefulness is not a significant predictor of BI for older adults as they will not necessarily adopt a new technology just because it is useful or practical (Teh, Ahmed, Chan, Cheong, & Yap, 2015). Garrett et al. (2014) reports that users aged 18-34 show no significant difference in their propensity to accept contactless pay; comparatively, consumers aged over 45 are least likely to have conducted an NFC transaction (Timetric, 2013). Therefore, it is expected that older consumers are apprehensive towards contactless cards whilst millennials are most likely avid users.

The summary of Davis et al.'s (1989) TAM and Venkatesh et al.'s (2003) UTAUT has rendered three critical variables which make up the endogenous constructs of the proposed model (Figure 2). These are perceived usefulness, perceived ease-of-use, and behavioural intent towards use (Figure 5). They possess repeated importance towards NFC acceptance and are influenced by the five antecedent variables discussed in the following section. The combination of both adapts the TAM into a contactless cards context and provides the essential framework for measuring consumer intent towards use. Additionally, there are known differences between age groups whilst awareness is considered a necessary precursor to acceptance. Hence, questions pertaining to both are included in the final questionnaire to provide a deeper insight.

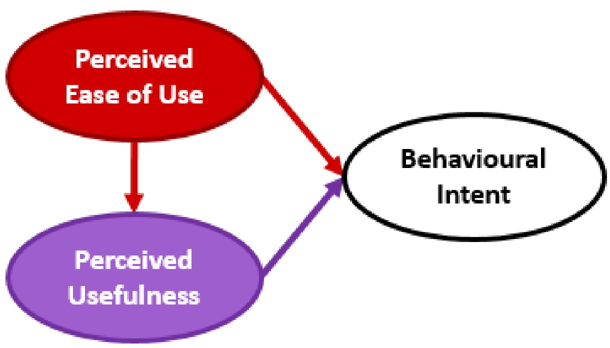

Figure 5: Essential Endogenous Variables drawn from TAM and UTAUT

2.5 Hypothesis Development

The previous section provides three endogenous constructs drawn from technology acceptance theory to form the dependent variables of the proposed model. This section provides an overview of risk perception theory and introduces five antecedent drivers that influence the core TAM constructs.

2.5.1 Perceived Risk Theory

Mitchell (1999) compiled a comprehensive literature review of perceived risk theory spanning thirty years of scholarly work. He argues that exploring perceived risk is appealing to marketers as it draws from an intuitive understanding of consumer perspective. Additionally, that perceived risks have the greatest influence on consumer behaviour as there is more motivation to avoid risk than to maximise utility from purchases (Mitchell, 1999). This aligns with a discussion by Lee (2009) that risk factors exert a stronger influence on decision making than any perceived benefits which may come from use. A recurring difficulty throughout the literature is settling on a conceptual definition as there is little consistency around what constitutes risk (Ross, 1975). This issue stems from abundant research which considers risk one-dimensional and refers to it as overall risk, without accounting for a wide number of variable factors (Mitchell, 1999). This is inadequate as risk is a multidimensional construct which contains corresponding risk factors relative to each situation (Dutot, 2015). For example, Khalilzadeh et al. (2017) demonstrated that perceived risk in relation to E-Wallets acceptance is comprised of performance and privacy risks. That is, the possibility of the phone or payment terminal not functioning properly or the loss of personal information as a result of use. These are situational factors which alter the meaning of risk relative to a circumstance which prevents the construct from possessing a fixed definition.

Despite this, there are many studies which use overall risk to account for uncertainty and consequences (Ross, 1975). In the presence of uncertainty, consumers may lessen their perceived risk to a tolerable level by deemphasising the amount which is at stake. In doing so, the cost or consequence in the event of failure becomes permissible (Ross, 1975). In relation to NFC pay, users may deemphasise the likelihood of transaction failure or importance of privacy breaches in order to comfortably use the technology without anxiety. This exemplifies the interdependence of various risk factors, where consequences are known to have the greatest influence on behaviour (Ross, 1975). Innovation or new technologies incite perceptions of risk as they can signify change to a satisfactory norm or threaten longstanding beliefs (Patsiotis, Hughes, & Webber, 2013). To some extent, all innovation represents uncertainty forcing many apprehensive consumers to avoid or postpone acceptance in order to gather information. To manage this, studies beyond Davis et al. (1989) have demonstrated that high interactivity with an innovation leads to trust which helps to diminish perceived risks (Patsiotis et al., 2013).

2.5.2 Perceived Privacy Risk

Research exploring the acceptance of NFC pay have used overall risk and relative subsets of risk to isolate which consequences have the greatest influence on consumer behaviour. Morosan and DeFranco (2016) claim that privacy reflects an individual's right to be left alone and not forced into societal participation. Consumers may sacrifice aspects of personal information in order to access small rewards or integrate into society (Hayashi, 2012). The relinquishing of personal information is thought to be paramount to creating a balance between public and private life which fits the individual (Morosan & DeFranco, 2016). A breach of privacy refers to an unauthorised acquisition or demand for information which impedes on this balance. Therefore, an amalgamated definition of privacy risk refers to the possibility of personal and confidential information becoming available to others without the user's knowledge or consent (Chen & Chang, 2013; Khalilzadeh et al., 2017). Consumers must trust that the data they provide over an NFC network will not be compromised or shared with inappropriate third parties (Shaw, 2015). A sophisticated breach of privacy may include hijacking card information at point-of-sale and using it forge counterfeit cards, make online purchases, sell to hackers or used in identity theft (Steele, 2017).

Privacy risk may also include using collected information for commercial purposes (e.g. advertising) which can be viewed as a breach of trust or exploitation of personal information (Ayo, Atinuke, Adewoye, & Eweoya, 2016). Even in the absence of NFC pay, electronic transactions are said to deprive businesses and their customers of the anonymous purchasing. Receiving personalised advertisements or forfeiting anonymous spending may seem trivial, but research shows some consumers are more sensitive than others (Bailey et al., 2017). Those who possess pre-existing privacy concerns are unlikely to respond favourably to new technologies and instead transform those concerns into criticisms about system integrity (Morosan & DeFranco, 2016). These criticisms may then be valid if there is insufficient public evidence that the system or technology is capable of protecting privacy (Morosan & DeFranco, 2016). As a result, consumers may be reluctant to conduct contactless transactions due perceived consequences and an unwillingness to risk privacy breaches.

Cocosila and Trabelsi (2016) demonstrated that the overall risk of using NFC payment is a multifaceted construct which is strongly influenced by perceived privacy. Additionally, Makki et al. (2016) found that the influence privacy risk has on overall risk is positive and accounts for a significant proportion of behavioural intent. Therefore, it can be hypothesised that:

H1: Perceived privacy risk influences the overall risk associated with using contactless cards

Morosan and DeFranco (2016) observed that modern research incorporates contextual factors into empirical research to isolate the greatest influences on behaviour. They added that critical inhibitors are not well understood and must be explored to provide a balanced view of what hinders and encourages behaviour. Furthermore, that privacy and security are essential elements of the digital business environment which is characterised by recurrent data breaches, fraud and constant surveillance (Morosan & DeFranco, 2016). To ignore or underestimate the significance of privacy may encourage consumers to safeguard their personal information or avoid behaviours which are crucial to technology acceptance.

2.5.3 Perceived Performance Risk

Throughout technology acceptance studies, privacy risk is often paired with performance risk as the two most influential subsets of overall risk. This has been demonstrated with both E-Wallets (Khalilzadeh et al., 2017; Makki et al., 2016) and e-commerce (Featherman & Pavlou, 2003) while performance risk is considered the primary inhibitor of product trialling (Lutz & Reilly, 1974). Khalilzadeh et al. (2017) defined performance risk as the possibility of malfunctioning in a way which does not deliver the expected results it was designed or advertised to produce. Lutz and Reilly (1974) claim that if consumers perceive a high degree performance risk, then they will likely revert to options that have proven competency. For example, if E-Wallets performed poorly, then users would likely revert to card payments or in the event of card failure, revert to cash. Niranjan et al. (2016) explain that consumers are concerned with system breakdowns, input errors by cashiers and the aptitude of resolution in the event of a fault. Lee (2009) adds that these concerns make consumers apprehensive towards acceptance as faults during transactions can lead to financial loss. Hence, consumers must be confident that the technology and infrastructure is developed enough to deliver flawless transactions with virtually no chance of error (Shaw, 2015).

Cocosila and Trabelsi (2016) posit that consumers are likely to accept innovative technologies if they are useful, easy to use and deliver a high degree of performance. An assessment of performance risk is based on existing knowledge and a cognitive appraisal of functionality (Makki et al., 2016). Therefore, if users expect functionality issues during contactless transactions, then performance risks will be higher, which deteriorates ease-of-use and usefulness. This highlights the critical role of functionality in relation to consumer expectations and behavioural intentions (Morosan & DeFranco, 2016). Performance has shown to have the greatest influence on overall risk (Khalilzadeh et al., 2017) above privacy, financial, time and social risks (Featherman & Pavlou, 2003). Therefore, it is hypothesised that:

H2: Perceived performance risk influences the overall risk associated with using contactless cards

Consistent and reliable performance increases satisfaction which can lead to joy during transactions due to improved task efficiency (Khalilzadeh et al., 2017). Additionally, the more users worry about privacy and system performance, the less they will enjoy the experience (Khalilzadeh et al., 2017). Therefore, if GPNs wish to promote contactless cards, then high functionality and low performance risk must be included in communications to help users formulate positive perceptions towards use. This is also crucial for shifting consumers out of information gathering stages and into product trialling (Lutz & Reilly, 1974).

2.5.4 Perceived Security

Ensuring user privacy and functionality without error are important aspects for consumer acceptance; but none is more prevalent in NFC literature than perceived security. Krol et al. (2016) conducted interviews with consumers in the United States and the United Kingdom to provide a cross-cultural analysis of consumer perceptions towards contactless pay. Their results showed that 51% of current and prospective users regard security as their main concern, whilst 61% of those unwilling to accept do not consider it safe. Interestingly, 36% of respondents who had never used NFC pay indicated they would feel safe using it, whilst 60% of those who had trialled it felt the same. This further supports claims by Davis et al. (1989) and Patsiotis et al. (2013) that trialling contactless cards is the key to reducing perceived risks, increasing trust, and attaining the greatest likelihood of acceptance.

Respondents from Krol et al.'s (2016) study criticised the authorisation steps involved in contactless transactions, claiming they expose cardholders to accidental and fraudulent purchases. In fact, many were surprised that banks would encourage such a "*low-security payment method*". This refers to the lack of authentication involved in PIN-free transactions which exclude the traditional two-factors of protection. Most credit/debit card transactions comprise of two authentication factors; the card (i.e. something the user has) and the PIN (i.e. something the user knows) (Coskun et al., 2015). E-Wallets retain these two-factors which makes PIN-free cards seem less secure by comparison as possession becomes the only evidence of ownership.

Conceptually, perceived security is not based on objective measures of system integrity but rather the consumer's subjective beliefs (Mitchell, 1999; Morosan & DeFranco, 2016). Moreover, Kim et al. (2010) claims these security beliefs dominate the decision to accept or avoid transaction technology. Within perceived security are two judgements consumers must make prior to trialling. Firstly, the likelihood of fraudulent transactions occurring; and secondly, the capacity of the system to withstand attacks (Hayashi, 2012). Kim et al. (2010) points out that it is difficult for consumers to objectively evaluate NFC security based solely on the interface. Without objectively knowing the likelihood of a security breach, users must rely on their subjective impressions which can lead to anxiety (Aluri & Palakurthi, 2011). A global survey comprised of 2,000 consumers and 300 business executives across 12 nations revealed that 67% of respondents are sceptical of NFC security as they fear hackers are capable of stealing their money (Warner & Wright, 2017). Therefore, an amalgamated definition of perceived security is the subjective belief that contactless cards can withstand interruption, interception or exploitation made by malevolent parties attempting to defraud the user (Khalilzadeh et al., 2017; Kim, Chung, & Lee, 2011; Lee, 2009).

GPNs are aware of security fears and offer "*zero-liability*" clauses with contactless cards to assure consumers they will be refunded in the event of financial loss (MasterCard, 2017a). This may not be sufficient as loss-of-time risk has shown to have a significant influence on NFC acceptance (Featherman & Pavlou, 2003; Makki et al., 2016). If consumers perceive a loss-of-time will accompany refund procedures in the event of fraudulent transactions, then any time gained through faster transactions will be worthless. In light of recurrent recessions, millennials have communicated greater trust in technology providers for financial services rather than banks (Warner & Wright, 2017). Hence, many users may perceive refund procedures to be passively resisted by untrustworthy banks and therefore, time consuming which depreciates the value of zero-liability assurances. It is worth noting that the interchange rates set by GPNs are calculated to cover the cost of fraudulent transactions (MasterCard, 2017a). Meaning, merchants and consumers are paying a percentage on-top of their purchases to compensate for the losses incurred by fraudulent PIN-free transactions.

Theoretically, security refers to the capacity to withstand system breaches using sufficient defences. The consequences of a breach may include financial losses, the loss of secure payment methods or the loss of sensitive information (Ooi & Tan, 2016). Logically, perceived security is paired with overall risk as users who deem security defences to be insufficient will perceive a higher risk of use (Lim, 2003). Furthermore, perceived security contributes the greatest influence to overall risk, particularly in relation to electronic transactions (Kim, Qu, & Kim, 2009). Therefore, it is hypothesised that:

H3: Perceived security influences the overall risk associated with using contactless cards

Krol et al. (2016) claim that in the context of payment cards, perceived security shares a stronger association with actual use than with trust. There are studies that show perceived security has a direct influence on behavioural intent (Kim et al., 2010; Lee, 2009; Peng et al., 2012). Conversely, there is sufficient evidence that perceived security influences the trust that consumers require in order to accept E-Wallets, card payments and online purchasing (Khalilzadeh et al., 2017; Kim et al., 2010; Kim et al., 2011). This influence is based on the principle that systems failing to provide adequate protection will be treated with suspicion and doubt which erodes trust (Kim et al., 2010). Perceived security is part of a risk assessment prior to accepting NFC pay as system breaches can prevent users from accessing funds that service basic needs (Morosan & DeFranco, 2016). Hence, perceptions of security precede feelings of trust meaning risk and security are antecedents to trust. Furthermore, avoiding contactless cards may indicate scepticism over security and signify proactive risk avoidance.

2.5.5 Perceived Overall Risk

Performance and privacy risk along with perceived security are critical to overall risk which is a multifaceted construct (Featherman & Pavlou, 2003). Makki et al. (2016) note that few studies explore the various risk dimensions that constitute overall risk with regard to NFC acceptance. Hence, a theoretical contribution of this study is uncovering and testing the critical risk factors impeding acceptance. Consumer behaviour and information systems literature denotes overall risk as an inhibitor of technology acceptance (Peng et al., 2012). Cocosila and Trabelsi (2016) view perceived risk as a constituent of "*sacrifice*" or "*give*" in exchange for benefits. Practical benefits include shorter queuing times, faster payments and reduced mental effort during transactions which amount to the usefulness one might expect from NFC cards. In reference to Bauer (1960) and Ross (1975), risk includes feelings of uncertainty and the consequences of actions that cannot be fully anticipated. Therefore, overall risk can be defined as a multifaceted belief that denotes feelings of psychological uncertainty when consumers are unable to predict the outcome of an action.

Overall risk is often viewed as an antecedent to benefits and has proven to have a negative total effect on behavioural intent (Cocosila & Trabelsi, 2016). Amoroso and Magnier-Watanabe (2012) claim that perceived security and privacy are positively related to overall risk and negatively related to trust. Khalilzadeh et al. (2017) confirmed this showing that in the presence of uncertainty, the perceived risks of NFC acceptance will depreciate user trust which in-turn, weakens intent to use. Therefore, it is hypothesised that:

H4: Perceived overall risk influences the trust associated with using contactless cards

Overall risk differs from the risks discussed thus-far as it encapsulates general feelings of uncertainty not accounted for by perceived security, performance or privacy. These may include social, psychological, physical or time risks which may not be critical to NFC acceptance, but contribute to an individual's behaviour (Featherman & Pavlou, 2003; Wu & Wang, 2005). For example, although social risk does not influence NFC acceptance for the majority (Madureira, 2017) some consumers who value social affiliation may use it to guide their decision making. Thus, risk perception is contextual, meaning NFC acceptance will be largely driven by the primary variables mentioned, and partly driven by various risk factors relevant to the individual (Nunkoo & Ramkissoon, 2013). It is hoped that an overall construct which encapsulates general risk will capture any margin of error not accounted for by the antecedent constructs.

The key takeaway is the convergent influence performance and privacy risk along with perceived security have on overall risk. Ross (1975) argues that overall risk is a necessary antecedent of trust and that increases in perceived risk will depreciate trust. Likewise, a reduction in overall risk should accompany an increase and trust (Nunkoo & Ramkissoon, 2013). The antecedent relationship of perceived risks on trust has been demonstrated in NFC acceptance and is reapplied in this study.

2.5.6 Trust

Dutot (2015) notes that creating trust towards the parties involved in NFC payment systems is crucial for encouraging acceptance. He claims that trust includes a willingness to rely on the parties and technology, which is influenced by the degree of competency perceived by the user. Zhang et al. (2012) adds that trust refers to the belief that the technology is secure and poses no threat to privacy. Nunkoo and Ramkissoon (2013) argue that in relation to e-commerce, trust is a confident expectation that one's vulnerabilities will not be exploited. Two phrases which often accompany trust in NFC literature are reliability and expectation. Reliability derives from the assurance that contactless cards and the NFC system is competent, credible and will not be used opportunistically (Luarn & Juo, 2013; Ooi & Tan, 2016). Expectation stems from the confidence that the technology and system will fulfil their responsibilities by providing the service they are advertised to produce (Luarn & Juo, 2013). Thus, an amalgamated definition of trust is the subjective belief that the parties and objects involved in an activity can be relied upon to perform in accordance with expectations.

Trust is a gateway in acceptance theory between potential gains and avoiding losses (Kim et al., 2010). Cardholders must trust that the correct amount will be debited from their accounts and that the information exchanged, will not be compromised (Shaw, 2015). Luarn and Juo (2013) postulate that many consumers are distrustful of technological services due to a lack of knowledge regarding the internal mechanics. As mentioned, it is difficult for users to judge the security of a payment system based solely on the interface (Kim et al., 2010). Pavlou (2003) argues that trust reduces the need to understand, monitor and control these mechanics or the functions of a system. Users can be assured that the correct funds will be transferred, that the system will not be breached and feel no need to scrutinise transaction records. Alternatively, when trust is low, consumers must give substantial attention to these aspects which requires time and effort that depreciate ease-of-use (Pavlou, 2003). Hence, it can be hypothesised that:

H5: Trust influences the perceived ease-of-use associated with contactless cards

This influence has been demonstrated in NFC acceptance (Leong et al., 2013; Sam et al., 2014) and is one of three relationships trust shares with the endogenous variables shown in Figure 5.

