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ASSESSING THE PERFORMANCE OF CASHLESS SOCIETY INNOVATIONS

DENNIS NG

SINGAPORE MANAGEMENT UNIVERSITY

2019

Assessing the Performance of Cashless Society Innovations

By

Dennis Ng

Submitted to the Lee Kong Chian School of Business in partial fulfilment of the requirements
for the Degree of Doctor of Business Administration

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for any degree in any university previously.

A handwritten signature in black ink, appearing to read 'Dennis Ng', with a stylized flourish at the end.

Dennis Ng

4 November 2019

Assessing the Performance of Cashless Society Innovations

Dennis Ng

Abstract

Payments research is essential in supporting the move towards a cashless society. This dissertation uses mixed methods, a field experiment and comparative analysis to propose a payments framework, assess incentive effectiveness, and investigate the role of habits and challenges related to adoption.

Essay 1 examines whether customers carry one payment instrument over their lifetime. By analysing payments through a customer relationship management and life cycle lens, the research brings a fresh perspective on how payment providers may need to offer different payment options across the customer life cycle if they wish to maximise customer lifetime value through a lifecycle framework of electronic payments choice. The essay also finds that payment choice is affected by regulations, parental choices, and the financial, social and psychological needs of consumers, which can be used as a basis for creating new products that are relevant for each life stage.

Essay 2 assesses the effectiveness of incentives and the role of habits on cashless payment adoption at the point-of-sale. Using a field experiment, preliminary results obtained seem to confirm the effectiveness of financial incentives on electronic payment adoption. However, behaviour change falls below control levels after the incentive is stopped. Furthermore, habits seem to hinder cashless payment adoption when cash has been the predominant method of payment. Five key takeaways are provided for greater adoption success.

Essay 3 studies the challenges of introducing high-technology payment applications into low-technology adoption settings which is common when countries embark on a cashless

payment journey. The study uses a comparative analysis approach to analyse the success of the Singapore Smart Nation E-Payment Initiative by comparing its success thus far with M-Pesa, a successful retail cashless payment project in Kenya. The comparative analysis approach allows for a deeper analysis of government policy, banking infrastructure and the socio-economic development on the ground. The adoption of innovation and ground-level consumer behaviour factors are also taken into consideration. Barriers to cashless adoption are discussed and solutions offered for a smoother transition to a cashless society.

The findings from Essay 1 will provide practitioners a deeper understanding of what affects payment choice at different stages of a customer's life cycle. It also highlights the critical role of regulations in determining the potential market, which also highlights the need for practitioners to engage the regulator continuously so that regulations are updated and appropriate. New perspectives on managing business portfolios arising from the need to maximise customer lifetime value are also offered. Essay 2 findings can provide clear guidance on how incentives can be better used to speed up cashless payment adoption. It also highlights that habits may need to be better understood and managed to reduce their negative impact on cashless payment adoption both from a research and also a practitioner point-of-view. Essay 3 provides guidance from a macro-perspective on the critical factors required for cashless payment adoption success. Contrary to conventional wisdom, developed countries may encounter unique challenges to cashless payment adoption as it relates to high-technology payment application to low-technology payment deployment settings. The essay highlights previously unresearched areas on unique barriers that developed countries may face. Together, these essays provide insights to academics to further their study into payments research from a multi-disciplinary perspective. For policy makers and practitioners, these essays will help guide decision making on what works in the field towards cashless payment adoption.

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Dedicated to Almighty God

You Are the Reason

Chapter 1: Introduction

Payments research has come a long way since its early beginnings in the 1970s. The Federal Reserve Bank of Philadelphia's Consumer Finance Institute's literature database ("Consumer Finance Institute", n.d.) provides a comprehensive history of payments research. Early payment research by central banks and academics in the 1970s was focused on cash and credit cards as payment instruments. At that time, credit cards were newly launched. Since credit cards allowed credit to be extended to the masses, much of the early research focused on its effects on personal debt and the demographics of the typical credit card user (Plummer, 1971; Hirschman, 1979). Later research investigated the growth of credit cards and its effects on the demand for paper currency, including the efficiency of credit cards versus paper money and checks (Arkand and Milbourne, 1987; Jonker, 2007; Klee, 2007).

When the traditional magnetic stripe on credit cards gave way to newer technologies involving chip, contactless and mobile, research also progressed to investigate the impact of these technologies on payment behaviour. Much work has investigated on the behavioural and network-related technology issues involving mobile payments over the past thirty years (Dahlberg et al., 2008).

Mobile technology in particular has allowed developing countries to overcome the limitations of their infrastructure to launch innovative payment solutions to the underserved in society. The M-Pesa project is a classic case where mobile payments were successfully introduced in Kenya to the unbanked and semi-literate, allowing convenient payment transfers (Hughes and Lonie, 2007).

Developed countries have also benefited from the cost efficiencies of using payment technology to move towards cashless payments. Today, even first world countries are exploring how these technologies can allow them to penetrate the last mile of the payment journey,

often typified by low value transactions, below US\$20. Nowhere is this more evident than in Asia, where countries have decided to embark on a journey towards a cashless society using new payment technologies to leapfrog from cash to digital payments, bypassing traditional banking. In this way, many are helped to gain access to financial services for the first time (UBS, 2018).

Technology has also offered consumers more payment choices. Today, consumers enjoy a myriad of payment instruments to suit their every need and want. Despite these advances, payments remain largely a human activity. Consumer payments are performed by human beings. How do consumers pay? Analysis of consumer behaviour is often complex, requiring a multi-disciplinary approach. But how they behave and make payment choices will affect payment adoption. Even if the most cost-efficient and technologically superior payment options are made available, adoption is only as good as how users perceive the benefits of the technology to be.

Chapter 2 investigates whether consumers hold different payment instruments at different stages of their lives. The answer to my research questions will guide payment providers as to whether they must offer different payment options for each stage of the customer's life if they wished to retain the customer for life and maximise his lifetime value, as proposed by customer relationship management (CRM) theory (Payne, 2006). Looking at payments using a CRM lens also provides fresh insights into how strategic payments businesses must be managed by providers to maximise customer lifetime value. New insights into the mass transit card as a general-purpose payment card are also discussed, and how mass transit operators can better monetize their products through collaboration is also considered. Finally, a framework is proposed to simplify payment choices across life stages and identifying the role that regulations, parental supervision, financial, social and psychological factors play.

Despite the guidance that can be provided by general frameworks to guide business and

policy decisions, fundamental payments research is still required to assist practitioners towards eliminating cash. One such area is the use of incentives to stimulate or encourage the use of cashless payments over cash at the point-of-sale. This is important during the pilot and early stages of cashless adoption. While the literature on effectiveness of incentives is quite well-developed (Lazear, 1996; Gneezy and Rustichini, 2000a, 2000b), there is little research on the use of incentives specifically in a payment adoption context. Practitioners do not know for sure if incentives work in motivating cashless payment adoption and whether the behaviour changes are permanent. The role of habits in payments has also not been researched.

Chapter 3 uses a field experiment to examine how incentives and habits affect cashless payment adoption. The use of field experiments in payments research has also been rare. Results from this field experiment on incentive effectiveness would be helpful to payment providers and governments as they move to a cashless society. It would also highlight whether any behaviour change would last beyond the incentive period and the role of habits in the overall adoption process. The results from qualitative research performed during the experiment will provide insights on other barriers to cashless adoption as well. The concept of cash displacement and how it is helpful in assessing the overall effectiveness of cashless payment efforts is introduced in this essay. From the research findings, I also provide practitioners with five key takeaways to improve cashless adoption in the field.

There has been increasing interest by many countries to move towards a cashless society. This interest has been partly driven by governments' desire to achieve the G20 goals of financial inclusion since it directly contributes to strong, sustainable and balanced growth (Capgemini, 2018). Despite the strong interest, there has been little research on the experiences of countries in their cashless payment journeys whereby new technologies like mobile and chip are used in low-technology adoption settings. One example of a successful cashless adoption is the M-Pesa mobile payment service launched in Kenya in 2007. M-Pesa has been

touted as an exemplar of how technological innovations like mobile phones allow commercial and social organisations to offer cashless payments to billions of consumers in the bottom-of-the-pyramid (BOP) segment. On the other hand, the Singapore cashless payment initiative is less than successful despite strong government support. What are the reasons for this lack of success? What can we learn from the success of M-Pesa? What are the key success factors that can help a country's cashless strategy?

Chapter 4 investigates the challenges of implementing high-technology payment applications in low-technology adoption settings. Countries embarking on the cashless payment journey often use the latest high-technology payment applications. These are then deployed in areas which predominantly accept cash – the small convenience stores and wet markets with low purchase value and physical settings that are not conducive to cashless payments, often resembling retail situations in developing countries. Using a comparative analysis approach between the successful M-Pesa mobile payment service in Kenya and the Singapore Smart Nation E-Payment Initiative, the essay offers strategic insights for governments and payment industry practitioners through five key implications that are derived from research findings. The essay also offers recommendations to further improve cashless adoption of the Singapore Smart Nation E-Payment Initiative.

Chapter 5 then concludes with a high-level overview of the results and the limitations of the research. It also suggests areas for future research.

Chapter 2: A Framework of Payment Choice

2.1. Introduction

This essay investigates whether consumers hold the same electronic payment instrument throughout their lives. Consumers today enjoy a wide range of electronic payment options. However, consumers' needs may also vary throughout their lives. Do these needs cause them to choose different payment instruments? Or is there a single payment instrument that meets their needs throughout their lives?

The background and motivation for this essay were the result of a commercial consultancy project to build customer personas for a client's range of customer segments covering a cradle-to-grave segmentation study: students, youths, working adults and retirees in Singapore. *Personas* are workable descriptions of typical users (Pruitt and Grudin, 2003) commonly used in the banking and consumer products industry¹.

During the commercial consultancy project to build customer personas, I became intrigued with the question: Do consumers² hold the same payment instruments throughout their life? Another related question also emerged: What are the factors that drive their payment choice? These two questions became the research questions for this essay. While analysing the results, I also wondered whether these factors could be simplified into a framework based on the life cycle concept.

The answer would suggest whether a successful payment provider must offer different payment options for each stage of the customer's life if they wished to retain the customer for life. In the *customer relationship management* (CRM) literature, the concept of *customer lifetime value* (CLV) proposes an active marketing campaign to keep customers that offer the highest lifetime value (Payne, 2006). It is defined as "the future flow of net profit, discount-

¹ An example of personas in the cosmetics industry is found in Appendix 2. Confidentiality clauses prohibit providing the actual personas created, so an example from the cosmetics industry is provided.

² In this essay, a "consumer" refers to *both* a user and a buyer of the payment product. The term "customer" on the other hand refers to people who have a business relationship with the company.

ed back to the present, that can be attributed to a specific customer” (Payne, 2006, p.9).

Findings from this research will offer strategies to the various payment providers on how to better capture the CLV of their customers. In the early days of the industry, when there were few payment options, payment providers assumed that an ATM card for local use and a credit card for international travel was all that was required for the average customer over his entire life. Not only are customers faced with a wider range of choices today, they have also become more sophisticated. This suggests that customers today may pick and choose a payment option for different stages of their lives. If so, then payment providers may wish to consider broadening their payment products by catering to the full lifetime of their customers so as to maximise their CLV.

What are the factors and decision processes affecting payment choice? It is with this perspective that I also attempted to understand the process that went into the decisions: the *how*s and *why*s of such decisions that can explain the rationale behind their payment decisions. It is an inductive process, using the data and evidence gathered from the research to provide new insights within an analytic frame which is common in social science research as it provides an outline of the phenomena (Ragin and Amoroso, 2011). The life cycle concept is the appropriate framework to answer the research question of whether consumers hold different cards throughout their lifetime.

2.2. Literature Review

A comprehensive literature review was conducted on consumer payments and consumer life cycle. The list of articles reviewed can be found in Appendix 3, Tables 1 and 2. The following sub-sections discuss the pertinent issues arising from the review related to my effort to craft a thesis essay to produce new knowledge for research and practice.

2.2.1. Perspective on Consumer Life Cycle

The life cycle concept is based on the assumption that a person's life can be understood as passing through a certain sequence of stages (Arndt, 1979). Lansing and Kish (1957) investigated life cycle as an independent variable. They commented that demographic variables were too frequently used as independent variables in a mechanical way without theory to guide their selection and appropriateness to the study. They gave the example of the age of a person as one such frequently used variable. Although traditionally, it is often used because of its relative ease and uniform acceptance, the authors proposed a person's life cycle as an alternative variable to age. They explained that many changes in family decisions like consumption may not be due to a person's birthday, but it might occur with changes in his family status, such as marriage or when a first child is born. Using data from a nation-wide survey, the researchers used age and stage of the life cycle to predict six dependent economic variables: home ownership, household debt, working wife, income above \$4,000 and car purchase. Using three different statistical methods, the researchers showed the amount of variation in the dependent variable that is explained by the independent variables - either age or family life cycle.

In Method I, they used the coefficient of within-class³ correlation, which measures the proportion of the variance among the class means as a proportion of the total variance among the individuals. In Method II, the sum of weighted absolute deviations from the overall means was used. In Method III, the authors separated the classes into high and low, depending on whether the mean for each class was above or below the mean. In all three methods, the variations or deviations were also measured and the ratios and differences were computed. The family life cycle stage proved to be a better predictor of the six economic variables as measured by the coefficient of interclass correlations, and the deviations and the differences

³ "Within class" is a term used to describe variances in ANOVA tests. It refers to variations caused by differences within individual groups or classes.

between low and high classes.

The better explanatory power of the life cycle can be attributed to its multidimensionality. In application, many individual demographic variables are captured. The typical life cycle in consumer research often includes occupation, income, age, family size and many others, of which some are latent variables that become strong predictors of the dependent variable (Nock, 1979; Cox et al., 1998).

As the life cycle concept grew in use within sociological research, Wells and Gubar (1966) extended the usefulness of the concept to the business world by suggesting that the life cycle could provide a promising basis for understanding changes in consumer needs and consumption patterns. They supplemented the work of Lansing and Kish (1957) by studying another source of data that compared age with life cycle from the “Expenditure Patterns of the American Family” by the National Industrial Conference Board. This data source provided additional information covering expenditures on durables and services, which went beyond the authors’ coverage. Evidence from their study showed that direct comparison between life cycle and age weighed heavily in favour of life cycle, whether the item was a product or a service.

Authors from other disciplines of the social sciences (e.g. marketing, economics and psychology) soon adopted the concept in their work. Although early research focused on family and then households, recent research has focused on the individual. Researchers, particularly in marketing, turned their attention to the individual consumer as the level of analysis (Bauer and Auer-Srnka, 2012). In contemporary marketing use, the term *life cycle*, therefore, refers to the *consumer life cycle*.

Early models of the life cycle concept were categorical models and used static data to assist in segmentation of heterogeneous consumers into homogenous groups for strategic marketing analysis (Wells and Gubar, 1966). Later models were used to investigate and predict

consumer behaviour on an individual basis (Harrison et al., 2011), while Du & Kamakura (2006) took a *life course* approach for analysing the effects of social and cultural contexts. The latter's models go beyond life cycle stages and allow life trajectories to be mapped out over time to better capture life cycle dynamics.

Taking a life course approach, Kamakura et al. (2005) discussed CRM as a way to analyse customer role transitions over time. CRM is a combination of strategies, processes and technologies to help companies manage customer relationships to improve profitability. This might help marketers to enhance their customers' CLV.

2.2.2. Perspectives on Consumer Payments

Early work on consumer payments mainly focused on how the use of credit cards affected the amount purchased (Hirschman, 1979), how the introduction of credit cards affected total household money (Akhand and Milbourne, 1986), and how transaction time influenced the choice of payment (Klee, 2006). The rapid growth of credit cards in the U.S. in the 1980s and 1990s, followed by a recession, drew researchers' interest on how economic conditions and new government credit card regulations affected payment choices towards the use of cash (Foster et al., 2011).

Thereafter, the focus of the research moved towards credit card rewards and their impact on payment choice and use, the effect of transaction size on payment mode, and an attempt to create a taxonomy of payments. Ching and Hayashi (2010) used the 2005/2006 U.S. Study of Consumer Payment Preferences in their research on the effects of credit card rewards and its impact on payment choices. They found that rewards had an effect on payment choice. Arango et al. (2015) investigated the effect of card rewards on the shift towards credit cards and away from cash and debit cards in the Canadian market. They concluded that rewards increased the use of credit cards, but the relationship was an inelastic one. They also noted that cash was the preferred payment choice for transactions below US\$25, after controlling for

merchant acceptance.

Amid the proliferation of new payment modes in the early 2000s, Briglevics and Schuh (2014) explored payment choice and cash withdrawals, and how they affected overall cash management. They found that rewards mattered to consumers when choosing payment modes. Jonker (2007) studied the social cost of different payment instruments on Dutch society. An interesting insight from her survey is that the size of the transaction affected payment choice because small value merchants only accepted cash as they did not have electronic payment terminals. Wang and Wolman (2016) studied the effect of threshold transaction size on payment choice. Their research found that consumers selected their payment mode based on transaction size. In the case of larger amounts, there was an opportunity cost of lost card rewards. So, credit cards were preferred for larger purchase amounts. Overall, the research on payment choice thus far has focused on the effect of rewards on payment choice and use, though demographic characteristics such as age, race and education seem to be related to payment choice (Ching and Hayashi, 2010).