As mentioned, trust involves a degree of faith that the parties involved in each transaction will not act opportunistically by exploiting the user's vulnerabilities (Nunkoo & Ramkissoon, 2013). Specifically, the theft of funds or distributing card information for fraudulent purposes. Teh et al. (2015) found that under certain circumstances, older consumers will not accept NFC technology, even if they perceive it to be useful. Hence, a lack trust may be a direct detriment on behavioural intent despite ease-of-use and perceived usefulness being known. Amoroso and Magnier-Watanabe (2012) note that trust is negatively related to perceived security, privacy and overall risk, whilst being positively related to behavioural intent. Furthermore, Dutot (2015) demonstrated that perceived security and privacy influence behavioural intentions through trust; whilst Luarn and Juo (2013) show that trust alone has a direct influence. Therefore, it is hypothesised that:

H6: Trust has a direct influence on the behavioural intent towards using contactless cards

Fang, Chiu, and Wang (2011) view trust as a mental shortcut used to reduce the uncertainty and complexity of accepting new payment methods. This can have a profound influence on behaviour as consumers and merchants have shown to accept insecure payment systems assuming they come from a reputable source (Kim et al., 2010). Pavlou (2003) claims that trust can be used to judge usefulness as the benefits of reduced queuing times and PIN-free transactions depends on the competency of the system and its providers. If contactless cards cannot be trusted to meet expectations, then there is little reason for consumers to expect any utility from use (Pavlou, 2003). Chircu, Davis, and Kauffman (2000) claim that if consumers do not trust a technology, then it will unable to provide value irrespective of objective capabilities. This relationship has been repeatedly demonstrated in NFC acceptance literature (Dutot, 2015; Leong et al., 2013; Sam et al., 2014) which allows for the following hypothesis:

H7: Trust has a direct influence on the perceived usefulness associated with contactless cards

Plenty of IS research has focused on trust as a prerequisite to e-commerce and the formation of business relationships (Peng et al., 2012). GPNs must inevitably form relationships with merchants if they are to successfully deploy contactless cards in prospective markets. Hence, trust will play a significant role in both merchant and consumer acceptance of contactless cards.

2.6 Proposed Model

The items derived from Davis et al.'s (1989) TAM and Venkatesh et al.'s (2003) UTAUT (Figure 5) are essential for estimating behavioural intent towards use. As discussed, perceived ease-of-use (PEOU) and perceived usefulness (PU) are influenced by trust and have a direct influence on behavioural intent. In context, PEOU is defined as the degree to which consumers believe using contactless cards will be free from physical and mental effort.

According to social cognitive theory, self-efficacy refers to the personal judgement one makes about their ability to perform the steps involved in a task (Ozturk, 2016). It affects the behaviours one chooses to make, the level of effort they are willing to give, and the amount of time they will spend overcoming obstacles (Ozturk, 2016). Makki et al. (2016) note that PEOU is dependent on whether there is a need to learn new skills when compared to other payment methods. Consumers must learn where to place their card, what distance from the terminal is appropriate and to recognise when payment has been received. Additionally, users must avoid routine behaviours such as swiping, inserting or entering PINs. In the event of low self-efficacy, consumers may be reluctant to learn these steps which will prevent contactless cards from being perceived as a useful. This principle allowed Leong et al. (2013) to view PEOU as an antecedent to PU as technology which is easy to navigate has a greater propensity to be considered useful. Furthermore, that PEOU has a stronger direct influence on PU than trust. Therefore, it is hypothesised that:

H8: Perceived ease-of-use has a direct influence on perceived usefulness

Venkatesh et al. (2003) explain that effort-orientated constructs are more important during initial acceptance when there are learning curves to overcome. Hence, PEOU has a small influence on BI which subsides over time as users become experienced and require more instrumental benefits (Karahanna et al., 1999). PEOU is thought to indirectly influence BI through PU; meaning ease-of-use is important, but is secondary to usefulness (Wu & Wang, 2005). Therefore, it is hypothesised that:

H9: Perceived ease-of-use has a small influence on the behavioural intent towards using contactless cards

Leong et al. (2013), Sam et al. (2014), Wu and Wang (2005) have all demonstrated that in an NFC context, PU has a strong direct influence on behavioural intent. PU can be defined as the degree to which consumers believe using contactless cards will improve their performance. Greater shopping efficiency, time saving and convenience are constituents of the improved performance gained from using contactless cards (Trütsch, 2014). These are incentives for consumers to exploit contactless cards and allows for the following hypothesis:

H10: Perceived usefulness has a direct influence on behavioural intent towards using contactless cards

Warner and Wright (2017) state that no matter the business or industry, consumers enjoy payment and transaction procedures the least, and would prefer the process to be invisible. Hence the simplified procedures of contactless transactions contribute to perceived usefulness which influences behavioural intent. As mentioned, the object of the TAM and UTAUT is to estimate the variance in behavioural intent towards using new technologies. BI can be defined as the strength of intention one has towards performing a specific behaviour (Amoroso &

Magnier-Watanabe, 2012). Additionally, it is a proxy for actual use, meaning the proposed model is a measure of strength each of the contributing factors has on the likelihood of using contactless cards.

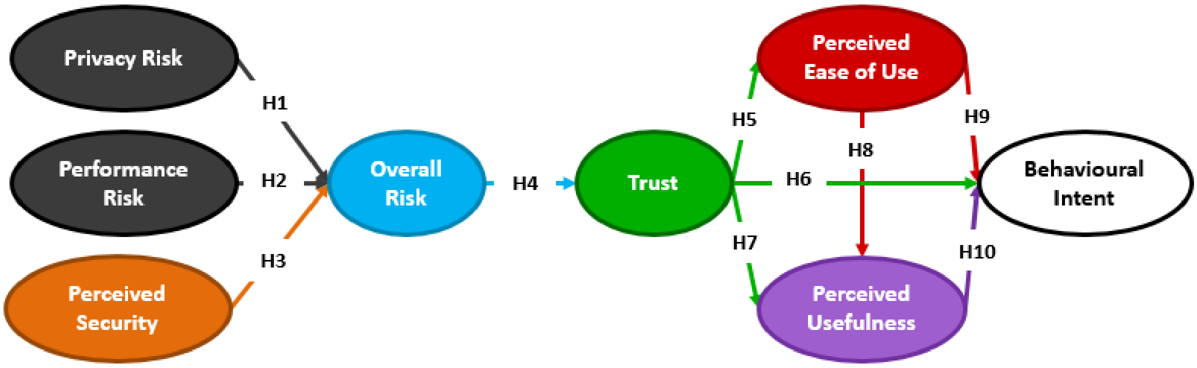

Figure 6: Theoretical Path Model with Hypotheses

2.7 Research Gaps

This study satisfies three gaps in NFC literature. Firstly, it is one of few to explore consumer perceptions towards contactless cards which have been overlooked despite recurring presence in global media (Kollmorgen, 2015). Secondly, it provides fresh insight into the slow uptake of E-Wallets by focussing on a precursor technology useful for prompting trial and familiarity with NFC payment. (Davis et al., 1989; Jamshidi & Hussin, 2016; Patsiotis et al., 2013). Finally, it consolidates key variables from numerous incomparable studies to formulate a holistic research framework designed for multinational case analyses (Madureira, 2017).

2.8 Chapter Summary

This chapter began by highlighting the research gap regarding consumer perceptions towards contactless cards. It provides insight into why E-Wallets have failed to attract consumer demand which has been the basis for many recent studies It outlined all critical components of the TAM and UTAUT to extract three endogenous variables which are vital for measuring technology acceptance. A brief overview of risk perception theory was followed by a detailed hypothesis development highlighting the five antecedent variables used in this study. Each construct of the proposed model was defined and discussed in relation to NFC acceptance to validate their selection. Demonstrated relationships were used to theorise ten hypotheses which form the structure of internal perceptions influencing acceptance. The following chapter outlines the methods used to obtain data for testing the proposed model.

Chapter 3: Methodology

3.1 Chapter Overview

This chapter begins by outlining the research design modelled from technology acceptance studies and risk perception theory. Theoretical arguments are used to justify the use of exploratory Partial Least Squares (PLS) SEM using reflective indicators. This is followed by the survey design which presents a finalised questionnaire along with screening procedures and demographic questions. Results from a pilot study are summarised followed by participant recruitment strategies and concluding remarks regarding methodology limitations.

3.2 Research Design

The variables shown in Figure 6 are not easily observable and require an empirical measurement approach which is straightforward for researchers replicating this study in other markets. Williams (2007) claims that quantitative research involves surveying and experimenting in order to build upon existing theories. As discussed, (section 1.3.1) this study builds upon Davis et al.'s (1989) TAM using variables that are relevant to NFC acceptance. Furthermore, explaining behavioural intent is a cornerstone of this study which suggests PLS-SEM may be a suitable approach. A key characteristic of quantitative research is the use of data to objectively measure reality or social phenomena (Williams, 2007). Consumer perceptions influencing the acceptance of contactless cards are a social phenomenon which may produce incomparable results if measured qualitatively. For instance, the vast majority of research exploring NFC acceptance have used quantitative analysis through SEM (Cocosila & Trabelsi, 2016; Dutot, 2015; Khalilzadeh et al., 2017; Makki et al., 2016; Niranjan et al., 2016; Teo et al., 2015). Additionally, the literature review revealed no studies using qualitative methods for examining NFC acceptance. Thus, an entirely new method and framework would need to be designed which is beyond the scope of this study. One of the research objectives is to create a simple and replicable framework to be applied in other markets. Hence, creating a qualitative framework may be feasible but impractical given current literature provides a reputable approach, relevant constructs and reliable indicators.

3.2.1 Exploratory vs Confirmatory Research

SEM is a multivariate application of statistical methods that simultaneously analyses multiple variables. It can be used to test the hypotheses of existing theories (confirmatory) or to search for patterns amongst data when there is limited information about how certain variables relate (exploratory) (Hair et al., 2014a, p. 3). The distinction is not always clear as a study may rely on existing theories and concepts (e.g. TAM) which resembles confirmatory. However, the same study may also explore whether additional independent variables are better predictors of outcome variables. Hence, testing the combined influence untested exogenous variables have on behavioural intent is unchartered territory, making this study exploratory by nature. Classifying this study as such is important as it helps to select between different styles of SEM relevant to different research contexts.

3.2.2 Partial Least Squares vs Covariance Based (CB) SEM

PLS-SEM is predominantly featured throughout NFC literature and enables researchers to study unobservable concepts (e.g. trust) using indicator variables (items). This contrasts CB-SEM which is equally valid but may not be suitable due to an objective of the study. For instance, Hair et al. (2014a) suggest that if the objective of applying SEM is to predict or explain the variance of target constructs, then PLS should be considered (p.14). An objective of this study is to explain the variance in behavioural intent towards using contactless cards. PLS achieves this by using data to estimate relationships between constructs with the goal of minimising error terms (residual variance) of endogenous variables. It estimates coefficients that maximise the R^2 of target constructs; which in this study, is behavioural intent towards use. Thus, PLS is a variance based approach to SEM which is ideal for explaining variance. It has the benefit of higher efficiency in parameter estimation when compared to CB, meaning a significant relationship found through testing a sample will reflect that which is significant in a population. Furthermore, it works well with small samples, complex models and non-normal data as it holds no distribution assumptions. Hair et al. (2014a) recommend checking items for skewness and kurtosis to assess normality in data. Assuming the data is non-normal, it is prudent to use PLS-SEM, particularly if the sample is small. The output from these tests are reported in the following chapter which partially validates the use of PLS-SEM henceforth.

3.2.3 Reflective vs Formative Indicators

Abstract, complex and unobservable (latent) variables such as perception and trust can be difficult to measure. Thus, SEM uses reflective and formative indicators which act as proxies for each construct. In PLS-SEM, an inner-model refers to the constructs of interest and paths between them (Figure 6), whilst the outer-model refers to the indicators and their relationships with constructs. Indicators are directly measured observations or raw data taken from survey respondents. Hair et al. (2014a) provide guidelines for deciding between reflective and formative outer models which considers whether constructs have an influence on indicators. According to classical test theory, reflective refers to measures that represent the effects or manifestations of an underlying construct (Hair et al., 2014a, p. 42). For example, the level of trust survey respondents have towards contactless cards will influence how they judge them in terms of trustworthiness. Hence, the construct of trust will influences the indicators (responses) making the model reflective.

In contrast, formative modelling involves indicators that capture specific aspects of a construct's domain (Hair et al., 2014a). Issues arise from the omission of items which has the potential to change the meaning of a construct as they contain causal influence. Special care must be taken in selecting indicators (survey questions) as a census rather than a sample of indicators must be used in order to accurately reflect each construct. The advantage of reflective modelling is that problematic indicators can be removed as the items are interchangeable (Hair et al., 2014a). This also means they will be highly correlated as the omission of one should cause a simultaneous change in all. The indicators used for this study are drawn from reflective modelling in NFC literature and hold demonstrated reliability (Dutot, 2015; Hua, Techatassanasoontorn, & Tan, 2013; Khalilzadeh et al., 2017; Ramos-de-Luna, Montoro-Rı´os, & Lie´bana-Cabanillas, 2016). Therefore, formative modelling is not present in this study as the items reflect a consequence of each construct, not a causal influence.

3.3 Survey Design

3.3.1 Screening Procedures

It is important that respondents possess awareness of contactless cards in order to form the perceptions that influence behavioural intent. As discussed, Jamshidi and Hussin (2016) studied credit card adoption and found that awareness was sufficient for influencing acceptance. Hence, the following screening question will separate those who are aware of contactless cards and have formed perceptions, from those who have no awareness and are therefore unsuitable.

Question 1: Visa payWave and MasterCard PayPass are chips embedded into debit and credit cards allowing you to wave your bank card near a reader in order to make an instant purchase. Are you aware of this technology?

Those who answer yes will able to continue, whilst those who do not will be excluded from the survey at this point.

A key issue is isolating survey respondents that depend on local payment methods, from those who are accustomed to foreign methods. For example, markets such as Korea, Japan, Taiwan and Singapore have a greater affinity towards E-Wallets (Zhang et al., 2012). Hence, temporary visitors from these markets may share positivity bias towards NFC pay due to personal experiences formed outside of New Zealand. As a result, responses from temporary visitors may skew survey data towards an outcome that does not accurately reflect how typical New Zealand consumers perceive contactless cards. Madureira (2017) states that each market must be measured separately due to situational variables, whilst responses must be free from bias formed outside of the target market. To combat this, a screening question which filters short-term visitors from long-term residents is applied.

Permanent residents and citizens are assumed to be acclimated to their payment environment, meaning they will likely rely on local payment methods. In contrast, visitors on working holidays or student visas may rely on unconventional or temporary payment systems which cover the length of their stay. New Zealand working visas cover 12-24 months whilst student visas reach up to 4 years (Immigration New Zealand, 2017). As most New Zealand tertiary degrees take 3 years to complete, it is safe to assume that respondents remaining after 3 years have adapted to the payment system and rely on their own judgement of payment methods. Therefore, the following screening question is included:

Question 2: Have you lived in New Zealand for the past 3 years?

Those who answer yes will able to continue whilst those who do not will be excluded from the survey at this point. Three demographic questions are also included which determine age, gender and education level along with two questions regarding usage frequency and purchase type (Appendix 1). Specifically, how often respondents use contactless cards and what they purchase during use.

3.3.2 Questionnaire Development

Hair et al. (2014a) claim that a suitable Likert scale for measuring latent variables should present symmetry across a neutral centre point (p. 9). For this reason, a 7-point Likert scale stretching from "*Strongly Disagree*" (1) to "*Strongly Agree*" (7) is applied to create an interval scale. This scale is routinely applied in NFC acceptance studies and produces dependable results (Cocosila & Trabelsi, 2016; Khalilzadeh et al., 2017; Makki et al., 2016; Ramos-de-Luna et al., 2016). Respondents will answer 4-7 questions per construct which act as reflective indicators. All questions are adapted from existing NFC acceptance studies (Table 4) and undergo reliability and validity testing in the following chapter.

Table 4: Measurement Items for Model Constructs

Code	Indicators (items)	Adapted from
	Perceived overall Risk	
PoR1	Using contactless cards to make payments involves very little risk	(Ho & Pham, 2014)
PoR2	In general, using contactless cards is risk-free	(Bailey et al., 2017)
PoR3	When compared with other payment methods, contactless cards have few uncertainties	(Ozturk, 2016)
PoR4	Overall, using contactless cards does not expose me to risk	(Featherman & Pavlou, 2003)
	Perceived Privacy Risk	
Pri1	When using contactless cards, my private information is unlikely to be used for other purposes	(Bailey et al., 2017)
Pri2	Using contactless cards does not involve a loss of privacy as my information cannot be used by others	(Cocosila & Trabelsi, 2016)
Pri3	When using contactless cards, the chances of losing control over my private information is low	(Makki et al., 2016)
Pri4	Hackers (criminals) are unlikely to take control of my private information if I use contactless cards	(Featherman & Pavlou, 2003)
	Perceived Performance Risk	
Per1	The probability of contactless cards failing to perform properly is low	(Khalilzadeh et al., 2017)
Per2	Contactless cards tend to perform well which eliminates any problems during transactions	(Khalilzadeh et al., 2017)
Per3	Considering their high level of performance, using contactless cards is relatively risk-free	(Khalilzadeh et al., 2017)
Per4	The equipment used to process contactless transactions is unlikely to fail resulting in payments being processed incorrectly	(Featherman & Pavlou, 2003)
	Perceived Security	
Sec1	I believe contactless cards are secure	(Kim et al., 2010)
Sec2	There are enough safeguards to ensure contactless card transactions are secure	(Hua et al., 2013)

Sec3	Security concerns don’t affect my decision to use contactless cards	(Sam et al., 2014)
Sec4	My personal information is secure when using contactless cards	(Khalilzadeh et al., 2017)
	Trust	
Tru1	I believe contactless cards are trustworthy	(Hua et al., 2013)
Tru2	When using contactless cards, I trust my transactions will be completed without error	(Luarn & Juo, 2013)
Tru3	If my card is stolen, I am protected against fraudulent transactions	(Leong et al., 2013)
Tru4	Overall, contactless cards are a reliable way to pay	(Luarn & Juo, 2013)
	Perceived Ease of Use	
PEOU1	Learning to use contactless cards is easy	(Dutot, 2015)
PEOU2	Using contactless cards is clear and understandable	(Dutot, 2015)
PEOU3	It’s easy to become skilled at using contactless cards	(Dutot, 2015)
PEOU4	I find it simple to use contactless cards	(Ozturk, 2016)
	Perceived Usefulness	
PU1	Using contactless cards makes me more productive	(Dutot, 2015)
PU2	Using contactless cards makes transactions easier	(Ramos-de-Luna et al., 2016)
PU3	Contactless cards are a useful payment method	(Ramos-de-Luna et al., 2016)
PU4	I find contactless cards to be useful during shopping	(Luarn & Juo, 2013)
	Behavioural Intent and Referral	
BI1	Given the chance, I will use contactless cards again	(Leong et al., 2013)
BI2	I plan on using contactless cards in the future	(Makki et al., 2016)
BI3	If possible, I intend to increase my use of contactless cards	(Luarn & Juo, 2013)
BI4	I will use contactless cards whenever possible	(Morosan & DeFranco, 2016)
BIR1	I will recommend that others use contactless cards	(Hua et al., 2013)
BIR2	I am willing to share my experience of contactless cards with friends and family	(Chen & Chang, 2013)
BIR3	At a point of sale, I will recommend that others use contactless cards	(Morosan & DeFranco, 2016)

3.4 Pilot Survey

A simple pilot study was used to ensure the questionnaire is clear and simple to navigate. Twenty student participants were randomly selected from the University of Canterbury and asked to comment on length, terminology and clarity of questions. Convenience sampling was used to acquire 9 male and 11 female with only minor adjustments being made to the items. The most significant of which was providing examples that improve clarity. For item PoR1, examples of risk where added which pertain to a "*loss of personal information or funds*". For item PoR4, examples of risk were added that include "*card theft or skimming*". Examples of "*other purposes*" were added to item Pri1 which include "*tracking purchasing behaviour*" which could be perceived as a breach of privacy. Furthermore, clarity of what constitutes "*productive*" was an issue for item PU1. Hence, PU1 was elongated to "*Using contactless cards makes me a more productive person or shopper*". Finally, feedback on the length of the survey was positive and the simplicity of the questions was commended.