Khan et al. (2015) investigated the softer aspects of decision making by studying consumers' perception of payment modes to understand their cognitive and emotional associations with these different modes. They found that reliability and customer perceptions influenced spending behaviour and ownership of payment modes. Hedman et al. (2017) argued that new payment instruments which were introduced contained features that influenced payment choice. Based on an in-depth analysis of the interviews of 15 payers' perception of six payment instruments, they developed a four-category taxonomy of payments comprising 16 payment characteristics.

Schreft (2006) analysed the electronic payment field and discussed the pressing policy issues in the 2000s. She noted that the set of payment options had expanded over time. Consumers progressed from using coins and bank notes to a much more sophisticated and wider

range of electronic payment options. She regretted that very little was known about consumer payment behaviour since much of the research on payment choice used economic modelling, which was not how people made decisions in real life. She also acknowledged that the point-of-sale decision was a complex one and should be approached from many angles, including viewpoints from behavioural economics, psychology and marketing.

Although there has been research on demographic variables and how they affect payment choices, this literature review has not identified any research using the life cycle concept to investigate payment choice which is specific to my research question. Furthermore, there is no research to holistically analyse payment choice from a multi-disciplinary angle. It is with this viewpoint in mind that I have undertaken this research focusing on payment choices through life cycle stages, with the hope that this may advance knowledge in this area.

2.3. Research Methods, Setting and Data

2.3.1 Research Method

My research approach was guided by the interpretive model of social research, where data and evidence are gathered through in-depth information on a small number of cases (Ragin and Amoroso, 2011). Evidence and data are then synthesized to form patterns or images, which were like portraits representing the different data and evidence collected. I consolidated my findings into a framework that represents how consumers made payment choices over their lifetime. Finally, the framework was validated with survey data. As an additional form of validation, an industry practitioner was consulted and the person provided an example of how the framework could be used by a hypothetical debit card provider.

Planned focus groups and opportunistic interview. A qualitative research method using focus groups was proposed and agreed to by the client since the origin of my research was a commercial project. The client categorized their customer base by life cycle segments:

students, youths, working adults and retirees. Data on the segments were collected through focus groups and interviews. The planned number of respondents for each focus group was eight. This number was obtained by balancing the research budget limitations of the client and the number of participants providing a reasonable representation of the segment.

Respondents were paid S\$30 for a one-hour session. Convenience sampling was employed due to client time constraints. *Convenience sampling* is a type of non-probability sampling in which people are sampled simply because they are “convenient” sources of data for researchers (Battaglia, 2011). Appendix 4, Table 1 shows the planned and actual categories of respondents for the four segments.

Respondents. The number of respondents was larger than the planned number. However, the actual number who participated was obviously less than that who responded. Arrangements were then made for the focus group sessions. The number of focus groups scheduled was related with the availability of the respondents for the specific date/time/venue. Exact details of the focus groups and interviews are shown in Appendix 4, Tables 2 and 3. A focus group survey was developed and approved by the client as shown in Appendix 5. Audio recordings of focus groups and interviews were done. The composition of the focus groups is listed in Table 2.1.

Table 2.1. Focus Group Description

Group (N)	Description
Students (9)	Primary and secondary students, ages 9-16 years, 6 females and 3 males
Youths (8)	Undergraduates and national servicemen, ages 19-24 years, 4 males and 4 females
Working Adults (8)	Various job roles, ages 22-47 years, 4 males and 4 females
Retirees (11)	Ages 58-76, all females ⁴

Focus group questions are listed in Appendix 6. Since two parents accompanied their children to the focus group for students, one parent was interviewed on an impromptu basis,⁵ after the focus group for students was completed. It lasted for about one hour and was audio-

⁴ It was difficult to get participants who are retirees. I had to seek help from a retiree community acting group. Even then only women agreed to be involved.

⁵ Female, early 40s, mother of two participants.

recorded.

2.3.2. Setting

The Singapore consumer payments market consists of international credit and debit cards, local PIN-based ATM access card and a mass rapid transit card. After three decades of double-digit growth in the industry, the overall number of cards has recently begun to stabilise (Euromonitor, 2018). During this time, the government intervened numerous times with stringent regulations like minimum income and maximum credit limit mandates to ensure personal debt levels did not reach unhealthy levels (Euromonitor, 2018).

The country has recently started to promote digital payments as part of a drive towards a cashless society. This has led to an increasing number of banks collaborating with major mobile wallet providers and introducing newer forms of mobile payments. Despite the various new payment options available, credit, debit and the ATM cards remain the mainstream payment options, with the mass rapid transit card as the mode of payment for buses and mass transit.

In Singapore, a typical consumer life cycle begins when students start schooling at age 7 and continue until they reach 18. They then progress to university for 3 to 4 years of their lives. Male Singaporeans will perform two years of mandatory military service. The working adulthood stage typically begins around 25 years until the official retirement age of 62.

2.3.3. Data

Data were collected over a two-month period from May to June 2017. Demographic data were obtained from all applicants who responded. They were asked to fill up a form requiring their name, age, gender, occupation, race, housing type, education, payment cards owned and payment cards most frequently used. The form also provided information on the research, that participation was voluntary, and their information would be kept confidential. They were also informed that they would be compensated for their time in the focus group and inter-

views. The shortlisted focus group applicants were then scheduled according to their life cycle stage for which qualitative data was collected.

Once the focus group sessions were completed, the data were transcribed and analysed. The primary objective was to create workable personas for the client. This contained mostly demographic information with some psychographic description of the lifestyle of all four segments. After this process, the same qualitative data were used to construct a more detailed understanding of each stage. This stage construction consisted of identifying the major needs, concerns and struggles of each segment.

My objective was to understand the context in which these needs arose, and the underlying concerns and motives behind their choices of payment instruments. Institutional Review Board (IRB) approval was obtained to use the survey, focus group and interview data for my dissertation. See Appendix 1 for IRB approvals. My first results involved development of an overview of the synthesis and construction of each stage of the life cycle by using the research data synthesized with information from the academic literature and secondary research at each stage.

2.4. Results from Focus Groups and Interviews

The results from the focus groups were organised according to the different segments that took part in the discussions – students, youths, working adults and retirees in this order. Within each segment, the first part of the discussion addressed the type of payment cards held while the second part discussed how they made their payment decision.

2.4.1. Students

When asked what cards they carried, students replied that they mostly used retail stored value cards. The reasons they provided were the discounts they enjoyed with these cards. Common stored value cards in Singapore are those issued by Starbucks, Café Galilee (a café

within all public libraries), and Popular Bookstore, along with the Kopitiam card (a neighbourhood food court card). They indicated that:

“I use the Starbucks Card to pay for drinks at Starbucks”. (Student)

“Sometimes when I go to the Kopitiam (local slang for neighbourhood coffeeshop) they allow their own cards to be used...” (Student)

Other than the retail stored value cards, students also mentioned the mass transit card as the other card that they used. It provided them with student concessions on public transport such as buses and the trains and convenience stores. For example:

“(I can) use it for the MRT, for food, at 7-Eleven. It’s very convenient.” (Student)

An interesting observation was that, in students’ responses, they implied that credit and debit cards were not choices for them. Regulations seemed to be one factor that affected their payment choice. They shared:

“For us students, right, we don’t have credit cards or debit cards, so the only cash-less payment we have is the mass transit card ...” (Student)

“Most of us don’t have credit cards or debit cards, so we just use the mass transit card at places where it is accepted.” (Student)

Another factor affecting their payment choice was parental supervision. The students’ responses indicated that the decision may not have been made by them. This was confirmed by the interview with a mother on how she controlled the spending of her two daughters, aged 9 and 10. She said:

“I get them to buy the Café Galilee Card as I don’t want them to carry so much cash. For \$20.50 they get 5 drinks which they can share among themselves. So when they go to the library, they can use it conveniently” and “.... if they purchase online, they (students) can get caught up. Even we adults get caught up.... For my son, if he wants to buy something online, he will have to come to me and we will use our credit cards so that we will know what he is purchasing.” (Parent)

Parents were also worried about children losing cash notes. They preferred to load their retail stored value cards and mass transit cards since these cards could be locked when misplaced, lost or stolen.

While discussing the places where they could use the mass transit card, the students high-

lighted that the *tuck shop* (small food retailer) in their schools accepted these cards. It was surprising to learn that various government welfare assistance schemes for poorer students were administered through the mass transit card. For example, free school tuck shop meals for needy students were carried out through a monthly top-up to the card. The students could then use these to pay for their meals in school.