3.5 Ethical Considerations

The final survey was submitted to the University of Canterbury Human Ethics committee for assessment. Minor adjustments were made which allowed respondents to complete the survey anonymously. All measures and demographic questions remained intact and the survey received notarised approval on the 15th August 2017 (Appendix 2).

3.6 Sampling and Data Collection

Exploiting convenience sampling by surveying students is a common strategy in NFC acceptance studies (Bailey et al., 2017; Dutot, 2015; Hua et al., 2013; Leong et al., 2013; Sam et al., 2014; Teo et al., 2015). These studies acknowledge the limitations of surveying students and conclude that their results do not reflect consumer populations due to a narrow sampling foci. A key weakness is the inadequate age variation in respondents due the relatively young age of many tertiary students. Hence, this study aims to collect a broad range of respondents that accurately reflects the age variation found in consumer markets. The questionnaire was posted online using a digital survey platform (Qualtrics, 2017), making it accessible to consumers nationwide. Research from the Auckland University of Technology estimates internet usage at 90% of New Zealanders in 2015, meaning an online survey is a reasonable strategy for sourcing a broad range of consumers (Smith, Bell, Miller, & Crothers, 2016). Furthermore, Nielsen data from 2017 reports that 56% of New Zealanders, from an even range of age groups, visit Facebook every month (Mosh, 2017), making it an optimal website for attracting participants. This site has the advantage of cost effective advertising, free membership and broad reach in the New Zealand market.

The data collection period ran from August 15th to October 31st 2017 using a variety of methods. Firstly, a custom-made Facebook profile was crafted which included an instructional video on how contactless cards work, links to the online survey and a description outlining the overall research aim (no longer accessible). Paid Facebook advertising was used to target New Zealanders, above the age of 18 and without gender specification. An additional, eighty A3 poster containing the same information as the Facebook profile were printed and distributed to public and private locations around Christchurch city (Appendix 3). Locations included supermarkets, retirement facilities, university campuses and polytechnics. An additional three hundred flyers (identical to the posters) were printed and delivered to mailboxes in the Somerfield district of Christchurch. This area was selected based on the high proportion of aged care facilities occupied by older citizens. The objective being to attract older respondents not present on Facebook or tertiary campuses. However, older consumers are present on Facebook as recent Nielsen data revealed that over 70% of New Zealanders aged 45-54, 55-64 and 65+ are active users. As a secondary strategy for attracting older respondents, the survey was offered to New Zealand's Grey Power Association; a nationwide union of citizens aged 50 and older who collaborate on social issues including those which impact retirees (Grey Power, 2017). The survey was successfully accepted and made available to members through private channels.

3.7 Sample Size Requirement

In order for the model to render meaningful results, a suitable quantity of responses must be used. Hair, Hult, Ringle, and Sarstedt (2014a) recommend the "*ten times rule*" which states the number of respondents should be at-least ten times the number of pathways pointed at any particular construct. The proposed model contains 3 independent predictors leading to overall risk and behavioural intent, meaning a minimum sample of 30 would suffice. Furthermore, Hair, Hult, Ringle and Sarstedt (2017) provide sample size requirements based on the theoretical underpinnings of ordinary least squares regression. If applying their guide to proposed model, attempting to detect an R^2 of 0.80 using significance levels of 0.10, 0.05 or 0.01 would be satisfied with a sample of $N \geq 169$ (p. 26). Thus, the acquired sample of 587 usable responses exceeds the minimum requirements for detecting meaningful results.

3.8 Methodology Limitations

Each construct contains similarly phrased measures necessary for portraying internal perceptions. As a result, respondents may recognise the intended relationships between items and arbitrarily agree (or disagree) with each statement at the expense of genuine beliefs (Watson, 1992). Thus, items which are grouped together (as shown in Table 4) suffer acquiescence bias and low engagement as respondents decipher the pattern of questions. Goodhue and Loiacono (2002) demonstrated that despite the rigour of TAM and UTAUT measures; labelled items presented together produce an artificially inflated Cronbach's alpha whilst intermixing items yields modest improvements in reliability. Hence, this study exploits the randomisation feature of Qualtrics surveys, making the order of items unique to each respondent. Furthermore, each question is presented separately to further combat acquiescence and straight-lining bias.

Straight-lining refers to survey responses, whereby the respondent provides little variation or the same answer for each question. This is detectable using the Standard Deviation (SD) of responses against the sample mean. Respondents displaying a SD of zero are engaged in straight-lining; most likely to finish the survey quickly or access incentives (Leiner, 2013). Respondents of this study are pooled into an anonymous prize draw for shopping vouchers which is only accessible upon completing the survey. Hence, straight-lining is a cunning strategy for accessing the prize draw without engaging the questionnaire. Two post hoc strategies are used to identify and remove straight-liners before the final analysis. Firstly, all construct data is paired with a corresponding SDs using Microsoft Excel 2013 to isolate zero values. Secondly, Qualtrics results include time taken to complete the survey. Results from the pilot survey estimate completion time at 8-10 minutes, meaning a significantly lower time may signify straight-lining and low engagement. The results of these removals are reported in Chapter 4, section 4.2.1.

Participant lethargy and dropout are recurring challenges for studies involving a high number of measurement items. Hoerger (2010) estimates an immediate dropout of 10%, particularly in relation to web based surveys. Hair et al. (2014a) recommend using mean replacement to substitute missing values, assuming the quantity absent does not exceed 5% of the total responses (p. 70). The results and quantity of removals can also be found in section 4.2.1.

Using posters and flyers to advertise the survey is a definite weakness of this study. Primarily because they were only available to people present in Christchurch during the time of the survey. As a result, this study is not considered representative of a population as convenience sampling was involved. In response, paid Facebook advertising was used to capture participants outside of Christchurch which did not neglect rural communities who may possess valuable insight. However, it is precarious to assume all respondents were present in New Zealand during the time of the survey, meaning responses may have come from any country. Thankfully, Qualtrics reports the IP addresses of respondents which can be traced using tracking software (InfoByIP, 2017). The results indicate which country each respondent dwelt during their attempt, although it is not area specific. Responses made outside of New Zealand are carefully considered before discarding and reported in section 4.2.1.

The usage question shown in Appendix 1 asks respondents which products they purchase using NFC which helps to delineate the exact behaviour consumers have towards contactless cards. This is valuable as the New Zealand statistics department does not provide data on product categories specific to contactless transactions which prevents researchers exploring secondary data (Statistics New Zealand, 2016). The categories selected for this question are based on routine purchases below the NZ$80 PIN-free payment threshold and popular products choices across similar markets (Ossolinski et al., 2014). An additional category "*Other, specify*" was included to allow respondents to add missing product types not featured in these options.

Finally, the current demographic questions gather limited information which could be improved by including income, location, occupation, marital status, immediate family composition and competence with digital technology. However, the current survey contains 40 questions with an estimated time of 8-10 minutes. Extending the questionnaire introduces a greater risk of response lethargy and dropout rates which are unjustifiable given the objectives of the study. Key focus areas are explaining behavioural intent and testing the value of the proposed model, constructs and items. Assuming the model is suitable for further research, it may be prudent to include such questions, but there is little value given the scope of this study.

3.9 Chapter Summary

This chapter provides a brief overview of the methodology and analysis procedures for this study. PLS-SEM has been selected due to exploratory and explanative research objectives. Reflective indicators are used which are repurposed from previous studies due to demonstrated reliability. Screening procedures have been summarised to ensure the correct participants are selected along with the strategies used to attract respondents. Finally, premeditated limitations have been described along with the strategies used to reduce bias.

Chapter 4: Analysis and Results

4.1 Chapter Overview

This chapter explores the data collected from 587 usable survey responses. It begins with data screening and cleaning to ensure the best quality responses are used. Intergroup comparisons are made using non-parametric tests due to distribution violations, along with a demographic overview of respondents. SmartPLS version 3.2.7 is used to fit the data to the proposed model which is tested for reliability and validity prior to an assessment of inter-construct relationships. Finally, the analysis concludes with the results of hypothesis testing and an empirical assessment of the model's ability to explain the constructs deemed relevant in the literature review.

4.2 Data Screening

4.2.1 Problematic Data and Removals

Table 5 displays the quantity of responses removed prior to analysis due to the violations described.

Table 5: Problematic Data and Removals

N = 801	Violation
108	Did not reside in New Zealand in the past 3 years
71	Did not complete the survey (dropout)
26	Straight-lining (SD of zero)
4	Where unaware of contactless cards
3	IP addresses did not belong to New Zealand
2	Did not agree to the terms and conditions
214	Total responses removed
587	Total responses remain

As mentioned, Hoerger (2010) estimates the participant dropout rate at approximately 10%, which holds true for this study at 8.86%. Hair et al. (2014a) recommends using mean as a substitute for missing values, assuming the quantity does not exceed 5% of the total survey. This does not apply to the 71 dropout respondents as none stayed within the 5% threshold for mean replacement; hence, all remaining surveys were completed.

4.2.3 Skewness and Kurtosis

Measuring the skewness and kurtosis of measurement items is a typical data screening procedure prior to SEM analysis. Skewness values greater than 1, or less than -1, are considered positively or negatively skewed and thus non-symmetric in distribution (Hair et al., 2014a). Meaning, the answers provided by respondent's trend towards strongly positive or strongly negative with regard to contactless cards. Additionally, kurtosis values greater than 1, or less than -1, are considered either leptokurtic or platykurtic. Meaning, responses are concentrated around a neutral central tendency or show a fairly level spread of responses with no obvious trend. A simple analysis using IBM SPSS version 23 reveals the following violations:

Table 6: Skewness and Kurtosis Violations

Item	Skewness	Kurtosis
Tru2	-1.038	
Tru3		-1.093
PEOU1	-1.836	4.472
PEOU2	-1.234	1.957
PEOU3	-1.509	2.514
PEOU4	-1.631	3.419
PU2	-1.573	3.071
PU3	-1.284	1.571
PU4	-1.360	1.746
BI1	-1.221	0.999
BI2	-1.278	1.194

Clearly the respondents consider contactless cards easy to use, but these violations also suggest CB-SEM may not be suitable for this data. Non-normal data inflates the standard errors from bootstrapping which decreases the likelihood of some relationships being deemed significant (Hair et al., 2014a, p. 54). Although non-normal data is an exploited excuse for selecting PLS over CB-SEM (Hair, Sarstedt, Hopkins, & Kuppelwieser, 2014b; Reinartz, Haenlein, & Henseler, 2009), Sarstedt, Ringle, and Hair (2017) warn that researchers should use more meaningful arguments which are outlined in section 3.2. Finally, Hair et al., (2014a) emphasise that in the event of large samples (≥250) and generous indicators per construct (≥4), PLS and CB render similar results which certainly applies to this study (p. 23).

4.3 Descriptive Statistics

4.3.1 Demographic Composition

Table 7 contains the demographic composition of respondents which are compared in the following sections.

Table 7: Demographic Statistics

	Frequency	%
Gender		
Male	236	40.2
Female	348	59.3
Other	3	0.50
Age		
18-24	338	57.6
25-34	100	17.0
35-44	84	14.3
45-54	46	7.80
55+	19	3.20
Education		
High School	286	48.7
Trade Certificate or Diploma	85	14.5
Undergraduate Degree	148	25.2
Postgraduate Degree	54	9.20
None	14	2.40

4.3.2 Usage by Gender

Respondents were asked to report their use of contactless cards for all transactions beneath the New Zealand PIN-free payment threshold ($80) in a typical week. The total responses are shown in Table 8 which raises further questions regarding differences in age and gender. Kolmogorov–Smirnov and Shapiro–Wilk tests using SPSS reveal that the data distributions are non-normal for both males $D(236) = 0.232$, $p < 0.001$ and females $D(348) = 0.171$, $p < 0.001$. Furthermore, a Levene's test shows the variances between genders differs slightly, $F(1, 582) = 4.242$, $p = 0.40$ meaning homogeneity variances is not met according to the mean.

However, according to the median F(1, 582) = 3.667, p = 0.56 results show that homogeneity requirements are met (Appendix 4).

Table 8: Weekly Contactless Card Usage for Low Value Transactions

% of time	Frequency	%
0	63	10.7
1-39	122	20.8
40-59	141	24.0
60-99	175	29.8
100	86	14.7

Given the data is ordinal and the distributions are non-normal, it is appropriate to use Mann–Whitney U to test for usage differences based on gender. The Monte Carlo method was applied due to the large sample size with full results shown in Appendix 4. The value of the mean rankings show that males (318.18) have a higher usage frequency than females (275.09) with regard to low value transactions. The following was used to estimate effect size (Field, 2009).

$$r = \frac{Z}{\sqrt{N}} \qquad \frac{-3.113}{\sqrt{587}} = -0.128$$

Male users (Mdn = 4) are significantly more likely to use contactless cards for under $80 transactions than females (Mdn = 3), U = 35004, z = −3.113, p = 0.002, r = −0.128. With such a small effect size, it is fair to say that the usage difference between males and females is significant but miniscule.

4.3.3 Usage by Age

Figure 7 displays the usage frequency based on respondent age categories. A visual inspection suggests ages 25-34, 35-44 and 45-54 contain a fairly normal distribution of usage. Normality tests and the Monte Carlo method were reapplied followed by a Kruskal–Wallis test that reveals the frequency of use is not significantly different between these groups H(2) = 4.85, p = 0.090 (Appendix 5). Mann–Whitney U tests were applied post hoc using a Bonferroni correction; meaning all results were compared using a 0.0167 significance level (0.05/3 tests) (Appendix 6). This confirmed that there is no significant usage difference between ages 35-44 (U = 4144, r = -0.012) and 45-54 (U = 1870, r = -0.155) when compared with ages 25-34. Furthermore, no difference was found when comparing ages 35-44 and 45-54 (U = 1503.5, r = -0.189).

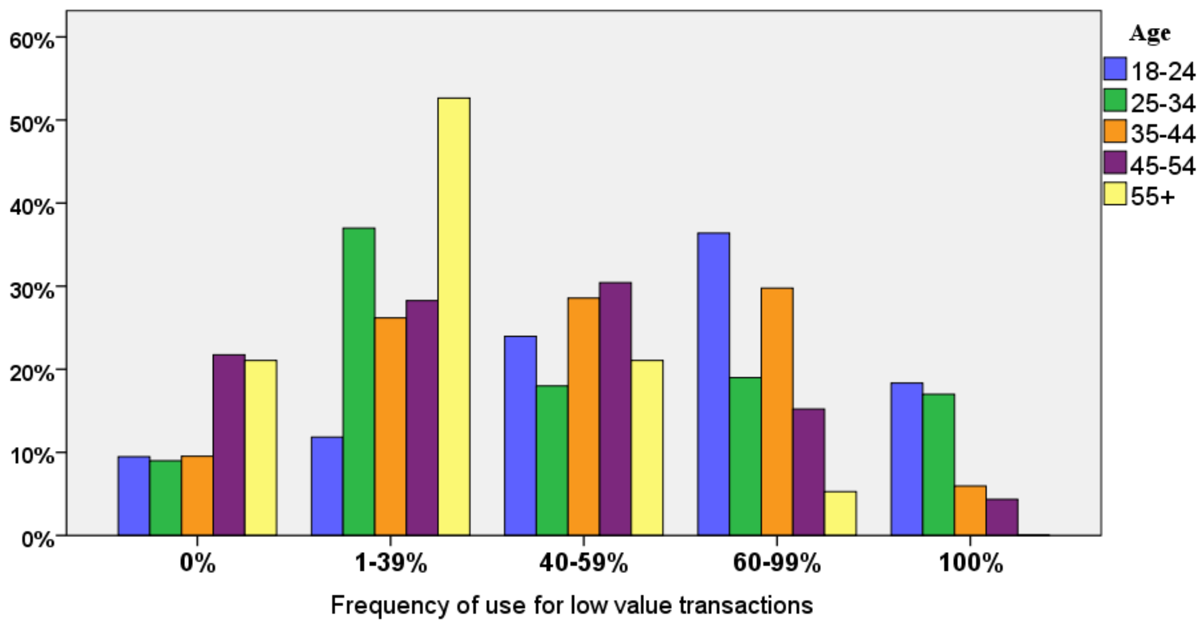

Figure 7: Usage Frequency by Age

Most noticeably, ages 18-24 have the greatest propensity to use contactless cards, with 54.7% indicating they use it for 60-100% of their low value transactions. Furthermore, 73.7% of respondents aged 55 and older report using contactless cards for 0-39% of their low value transactions. This result polarises the behaviour of ages 18-24 but should be treated with caution due the low quantity of older respondents.

4.3.4 Product Purchase Type

Table 8 reveals that 89.3% of respondents use contactless cards for at-least 1% of their low value transactions. This should indicate to prospective researchers and stakeholders that the large majority of New Zealand consumers who are aware of contactless cards are actively using. Respondents were asked to identify what products they typically purchase using contactless cards with the results shown in Table 9. Supermarkets items (84.0%) standout as the most popular choice followed by takeaways (69.3%). Café items (68.1%) and petrol (60.5%) are also prominent choices which confirms that NFC pay is most relevant for retailers dealing with high customer turnover (Timetric, 2013). This confirms claims by Krol et al. (2016) that users opt for PIN-free transactions in order to limit their transaction and queuing times. This also suggests that consumers will forego two-factor authentication in order to access these benefits. Perhaps EFTPOS and PINs are a logical choice in terms of fees, retailing costs and perceived security. However, these preliminary results indicate that convenience is a strong motivator of use.

Table 9: Product Categories typically purchased using Contactless Cards

Product Type	Frequency	%
Nothing	51	8.70
Café Items	400	68.1
Supermarket Items	493	84.0
Petrol	355	60.5
Alcohol	215	36.6
Clothing	325	55.4
Takeaways	407	69.3
Other		
Anything or Everything	19	3.24
Household Items	6	1.02
Pharmaceuticals	3	0.51
Vending Machines	2	0.34

4.4 Validity and Reliability of Measurement (Outer) Model

4.4.1 Indicator Reliability

Outer model loadings are the focus of reflective modelling and represent the contribution each indicator has towards their associated construct (Garson, 2016). Loadings vary from 0 to 1 whilst larger loadings reflect a stronger and more reliable measurement model. Hair et al. (2014a) recommends a minimum of 0.708 for outer loadings whilst lower scores should be considered for removal supposing it improves composite reliability. A reliability analysis using SPSS reveals the improvement to Cronbach's alpha (α) gained from removing these items.