“... the tuck shop accepts the mass transit card for FAS (Financial Assistance Scheme) students to pay for their meals”. (Student)

Overall the focus group findings show that students’ choices of payment were limited to retail stored value cards and mass transit cards. Their payment choices were affected by regulations limiting broader options like credit and debit cards into their choices. The availability of travel concessions and government welfare which are administered through the mass transit card was another key factor. The specific discounts provided by retail outlets provided a reason for students to also prefer retail stored value cards. Parental supervision was also a key factor in the decision.

One key finding that was external to the original objective of the focus group was the importance of user perception on the ability of a payment product to expand its use. The mother whom I interviewed said that the mass transit card should not be expanded for acceptance at e-commerce sites, restaurants and shopping malls. This was because she associated the card with *saving* money whereas the act of online shopping, restaurant dining and shopping were acts of *spending* money. She commented:

“....the mass transit card should not be allowed for use on the internet. I don’t know...but I feel that the reason why people use the mass transit card is that it allows me to control their spending. But if it can be used on the internet, then it’s like it will help me to spend rather than save.” (Parent)

2.4.2. Youths

When asked for their favourite payment method, the debit card was the preferred payment choice among youths. The major reasons for choosing the debit card over other forms of

payment was that it allowed for online shopping, payment of taxi-sharing services like Uber and Grab, and dining at restaurants. They indicated that:

“I use debits cards like the XXXX Mastercard because it’s convenient for online shopping and also useful for Uber and Grab.” (Youth)

“.... while I would like to use the mass transit cards at hawker centres, I would prefer debit cards or XXX card (a local PIN-based ATM card) for restaurants.” (Youth)

When asked for the brand of debit cards they used, they said it was the signature-based ones issued by the various banks in association with Visa or Mastercard. Debit cards were preferred over the local ATM card because it was signature-based which allowed for online shopping, and also because it offered some discounts and promotions at dining outlets in Singapore.

When asked specifically about online shopping, the participants said that, while the debit card was the preferred choice, their second option was either using Internet banking, whereby they transferred the money to the seller using an ATM, or they would use PayPal. One observed:

“Other than debit cards, I would also use PayPal for online purchases because it’s safer.” (Youth)

On the factors affecting their choice of payment cards, one key factor that was mentioned by many participants was convenience from the need to top up a pre-paid card regularly, as the debit card is automatically linked to a banking account. The other factor was the ability of debit cards to earn reward points and rebates. They stated:

“The difference between the debit card and other cards is that you don’t have to top it up, so that’s very convenient for me.” (Youth)

“... so like credit or debit cards you earn rebates but for the ATM Card you do not earn anything” (Youth)

“... like Visa and Mastercard (debit), they have points and rebates so it’s important for us.” (Youth)

In a reference to their changing lifestyle needs as they move out of the student stage, a participant also mentioned how convenient debit and credit cards were when travelling over-

seas, as they provide an emergency source of cash and also take away the hassle of dealing with foreign exchange:

“So like Visa and Mastercard, when you are overseas you can use the card to get emergency cash and also you don’t have to worry about currency exchange although the rates can be quite expensive.” (Youth)

Male participants who were still in national service also mentioned that a mass transit card was convenient. Many military camps have vending machines and these cards would be useful for payment when they run out of cash. Both male and female undergraduates also mentioned the utility of the mass transit card as the photocopying machines in their universities were self-service and required cashless payments.

Overall, the participants from the Youth focus group preferred debit cards as their primary payment choice while PayPal and the mass transit card were a secondary or specialised payment options. Their decisions are affected by the benefits, the general convenience of the payment method and the specific needs of their lifestyle, like frequent ride-sharing taxis, online shopping, travels and dining.

2.4.3. Working Adults

The participants in this focus group held many cards in their wallets. Their working status and age allowed them to meet all regulatory requirements. Participants were unanimous in their choice of credit cards as the preferred payment choice. They were also unanimous in assessing the reasons for their choice – it allowed them to earn rewards and enjoy discounts.

“... prefer credit cards because I can earn points.” (Working Adult)

“... I prefer credit cards because of reward points, discounts and promotions.” (Working Adult)

“.... prefer PayWave (on credit cards) because of convenience, lucky draws and points.” (Working Adult)

One participant brought up the point that her preferred method of payment would depend on the transaction size:

“.... for me, it depends on the amount. If it is large, then it will be credit cards.”

(Working Adult)

Despite preferring credit cards for overall purchases, participants still retained the mass transit card as a specialised payment choice for public transport. Although the mass transit system accepts credit cards for payment, participants in the focus group did not seem to associate mass transit travel with credit cards. One of my respondents said:

“... the mass transit card is convenient and fast, instead of cash.” (Working Adult)

As for retail stored value cards and PayPal, working adults continued using them as a special use cards, so they could enjoy special discounts. They noted that:

“I still use the Starbucks Card because it helps me get free cups of coffee.” (Working Adult)

“I use PayPal or Alipay because it is faster.” (Working Adult)

In response to factors affecting their choice, participants mentioned benefits, particularly monetary benefits, as a key factor. The other factor was convenience – how convenient it was to apply for the product and also to use the product.

Overall, participants in this segment preferred credit cards as the main payment choice because of their ability to offer rewards. Participants, however, still kept the stored value card and the mass transit card as specialised payment options for specific uses. Factors that influenced their payment decisions were benefits, the convenience the payment product offered, and the amount of the transaction (with the credit card for larger purchase amounts).

2.4.4. Retirees

The participants in this group were elderly women who were either housewives or working part-time. I brought a translator with me to the discussion because only one participant spoke good English. Even then, the discussion took place using a smattering and mixture of Mandarin, Cantonese and English. Due to language issues, the quotes below are a mix of translation and paraphrasing.

When asked what their preferred payment choice was, all participants indicated the local ATM card as their preferred choice. An example is:

“... I would use cash or the ATM card. I get a discount when I pay if I show my NTUC Identification Card for seniors.” (Retiree)

Due to their age, participants enjoyed various discounts at supermarkets and government services on the provision of a senior’s identification card. Some of these identification cards were provided by the retailer, like NTUC. The mass transit card also functions as an identification card. Therefore, they continued to hold the mass transit card and used it for small value purchases and local public travel where they enjoyed concession rates. They told me that:

“... mass transit card can get discounts.” (Retiree)

“... mass transit card is better than cash. More convenient, especially when need to change many routes and if done within 2 hours, can get discounts.” (Retiree)

This same mass transit card, which is also a senior citizen identification card, is tied to the pedestrian “green man” at traffic junctions. It allows participants more time to cross the road. Participants often indicated the various discounts they received as retirees, like free membership to senior gyms, libraries and public transport. They used many of these government-subsidised facilities and the retiree identification provided by the mass transit card was therefore important. I learned that:

“For retirees like us, there is discount at many places like museum, and the mass transit card gives us the official status to enjoy these discounts.” (Retiree)

Overall, the participants’ predominant form of payment was the ATM card but they continued to hold the mass transit card as an identification card which unlocks various senior benefits relating to their retiree lifestyle. Factors that affected their payment choice include the monetary benefit the card brings and convenience of using the card.

2.5. Primary Focus Group and Interview Findings for Research Questions

2.5.1. Findings

A summary of the results from the focus groups and interview is found in Table 2.2.

Table 2.2. Summary of Results

	Students	Youths	Working Adult	Retirees
Preferred Payment Method	Retail stored value card Mass transit card	Debit cards	Credit cards	ATM cards
Factors Affecting Payment Choice	Regulations Parents Benefits Concessions Welfare	Regulations Benefits Lifestyle	Benefits Convenience Transaction size	Benefits Convenience

When I asked all the participants in the focus group for their preferred payment choice, their responses provided me with evidence to answer the first research question: whether consumers hold the same payment instrument throughout their life.

- **Finding 1 (Payment Type):** *Consumers hold different payment instruments throughout their life.*

Students preferred to use prepaid retail stored value cards and mass transit cards. Youths, on the other hand, preferred debit cards while working adults preferred credit cards. Retirees stated that the ATM card was their preferred mode of payment.

The second research question about the factors that drive payment choice was less directly answered. Although participants listed typical microeconomic factors like rewards and convenience, the underlying drivers of such choices – financial, social and psychological needs – could not be sufficiently articulated nor discussed in the less structured setting of a focus group discussion. This included the effect of regulations which restricted their choices to a narrower set of payment instruments. This was implied by their answers.

With additional research using the literature and secondary sources of data, I obtained sufficient data to offer more insights into factors affecting their payment choices. The demographic data obtained from the focus group application form was one additional source of information on income and lifestyle indicators. The commercial objective of building personas was also helpful in gathering deeper insights into the underlying motives for payment

choices.

- **Finding 2 (Regulations):** *Regulations affect the life cycle choice of payment instruments.*

I performed additional research using secondary sources of data, like central bank websites covering regulations on ownership of financial instruments in Singapore. The minimum age requirement for opening a bank account is 15 years. Therefore, students who are below 15 years are not allowed to hold ATM cards and debit cards because these cards need to be linked to a bank account. Although the universal set of payment options is technically open to students below 15, their *consideration set* (Shocker et al., 1991) is limited to retail stored value payments and the mass transit card which do not have a minimum age requirement.