Table 10: Problematic Item Loadings

Item	Loading	α	Alpha if item deleted
Pri1	0.704	0.761	0.729
PoR3	0.611	0.790	0.828
Tru3	0.563	0.776	0.813
BIR2	0.650	0.931	0.940

Items Por3, Tru3 and BIR2 have been removed from further analysis. The remaining items which satisfy the 0.708 reliability threshold (Hair et al., 2014a) are shown in Table 11.

Table 11: Reliability and Validity Statistics for Measurement Model

Item	Loadings	Mean	Grand Mean	SD	α	CR	AVE	VIF
Pri2	0.833	4.02		1.544				
Pri3	0.828	4.02		1.602				
Pri4	0.754	3.71	3.92	1.647	0.730	0.847	0.649	2.335
Per1	0.770	4.27		1.496				
Per2	0.811	4.36		1.429				
Per3	0.810	3.91		1.469				
Per4	0.745	4.90	4.36	1.424	0.796	0.865	0.616	2.541
Sec1	0.883	5.06		1.389				
Sec2	0.850	4.34		1.551				
Sec3	0.761	4.40		1.423				
Sec4	0.813	4.39	4.55	1.602	0.846	0.897	0.685	3.038
PoR1	0.844	4.37		1.544				
PoR2	0.871	4.57		1.747				
PoR4	0.873	4.57	4.50	1.398	0.828	0.897	0.744	1.000
Tru1	0.853	4.66		1.489				
Tru2	0.816	5.28		1.404				
Tru4	0.890	5.27	5.07	1.425	0.814	0.890	0.729	2.347
PEOU1	0.823	6.12		1.092				
PEOU2	0.827	5.84		1.130				
PEOU3	0.804	5.90		1.252				
PEOU4	0.858	6.07	5.98	1.108	0.847	0.897	0.686	2.528
PU2	0.889	5.90		1.201				
PU3	0.889	5.76		1.303				
PU4	0.897	5.72	5.79	1.331	0.871	0.921	0.795	3.708
BI2	0.868	5.64		1.451				
BI3	0.881	4.92		1.629				
BI4	0.890	5.26		1.685				
BIR1	0.891	5.05		1.577				
BIR3	0.852	4.79	5.13	1.577	0.925	0.943	0.768	

4.4.2 Indicator Mean and Standard Deviation

Table 11 displays the means of each item and the grand means of constructs based on a 7-point Likert scale. Additionally, all responses fell within 2 standard deviations of their respective means suggesting that perceptions towards contactless cards are fairly uniform. Overall, respondents either agree or were neutral towards each question which is important given items was positively phrased. Compiling a questionnaire with only positive items can cause acquiescence bias, however, inter-mixing positive and negative items damages internal consistency (Salazar, 2015). Additionally, acquiescence bias was treated by screening SD scores for straight-lining and removing such responses. A construct mean of approximately 4 indicates that respondents neither agreed nor disagreed which certainly applies to performance (M = 4.36) and privacy risk (M = 3.92). Respondents feel neutral towards the possibility of a system failure or privacy breach which may be attributed to uncertainty. Without a historic account of performance failures or privacy breaches, users remain open to the possibility that either could occur with no amount of certainty.

The item means for Per3 (M = 3.91) and Per4 (M = 4.90) are the most dissimilar amongst all inter-item comparisons. Respondents somewhat agree it is unlikely contactless cards will fail to perform properly (Per4), but are not convinced they perform to a high enough standard to be risk-free (Per3). Again, this can be attributed to uncertainty as this is a relatively new technology and users are yet to experience any consequences of poor performance. As seen by their associated grand means, respondents somewhat trust contactless cards (M = 5.07) and share somewhat of an intention to use or refer others towards use (M = 5.13). Finally, at-least 70% of respondents agree or strongly agree that contactless cards are easy to use (M = 5.98) and are a useful payment method (M = 5.79). This percentage is based on frequencies and gives an indication on how respondents typically view contactless cards.

Arguably, consumers are using objective criteria to evaluate contactless cards, in spite of personal beliefs. Respondents have a neutral stance on the possibility of performance failures or privacy breaches due to a lack of evidence. Likewise, whether consumers use or disapprove of contactless cards, they can equally recognise the ease-of-use and usefulness. If consumers were decidedly for or against, one might expect to see a sizable division in average responses (bimodal), or perhaps a high degree of skewness. Thus, this is a new technology that consumers have yet to fully commit-to or condemn. They use objective criteria to evaluate their perception of contactless cards, in spite of distrust or perceived risk.

4.4.3 Internal Consistency Reliability

Traditionally, Cronbach's alpha provides an estimate of reliability based on the inter-correlations between items. However, it assumes all indicators are equally reliable and tends to underestimate internal consistency reliability (Hair et al., 2014b). Some researchers consider Composite Reliability (CR) a more appropriate measure (Hair et al., 2014a) with a criterion of 0.7 to 0.95 for reliability standards (Sarstedt, Ringle, & Hair, 2017). Typically, Cronbach's alpha reflects the lower-bound of internal consistency whilst CR reflects the upper-bound (Sarstedt et al., 2017). Hence, researchers should report both as shown in Table 11. Additionally, Sarstedt et al. (2017) claim CR scores above 0.95 are problematic as they indicate the items are identical and subsequently redundant. As shown (Table 11) all alpha and CR scores dwell within 0.730 and 0.943 meaning internal consistency reliability standards are met.

4.4.4 Convergent Validity

Convergent validity refers to the extent to which each construct converges on its indicators by explaining the item's variance (Sarstedt et al., 2017). This can be tested using Average Variance Extracted (AVE) scores which represent the grand mean of squared loadings from a set of indicators (Hair et al., 2014b). An AVE > 0.50 is a minimum requirement and confirms that a construct explains more than half of the variance of its associated indicators (Hair et al., 2011). As shown (Table 11) all AVE scores are well above the minimum 0.50 threshold whilst outer-loadings are above 0.708. Hence, convergent validity requirements are met.

4.4.5 Discriminant Validity

Discriminant validity refers to the degree to which a construct is distinct from others and measures that which is intended (Hair et al., 2014b). There are two strategies for assessing discriminant validity which include the Fornell-Larcker criterion and examining the cross-loadings between items. The Fornell-Larcker criterion demands that the square root of any AVE must be greater than its correlation with any other construct (Garson, 2016). That is, the variance shared between a construct and its indicators is greater than the variance it shares with other constructs (Hair et al., 2011). Preliminary results show that items PU1 and Pri1 overinflate the correlation with their corresponding constructs impeding discriminant validity. Thus, both items were removed from the analysis whilst the finalised results are shown in Table 12. AVE scores are shown in Table 11 whilst the square root of AVE values are bolded on the descending diagonal in Table 12.

Table 12: Fornell-Larcker Cross-Tabulation Matrix

	Pri	Per	Sec	PoR	Tru	PEOU	PU	BI
Pri	**0.806**							
Per	0.672	**0.785**						
Sec	0.736	0.761	**0.828**					
PoR	0.732	0.715	0.777	**0.863**				
Tru	0.623	0.782	0.793	0.648	**0.854**			
PEOU	0.381	0.549	0.486	0.338	0.611	**0.828**		
PU	0.469	0.634	0.617	0.443	0.757	0.777	**0.892**	
BI	0.567	0.713	0.754	0.621	0.805	0.626	0.827	**0.877**

Pri = Privacy | Per = Performance | Sec = Security | PoR = Perceived overall Risk
PEOU = Perceived Ease of Use | PU = Perceived Usefulness | BI = Behavioural Intent

The second strategy is to examine the cross-loadings between indicators and assess whether items correlate highest with their associated constructs (Hair et al., 2011). Theoretically, items should load highest with their associated construct which is demonstrated in Appendix 7. Thus, according to the Fornell-Larcker criterion and the correlations between items, requirements for discriminant validity are met. These strategies are modelled from current studies that successfully integrate Davis et al.'s (1989) TAM and PLS-SEM into marketing (Mendes-Filho, Mills, Tan, & Milne, 2017) and management research (Bailey et al., 2017).

4.5 Evaluating the Structural (Inner) Model

4.5.1 Multicollinearity in Reflective Modelling

According to Garson (2016), multicollinearity occurs in ordinary least squares regression when two or more independent variables are highly inter-correlated. It inflates standard errors making significance testing between such variables unreliable (p. 71). Garson (2016) recommends that inner model variance inflation factor (VIF) scores dwell below 4 in order to satisfy collinearity issues. Preliminary analysis reveals that removing item BI1 corrects overinflated VIF values for items BI2, BI4 and BIR1. Hence, item BI1 was removed allowing all remaining VIF scores to satisfy the recommended threshold (Table 11).

The proposed model (Figure 6) using the finalised items in Table 11 were analysed using SmartPLS to produce the associated R^2 values and path coefficients shown in Figure 8. A maximum of 300 iterations were used and the model successfully converged after 5.

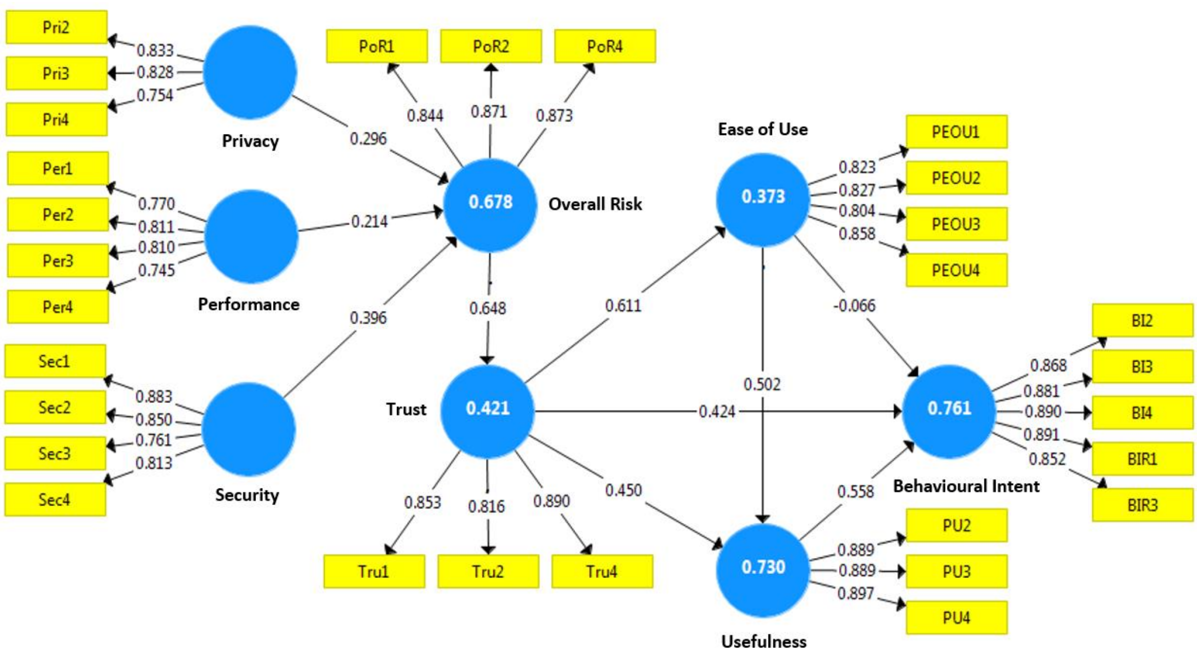

Figure 8: Proposed Model with Path Coefficients and Associated R^2

4.5.2 Coefficients of Determination (R^2) and Predictive Power

According to Khalilzadeh et al. (2017) the coefficient of determination (R^2) is a measure of the model's explanatory power and predictive accuracy. It represents the combined variance exogenous predictors have on their endogenous counterparts (Hair et al., 2017). For instance, the combined influence of privacy and performance risk along with perceived security explain 67.8% of the variance in overall risk (Table 13). This is a moderate to substantial influence as R^2 values of 0.75, 0.50 and 0.25 are regarded as substantial, moderate and weak (Hair et al., 2017). Thus, two-thirds of the variance in overall risk is attributable to privacy risk, performance risk and perceived security.

On its own, perceived overall risk explains 42.1% of the variance in trust ($R^2 = 0.421$) which is considered a weak to moderate influence. This could be explained by the strong association between perceived security and trust (Sam et al., 2014) in the absence of overall risk. However, a contribution of this study is delineating the variables which constitute overall risk in NFC acceptance, of which perceived security is the largest contributor ($\beta = 0.396$, $p < 0.001$). Thus, the influence overall risk has on trust is moderate but important.

As trust is the only exogenous construct directly influencing ease-of-use, one might expect the R^2 to be low. Thus, trust only accounts for 37.3% of the variance in ease-of-use ($R^2 = 0.373$) which is a fairly weak influence. However, this may not be entirely related to the low number of predictors, but rather the irrelevance trust has towards ease-of-use. Referring to section 4.4.2, if consumers use objective criteria to evaluate contactless cards, then trust should have little influence on usability and the ease of learning. Ease-of-use would be determined by the simplicity of use, functionality and the interface, not subject beliefs or expectations.

Table 13: Coefficients of Determination with Endogenous Constructs

Predictors	Endogenous	R^2	% of Variance
Privacy Risk Performance Risk Perceived Security	Overall Risk	0.678	67.8
Overall Risk	Trust	0.421	42.1
Trust	Ease of Use	0.373	37.3
Ease of Use Trust	Usefulness	0.730	73.0
Ease of Use Trust Usefulness	Behavioural Intent	0.761	76.1

Various NFC acceptance studies which use Davis et al.'s (1989) TAM have identified the moderate influence that ease-of-use has towards perceived usefulness (Dutot, 2015; Leong et al., 2013; Ramos-de-Luna et al., 2016). However, this study has uncovered the substantial combined influence that trust and ease-of-use have towards usefulness ($R^2 = 0.730$). Obviously, new technologies that are trustworthy and easy-to-use have a high likelihood of being considered useful. Although, it is important to note that the remaining variance will likely depend on whether the technology solves an issue or reduces the difficulty of an existing task. If, contactless cards reduce queuing times, are easy-to-use and dependable, they have a high likelihood of being considered useful.

Most importantly, the combined influence of all exogenous constructs in the proposed model account for 76.1% of the variance in behavioural intent towards use ($R^2 = 0.761$). This is a substantial effect, particularly in marketing fields, and indicates that the model may be suitable for measuring acceptance in prospective markets. It is concluded that ease-of-use, trust and usefulness are adequate predictors of BI and mostly reflect what consumers expect from payment technologies. However, issues arise between the direct influence PEOU has on BI due to a negative path coefficient ($\beta = -0.066$, $p = 0.090$) which is discussed in the following section.

4.5.3 Structural Path Significance using Bootstrapping

Bootstrapping involves a repeated sampling and resampling of selected data in order to attain reasonable approximation of coefficient distribution in a population (Hair et al., 2014a, p. 134). A bootstrapping procedure using 5000 subsamples was applied which rendered critical *t*-values and tested the significance of path coefficients. Default settings for bootstrapping were changed to a two-tailed test using a significance level of 0.01 in order to scrutinise the procedure into producing the most significant results. Thresholds for significant critical *t*-values are 1.65 for a 10% significance level, 1.96 for a 5% level and 2.58 for a 1% level (Hair et al., 2011).

Table 14: Hypothesis Testing post Bootstrapping Procedure

Hypothesis	Coefficients	Confidence Interval	*t*-value	*p*-value	Support
H1: Pri → PoR	0.296	[0.174, 0.413]	6.584	< 0.001	Yes
H2: Per → PoR	0.214	[0.102, 0.331]	4.814	< 0.001	Yes
H3: Sec → PoR	0.396	[0.260, 0.535]	7.437	< 0.001	Yes
H4: PoR → Tru	0.648	[0.571, 0.712]	24.216	< 0.001	Yes
H5: Tru → PEOU	0.611	[0.522, 0.683]	20.241	< 0.001	Yes
H6: Tru → BI	0.424	[0.316, 0.524]	10.726	< 0.001	Yes
H7: Tru → PU	0.450	[0.332, 0.557]	10.789	< 0.001	Yes
H8: PEOU → PU	0.502	[0.389, 0.614]	11.775	< 0.001	Yes
H9: PEOU → BI	-0.066	[-0.173, 0.031]	1.697	0.090	No
H10: PU → BI	0.558	[0.432, 0.677]	11.768	< 0.001	Yes

Pri = Privacy | Per = Performance | Sec = Security | PoR = Perceived overall Risk
PEOU = Perceived Ease of Use | PU = Perceived Usefulness | BI = Behavioural Intent

Table 14 shows that all hypotheses are supported at a 1% significance level; except for H9 (PEOU → BI) which narrowly meets the 10% significance level. Additionally, bootstrapped outer-loadings for every item satisfy the 1% significance level; meaning all items continue to load well with their respective constructs (Appendix 8).

Perceived security ($\beta = 0.396$, $p < 0.001$) has the largest significant effect on overall risk. Meaning, the belief that contactless cards can withstand interception or exploitation from malevolent parties is paramount to perceived overall risk. Likewise, perceived privacy risk is the second most significant influence on overall risk ($\beta = 0.296$, $p < 0.001$). Privacy breaches leading to a loss of personal or confidential information is an important consideration for prospective and current users. Finally, perceived performance risk (β = 0.214, $p < 0.001$) is also a significant contributing factor towards perceived overall risk. The possibility of contactless cards or the payment system failing to deliver expected results plays a significant role in consumer risk assessment. Thus, hypotheses 1-3 are confirmed with a total variance of 67.6%, and a clear outline of what constitutes overall risk in terms of NFC acceptance.

Perceived overall risk has a large significant influence on consumer trust (β = 0.648, $p < 0.001$) which confirms Hypothesis 4. This coefficient is the largest of all construct pathways and demonstrates the critical influence that perceived risk has towards trusting contactless cards. Trust also shares a significant influence on ease-of-use (β = 0.611, $p < 0.001$), behavioural intent towards use (β = 0.424, $p < 0.001$) and usefulness (β = 0.450, $p < 0.001$). Thus, hypotheses 5-7 are confirmed as consumers who trust contactless cards may find them useful, easy-to-use and have high intent of use.

Ease-of-use has large significant influence on usefulness (β = 0.502, $p < 0.001$), but much less of an influence on behavioural intent (β = -0.066, $p = 0.090$). Hypothesis 8 has a simple explanation, in that a payment device which is easy-to-use is considered more useful than one which is difficult (Leong et al., 2013). With regard to H9, Davis et al. (1989) postulate that ease-of-use has a small significant influence on behavioural intent which is confirmed by this study. Later discoveries by Venkatesh et al., (2003) reveal that PEOU becomes insignificant as users become experienced with use. This is because effort orientated constructs are important during learning stages of technology acceptance and become surpassed by instrumental demands over time (Nunkoo & Ramkissoon, 2013). Given 89.27% of respondents have used contactless cards at-least once (Table 8), it is obvious the New Zealand market has shifted beyond learning stages and now require instrumental benefits. Wu and Wang (2005) claim PEOU has an indirect influence on BI through PU, which is confirmed by inspecting bootstrapped indirect effects (β = 0.280, $t = 7.088$ $p < 0.001$). Therefore, ease-of-use is an important determinant of behavioural intent, assuming contactless cards are useful.

Finally, hypotheses 10 is confirmed as perceived usefulness has a large significant effect on behavioural intent towards use (β = 0.558, p < 0.001). Hence, the degree to which consumers believe contactless cards can improve their shopping efficiency is a direct determinant of the intent to use. This supports assertions by Warner and Wright (2017) that consumers enjoy transaction procedures the least and will likely select an instrument which limits the experience.

4.5.4 Relevance of Significant Relationships

Theoretically, in order for the model to be considered complete, path coefficients must undergo effect size measurement in order to estimate to what extent their presence is necessary. Specifically, whether the omission of any construct has a substantial influence on endogenous variables. Hair et al. (2014a) recommend Cohen's f^2 statistic using thresholds of 0.02 for small effects, 0.15 for moderate effects and 0.35 for large effects. SmartPLS version 3.2.7 automatically computes these statistics providing the following results.

Table 15: Effect Sizes for Model Paths

Hypotheses	**Pathway**	f^2	**Effect Size**
H1	Privacy → Overall Risk	0.116	*
H2	Performance → Overall Risk	0.056	*
H3	Security → Overall Risk	0.160	**
H4	Overall Risk → Trust	0.726	***
H5	Trust → Ease of Use	0.595	***
H6	Trust → Usefulness	0.471	***
H7	Trust → Behavioural Intent	0.321	**
H8	Ease of Use → Usefulness	0.585	***
H9	Ease of Use → Behavioural Intent	0.007	*n.s*
H10	Usefulness → Behavioural Intent	0.352	***

* Small effect size
** Moderate effect size
*** Large effect size
n.s Non-significant

These results confirm what was discovered in the previous section; that perceived security has the greatest influence on overall risk ($f^2 = 0.160$), followed by privacy risk ($f^2 = 0.116$) and finally performance risk ($f^2 = 0.056$). Given the small effect size of privacy and performance risk, it is feasible that such concerns are not critical to an overall risk assessment in the New Zealand market. Hence, only perceived security can be considered a strong predictor of the overall risk and an essential antecedent to acceptance.

Overall risk has a noticeably large effect on trust ($f^2 = 0.726$), which is expected from a single direct predictor. Recognising such an effect is important as it demonstrates the influence internal perceptions have towards latent emotions. Users will use objective criteria to formulate perceptions of risk which help to build or degrade trust. Thus, an overall risk assessment has a strong influence on how consumers perceive contactless cards in terms of trustworthiness. Additionally, the following three relationships trust shares with PEOU, PU and BI further validates the relevance it has towards NFC acceptance.

Trust has the largest effect on ease-of-use (f^2 = 0.595), followed by perceived usefulness (f^2 = 0.471) and finally behavioural intent (f^2 = 0.321). Given the threshold for large effects is 0.35, it is safe to assume that trust has a moderate-to-large effect on behavioural intent, meaning its relevance to NFC acceptance is critical. It acts as a mental shortcut by which to measure contactless cards prior to acceptance (Fang, Chiu, & Wang, 2011). Assuming contactless cards satisfy a latent degree of trust within consumers, then trial and acceptance can ensue.

Revisiting Hypothesis 9 which was deemed significant at a 10% level (section 4.5.3); ease-of-use has virtually no influence on behavioural intent (f^2 = 0.007). Hence, this post hoc assessment debunks any assertion that perceived ease-of-use has a significant, albeit small influence on acceptance. However, it does have a large effect on perceived usefulness (f^2 = 0.585) which aligns with current NFC acceptance studies (Debajyoti et al., 2015; Dutot, 2015; Leong et al., 2013; Zarrin-kafsh, 2015) and technology acceptance theory (Davis et al., 1989). Finally, usefulness has a large effect on behavioural intent (f^2 = 0.352), meaning instrumental benefits have a high degree of relevance to acceptance.

4.5.5 Predictive Relevance using Blindfolding

Reflective modelling contains another post hoc procedure useful for measuring predictive power by means of cross-validated redundancy. The Stone-Geisser Q^2 value estimates each construct's predictive relevance by systematically omitting inner model relationships and using mean replacement to screen for differences in model composition (Hair et al., 2014a). A Q^2 greater than zero is indicative of predictive relevance for reflective endogenous constructs.

Omission distance (D) is an input criterion prior to running a blindfolding procedure. Hair et al. (2014a) recommend selecting a D between 5 and 10; assuming the sample size divided by the D does not equal an integer. The D selected for this study is 7 as 587/7 = 83.86, which is not an integer. SmartPLS version 3.2.7 automatically computes Q^2 values providing the following results.

Table 16: Construct Cross-Validated Redundancy

Construct	**Q^2**
Overall Risk	0.477
Trust	0.290
Ease of Use	0.240
Usefulness	0.549
Behavioural Intent	0.546

Each of the endogenous constructs are above the zero threshold which indicates high predictive accuracy, whilst the model is capable of strong explanatory power. Unsurprisingly, PEOU and PU, which were derived from Davis et al.'s (1989) TAM, possess the greatest explanatory power. This is expected as these constructs and their indicators are well rehearsed throughout technology acceptance theory. Overall risk and the associated antecedents are a theoretical contribution of this study. Makki et al. (2016) noted that few NFC acceptance studies explore the various risk dimensions that constitute overall risk. Featherman and Pavlou (2003) were correct in their assertion that overall risk is a multifaceted construct which has a critical influence on NFC acceptance. This study has demonstrated that overall risk (Q^2 = 0.477) has a similar predictive accuracy as usefulness and behavioural intent whilst substantially contributing to the model's explanatory power. Trust possesses a smaller degree of predictive accuracy (Q^2 = 0.290) but still plays a significant role towards NFC acceptance. Kim et al. (2010) note that trust is a gateway between potential gains and losses. Specifically, a channel between the perceived risks of using contactless cards and potential benefits.

4.6 Chapter Summary

Demographic statistics reveal that respondents aged 18-24 and 55+ are distinctly different in terms of contactless card use. After removing problematic items, the proposed model meets reliability and validity standards and successfully explains more than 76% of the variance in behavioural intent towards use. Nine of the hypotheses tested are supported at a 0.001 significance level meaning basically all of the constructs play a significant role influencing NFC acceptance. This is further validated by effect size measurements and predictive relevance testing which show overall risk and trust are critical antecedents towards acceptance. The totality of these results indicates that the model is suitable for reapplication which is discussed in the following chapter.

Chapter 5: Discussion and Conclusion

5.1 Chapter Overview

The following chapter begins by discussing the results of this study in relation to current literature. It outlines several theoretical and managerial contributions before revisiting the research gap, aim and objectives. Recommendations for stakeholders, policy makers and researchers are discussed followed by the various limitations of this study. The chapter concludes with comments on the New Zealand payment system and calls-to-action for academic researchers and policy makers.

5.2 Discussion

The proposed model successfully explains 76.1% of the variance in behavioural intent towards using contactless cards. Behavioural intent was used as a proxy for actual use whilst the majority of respondents (89.27%) have trialled. Ergo, a substantial proportion of New Zealand consumers are using contactless cards and the antecedents outlined in this study heavily influence their decision to do so. Furthermore, perceptions towards contactless cards are either neutral or positive (section 4.4.2) which contrasts claims by periodicals (Coster, 2016) and trade publications (Timetric, 2013) that consumers are hesitant towards NFC payment. Respondents were screened for awareness of contactless cards whilst the majority have trialled, which demonstrates that awareness and trial is sufficient for achieving acceptance. Consumers use objective criteria for evaluating contactless cards, meaning the instrumental benefits of shorter queuing times and faster transactions is enough incentive to encourage acceptance (Krol et al., 2016). This should alert GPN's and banks to marketing communications that incentivise use as they may not be necessary given awareness alone triggers a natural progression towards use. This also weakens claims that contactless interchange fees must be set at a rate which covers the cost of customer incentives (MasterCard, 2017a).

This study draws from perceived risk theory in order to demystify the apprehension towards E-Wallets and explain the positive perception of contactless cards. Ross (1975) posits that in the presence of uncertainty, consumers lessen their perceived risk to tolerable levels by deemphasising the amount which is at stake. In doing so, the cost or consequence in the event of failure becomes permissible. With regard to privacy, consumers may relinquish aspects of their personal self in order to access rewards or benefits (Hayashi, 2012). As ages 18-24 are the most frequent users of contactless cards (Figure 7), there is evidence that younger consumers are more willing to risk or relinquish private information. This would explain why the influence privacy risk has on overall risk ($\beta = 0.214$, $p < 0.001$) contains a small size effect ($f^2 = 0.116$) whilst respondents were largely positive towards contactless cards (section 4.4.2) as young consumers make up the majority of respondents (Table 7). Aluri and Palakurthi (2011) claim that younger cohorts tend to be early adopters, experienced with new technologies and proactive towards innovation. Furthermore, that millennials, possess strong intent towards accepting contactless cards (Trütsch, 2014) and contactless pay technologies (Garrett et al., 2014; Leong et al., 2013). Thus, it can be concluded that younger consumers are early adopters of contactless cards as they are more familiar with innovative technology and are more comfortable relinquishing private information. It is no secret that young consumers spend ample time online and so theoretically, greater time spent relinquishing private information online would deemphasise the amount which is at stake, making the risk of use permissible.

Continuing with perceived risk theory, consumers are likely to accept technologies that deliver a high degree of performance which they gauge using a cognitive appraisal of functionality (Makki et al., 2016). Consistent and reliable performance has shown to increase satisfaction due to improved task efficiency, whilst performance failures lead to a heavy decline in the enjoyment of use (Khalilzadeh et al., 2017). This study demonstrates that performance risk has the least influence on overall risk and perhaps the least relevance towards acceptance. This can be explained by the large proportion of respondents that have already trialled contactless cards (89.27%). Conceivably, concerns over system breakdowns, input errors by cashiers and the aptitude of fault resolution are a greater concern prior to trialling. This is due to a lack of evidence that contactless cards are capable of performing properly which can be countered through product trialling (Patsiotis et al., 2013). Thus, since the majority of respondents have trialled contactless cards, performance risk is barely influential as they can recall past experiences of successful transactions. Therefore, performance risk will only be influential prior to use and will become less significant through trialling.

This study confirms Kim et al.'s (2010) assertion that perceived security dominates consumer decisions to accept or avoid transaction technology. It possesses the strongest influence on overall risk ($\beta = 0.396$, $p < 0.001$) as security breaches may cause a financial loss for cardholders. A global study by Warner and Wright (2017) revealed that two-thirds of consumers are sceptical of NFC security as they believe hackers are capable of stealing account information and funds. These beliefs are valid as IT specialists have demonstrated the various strategies for intercepting contactless transactions (Jensen et al., 2016) whilst NFC exploitation is a featured topic in periodicals (Zolfagharifard, 2015). Hence, perceived security is a prominent concern which is valid and driven by public evidence of security flaws. However, although users are aware of these flaws, this does not prevent use. Those who have trialled contactless cards push-aside concerns over security or the lack of two-factor authentication in order to access benefits. This could be the result of zero-liability guarantees given by GPN's that assure financial losses will be refunded (MasterCard, 2017a). These guarantees help to diminish perceived security threats to a tolerable level which makes continued use permissible (Ross, 1975). An alternative view is that current users conduct more transactions than those who are apprehensive towards use (Trütsch, 2014). They possess a strong focus on convenience and are more prone to impulse spending (Garrett et al., 2014). Thus, security weaknesses do not outweigh the convenience of improved purchasing efficiency.

Cocosila and Trabelsi (2016) consider overall risk as the sacrifice or give users make in exchange for shorter queuing times, faster payments and reduced mental effort during transactions. It accounts for general risk which may not be observable or directly measurable. More importantly, it is an intersection by which all variable risks or costs converge with potential benefits. Perceived risk theory views overall risk as a necessary antecedent to trust as negative consequences can be consciously recognised and exist prior to the formation of faith or assurance (Mitchell, 1999). Thus, risk and trust represent a balanced scale by which the reduction of one links to a rise in the other. This is demonstrated by the sizable influence overall risk has on trust ($\beta = 0.648$, $p < 0.001$) not to mention the substantial size effect ($f^2 = 0.726$) which is the most influential relationship between any two constructs in the proposed model. Additionally, delineating the multifaceted nature of overall risk is a theoretical contribution of this study which is discussed further in section 5.2.1.

Contrary to overall risk is trust, which stands as a gateway between the perceived cost and potential gains of acceptance (Kim, 2010). Specifically, the subjective belief that the system, technology and parties involved can be relied upon to perform in accordance with expectations. This study demonstrates that trust has a moderate to large influence on behavioural intent ($\beta = 0.424$, $p < 0.001$, $f^2 = 0.321$) whilst its primary role seems to be influencing perceived usefulness. As discussed (section 4.5.2), this study has uncovered the substantial combined influence that ease-of-use and trust have on perceived usefulness ($R^2 = 73.0$). Thus, it is conceivable that trust could be a valuable addition to Davis et al.'s (1989) TAM and Venkatesh et al.'s (2003) UTAUT. Trust also shares a significant relationship with ease-of-use ($\beta = 0.611$, $p < 0.001$) as a low degree of trust accompanies greater time and energy spent ensuring transactions are processed correctly. Doing so depreciates ease-of-use which has a detrimental effect on usefulness (β = 0.502, $p < 0.001$). Therefore, although trust possesses only a moderate influence on behavioural intent, it plays a pivotal role between costs and benefits and is one of two variables which constitute the majority of perceived usefulness. This is an important discovery as it brings technology acceptance theory closer to a complete understanding of what constitutes usefulness, which is the principal predictor of behavioural intent.

The remaining constructs used in this study were extracted from popular theoretical frameworks used in technology acceptance theory (section 2.4). These include perceived usefulness (performance expectancy), ease-of-use (effort expectancy) and behavioural intent towards use (Figure 5). Behavioural intent was used as a proxy for actual use whilst the attitude construct found in Davis et al.'s (1989) TAM was omitted. Each of these constructs performed as expected, and play a significant role in determining actual use. Perceived usefulness possesses the strongest direct influence on behavioural intent (β = 0.502, $p < 0.001$) whilst perceived ease-of-use has small influence (β = -0.066, $p = 0.090$) that subsides over time as cardholders become experienced with use (Venkatesh et al., 2003). As mentioned, ease-of-use is important during introductory and learning stages which have been surpassed in the New Zealand market (section 4.5.3). At this stage, instrumental benefits are a priority; although this is not indicative of acceptance. Many consumers will not accept a new technology based solely on usefulness (Teh, 2015). Thus, it is important to ensure that perceived benefits beyond usefulness outweigh the perceived risks of acceptance.

By testing the influence that each of the endogenous constructs have towards behavioural intent, this study has captured a large proportion of variance that may influence acceptance in prospective markets. There are cultural differences that may vary depending on country. For instance, Zhang et al. (2012) demonstrated that perceived usefulness is more influential in western cultures whilst ease-of-use is more important in eastern cultures. Hence, researchers attempting to replicate this study should place greater emphasis on variables relative to the market. This also precludes the omission of less influential constructs (e.g. privacy and performance) as they may dominate decision making depending on nationality or sample characteristics. Therefore, the model is suitable for reapplication in other markets and has the advantage of being parsimonious. This is important as it helps to avoid overstated R^2 values and inflated standard errors which come from adding irrelevant variables to complex models (Williams, 2015).

5.2.1 Theoretical Contributions

This study combines perceived risk theory with technology acceptance from the perspective that consequences have a greater influence on behaviour than benefits or usefulness (Lee, 2009). Thus, overall risk was conceived to account for the various risk factors which may impede NFC acceptance. Challenges surfaced in the literature due to a lack of certainty regarding what exactly constitutes overall risk (Ross, 1975). Some argue that risk is a multifaceted construct that cannot possess a fixed definition as it changes relative to the research context (Dutot, 2015). This is troublesome as many technology acceptance studies use irrelevant risk factors to account for uncertainty and consequences that cannot be fully anticipated (Bauer, 1960; Featherman & Pavlou, 2003). Thus, a contribution of this study is demonstrating that overall risk can be comprised of context specific risk factors whilst simultaneously accounting for general risk. It is certainly a multifaceted construct which represents interchangeable components depending on the research focus (Mitchell, 1999). It is a receptacle by which to insert probable risk factors whilst accounting for risk not represented by those which are attached.

This study contributes to the abundant literature concerning E-Wallet acceptance in two ways. Firstly, it outlines the influential constructs found in NFC acceptance studies and combines them into a holistic model which accounts for a significant proportion of variance in behavioural intent towards use ($R^2 = 0.761$). Scholars exploring the acceptance of E-Wallets can rely on the proposed model to account for the significant variables influencing acceptance.

Secondly, this study explores a popular technology which could be instrumental in remedying the slow uptake of E-Wallets (Debajyoti et al., 2015; Ossolinski et al., 2014; Warner & Wright, 2017). New Zealand consumers promptly rejected the E-Wallet Semble after its introduction in 2012 (Keall, 2016). The results of this study and current consumer trends (Figure 1) show that New Zealand consumers are far more receptive towards contactless cards. As mentioned, representatives of Norwegian bank Den Norske proposed that contactless cards should be introduced ahead of E-Wallets to give consumers a hands-on experience with the technology (Sajid & Haddara, 2016). Davis et al. (1989) and Patsiotis et al. (2013) claim trialling technology is the critical for acceptance which is confirmed by the high trial rate and positive reception found in this study. Hence, this study has uncovered a precursory technology that allows consumers to trial NFC payment prior to E-Wallet acceptance. Researchers exploring NFC acceptance must consider trialling as a cornerstone of their research focus.

5.2.2 Managerial Contributions

GPN's and proponents of NFC payment can use this study to inform entry plans into prospective markets. For instance, the New Zealand market contains a 93.8% saturation rate for payment cards amongst adult consumers (MBIE, 2016). Hence, the transition to contactless cards has not been difficult as EFTPOS, debit and credit cards already provide a foundation technology that consumers are familiar with. Thus, a contribution of this study is capturing the ease of acceptance present in card based markets which should be targeted by GPN's.

This study illustrates the significant influence that trust has on behavioural intent towards using contactless cards. Consumers have criticized banks for their forceful conduct which deprives customers the ability to opt against having NFC enabled in their bank cards (Collinson, 2015; Devereux, 2014; Kollmorgen, 2015). IS literature claims that building trust requires treating customers with respect, kindness and manners (Fang et al., 2011).This study adds that, assuming it does not impede business performance, customers should be allowed to manage that which they own. With regard to contactless cards, dissatisfied customers from New Zealand's BNZ bank feel that "*It's my money, my account, and I have no control over it*" (Devereux, 2014). Contrary to this, New Zealand's ASB bank allows customers to remotely disable and enable NFC features online (ASB, 2017). Hence, a contribution for managers is highlighting the importance of providing control which allows customers the freedom to trial if they wish or avoid if they are distrustful.

A final contribution for managers is a demographic profile of consumers most likely to accept NFC pay technologies. Results from the New Zealand market indicate very little usage difference between genders, although males are slightly more likely to use contactless cards. Ages 25-54 use contactless cards for around half of their low value transactions (Figure 7), whilst ages 18-24 are the most likely to accept and most often use. NFC literature describes this group as early adopters, few financial burdens, recreationally orientated with a keen interest in entertainment outside of the home (Polasik et al., 2010). Hence, a contribution to marketing managers is isolating the characteristics that advertising campaigns should reflect in order to encourage acceptance.