For youths between the ages of 17 and 24, the minimum age for a credit card application is 18 years, but their card is only a supplementary card to the parent. Therefore, those whose parents are not willing to sign them up as a supplementary cardholder will need to apply for a debit card instead. The minimum requirement for a credit card account is 21 years and an annual income of S\$30,000. Therefore, regulations affect payment choice by restricting the payment set to a narrower set of alternatives. This particularly affected students and youths.

- **Finding 3 (Parental Supervision):** *Parents affect the payment choices of students.*

This was clear even during the focus group discussions. The two sisters aged 9 and 10 kept looking towards their mother (who had accompanied them to the focus group venue but was seated at a distance) when certain questions were asked. This prompted me to approach the mother for an impromptu interview. During the interview, the parent confirmed that she controlled the payment choices of her children and provided instances when she directly controlled the payment choices.

- **Finding 4 (Financial, Social and Psychological Needs):** *Payment choices are also affected by financial, social and psychological needs.*

Again, this was not directly answered by the participants but instead inferred through

their answers to the question of where they would like their payment instrument to be accepted. Together with additional research and the experience of running similar focus groups over the past 25 years in my corporate experience in payments, I was able to synthesize the factors covering benefits, concession, welfare, convenience and various other microeconomic factors into larger groups of financial, social and psychological needs. The synthesis was guided by the research of Morton (2005), who applied a psychological and social growth view to break down the factors at each age range:

- **18-29:** Choose course of life, leave control of parents, plan occupation, decide philosophy of life, enter early adulthood.
- **30-45:** Seek validation around jobs, want to be responsible adults, care for family want to be seen as promotable employees, sacrifice for family and jobs, live in a whirlwind of activity to complete early adulthood tasks, start family and establish oneself in community, church and job.
- **45-55:** Question life, endure a volatile transition, and prepare for a new second adulthood. The stage begins with transition to full-time employment and ends with preparation for another transition to retirement.

For example, the transition from student to youth was particularly observable through the choices of benefits they sought in a payment choice. These benefits that were sought also shed light on their broader social and psychological needs. Youths needed payment types that allowed internet shopping, taxi-sharing payment, dining and overseas travel, which made the debit card their preferred choice. Working adults were keen on the monetary rewards that credit cards offered. Retirees on the other hand just wanted a simple, no cost payment card to complement their simplified lifestyle needs, which led them to prefer the ATM card.

- **Finding 5 (Mass Transit Cards):** *Mass transit cards seem to be carried for life, albeit as a secondary or specialised card in later stages of life.*

Students use the mass transit cards as one of their payment options. While this card is replaced by other payment options as students grow up, they nevertheless remain as the secondary payment choice for the travel concessions they enjoy in the youth stage and retiree stage. In the adult stage, mass transit cards continue to be carried as a specialised and more

convenient form of payment for public transport. Furthermore, there is no cost to ownership.

- **Finding 6 (Consumers' Associations):** *Consumers categorise payment products as saver and spender products*

While not directly related to the research question, this finding is worthy of further discussion, as it is a novel idea which has ramifications for payments research. The interviewee in this study mentioned that she unconsciously labeled payment products in her mind as *saver products* and *spender products*. Saver products would generally include pre-paid products that need to be topped up regularly, have limited acceptance, and do not offer rewards for use. Spender products, on the other hand, do not need to be topped up as they are linked to a bank account or credit line, have good acceptance, and offer generous rewards.

The results can be summarised into a framework of payment choice, as shown in Table 2.3. I also provide instances how this framework can be adopted in different countries by using existing academic research on life cycle and customising it with local central bank laws in Appendix 7.

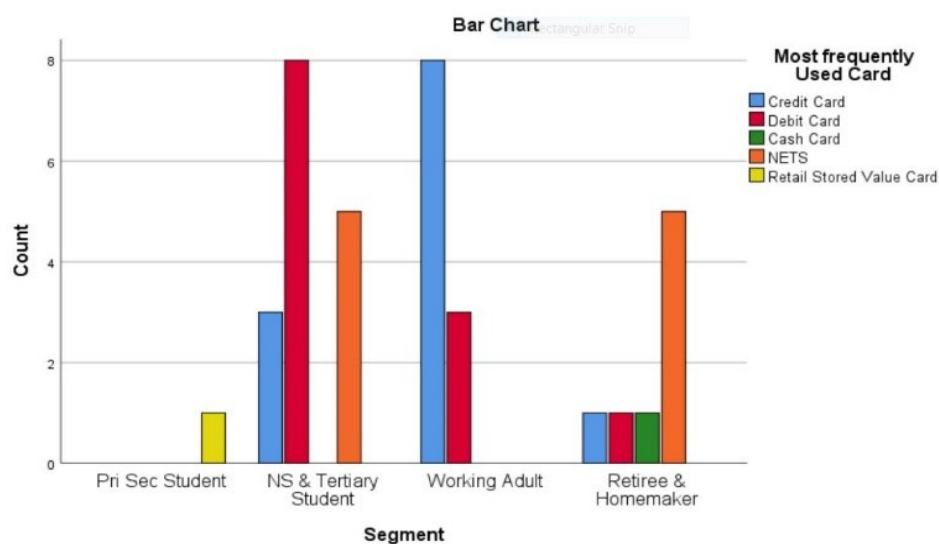
2.5.2. Framework Validation

During the selection of focus group participants, I requested all respondents to fill up a survey form listing their demographics, payment preferences, and broad lifestyle. A total of 74 survey forms were collected. This was more than double the number of focus group participants, thereby providing a larger sample for analysis. Using the demographic data they provided, I then analysed how consumers chose payment instruments at each life stage. Figure 2.1 shows the results.

Table 2.3. A Life Cycle Framework for Payment Choice

Stage	Student	Youth	Working Adult	Retiree
Demographic Characteristics	7-17 years Single No income, financed by parents	18-24 years Single, starting relationships Part-time income	25-64 years Married, family with kids Full-time income	65+ years Empty nest Reduced income
Parental Control	High parental control	Breaking free from parental control	Freedom from parental control	Parents no longer around
Regulations	Minimum age 16 years for ATM or debit card Minimum age 21 years for credit card	Minimum age 21 years for credit card Minimum income S\$30,000 for credit card	Minimum income \$30,000 Credit limit max 4X monthly salary	Minimum income S\$15,000 Max credit limit 2X monthly salary
Financial Needs	Spend within parental budget Take advantage of student concession prices on transport and other public services	Take advantage of student concession prices Attempt for financial freedom while managing new lifestyle needs like clubbing & online shopping Payback study loans First baby banking relationship	Financial responsibilities especially when starting a family Loans for car and first homes Financial budgeting for discounts and money-stretching strategies including using credit responsibly to make ends meet Planning and saving ahead for kid's education and retirement Full banking relationship management including using credit responsibility	Work at reduced pace, some to support themselves while others for feelings of purpose Financial health vary, depends on wealth accumulation during previous stage
Psychological & Social Needs (Morton, 2005)	Working out their identity through physical changes and acceptance by peers Struggle for independence while staying within parental control Coping with schoolwork	Choose course of life Leave control of parents Decide planned occupation Develop philosophy of life Prepare to enter into first adulthood	Seek validation through jobs Desire to be responsible adults, caring for families and become promotable employees Sacrifice for families, jobs Live in whirlwind of activities to complete adulthood tasks Start families, establish communities in neighbourhood, church, jobs Prepare for second half of life	Attitude and mental health are key to positive outlook in this stage Some age passively while others age successfully Need to avoid depression with positive attitudes, continuing education and social contacts
Primary Payment Choice	Retail stored value cards Mass transit cards	Debit cards	Credit cards	ATM cards
Secondary or Specialised Payment Choice	--	Retail stored value cards Mass transit cards ATM cards PayPal	Mass transit cards Debit cards Retail stored value cards ATM cards PayPal	Mass transit cards

Figure 2.1. Most Frequently Used Card



Consumers in different life cycle stages seem to choose different types of payment methods: the retail stored value card for students, the debit cards for youths, the credit card for working adults and the ATM card for retirees. My findings are far from conclusive, given the small sample size and the non-probabilistic sampling methods, but they are indicative of the likely underlying truths that my research points to.

As an added form of validation, I asked the Vice President of a major U.S. financial services provider to provide his feedback on the framework. He thought the overall framework was reasonable. He commented that it provided a convenient “cheat sheet” for early entrants into the industry, for example, the barriers preventing a product from becoming a part of the customer’s consideration set (regulatory factors), and the unique life cycle stage needs that drive the search for specific benefits from the product. But more importantly, he thought the insights covering the psychological and social needs at each stage would be beneficial to product managers as they develop their products to be relevant to consumers at each stage. For example, he gave the case of some retirees, who might not be in full employment, yet still might have unique recognition needs that require some form of recognition and rewards.