5.2.3 Revisiting the Research Gap, Aim and Objectives

Despite recurring presence in the media, a thorough literature review reveals limited research regarding consumer behaviour towards contactless cards. However, substantial research has gone towards investigating the global apprehension towards E-Wallets (section 2.3). Many of these studies produced similar results which describe core antecedents that influence NFC acceptance. These antecedents were adapted into a holistic model (Figure 2) which is powerful at explaining NFC acceptance in prospective markets. Furthermore, this study is the first to view contactless cards as an introductory technology to NFC payment which is useful for steering consumer behaviour. Awareness and trial is critical to acceptance and contactless cards provide a trial of NFC payment which promotes trends towards E-Wallets. Thus, this study has filled the research gap regarding consumer behaviour towards contactless cards which doubles as a novel solution for driving E-Wallet acceptance.

The first objective (section 1.3.2) was to measure consumer perceptions and explain behavioural intent towards using contactless cards. Results from the analysis accomplished this as the proposed model successfully accounts for 76.1% of the variance in consumer intent to use contactless cards. Thus, it can be concluded that antecedents outlined in the proposed model account for the majority of predictors which drive behaviour and actual use.

The second objective was to identify and test the relationships between antecedents that influence intent to use. It can be concluded that the core constructs for predicting behavioural intent include perceived usefulness, trust, overall risk and perceived security. To a lesser extent, performance and privacy risk are antecedents to overall risk whilst mean responses (section 4.4.2) depict a fairly neutral perception of either. Ease-of-use has little bearing on behavioural intent, although it shares a meaningful relationship with perceived usefulness. Thus, the totality of these results demystifies what drives acceptance which should aid proponents in crafting relevant marketing communications. For example, ease-of-use was not a significant influence on behavioural intent, but perceived security was a strong determinant of overall risk. Thus, advertising should highlight the security features of contactless cards and lessen their emphasis on speed and simplicity (Franzen, 2012; StopPress NZ, 2014b; Visa New Zealand, 2013).

The third and final objective was to create a replicable framework that helps scholars estimate acceptance and supports calls for multinational case analyses (Madureira, 2017). The proposed model exudes strong predictive power whilst meeting validity, reliability and multicollinearity standards. The indicators possess strong relevance to their associated constructs whilst all coefficient pathways satisfy the 0.001 significance level with the exception of H9 (PEOU → BI) which was expected. Hence, the items and constructs are suitable for reapplication in prospective markets and provide a standardised framework by which to measure consumer behaviour on a multinational scale. Continuing to overlook this topic may be hazardous as contactless cards have a sizable displacement effect on traditional payment methods (e.g. Figure 1 & Ossolinski et al., 2014) whilst representing a financial loss to consumers and merchants through interchange fees.

The research aim was to test the antecedent influence that security, trust and various risk factors have on behavioural intent, and in doing so, create a replicable framework that is capable of explaining acceptance in prospective markets. The research objectives accomplish this as the highlighted antecedents possess significant relevance, the framework is easily replicable and the model is highly capable of explaining consumer acceptance.

5.3 Recommendations

Although consumer perceptions were the primary focus of this study, a broader investigation reveals the detriment and discourse caused by NFC interchange fees. As discussed, these fees cover the cost of incentives and refunds from fraudulent transactions (MasterCard, 2017a). However, merchants and consumers suffer higher costs to account for these fees which are controlled by GPN's. Therefore, the MBIE must persuade the New Zealand Treasury and Commerce Commission to investigate the necessity of NFC interchange fees. This should involve a transparent collaboration between GPN's, banks and Retail NZ to negotiate a fee structure deemed reasonable by all. GPN's must provide a clear outline of why current interchange rates are essential, especially when compared to New Zealand's zero-fee EFTPOS scheme. Although MasterCard advises against regulated interchange fees (MasterCard, 2017b), it is the responsibility of financial authorities to intercept exploitation and judge the relevance of costs to the New Zealand economy.

New Zealand's EFTPOS scheme is a unique transaction system that provides electronic transactions at a low cost to merchants and consumers. However, this system is under threat as consumers are readily accepting NFC cards issued by GPN's. A novel solution is to enable all terminals supplied by Paymark and EFTPOS cards distributed by banks with standard NFC capabilities. Doing so provides consumers the convenience of PIN-free transactions at no additional cost to merchants. Thus, GPN's will be rivalled in their dominance over NFC payment whilst New Zealand's payment system will continue to be self-sustaining and free from profiteering. Initial costs will be high but justifiable as the current loss from interchange fees is approximately $300 million annually (Pullar-Strecker, 2017). A contribution of equal size into upgraded EFTPOS technology is reasonable as interchange fees are projected to rise

(Retail NZ, 2015). It is critical that New Zealand's payment system remains self-reliant and free from the influence of private firms concerned with profit maximising.

A key takeaway from this study is recognising the importance of trial ahead of acceptance. As mentioned, (section 5.2.1), releasing contactless cards into prospective markets is one strategy for remedying the apprehension toward E-Wallets. Another strategy is changing the function of E-Wallets to accommodate services which are low risk and do not require high security. For example, some apprehensive consumers have responded positively to the idea of using E-Wallets to store loyalty points, membership cards, coupons and digital tickets (Taylor, 2016). Businesses using loyalty programmes can develop smartphone apps which store credentials and transfer benefits via NFC using real-time data collected of repeat customers. Thus, markets could be introduced to E-Wallets and NFC technologies whilst avoiding tactile instruments used in loyalty programmes. This has the advantage of low cost maintenance, digital records of loyal customers and ease-of-use for consumers involved in multiple loyalty programmes. More importantly, it allows consumers to trial NFC technology and E-Wallets which helps to build trust and reduce perceived risks. Thus, consumers will be able to transfer accumulated trust to E-Wallets once they feel the technology is reliable and competent.

Two weaknesses in current NFC literature include a limited global understanding of consumer perceptions, and incomparable results from a small number of studies due to dissimilar modelling. Thus, this study proposes a reliable and valid model which can be applied in multinational markets in order to form a global understanding of consumer perceptions. It creates uniformity amongst studies which helps to uncover which known variables are significant in differing markets. As a preliminary step, interested researchers should evaluate the target market status regarding contactless cards and E-Wallets. Assuming the infrastructure and use of electronic cards is abundant, the research framework outlined in this study is a valuable precursor analysis for estimating market receptivity.

5.4 Research Limitations

There are limitations which should caution future researchers interested in this topic or the methods used. Firstly, there are sound arguments within modelling literature which does not regard PLS as a style of SEM, but rather a regression analysis using composite scores (Rönkkö, McIntosh, Antonakis, & Edwards, 2016). Specifically, there are issues regarding the function of indictor weights and the common underestimation of measurement error. Proponents for PLS have retorted, saying that extreme criticisms leading to systematic boycotts of research methods have a tendency to overlook the benefits of such techniques (Hair et al., 2017). Thus, studies reapplying this model may prefer to use CB SEM henceforth until a consensus is found regarding the empirical capabilities of PLS. CB SEM is a valid technique as all the indicators are reflective and further research should be focussed on confirmatory analysis (Hair et al., 2014a) as the exploratory steps and theory development have been covered in this study.

Screening for discriminant validity determines whether variables represent unique phenomena not captured by other constructs in the model (Henseler, Ringle, & Sarstedt, 2015). Typical screening procedures include applying the Fornell-Larcker criterion or examining the cross-loadings between items as shown in section 4.4.5. Henseler et al. (2015) demonstrated that both of these approaches are capable of overlooking discriminant validity violations and proposed the Heterotrait-Monotrait (HTMT) ratio as an alternative for reflective constructs. This procedure compares the average correlation of indicators within constructs relative to the average correlation of indicators between constructs. Henseler et al. (2015) also recommend a maximum HTMT score of 0.90 (preferably 0.85) with higher construct values indicating a lack of discriminant validity. Henseler et al. (2015) acknowledge the difficulty of obtaining discriminant validity for Davis et al.'s (1989) TAM and Venkatesh et al.'s (2003) UTAUT and recommend using more liberal criteria. Further studies applying his model or researchers interested in PLS SEM are encouraged to use the HTMT ratio in place of traditional discriminant validity screening procedures.

Current research is exploring the inappropriateness of the 10 times rule suggested by Hair et al. (2014a) for predicting sample size requirements. Some researchers also refer to G*Power software for ratifying sample size requirements, usually as post hoc procedure (G*Power, 2017). However, a recent experiment involving repeated Monte Carlo simulations demonstrated the consistent inaccuracy of the 10 times rule and minimum R-Squared methods at estimating sample sizes (Kock & Hadaya, 2018). This is a grave concern for studies which have exploited PLS SEM for the small sample requirements as empirical evidence suggest their results may be null and void. Kock and Hadaya (2018) recommend an inverse square root method and the gamma-exponential method with the latter being more precise whilst the former is simpler to calculate. Their results show that traditional methods can underestimate required sample sizes by hundreds, which is less of an issue for this study due to the relatively large sample (n = 587). Thus, it is recommended that researchers attempting to replicate this study, work towards understanding these procedures and obtaining significantly larger samples than those recommended by traditional methods.

Using an online survey to capture a broad audience is a justifiable approach (section 3.6), although it may exclude willing participants who do not have access or competency with the internet. This introduces theoretical bias as the positive perceptions consumers have towards contactless cards (section 4.4.2) may be linked to their enthusiasm for innovative technologies. As such, internet users, Facebook users and survey respondents may represent a subcategory of society which are prone to technology acceptance. Theoretically, the sampling method may have overlooked many consumers who are apprehensive toward technology and thus unable to access or navigate through the survey. In order to counter this, the survey could be distributed as a physical or hard copy to participants responding to flyers and posters. A telephone number or self-returnable postcards could be used to capture audiences not present online which may yield a balanced view of consumer perceptions. Therefore, this study relies on convenience sampling which may overlook subcategories of consumers who are technologically averse. Researchers replicating this study or applying the same methods should seriously consider this limitation.

Due to ethical considerations and the nature of anonymous surveying, it is difficult to track the exact areas respondents dwell or where they use contactless cards. Arguably, usage behaviour may differ if respondents reside in rural or urban areas, small or large cities, dense or sparse populations. This creates a dimension of consumer behaviour which is unknown. However, Arango et al. (2015) demonstrated that in developed markets, location has no significant influence on the choice of payment instrument. They also concluded that family size, marital status, internet access, employment status and education level also have no significant influence (Arango et al., 2015). This is understandable as this study demonstrates that NFC acceptance is mostly driven by internal perceptions rather than externalities.

Nunkoo and Ramkissoon (2013) claim it is often difficult to obtain an objective measurement of actual behaviour. Hence, this study used behavioural intent as a proxy for actual use as it is a known antecedent which contains a strong direct influence (Wu & Wang, 2005). While it is important to keep structural models parsimonious in order to avoid overstating R^2 values and standard errors (Williams, 2015), a conservative approach would be to measure actual use directly or perform follow-up studies on the same participants. Thus, it is difficult to know whether consumer intent to use contactless cards actually transfers to usage. As such, behavioural intent is a precursor measure used as an approximation of actual use, not an equivalent substitution.

5.5 Conclusions

Consumer uptake of contactless cards is growing rapidly in New Zealand. Consumers are aware of the risks and low security features, but are willing to forgo such concerns in order to access simpler transactions. Acceptance appears to be gender and age neutral as most respondents have trialled or fully accepted contactless cards as part of routine life. As with many innovative technologies, young adults are early adopters and frequent users whilst older respondents are showing greater apprehension. Overall, the market response is positive which gives some insight into the future trends of contactless cards.

The core of this study is developing and testing a theoretical framework that empirically measures social phenomena. The results indicate that decision making, in technology acceptance, involves a balance between risk and trust which is drastically influenced by trialling. Apprehension towards new technologies may be valid and based on sound judgement, although a small interaction with useful technology may diminish perceived risk whilst nurturing trust. GPN's and banks must consider latent perceptions as this technology has the potential to reach market saturation and wide acceptance if released globally.

Plenty of discussion throughout this study has focussed on unregulated interchange fees in the New Zealand payment system. Although these fees are somewhat arbitrary and threatening to New Zealand's EFTPOS scheme, these study should not be construed as a slant or rhetoric against GPN's. Rather, its objective is to draw academic attention towards contactless cards and interchange fees. There is no evidence that cardholders are aware of such fees or that merchants are raising prices in order to recover costs. Such information may alter consumer behaviour, but this is unknown as the topic is yet to be explored thoroughly.

MasterCard responded to the MBIE investigation citing several markets where regulated interchange fees lead to less generous reward programmes and increased interest rates on credit. If the objective of policy makers is to provide New Zealand an efficient payment system, such customer experience concerns should not dissuade due process or regulation. Policy makers should also not be concerned with the cost to consumers for selecting payment instruments. New Zealanders have a range of payment methods to choose from which they are personally responsible for, which does not justify passing such costs onto small-to-medium enterprises that lack negotiating power. Had GPN's provided an empirical justification for the necessity of interchange fees beyond customer incentives, then this study could not conclude that such fees appear to be part of a financial ruse.

References

Aluri, A., & Palakurthi, R. (2011). The Influence of Demographic Factors on Consumer Attitudes and Intentions to use RFID Technologies in the US Hotel Industry. *Journal of Hospitality and Tourism Technology, 2*(3), 188-203.

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

Arango, C. A., Hogg, D., & Lee, A. (2015). Why is Cash (Still) So Entrenched? Insights from Canadian Shopping Diaries. *Contemporary Economic Policy, 33*(1), 141-158.

ASB. (2017). *How do I Disable/Turn off the Contactless Option on My Card?* Retrieved January 28, 2018, from ASB: https://www.asb.co.nz/help/how-do-i-disable-turn-off-the-contactless-option-on-my-card-.html

Ayo, C. K., Atinuke, A. O., Adewoye, O. J., & Eweoya, I. O. (2016). E-Banking Users' Behaviour: E-Service Quality, Attitude, and Customer Satisfaction. *International Journal of Bank Marketing, 34*(3), 347-367.

Azhari, F. (2014). Quick Detection of NFC Vulnerability: Implementation Weakness Exploitation. *Information Management & Computer Security, 22*(2), 134-140.

Bailey, A. A., Pentina, I., Mishra, A. S., & Mimoun, M. S. (2017). Mobile Payments Adoption by US Consumers: An Extended TAM. *International Journal of Retail & Distribution Management, 45*(6), 626-640.

Balaban, D. (2008). Contactless Payment in the UK is off to a Slow Start. *Cards & Payments, 21*(8).

Bandyopadhyay, K., & Fraccastoro, K. A. (2007). The Effect of Culture on User Acceptance of Information Technology. *Communications of the Association for Information Systems, 19*(23), 522-543. Retrieved from http://aisel.aisnet.org/cgi/viewcontent.cgi?article=2666&context=cais

Bauer, R. A. (1960). Consumer Behavior as Risk Taking. In R. S. Hancock, *Dynamic Marketing for a Changing World: Proceedings of the 43rd National Conference of the American Marketing* (pp. 389-398). Chicago: American Marketing Association.

Boden, R. (2015). *Australia Leads the Way for Contactless Ownership and Usage*. Retrieved July 22, 2017, from NFC World: https://www.nfcworld.com/2015/05/13/335191/australia-leads-the-way-for-contactless-ownership-and-usage/

Carten, M., Littman, D., Schuh, S., & Stavins, J. (2007). Consumer Behavior and Payment Choice: 2006 Conference Summary. (pp. 1-61). Boston: Federal Reserve Bank of Boston.

Carter, S. (2005). The 'Contactless' Opportunity. *Card Technology Today, 17*(9), 10-11.

Chen, K.-Y., & Chang, M.-L. (2013). User Acceptance of 'Near Field Communication' Mobile Phone Service: An Investigation Based on the 'Unified Theory of Acceptance and Use of Technology' Model. *The Service Industries Journal, 33*(6), 609–623.

Chircu, A. M., Davis, G. B., & Kauffman, R. J. (2000). Trust, Expertise, and E-Commerce Intermediary Adoption. *Americas Conference on Information Systems:AMCIS 2000 Proceedings* (pp. 710-716). Association for Information Systems. Retrieved December 4, 2017, from http://aisel.aisnet.org/cgi/viewcontent.cgi?article=1853&context=amcis2000

Chung, W., & Paynter, J. (2002). An Evaluation of Internet Banking in New Zealand. *35th Hawaii International Conference on System Sciences* (pp. 1-10). Auckland,: Department of Management Science and Information Systems.

Cocosila, M., & Trabelsi, H. (2016). An Integrated Value-Risk Investigation of Contactless Mobile Payments. *Electronic Commerce Research and Applications, 20*, 159–170.

Collinson, P. (2015). Contactless Payments: Should Banks Force us to Use Them? *The Guardian*. Retrieved October 29, 2017, from https://www.theguardian.com/money/2015/jan/17/contactless-payments-banks-force-us

Coskun, V., Ozdenizci, B., & Ok, K. (2015). The Survey on Near Field Communication. *SENSORS, 15*(6), 13348-13405.

Coster, D. (2016). Contactless Cards Convenient for Customers, and Some Criminals Too. *Stuff: Business Day*. Retrieved October 29, 2017, from http://www.stuff.co.nz/business/83938760/Contactless-cards-convenient-for-customers-and-some-criminals-too

Currie, G., Scott, R., & Tivendale, K. (2013). *Experience With Value-for-Money Urban Public Transport System Enhancements September 2013.* Booz & Company. Retrieved July 20, 2017, from https://www.nzta.govt.nz/assets/resources/research/reports/531/docs/531.pdf

Davis, F., Bagozzi, R., & Warshaw, P. (1989). User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. *Management Science, 35*(8), 982-1003.

Dawson, K. (2016). Contactless Cards Targeted by Young Thieves. *New Zealand Herald*. Retrieved from http://www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=11748513

Debajyoti, P., Vanijja, V., & Borworn, P. (2015). An Empirical Analysis towards the Adoption of NFC Mobile Payment System by the End User. *Procedia Computer Science*, 13-25.

Devereux, J. (2014). Paywave or No Card, Bank Customer Told. *Stuff*. Retrieved from http://www.stuff.co.nz/business/money/9832235/PayWave-or-no-card-bank-customer-told

Dewan, S. G., & Chen, L.-d. (2005). Mobile Payment Adoption in the US: A Cross-industry, Crossplatform Solution. *Journal of Information Privacy & Security, 1*(2), 4-28.

Dutot, V. (2015). Factors Influencing Near Field Communication (NFC) Adoption: An Extended TAM Approach. *Journal of High Technology Management Research, 26*, 45–57.

European Central Bank. (2016). *Press Release 26 September 2016 Payments Statistics for 2015.* European Central Bank. Retrieved July 21, 2017, from https://www.ecb.europa.eu/press/pdf/pis/pis2015.pdf

Fang, Y.-H., Chiu, C.-M., & Wang, E. T. (2011). Understanding Customers' Satisfaction and Repurchase Intentions: An Integration of IS Success Model, Trust, and Justice. *Internet Research, 21*(4), 479-503.

Featherman, M. S., & Pavlou, P. A. (2003). Predicting E-Services Adoption: A Perceived Risk Facets Perspective. *International Journal of Human-Computer Studies, 59*(4), 451-474.

Fiedler, M., & Öztüren, A. (2014). Online Behavior and Loyalty Program Participation-parameters Influencing the Acceptance of Contactless Payment Devices. *Research Journal of Applied Sciences, Engineering and Technology, 7*(15), 3188-3197.