Similarly, the unique needs of the young adults can inform product managers of debit cards as they design rewards and loyalty programs that encompass lifestyle and dining needs of this group of customers.

As a further form of validation, I have also provided an example of how this framework can be applied in a more strategic manner using a CRM perspective to improve CLV to a fictional debit card provider, as reported in Appendix 8.

2.6. Discussion

As is typical in social science research, this essay has synthesized seemingly different evidence affecting payment choice. Through this synthesis within the life cycle analytic frame, connections were made that lead to insights into the phenomena being studied - payment choice in Singapore.

2.6.1. Research Contributions

The CRM literature proposed an active marketing campaign to retain customers that offer the highest lifetime value (Payne, 2006). By providing evidence that customers hold different cards over their lifetime, this research brings a fresh perspective. Payment providers who are unable to meet the current needs of customers fully with one payment product might need to offer different payment options for each stage of the customer's life cycle, if they wished to maximise CLV. This finding is particularly relevant to *monoline providers* – payment services firms that carry only one product - like MBNA in the U.S. If developing new products for other stages of the life cycle is not viable, then they might wish to consider acquiring other payment providers offering different products so as to “fill” the portfolio with products to better capture CLV.

This is a strategic insight for payment research in terms of payments business management. Large banks, on the other hand, carry various payment product types. The strategic

imperative for the banks is to ensure how different departments in charge of different products are coordinated so that products can be sequentially offered across the customer life cycle. Theoretically, this may sound like a simple endeavour, but in practice, large organisations often work in product silos. Unless senior management sets a strategic focus on coordinating the different product departments into a unified life cycle centred on the customer, then the provider is leaving money on the table. This is especially acute in today's business environment with customers enjoying a wide range of payment choices from competitors.

This research creates new insights on the mass transit card as a general-purpose payment card which is held throughout a person's life. This is a strategic business insight when seen from the CRM perspective. Mass transit operators in London (Oyster), Japan (Suica, Pasma, Icoca, Kitaca), Hong Kong (Octopus) and Thailand (Rabbit) should review their business strategy to explore how their product access to consumers throughout their whole lives can be monetized through creative collaborations with other payment providers.

The way in which consumers subconsciously categorise payment products into *spender* and *saver products* is novel also. Besides my sole parent interviewee, I myself did this subconsciously and was not aware of this until the parent brought it up. I suspect more people may classify it in this way. This finding is consistent with Zelizer's (1989) argument that money can have more than just a utilitarian meaning. She proposed an alternative model of "special monies" that includes the social and symbolic significance of money. Khan et al. (2015) researched the perceptions associated with different payment modes using more fundamental drivers of cognitive and emotional perception, however, this might not necessarily be how consumers actually make their payment choices. My research indicated that consumers may use a simpler binary heuristic – classifying products either as saver or spender. They then choose the product which aligns with their general orientation. This is an interesting finding and more research is required to unveil the mental processes of consumers in this re-

spect.

This research also delves deeper into the consumer decision process in response to the call by Schreft (2006) to investigate the point-of-sale decision from many angles due to its complexity, including viewpoints from behavioural economics, psychology and marketing. This research has provided fresh insights on the factors that affect payment choice decisions: regulations covering age and income, the role of parental supervision, and social, financial and psychological needs. It is by no means meant to be an exhaustive list, but is a springboard for further qualitative research into the complex manner in which consumers make payment choices in real life.

This research also confirms the works of recent payment researchers (Simon et al., 2010; Arango et al., 2015) that demographics are related to payment choice. My work suggests additional variables that may affect payment choice: regulations, financial needs, parental supervision, lifestyle needs and psychological needs. This research also complements the payment characteristic research of Hedman et al. (2017) by investigating the payment choice behaviour of consumers below 18 years old and providing insights into their decision making.

Finally, my research extends the work of Mallat (2007), who investigated general mobile payment adoption across six life cycle stages in a broader study of payment technology adoption⁶. Her study did not find adoption differences across groups, possibly because she did not separate mobile payments by different payment instruments, but instead grouped them under a general category called “mobile payments.” Since my study involved in-depth analysis of each segment, my research was able to discover different choices in payments that were made throughout the life cycle.

2.6.2. Industry Contributions

The first part of the essay provides evidence that consumers choose different payment

⁶ Mallat used six naturally forming groups in Finland. On the other hand, my four segments were pre-determined by my client as relevant to their business in Singapore.

products throughout their life. Together with the overlay of a CRM perspective, this provides interesting managerial implications for practitioners as to how to manage profits and growth. Obviously, being able to offer a single product relevant to all life stages is ideal. The second-best option would be to provide all the different products relevant to the different life stages. And this is typical of banks who offer a wide range of products. But what about non-banks and other niche players who may not have the full suite of products?

It is therefore critical for non-bank players to ask if the potential market is sufficiently large to cover the high fixed cost often associated with payment products. These are strategic business decisions which must be made at the highest levels of the business. If the potential market is insufficient, then the business needs to ask how it can acquire or collaborate with other players who can offer products to complement the product line such that a full suite covering the consumer's life cycle can be offered. In smaller markets, it becomes imperative for single product players to examine the relevance of their business model or take the necessary strategic steps to place them in a more favourable position to maximise CLV. This may include collaborating with other players to overcome the size limitations of the market.

The second part of the essay identifies factors affecting payment choice: regulations, parental choices and unique needs including financial, social and psychological. Using regulations as a driver of payment choice has ramifications for payment providers because regulations determine the potential *size* of the market for the product. It is therefore imperative that providers continue to engage with the central banks to ensure a more favourable regulatory regime for their specific product. This is especially important for products catering to younger consumers and those that carry a line of credit because of societal ramifications. Unfortunately, many payment providers often take a passive approach to regulator engagement, believing that regulators are impervious to the struggles of the industry, often to their own detriment. My personal experience has shown that, while regulators primary responsibility is

to safeguard society, they often take into consideration the legitimate needs of the industry. Healthy engagement with the regulator is therefore critical.

Parental supervision of younger consumers also implies that, although parents are not consumers, they are nevertheless customers of payment providers since they make decisions on behalf of their children. Therefore, payment providers must ensure they take into consideration parents' preferences in the areas of security and safety of payment instruments. The more enterprising providers will go a step further to consider the current *pain points* and *trade-offs* that both students and parents encounter when choosing the current payment instruments as a springboard to create new products that better meet the needs of both parties.

As expected, consumers at each life stage have unique financial, social and psychological needs which the framework broadly categorized and highlighted. This is by no means an exhaustive list. Therefore, astute payment providers would find it worthwhile to take a deeper dive using a combination of interviews, focus groups and even ethnographical research to uncover the deeper needs of each segment. This can reveal pain points that can lead to new products and services to better meet their customers' needs.

A possible area of interest is the identification of *transition points* within each life stage – the life *event* which will trigger the search of a payment instrument for the next stage of the life cycle. From a practical standpoint, marketers need to know when to offer their products to their customers. Transition points allow marketers to send event-based marketing messages to future consumers who are in an appropriate frame of mind to consider their products. Examples of transition points for youths would be receiving a driving licence and for working adults, it would be marriage.

A more tactical application from the findings of this essay is how banking products can be tied to the mass transit card as a form of top-up to lower the rate of attrition. Since the mass transit card is held (albeit as a secondary card) throughout all life stages, it would make

sense for banks to encourage their customers to place a standing instruction to automatically top up the mass transit card when the value drops below a certain predetermined amount. This standing instruction (often called GIRO in many countries) is a strategy to lower the risk of customer attrition on the banking product, improving the *stickiness* of the banking product.

This research also contributed to the creation of personas for each life-cycle stage for my commercial client. Rather than projecting their needs to their customers, these personas help commercial providers better understand the unique needs of those who are dissimilar to them. Appendix 2 shows an example of personas.

In the future, a flow approach could be applied to the framework for strategic planning purposes whereby a debit card provider, for example, could forecast how customers in each stage would flow into the next stage, thereby creating a scenario analysis of the future customer base. The provider would then be able to spot areas of future concern and take early remedial action. For instance, if the current portfolio of products is not relevant to working adults and retirees, then perhaps the provider may wish to consider partnerships with other operators. Or perhaps even consider developing new products that would cater to the working adults and retirees.