Field, A. (2009). *Discovering Statistics Using SPSS : (and Sex and Drugs and Rock 'N' Roll).* Far East Square: SAGE Publications Asia-Pacific Pte Ltd.

Franzen, T. (2012). *Australian Visa PayWave Commercial*. Retrieved January 23, 2017, from Tommy Franzen: https://tommyfranzen.wordpress.com/2012/09/10/the-visa-paywave-commercial-that-im-in/

G*Power. (2017). *G*Power 3.1 Manual.* Retrieved January 30, 2018, from http://www.gpower.hhu.de/fileadmin/redaktion/Fakultaeten/Mathematisch-Naturwissenschaftliche_Fakultaet/Psychologie/AAP/gpower/GPowerManual.pdf

Garrett, J. L., Rodermund, R., Anderson, N., Berkowitz, S., & Robb, C. A. (2014). Adoption of Mobile Payment Technology by Consumers. *Family and Consumer Sciences Research Journal, 42*(2), 358–368.

Garson, D. G. (2016). *Partial Least Squares: Regression and Structural Equation Models.* Asheboro: Statistical Associates Publishing. Retrieved January 1, 2018, from https://www.smartpls.com/resources/ebook_on_pls-sem.pdf

Ghosh, S., Goswami, J., Mohanty, S. P., & Bhattacharyya, B. K. (2017). Swing-Pay: One Card Meets All User Payment and Identity Needs. *IEEE Consumer Electronics Magazine*, pp. 82-93.

Gibson, E. (2015). Credit Cards Costing Small Businesses $100 a Week. *Stuff*. Retrieved from http://www.stuff.co.nz/business/money/70217405/credit-cards-costing-small-businesses-100-a-week

Goodhue, D. L., & Loiacono, E. T. (2002). Randomizing Survey Question Order vs. Grouping Questions by Construct: An Empirical Test of the Impact On Apparent Reliabilities and Links to Related Constructs. *Proceedings of the 35th Annual Hawaii International Conference on System Sciences* (pp. 3456-3465). IEEE Computer Society.

Gorman, E., Scobie, G. M., & Paek, Y. (2013). *Measuring Saving Rates in New Zealand: An Update.* New Zealand Treasury. Retrieved November 8, 2017, from http://www.treasury.govt.nz/publications/research-policy/wp/2013/13-04/twp13-04.pdf

Grey Power. (2017). *Welcome*. Retrieved August 26, 2017, from Grey Power: https://greypower.co.nz/

H. X., Techatassanasoontorn, A., & Tan, F. (2013). Exploring the Influence of Trust on Mobile Payment Adoption. *Pacific Asia Conference on Information Systems.* Association for Information Systems AIS Electronic Library. Retrieved from http://aut.researchgateway.ac.nz/bitstream/handle/10292/5475/PACIS%202013%20Xu-Tech-Tan.pdf;sequence=2

Hair, J. F., Hult, G. M., Ringle, C. M., & Sarstedt, M. (2014a). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM).* Los Angeles: SAGE Publications.

Hair, J. F., Hult, T. M., Ringle, C. M., & Sarstedt, M. (2017). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)* (2nd ed.). Los Angeles, California: Sage Publishing.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a Silver Bullet. *Journal of Marketing Theory and Practice, 19*(2), 139-152.

Hair, J. F., Sarstedt, M., Hopkins, L., & Kuppelwieser, V. G. (2014b). Partial Least Squares Structural Equation Modeling (PLS-SEM): An Emerging Tool in Business Research. *European Business Review, 26*(2), 106-121.

Hayashi, F. (2012). Mobile Payments: What's in it for Consumers? *Economic Review, 97*(1), 35-66.

Hayashi, F., & Bradford, T. (2014). Mobile Payments: Merchants' Perspectives. *Economic Review*, 5-30.

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A New Criterion for Assessing Discriminant Validity in Variance-based Structural Equation Modeling. *Journal of the Academy of Marketing Science, 43*(1), 115-135.

Hernandez, W. (2016). *Banks Get Another Ally in Mobile Payments with the New Masterpass*. Retrieved from Mobile Payments Today: https://www.mobilepaymentstoday.com/articles/banks-get-another-ally-in-mobile-payments-with-the-new-masterpass/

Hirschman, E. C. (1979). Differences in Consumer Purchase Behavior by Credit Card Payment System. *Journal of Consumer Research, 6*(1), 58-66.

Ho, J., & Pham, T. (2014). What are the Core Drivers in Consumer Adoption of NFC-Based Mobile Payments?: A Proposed Research Framework. *PICMET '14: Infrastructure and Service Integration.* (pp. 3041-3049). Portland: PICMET.

Hoerger, M. (2010). Participant Dropout as a Function of Survey Length in Internet-Mediated University Studies: Implications for Study Design and Voluntary Participation in

Psychological Research. *Cyberpsychology, Behavior, and Social Networking, 13*(6), 697-700.

Immigration New Zealand. (2017). *Visas to Work*. Retrieved December 23, 2017, from Immigration New Zealand: https://www.newzealandnow.govt.nz/move-to-nz/new-zealand-visa/work-visa

InfoByIP. (2017). *Domain and IP Bulk Lookup Tool*. Retrieved December 27, 2017, from InfoByIP: https://www.infobyip.com/ipbulklookup.php

Jamshidi, D., & Hussin, N. (2016). Islamic Credit Card Adoption Understanding: When Innovation Diffusion Theory Meets Satisfaction and Social Influence. *Journal of Promotion Management, 22*(6), 897-917.

Jensen, O., O'Meara, T., & Gouda, M. (2016). Securing NFC Credit Card Payments against Malicious Retailers. *Networked Systems: 4th International Conference* (pp. 214-228). University of Texas at Austin.

Jones, R. (2016). Once it was Touch and Go, Now Contactless is a New-Wave Revolution. *The Guardian*. Retrieved from https://www.theguardian.com/money/2016/sep/10/contactless-cards-wave-pay-oyster-london-use

Karahanna, E., Straub, D. W., & Chervany, N. L. (1999). Information Technology Adoption across Time: A Cross-Sectional Comparison of Pre-Adoption and Post-Adoption Beliefs. *MIS Quarterly, 23*(2), 183-213.

Keall, C. (2016). *Semble Put to Sleep*. Retrieved November 15, 2017, from The National Business Review: https://www.nbr.co.nz/article/semble-put-sleep-ck-194136

Kerr, C. (2014). *Visa Paywave Transactions Hit 3 Million Per Month*. Retrieved July 22, 2017, from Visa: http://www.visa.co.nz/aboutvisa/mediacenter/NR_NZ_041114_nzpayments.html

Khalilzadeh, J., Ozturk, A. B., & Bilgihan, A. (2017). Security-Related Factors in Extended UTUAT Model for NFC Based Mobile Payment in the Restaurant Industry. *Computers in Human Behavior, 70*, 460-474.

Kim, C., Tao, W., Shin, N., & Kim, K.-S. (2010). An Empirical Study of Customers' Perceptions of Security and Trust in E-Payment Systems. *Electronic Commerce Research and Applications, 9*(1), 84-95.

Kim, L. H., Qu, H., & Kim, D. J. (2009). A Study of Perceived Risk and Risk Reduction of Purchasing Air-Tickets Online. *Journal of Travel & Tourism Marketing, 26*(3), 203-224.

Kim, M. J., Chung, N., & Lee, C. K. (2011). The Effect of Perceived Trust on Electronic Commerce: Shopping Online for Tourism Products and Services in South Korea. *Tourism Management, 32*, 256–265.

Kock, N., & Hadaya, P. (2018). Minimum Sample Size Estimation in PLS-SEM: The Inverse Square Root and Gamma-Exponential Methods. *Information Systems Journal, 28*, 227-261.

Kollmorgen, A. (2015). Should we be able to say No to Tap-and-Go Technology? Tap and No Thanks. *Choice*. Retrieved October 29, 2017, from https://www.choice.com.au/money/credit-cards-and-loans/credit-cards/articles/visa-paywave-and-mastercard-paypass-security

Krol, K., Rahman, M. S., Parkin, S., Cristofaro, E. D., & Vasserman, E. (2016). An Exploratory Study of User Perceptions of Payment Methods in the UK and the US. *NDSS Workshop on Usable Security* (pp. 1-10). San Diego: Internet Society. Retrieved from http://discovery.ucl.ac.uk/1508474/

Lee, M.-C. (2009). Factors Influencing the Adoption of Internet Banking: An Integration of TAM and TPB with Perceived Risk and Perceived Benefit. *Electronic Commerce Research and Applications, 8*(3), 130–141.

Leiner, D. J. (2013). *Too Fast, too Straight, too Weird: Post-hoc Identification of Meaningless Data in Internet Surveys.* Retrieved December 27, 2017, from Research Gate: https://www.researchgate.net/publication/258997762_Too_Fast_Too_Straight_Too_Weird_Post_Hoc_Identification_of_Meaningless_Data_in_Internet_Surveys

Leong, L.-Y., Hew, T.-S., Tan, G. W.-H., & Ooi, K.-B. (2013). Predicting the Determinants of the NFC-Enabled Mobile Credit Card Acceptance: A Neural Networks Approach. *Expert Systems with Applications, 40*(15), 5604–5620.

Lim, N. (2003). Consumers' Perceived Risk: Sources versus Consequences. *Electronic Commerce Research and Applications, 2*(3), 216-228.

Lomax, C. (2005). The Future is Contactless. *Card Technology Today*, *17*(10), 10-11.

Luarn , P., & Juo, W.-J. (2013). The Role of Trust in Technology within the TAM in the Context of NFC Mobile Payment. *Journal of Information and Optimization Sciences, 31*(4), 875–896.

Lutz, R. J., & Reilly, P. J. (1974). An Exploration of the Effects of Perceived Social and Performance Risk on Consumer Information Acquisition. *Advances in Consumer Research Volume 1, 01*, 393-405. Retrieved November 24, 2017, from http://acrwebsite.org/volumes/5672/volumes/v01/NA-01

Madureira, A. (2017). Factors that Hinder the Success of Sim-Based Mobile NFC Service. *Telematics and Informatics, 34*, 133–150.

Makki, A., Ozturk, A. B., & Singh, D. (2016). Role of Risk, Self-Efficacy, and Innovativeness on Behavioral Intentions for Mobile Payment Systems in the Restaurant Industry. *Journal of Foodservice Business Research, 19*(5), 454–473.

MasterCard. (2011). *MasterCard Worldwide: Leading the Growth of Contactless: Fact Sheet.* Retrieved November 9, 2017, from Newsroom: https://newsroom.mastercard.com/wp-content/uploads/2011/09/PayPass-Business-Stats-Fact-Sheet-FINAL.pdf

MasterCard. (2012a). *The Mobile Payments Readiness Index: A Global Market Assessment.* MasterCard Worldwide. Retrieved July 20, 2017, from https://mobilereadiness.mastercard.com/globalreport.pdf

MasterCard. (2012b). *New Zealand*. Retrieved from Mobile Payments Readiness Index: https://mobilereadiness.mastercard.com/country/?nz

MasterCard. (2017a). *Submission to the Ministry of Business, Innovation and Employment's consultation on Retail Payment Systems.* Retrieved October 23, 2017, from Ministry of Business, Innovation and Employment: http://www.mbie.govt.nz/info-services/business/competition-policy/retail-payment-systems/retail-payment-systems-submissions/Mastercard-NZ.pdf

MasterCard. (2017b). *Understanding Interchange*. Retrieved January 15, 2017, from MasterCard: What We Do: https://www.mastercard.com/us/company/en/whatwedo/interchange.html

MBIE. (2016). *Retail Payment Systems in New Zealand: Issues Paper.* Ministry of Business, Innovation and Employment. Retrieved July 19, 2017, from http://www.mbie.govt.nz/info-services/business/competition-policy/retail-payment-systems/issues-paper/retail-payment-systems-issues-paper.pdf

Mendes-Filho, L., Mills, A. M., Tan, F. B., & Milne, S. (2017). Empowering the Traveler: An Examination of the Impact of User-Generated Content on Travel Planning. *Journal of Travel & Tourism Marketing*, 1-12. Retrieved January 3, 2018, from http://www.tandfonline.com/doi/full/10.1080/10548408.2017.1358237

Mitchell, V. W. (1999). Consumer Perceived Risk: Conceptualisations and Models. *European Journal of Marketing, 33*(1/2), 163-195.

Morosan, C., & DeFranco, A. (2016). It's About Time: Revisiting UTUAT2 to Examine Consumers' Intentions to Use NFC Mobile Payments in Hotels. *International Journal of Hospitality Management, 53*, 17-29.

Mosh. (2017). *The New Zealand Facebook Report.* Mosh. Retrieved December 26, 2017, from http://mosh.co.nz/wp-content/uploads/2017/09/The-New-Zealand-Facebook-Report-2017.pdf

NFC Today. (2017). *The Difference Between NFC and RFID*. Retrieved from NFC. Today: http://nfc.today/advice/difference-nfc-rfid-explained

Niranjan, I., Saravanan, A. S., Patwa, N., & Reddy, K. (2016). Consumer Perceptions in Adopting E-money in Developed Markets. *International Journal of Academic Research, 4*(4), 246-270. Retrieved November 20, 2017, from http://www.ijarsite.com/wp-content/uploads/2016/12/IJAR-16-4-2016.pdf

Nunkoo, R., & Ramkissoon, H. (2013). Travelers' E-Purchase Intent of Tourism Products and Services. *Journal of Hospitality Marketing & Management, 22*(5), 505–529.

O'Connor, S.-J. (2013). Crime 'Wave' Causes Bank Rethink. *Stuff*. Retrieved from http://www.stuff.co.nz/national/crime/9435792/Crime-wave-causes-bank-rethink

OECD. (2012). Policy Roundtables: Competition and Payment Systems. (pp. 83-89). Organisation for Economic Co-operation and Development. Retrieved July 20, 2017, from http://www.oecd.org/competition/PaymentSystems2012.pdf

Olsen, C. (2008a). Is Contactless Payment a Reality for the Retail Industry? *Card Technology Today, 20*(11), 10-11.

Olsen, C. (2008b). Contactless – What's Next? *Card Technology Today*, *20*(1), p. 9.

Ooi, K.-B., & Tan, G. W.-H. (2016). Mobile Technology Acceptance Model: An Investigation Using Mobile Users to Explore Smartphone Credit Card. *Expert Systems With Applications*, *59*, 33-46.

Ossolinski, C., Lam, T., & Emery, D. (2014). *The Changing Way We Pay: Trends in Consumer Payments.* Reserve Bank of Australia. Retrieved from https://www.rba.gov.au/publications/rdp/2014/pdf/rdp2014-05.pdf

Ozturk, A. B. (2016). Customer Acceptance of Cashless Payment Systems in the Hospitality Industry. *International Journal of Contemporary Hospitality Management801 - 817, 28*(4), 801 - 817.

Patsiotis, A. G., Hughes, T., & Webber, D. J. (2013). An Examination of Consumers' Resistance to Computer-Based Technologies. *Journal of Services Marketing, 27*(4), 294-311.

Pavlou, P. A. (2003). Consumer Acceptance of Electronic Commerce: Integrating Trust and Risk with theTechnology Acceptance Model. *International Journal of Electronic Commerce, 7*(3), 101-134.

Paymark. (2016). *The Impact of Debit Cards and Contactless on the Retail Sector.* Retrieved July 22, 2017, from Paymark: https://www.scribd.com/document/369255096/The-Impact-of-Debit-Cards-and-Contactless-on-the-Retail-Sector

Paymark. (2017). *Our Story*. Retrieved July 22, 2012, from Paymark: https://www.paymark.co.nz/about/our-story/

Peng, R., Xiong, L., & Yang, Z. (2012). Exploring Tourist Adoption of Tourism Mobile Payment: An Empirical Analysis. *Journal of Theoretical and Applied Electronic Commerce Research, 7*(1), 21-33.

Polasik, M., Górka, J., Wilczewski, G., Kunkowski, J., Przenajkowska, K., & Tetkowska, N. (2012). Time Efficiency of Point-of-Sale Payment Methods: Empirical Results for Cash, Cards and Mobile Payments. *Lecture Notes in Business Information Processing, 141*, 306-320.

Polasik, M., Wisniewski, T. P., & Lightfoot, G. (2010). *Modeling Customers' Intentions to Use Contactless Cards.* Retrieved November 8, 2017, from Social Science Research Network: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1704723

Pullar-Strecker, T. (2017). Retailers and Credit Card Companies Square Off Over $300m Payment Card Controversy. *Stuff*. Retrieved January 15, 2017, from https://www.stuff.co.nz/business/industries/92433714/retailers-and-credit-card-companies-square-off-over-300m-payment-card-controversy

Qualtrics. (2017). *Research Core*. Retrieved October 1, 2017, from Qualtrics: https://www.qualtrics.com/research-core/

Ramos-de-Luna, I., Montoro-Rı´os, F., & Lie´bana-Cabanillas, F. (2016). Determinants of the Intention to use NFC Technology as a Payment System: An Acceptance Model Approach. *Information Systems and e-Business Management*, *14*(2), 293–314.

Reardon, M. (2012). *Mobile payments: A Solution in Search of a Problem?* Retrieved November 20, 2017, from CNET: https://www.cnet.com/news/mobile-payments-a-solution-in-search-of-a-problem/

Reinartz, W., Haenlein, M., & Henseler, J. (2009). An Empirical Comparison of the Efficacy of Covariance-Based and Variance-Based SEM. *International Journal of Research in Marketing*, *26*(4), 332–344.

Research New Zealand. (2015). *A Report on a Survey of New Zealanders' Use of Smartphones and other Mobile Communication Devices 2015.* Wellington: Research New Zealand. Retrieved July 20, 2017, from http://www.researchnz.com/pdf/Special%20Reports/Research%20New%20Zealand%20Special%20Report%20-%20Use%20of%20Smartphones.pdf

Retail NZ. (2015). *Towards Fairer Payments Fees.* Retrieved July 19, 2017, from http://www.retail.kiwi/advocacy/payments

Retail NZ. (2017). *Associate Membership*. Retrieved from Retail NZ: http://www.retail.kiwi/membership/associate-membership

Rogers, E. M. (1995). Chapter 5: The Innovation-Decision Process. In *Diffusion of Innovations* (3 ed., pp. 164-165). London: Collier Macmillan Publishers. Retrieved November 15, 2017, from https://teddykw2.files.wordpress.com/2012/07/everett-m-rogers-diffusion-of-innovations.pdf

Rönkkö, M., McIntosh, C. N., Antonakis, J., & Edwards, J. R. (2016). Partial Least Squares Path Modeling: Time for Some Serious Second Thoughts. *Journal of Operations Management, 47-48*, 9-27.

Ross, I. (1975). Perceived Risk and Consumer Behavior: A Critical Review. *Advances in Consumer Research*, *2*, 1-15.

Sajid, O., & Haddara, M. (2016). NFC Mobile Payments: Are We Ready for Them? *SAI Computing Conference*, (pp. 960-967). London.

Salazar, M. S. (2015). The Dilemma of Combining Positive and Negative Items in Scales. *Psicothema*, *27*(2), 192-199.

Sam, K., Chatwin, C., & Zhang, J. (2014). Adoption of Near Field Communication for Mobile Payment: Evidence from Macau. *Industrial Engineering and Engineering Management (IEEM)* (pp. 1121-1125). Bandar Sunway: IEEE.