From a more futuristic standpoint, there is increasing interest in platforms as the basis for product development in today's digital markets⁷. de Reuver et al. (2018) suggest that platform design and data-driven approaches are important research questions that need to be addressed as part of the larger theory development for digital platforms. Platforms bring buyers, sellers and many other value providers together. Today's technology makes platforms easier to scale and collect data. The multi-sided platform model is increasingly being adopted in industries, the payment industry being no different. The merchants are the seller of benefits and the cardholder is the buyer. Between these key actors, there are numerous other value

⁷ *Platforms* are technologies, products or services that create value primarily by enabling direct interaction between two or more customer or participant groups (Hagiu, 2014). Varian (2010) also talks about how platforms can be offered as a service, just like *software as a service* (SaaS) is being offered.

providers in a complex ecosystem managed by the platform owner. Platform design, therefore, becomes an important part of the whole ecosystem. This research provides a framework that can inform the design of a payment platform through possible platform design based on a matrix of life cycle stage, situations and interface factor (Robertson and Ulrich, 1998; Simpson et al., 2014). Platform owners enjoy the benefits of data which is captured and generated from transactions occurring within the platform. This data can then be used for the early beginnings of a flow model of life cycle (Du and Kamakura, 2006).

2.7. Conclusion

My research has shown that consumers hold different payment cards throughout their lifetime, thus answering the research question. Their payment choices are affected by regulations, parental supervision, financial, psychological and social needs over different stages of their lives. The results of the research were summarised into a framework. Offering a new CRM perspective to the traditional life cycle concept has provided interesting strategic insights for payment business management, including the lifetime role of the humble mass transit card. In closing, I also want to share two thoughts about the possible future of payments.

Firstly, the huge base of mass transit cardholders in many countries provide a critical mass of electronic payment instruments that only need a wider acceptance network to become the card of choice for small value cashless payments.

Secondly, I see the possibility of governments around the world realising the value of the mass transit card, and positioning it strategically and appropriately within their larger cashless strategy. The mass transit card may be the only card we will ever need for a truly cashless future.

Thirdly, governments in the future will work more closely with mass transit providers to

unlock the potential that the mass transit card can play in the overall cashless payment journey. Once this happens, mass transit operators can take a more strategic view of their business and implement appropriate business plans to maximise shareholder value, given the huge opportunities in the market that this research has uncovered.

A final note is on several limitations of this research. The research methodology did not allow causality to be confirmed. Furthermore, the small sample size and non-random selection of participants prevented generalisations, and the short research period also limited the scope and strength of the conclusions that can be drawn.

Chapter 3: Incentives and Habits in Cashless Payment Adoption

3.1. Introduction

This essay examines the effectiveness of incentives and the role of habits in encouraging the adoption of cashless payments at the point-of-sale. This is becoming increasingly relevant as countries take advantage of recent advances in digital technologies to move towards a cashless society. Singapore is a good place to conduct this research because the government has placed the cashless agenda high in its national digitalization efforts, with pilot projects in cashless payment running in the country, mainly in the polytechnics, universities and hawker centres (Smart Nation Singapore, 2018; Chan, 2018; Tung, 2016). Refer to Appendix 9 photos A1-A4, for hawker centres.

The overarching research question is: How do incentives and habits affect cashless payment adoption? This research question has two sub-questions: firstly, are incentives effective in promoting cashless payment adoption; and secondly, do habits overpower incentives in cashless payment adoption?

Payment providers often provide incentives in various forms, with the belief that this will be effective in encouraging consumers to use cashless payments instead of cash. Unfortunately, payments research thus far (Agarwal et al., 2010; Simon et al., 2010; Arango et al., 2011) has focused on card rewards and its effects on credit card usage, with practitioners uncertain if their incentives actually worked to encourage cashless payment adoption. Furthermore, there was also uncertainty as to whether cashless payment behaviour would continue after the incentives ended (Goswami and Urminsky, 2017). Similarly, despite the recent advances in habit theory, the role of habits within payments research and cashless payment adoption have not been investigated (Lally et al., 2009; Wood and Runger, 2016; Verplanken, 2018).

While the theoretical literature on the economics of payment cards has grown, the empirical literature is still insufficient to provide much guidance to public authorities on policy in-

tervention. Bolt and Chakravorti (2011) asserted that market interventions may be a natural experiment in itself, allowing the validation of various theories in payment economics. Their comment is heartening as my field experiment hopes to cover some gaps by providing empirical evidence on the effectiveness of incentives and how habits overwhelm the effects of incentives in cashless payment adoption.

Results from this study would be relevant to industry practitioners who have been depending on intuition and anecdotal evidence when applying incentives to improve cashless payment adoption. In addition, the way habits inhibit cashless adoption has also not been investigated by researchers. Results from this field experiment would also be useful to the Singapore government as they move to a cashless society (KPMG, 2016). Besides providing them with empirical evidence on the effectiveness of incentives to speed up cashless payment, it would also highlight whether any behaviour change would last beyond the incentive period, the inhibiting role of habits in the overall change process, and other barriers to the adoption of cashless payment.

3.2. Literature Review

A systematic literature review was conducted to ensure that no similar research or experiments existed elsewhere pertaining to the use of incentives for cashless payment adoption. The review was challenging because there was an abundance of literature on credit cards, mobile payments and electronic shopping while there was nothing specific on financial incentives on payment behaviour. Therefore, a structured approach to the literature review was needed to minimize the number of relevant academic articles reviewed. For additional details on the systematic review on consumer payments research literature, refer to Appendix 10.

3.2.1. Consumer Payments

A total of 17 articles relating to consumer payments were reviewed in detail. A full list-

ing of these articles is contained in Appendix 11, Table 1. They can be broadly categorised into those relating to the impact of credit card rewards on spending and payment choice, the impact of surcharges and discounts on spending and payment choice, and finally, other broad factors affecting payment choice and adoption. Of these three categories, those relating to the impact of credit card rewards would have the highest relevance to this research as rewards are a form of pecuniary incentive, and they are often provided by credit card companies.

3.2.1.1. Credit Card Rewards

Central bank researchers investigated the effects of credit card rewards on payment usage because there was concern in the mid-2000s that the proliferation of such reward programs would lead to increases in credit card debt. Hayashi (2009) investigated whether credit card rewards in the U.S. were perceived to benefit consumers and society as a whole. Carbo-Valverde and Linares-Zegarra (2009) found that rewards modified preferences for card payments over other payment instruments. Agarwal et al.'s (2010) research on the impact of rewards on spending found that a 1% cashback reward led to an increase in spending by US\$68, together with an increase in debt. Arango et al. (2011) found that reward-driven credit card usage is inelastic – it takes a disproportionate change in rewards to induce a change in card usage. Using a US\$100 transaction as an example, a 10% increase in monetary rewards leads to an increase in the probability of using a credit card by only 1.0-3.7%.⁸

Reserve Bank of Australia researchers, Simon et al. (2010), investigated the effect of reforms on credit and debit card arrangements which reduced loyalty program rewards. They found that participation in a loyalty program increased credit card use over alternative payments like cash and debit cards. Arango et al. (2015) attempted to disentangle the effect of merchant acceptance from the effect of credit card rewards on usage. They found that participation in credit card rewards programs also induced a shift towards credit card use rather than

⁸ They also found that the lack of acceptance was the main reason why cash is predominantly used especially for transactions below US\$25.

both debit cards and cash. Furthermore, the percentage change in *ad valorem* (or proportional to the value) rewards had a small or inelastic effect on the probability of paying with credit cards. All the research carried out thus far seems to indicate that the provision of credit card rewards leads to an increase in credit card use.

3.2.1.2. Payment Surcharges and Discounts

Both central banks and credit card associations around the world have rules that either allow or disallow the use of surcharges and discounts to change payment choice. This topic attracted a fair amount of research. The early works of Ingene and Levy (1982) in the U.S. showed that a large percentage of customers were willing to change from credit cards to cash use when discounts were offered for cash use, so long as the amount was of a moderate size. In the Netherlands, et al. (2010) found that surcharging debit cards steered customers towards using cash. Stavins and Shy (2015) investigated whether U.S. merchants were using their new-found freedom to take advantage of discounts or surcharges for use of various payment options. They found that only a very small fraction of transactions was actually given a discount, and even fewer were subject to a surcharge.

Merchants' fear of customer alienation was the common reason. It seemed that when surcharges and discounts were used, they did impact customers' payment choices, if the transaction amount was of a moderate size. But these surcharges and discounts were seldom offered for fear of alienating customers and lowering business margins.

3.2.1.3. Other Factors

Various other factors also have affected payment choice. Sung et al. (2017) analysed how tax legislation was successful in encouraging businesses in Korea to use electronic forms of payment. Using a field experiment, Herbst-Murphy (2013) found that sweepstakes and consumer education were required for positive behaviour change in a prepaid card setting. Looking at the overall payment research landscape, central bank researchers, Bolt and Chakravorti

(2011) remarked that the current literature on payments was insufficient. They encouraged more empirical research so as to provide better guidance to public authorities on policy interventions.