Sarstedt, M., Ringle, C. M., & Hair, J. F. (2017). *Partial Least Squares Structural Equation Modeling.* Retrieved December 30, 2017, from ResearchGate: https://www.researchgate.net/publication/319669432_Partial_Least_Squares_Structural_Equation_Modeling

Shaw, N. (2015). Younger Persons are More Likely to Adopt the Mobile Wallet than Older Persons, or are They? The Moderating Role of Age. *Twenty-first Americas Conference on Information Systems,* (pp. 1-15). Puerto Rico. Retrieved November 16, 2017, from https://pdfs.semanticscholar.org/efec/ac6efb897ee4badd1dac83ebb30ad9d3e900.pdf

Smith, P., Bell, A., Miller, M., & Crothers, C. (2016). *Internet Trends in New Zealand 2007-2015.* Auckland: Auckland: Institute of Culture, Discourse & Communication. Retrieved December 26, 2017, from https://icdc.aut.ac.nz/__data/assets/pdf_file/0019/73441/WIPNZtrends-07-15.pdf

Statistics New Zealand. (2016). *Electronic Card Transactions: February 2016*. Retrieved from Statistics New Zealand: http://www.stats.govt.nz/browse_for_stats/businesses/business_characteristics/ElectronicCardTransactions_HOTPFeb16/Data%20Quality.aspx

Steele, J. (2017). *Credit Card Fraud and ID Theft Statistics*. Retrieved November 23, 2017, from Credit Cards: https://www.creditcards.com/credit-card-news/credit-card-security-id-theft-fraud-statistics-1276.php

Stock, R. (2015). Merchant Anger Rising at Growing Cost of 'Interchange' on Credit and Debit Cards. *Stuff*. Retrieved from http://www.stuff.co.nz/business/73515906/Merchant-anger-rising-at-growing-cost-of-interchange-on-credit-and-debit-cards

StopPress NZ. (2014a). *Heeeee's Baaaaack! Mastercard's Tim Rides Again, Whisks Away 'Best Mate' Richie Mccawesome for Mystery Trip*. Retrieved July 23, 2017, from StopPress NZ: http://stoppress.co.nz/news/heeeees-baaaaack-mastercards-tim-rides-again-whisks-away-best-mate-richie-mccawesome-mystery-trip

StopPress NZ. (2014b). *Visa Paywave in the Skate Bowl*. Retrieved January 23, 2017, from StopPress NZ: http://stoppress.co.nz/poppress/visa-paywave-skate-bowl

Tan, G.-H., Ooi, K.-B., Chong, S.-C., & Teck-Soon, H. (2014). NFC Mobile Credit Card: The Next Frontier of Mobile Payment? *Telematics and Informatics, 31*, 292–307.

Taylor, E. (2016). Mobile Payment Technologies in Retail: A Review of Potential Benefits and Risks. *International Journal of Retail & Distribution Management, 44*(2), 159-177.

Teh, P.-L., Ahmed, P. K., Chan, A., Cheong, S.-N., & Yap, W.-J. (2015). Useful or Easy-to-Use? Knowing What Older People Like about Near Field Communication Technology. *International Conference on Human Aspects of IT for the Aged Population* (pp. 273-281). Springer, Cham. Retrieved November 16, 2017, from https://link.springer.com/chapter/10.1007/978-3-319-20892-3_27#citeas

Teo, A.-C., Tan, G. W.-H., Ooi, K.-B., Hew, T.-S., & Yew, K.-T. (2015). The Effects of Convenience and Speed in M-Payment. *Industrial Management & Data Systems, 115*(2), 311-331.

Timetric. (2013). *2020 Foresight: Innovation in Payment Systems: The Emergence of Contactless Cards and Payments.* Timetric. Retrieved July 19, 2017, from http://www.marketresearch.com/product/sample-7466384.pdf

Trütsch, T. (2014). The Impact of Contactless Payment on Spending. *International Journal of Economic Sciences, 3*(4), 70-98.

Trütsch, T. (2016). The Impact of Mobile Payment on Payment Choice. *Financial Markets and Portfolio Management, 30*(3), 299-336.

Türkmen, C., & Değerli, A. (2015). Transformation of Consumption Perceptions: A Survey on Innovative Trends in Banking. *Procedia - Social and Behavioral Sciences, 195*, 376 – 382.

Van Dyke, J. (2006). Contactless Payments: Consumer Attitudes and Acceptance in the United States. *Smart Card Alliance Annual Conference* (pp. 2-5). Smart Card Alliance and Javelin Strategy & Research.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly, 27*(3), 425-478.

Viehland, D., & Leong, R. S. (2010). Consumer Willingness to Use and Pay for Mobile Payment Services. *International Journal of Principles and Applications of Information Science and Technology, 3*(1), 35-46.

Visa. (2017). *Frequently Asked Questions*. Retrieved July 17, 2017, from Visa: http://www.visa.com.hk/en_HK/personal/features/visapaywave_faqs.html

Visa New Zealand. (2013). *Visa New Zealand payWave TV Commercial*. Retrieved January 23, 2017, from https://www.youtube.com/watch?v=ZB9DtJvbCEQ

Wang, Y.–M. (2008). Determinants Affecting Consumer Adoption of Contactless Credit Card: An Empirical Study. *Cyber Psychology & Behavior, 11*(6), 687-689.

Want, R. (2011). Near Field Communication. *IEEE Pervasive Computing, 10*(3), pp. 4-7.

Warner, J., & Wright, B. (2017). *The Future of Money: How Digital Payments are Changing Global Commerce.* Oxford Economics. Retrieved October 29, 2017, from https://d1iydh3qrygeij.cloudfront.net/Media/Default/landing-pages/recent-releases/2017/Future_of_Money_Report_V12%20FINAL%20WEB.pdf

Watson, D. (1992). Correcting for Acquiescent Response Bias in the Absence of a Balanced Scale: An Application to Class Consciousness. *Sociological Methods & Research, 21*(1), 52-88.

Widjaja, E. (2016). Non-Cash Payment Options in Malaysia. *Journal of Southeast Asian Economies, 33*(3), 398-412.

Williams, C. (2007). Research Methods. *Journal of Business & Economic Research, 5*(3), 65-72. Retrieved December 18, 2017, from https://www.cluteinstitute.com/ojs/index.php/JBER/article/download/2532/2578

Williams, R. (2015). *Multicollinearity.* Retrieved January 23, 2017, from University of Notre Dame: https://www3.nd.edu/~rwilliam/stats2/l11.pdf

Williamson, J. (2017). *Public Transport Payment Revolution Coming to Everywhere Except Auckland*. Retrieved November 16, 2017, from Stuff: http://www.stuff.co.nz/national/93121092/Public-transport-payment-revolution-coming-to-everywhere-except-Auckland

Wu, J.-H., & Wang, S.-C. (2005). What Drives Mobile Commerce? An Empirical Evaluation of the Revised Technology Acceptance Model. *Information & Management*, *42*(5), 719–729.

Yarrow, K. (2014). *Decoding the New Consumer Mind: How and Why We Shop and Buy* (1st ed.). Jossey-Bass.

Yen, Y. (2010). Can Perceived Risks Affect the Relationship of Switching Costs and Customer Loyalty in E-Commerce? *Internet Research, 20*(2), 210-224.

Yu, S. (2009). *Factors Influencing the Use of Mobile Banking: The Case of SMS-based Mobile Banking.* Auckland: Auckland University of Technology. Retrieved November 16, 2017, from http://aut.researchgateway.ac.nz/handle/10292/666

Zarrin-kafsh, S. (2015). *Developing Consumer Adoption Model on Mobile Wallet in Canada.* University of Ottawa. Ottawa: University of Ottawa. Retrieved November 14, 2017, from https://ruor.uottawa.ca/bitstream/10393/32391/1/Zarrin_kafsh_Sanaz_2015_thesis.pdf

Zhang, L., Zhu, J., & Liu, Q. (2012). A Meta-Analysis of Mobile Commerce Adoption and the Moderating Effect of Culture. *Computers in Human Behavior, 28*(5), 1902-1911.

Zolfagharifard, E. (2015). Will You be a Victim of Digital Pickpockets? Hacker Reveals How Easy it is to Steal Credit Card Numbers in Seconds While You Still Have Them in Your Hand. *Daily Mail*. Retrieved November 17, 2017, from http://www.dailymail.co.uk/sciencetech/article-2948212/Will-victim-digital-pickpockets-Hacker-reveals-easy-steal-credit-card-numbers-air-SECONDS.html

Appendices

Appendix 1: Demographic and Usage Survey Questions

Think of all the transactions you make in a typical week that are less than $80; of all the under $80 transactions you make, how often do you use contactless cards?

0% of the time	1-39% of the time	40-60% of the time	61-99% of the time	100% of the time
O	O	O	O	O

What type of products do you use contactless pay for? (tick as many as necessary)

None	Café Items	Supermarket Items	Petrol	Alcohol	Clothing	Takeaways	Other, specify
O	O	O	O	O	O	O	O

Age

18-24	25-34	35-44	45-54	55+
O	O	O	O	O

Gender

Male	Female	Other
O	O	O

Highest level of education achieved

High School	Trade Certificate or Diploma	Undergraduate Degree	Postgraduate Degree	Other, specify	None
O	O	O	O	O	O

Appendix 2: Ethics Approval Letter

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

HUMAN ETHICS COMMITTEE

Secretary, Rebecca Robinson
Telephone: +64 03 369 4588, Extn 94588
Email: human-ethics@canterbury.ac.nz

Ref: HEC 2017/51/LR

15 August 2017

James McMillan
Management, Marketing and Entrepreneurship
UNIVERSITY OF CANTERBURY

Dear James

Thank you for submitting your low risk application to the Human Ethics Committee for the research proposal titled "Consumer Perceptions Towards Contactless Payment Cards".

I am pleased to advise that this application has been reviewed and approved.

Please note that this approval is subject to the incorporation of the amendments you have provided in your emails of 25th July and 7th August 2017.

With best wishes for your project.

Yours sincerely

pp. R. Robinson

Associate Professor Jane Maidment
Chair, Human Ethics Committee

Appendix 3: Poster used in Survey Campaign

Appendix 4: Normality and Mann–Whitney U Results between Genders

Tests of Normality

	Gender	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Usage	Male	.232	236	.000	.898	236	.000
	Female	.171	348	.000	.908	348	.000

a. Lilliefors Significance Correction

Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
Usage	Based on Mean	4.242	1	582	.040
	Based on Median	3.667	1	582	.056
	Based on Median and with adjusted df	3.667	1	553.165	.056
	Based on trimmed mean	4.408	1	582	.036

Ranks

	Gender	N	Mean Rank	Sum of Ranks
Usage	Male	236	318.18	75090.00
	Female	348	275.09	95730.00
	Total	584		

Test Statistics[a]

			Usage
Mann-Whitney U			35004.000
Wilcoxon W			95730.000
Z			-3.113
Asymp. Sig. (2-tailed)			.002
Monte Carlo Sig. (2-tailed)	Sig.		.002[b]
	99% Confidence Interval	Lower Bound	.001
		Upper Bound	.003
Monte Carlo Sig. (1-tailed)	Sig.		.001[b]
	99% Confidence Interval	Lower Bound	.000
		Upper Bound	.001

a. Grouping Variable: Gender

b. Based on 10000 sampled tables with starting seed 2000000.

Appendix 5: Normality and Kruskal–Wallis Results between Age Groups

Tests of Normality

	Age	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Usage	18-24	.233	338	.000	.887	338	.000
	25-34	.240	100	.000	.880	100	.000
	35-44	.186	84	.000	.908	84	.000
	45-54	.178	46	.001	.904	46	.001
	55+	.289	19	.000	.856	19	.008

a. Lilliefors Significance Correction

Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
Usage	Based on Mean	3.113	4	582	.015
	Based on Median	2.100	4	582	.079
	Based on Median and with adjusted df	2.100	4	524.532	.080
	Based on trimmed mean	3.211	4	582	.013

Kruskal-Wallis Test

Ranks

	Age	N	Mean Rank
Usage	25-34	100	119.24
	35-44	84	121.27
	45-54	46	96.84
	Total	230	

Test Statistics[a,b]

			Usage
Chi-Square			4.851
df			2
Asymp. Sig.			.088
Monte Carlo Sig.	Sig.		.090[c]
	99% Confidence Interval	Lower Bound	.082
		Upper Bound	.097

a. Kruskal Wallis Test

b. Grouping Variable: Age

c. Based on 10000 sampled tables with starting seed 2000000.

Appendix 6: Mann–Whitney U Results between Age Groups

25-34 vs 35-44

			Usage
Mann-Whitney U			4144.000
Wilcoxon W			9194.000
Z			-.161
Asymp. Sig. (2-tailed)			.872
Monte Carlo Sig. (2-tailed)	Sig.		.874
	99% Confidence Interval	Lower Bound	.866
		Upper Bound	.883

25-34 vs 45-54

			Usage
Mann-Whitney U			1870.000
Wilcoxon W			2951.000
Z			-1.869
Asymp. Sig. (2-tailed)			.062
Monte Carlo Sig. (2-tailed)	Sig.		.066
	99% Confidence Interval	Lower Bound	.060
		Upper Bound	.073

35-44 vs 45-54

			Usage
Mann-Whitney U			1503.500
Wilcoxon W			2584.500
Z			-2.154
Asymp. Sig. (2-tailed)			.031
Monte Carlo Sig. (2-tailed)	Sig.		.031
	99% Confidence Interval	Lower Bound	.027
		Upper Bound	.036

Effect Sizes

r = 25-34 vs 35-44 = $\frac{-0.161}{\sqrt{184}} = -0.012$

r = 25-34 vs 45-54 = $\frac{-1.869}{\sqrt{146}} = -0.155$

r = 35-44 vs 45-54 = $\frac{-2.154}{\sqrt{130}} = -0.189$

Appendix 7: Factor Loadings with Correlations

	Pri	Per	Sec	PoR	Tru	PEOU	PU	BI
Pri2	**0.833**	0.569	0.636	0.639	0.550	0.345	0.439	0.496
Pri3	**0.828**	0.606	0.656	0.603	0.567	0.366	0.412	0.506
Pri4	**0.754**	0.438	0.473	0.518	0.372	0.195	0.265	0.355
Per1	0.452	**0.770**	0.529	0.446	0.599	0.493	0.535	0.539
Per2	0.518	**0.811**	0.617	0.530	0.690	0.560	0.646	0.637
Per3	0.627	**0.810**	0.705	0.712	0.629	0.345	0.446	0.589
Per4	0.471	**0.745**	0.490	0.490	0.534	0.367	0.389	0.461
Sec1	0.630	0.673	**0.883**	0.709	0.715	0.383	0.505	0.650
Sec2	0.631	0.640	**0.850**	0.658	0.663	0.400	0.500	0.602
Sec3	0.487	0.577	**0.761**	0.573	0.629	0.433	0.555	0.687
Sec4	0.682	0.626	**0.813**	0.625	0.615	0.404	0.493	0.568
PoR1	0.612	0.610	0.655	**0.844**	0.578	0.350	0.417	0.548
PoR2	0.646	0.644	0.692	**0.871**	0.564	0.271	0.377	0.535
PoR4	0.635	0.594	0.663	**0.873**	0.535	0.255	0.350	0.524
Tru1	0.641	0.707	0.774	0.678	**0.853**	0.461	0.594	0.679
Tru2	0.442	0.651	0.575	0.448	**0.816**	0.542	0.622	0.622
Tru4	0.511	0.648	0.677	0.532	**0.890**	0.562	0.717	0.756
PEOU1	0.250	0.377	0.353	0.221	0.450	**0.823**	0.608	0.450
PEOU2	0.362	0.514	0.433	0.304	0.537	**0.827**	0.644	0.536
PEOU3	0.305	0.451	0.384	0.295	0.495	**0.804**	0.605	0.484
PEOU4	0.337	0.469	0.432	0.295	0.534	**0.858**	0.708	0.590
PU2	0.416	0.559	0.522	0.375	0.643	0.713	**0.889**	0.707
PU3	0.447	0.575	0.585	0.395	0.695	0.691	**0.889**	0.745
PU4	0.391	0.563	0.541	0.413	0.685	0.674	**0.897**	0.759
BI2	0.437	0.591	0.625	0.477	0.711	0.616	0.792	**0.868**
BI3	0.559	0.664	0.692	0.588	0.715	0.507	0.708	**0.881**
BI4	0.495	0.593	0.647	0.524	0.704	0.569	0.753	**0.890**
BIR1	0.506	0.664	0.696	0.575	0.713	0.544	0.707	**0.891**
BIR3	0.491	0.613	0.646	0.565	0.686	0.501	0.656	**0.852**

Appendix 8: Outer-loadings Post Bootstrapping Procedure

	Original	Mean	SD	*t*-value	*p*-value
Pri2 ← Privacy	0.833	0.833	0.017	49.029	< 0.001
Pri3 ← Privacy	0.828	0.827	0.017	48.765	< 0.001
Pri4 ← Privacy	0.754	0.753	0.032	23.397	< 0.001
Per1 ← Performance	0.770	0.769	0.024	32.689	< 0.001
Per2 ← Performance	0.811	0.811	0.018	44.697	< 0.001
Per3 ← Performance	0.810	0.811	0.014	56.300	< 0.001
Per4 ← Performance	0.745	0.744	0.029	25.839	< 0.001
Sec1 ← Security	0.883	0.884	0.010	85.745	< 0.001
Sec2 ← Security	0.850	0.849	0.013	62.995	< 0.001
Sec3 ← Security	0.761	0.760	0.021	35.593	< 0.001
Sec4 ← Security	0.813	0.813	0.017	48.165	< 0.001
PoR1 ← Overall Risk	0.844	0.844	0.016	53.148	< 0.001
PoR2 ← Overall Risk	0.871	0.870	0.013	65.248	< 0.001
PoR4 ← Overall Risk	0.873	0.873	0.013	66.533	< 0.001
Tru1 ← Trust	0.853	0.853	0.013	64.358	< 0.001
Tru2 ← Trust	0.816	0.816	0.021	38.617	< 0.001
Tru4 ← Trust	0.890	0.890	0.012	73.580	< 0.001
PEOU1 ← Ease of Use	0.823	0.823	0.026	31.724	< 0.001
PEOU2 ← Ease of Use	0.827	0.827	0.019	42.994	< 0.001
PEOU3 ← Ease of Use	0.804	0.804	0.024	32.910	< 0.001
PEOU4 ← Ease of Use	0.858	0.858	0.016	55.089	< 0.001
PU2 ← Usefulness	0.889	0.889	0.014	64.678	< 0.001
PU3 ← Usefulness	0.889	0.889	0.014	63.066	< 0.001
PU4 ← Usefulness	0.897	0.897	0.015	59.498	< 0.001
BI2 ← Behavioural Intent	0.868	0.868	0.015	59.528	< 0.001
BI3 ← Behavioural Intent	0.881	0.881	0.012	74.033	< 0.001
BI4 ← Behavioural Intent	0.890	0.890	0.011	80.086	< 0.001
BIR1 ← Behavioural Intent	0.891	0.890	0.013	67.323	< 0.001
BIR3 ← Behavioural Intent	0.852	0.851	0.017	51.077	< 0.001