Summarising the literature review on payments, the research thus far indicates that rewards have an impact on usage but no work has been done on whether financial incentives have an impact on adoption of cashless payments. I next turn my attention to the literature on incentives for guidance.

3.2.2. Incentives

The full list of articles reviewed on incentives is contained in Appendix 11, Table 2. The more salient articles are highlighted and discussed below.

3.2.2.1. Earlier Work on Incentives

The early seminal works of Skinner (1953) state that the best way to understand behaviour is to analyse the cause of the behaviour and its consequences. The nineties saw several research efforts linking incentives to performance. In particular, Prendergast (1999) provided empirical evidence on the use of incentives in firms, showing that incentives improved performance. Other researchers (Lazear, 1996; Paarsch and Scherer, 1996; Boning et al., 2007) also provided similar results, all pointing to the strong effects of pay-for-performance incentives.

Early behavioural theory shares a similar opinion with mainstream economists, who said that an increase in financial incentives will result in an increase in performance. This relationship is based on assumptions in economics, that performance is positively correlated with effort; effort is unpleasant and should be avoided; and money is good and to be desired (Gneezy and Rustichini, 2000a). The authors tested these opposing hypotheses in a laboratory experiment at the University of Haifa with 160 students. They found that larger sums of money (extrinsic motivation) produced higher performance.

An alternative point of view was put forward by cognitive psychologists when they researched extrinsic and intrinsic motivations of behaviour. This viewpoint proposed that a reward or incentive might get in the way of the intrinsic joy that comes from performing the task, such that the overall motivation may be reduced. This is called the *crowding-out effect* (Frey and Oberholzer-Gee, 1997). In contrast, recent program-evaluation studies have not found evidence of post-incentive reduction in behaviours, with some studies even reporting positive effects (Halpern et al., 2015; Goswami and Urminsky, 2017). Research in the area of post-reward behaviour seemed to show contrasting results.

3.2.2.2. More Recent Incentive-Related Research

In the area of new technology adoption, Atkin et al. (2017), through a field experiment in Pakistan, showed how technology innovation among soccer-ball producers did not have the expected adoption effects after 15 months. The researchers then conducted a second experiment with employee incentive to adopt the technology. The results showed that adoption increased by 27-32% from a baseline adoption rate of 13%. The authors concluded that it was possible to improve adoption significantly with a small payment. Similarly, Loughrey et al. (2013) found that consumer incentives were best accompanied by a merchant incentive for behaviour change with credit card promotion in a retail setting.

Overall, although we received guidance from the incentive literature that incentives are able to change behaviour in the short run, there is yet to be an empirical test of its effectiveness in a cashless payment adoption setting. Furthermore, it is uncertain if the behaviour change will last beyond the incentive, with researchers showing contrasting results of post-incentive behaviour.

3.2.3. Habits

Purchase and consumption behaviours in daily life are often repetitive and performed in customary places. This has led consumers to develop habits, such that environmental cues

can activate practiced responses without conscious decision making when the habits are formed (Ji and Wood, 2007). I reviewed academic literature on habits as well (Appendix 11, Table 3). I now discuss the key points from the literature review, focusing on the theory, process and literature on consumption habits.

The history of habits is closely tied to developments in the history of psychology. The literature on habits has grown, fuelled by evidence of the high levels of repetition in our daily lives. *Habits* can be defined as “memory-based propensities to respond automatically to specific cues, which are acquired by the repetition of cue-specific behaviours in stable contexts” (Verplanken, 2018). Habits are activated in memory in an autonomous fashion without requiring executive control (Evans and Stanovich, 2013). *Habit formation* is a process by which behavioural control shifts from goal dependence to context dependence.

Many habits begin with goal pursuit. According to Wood and Runger (2016), goal pursuit turns into a habit in three ways: first, goals influence habit formation by driving people to repeat actions in a certain context; second, goals interact with habits by influencing the expression of habitual behaviour. Once habits are formed, habitual behaviours are activated in memory directly by context, regardless of goals. The terms *habit* and *automaticity* are often used interchangeably in the literature.

Most research on habits relates to health behaviours. A few researchers have focused on the role of habits in consumer decision making. Chen and Chao (2011) investigated behaviours of Taiwanese commuters when they switched from private transport to public transport. They used an integrated model combining the theory of planned behaviour, the technology acceptance model and habits to examine their switching intentions towards public transport. They found that habitual behaviour hindered an individual’s intention to switch from a car or a motorcycle to public transit. Kosse and Vermeulen (2014), on the other hand, found habitual behaviour to have a weak correlation with the choice of remittance channel in the Nether-

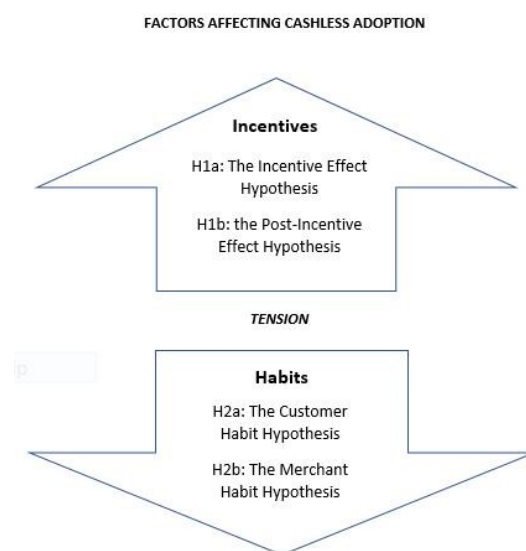
lands. Ajzen (2002, p.119) summarised the habits appropriately: “whether we adopt the habituation or reasoned action perspective, we would expect that, so long as the situation remains stable, a behaviour that has been performed frequently in the past is likely to be performed again”. Lally et al. (2010) found that it took research participants 18 to 254 days for habitual behaviour to be formed, with an average of 66 days of repetitions. Participants were provided a payment of £30 if they completed the study.

Despite the literature review covering a wide range of topics including research on payments, incentive and habits, what remains unanswered is whether incentives are effective in cashless payment adoption. And, if they are, will behaviour change continue beyond the incentive period? The role of habits in overall cashless payment adoption also remains unresearched.

3.3. Theory and Hypotheses

Figure 3.1 summarises the hypotheses on the overarching research question: how do incentives and habit impact cashless adoption?

Figure 3.1 Cashless Adoption Hypotheses



There are various factors affecting cashless adoption. In this research, I focus on incen-

tives and habits. While incentives are used to encourage cashless adoption, habits, on the other hand, slow down cashless adoption. However, using cash for payments may have become habitual.

A tension, therefore, exists between incentives and habits as they work in opposite direction in cashless payment adoption. This tension is a key construct that remains under-investigation within payments research. Research on habits has concluded that they are strong influencers on behaviour in stable environments when the action has been repeated frequently (Azjen, 2002). But once incentives enter into the picture, tension is then created because it creates a financial motivation to adopt a behaviour that is contrary to what habits would automatically produce.

On the effects of incentives on behaviour, the research works by Gneezy and Rustichini (2000a, 2000b) and Gneezy et al. (2011) are particularly influential. Gneezy and Rustichini (2000a) carried out a laboratory experiment with 160 students at the University of Haifa. The students answered 50 questions. Compared to the group without any financial incentive, the group with a financial incentive increased their effort resulting in an increased number of correct answers. Just as the offer of incentives in the above experiment led to increased effort when answering questions, the offer of incentives for cashless payment adoption can be expected to lead to higher cashless payment use. Therefore, the first hypothesis for this incentive experiment on cashless payment is:

- **Hypothesis 1a (The Incentive Effect Hypothesis):** *If incentives are effective in promoting cashless adoption, then the amount of cashless payments used in the treatment site will be higher than that of the control site when the incentive is offered.*

When incentives are available, they obviously are likely to affect behaviour. But what happens after the rewards have ended? Research thus far has shown contrasting results, with some showing an increase (Halpern et al., 2015; Goswami and Urminsky, 2017)) while others show a decrease (Deci and Ryan, 1985). But practitioners provide incentives not only to

change behaviour while incentives are offered, but also hope that the changed behaviour will continue after incentives end. In other words, the effects of the incentive will linger beyond the incentive period. This leads to my second hypothesis:

- **Hypothesis 1b (The Post-Incentive Effect Hypothesis):** *If incentives are effective in promoting cashless adoption, then the amount of cashless payments used in the treatment site will be higher than the control site's level even after incentives are removed.*

Small value purchases in Singapore over the past decades have been typically carried out in cash until the recent Smart Nation Initiative (Smart Nation Singapore, 2018). Are low value payments by cash today due to the habitual behaviour of the past? If this were the case, then how long would it take to change this habit? Lally et al. (2009) investigated the process of habit formation in everyday life. They asked 96 volunteers to choose an eating, drinking or activity behaviour to be carried out in the same context over 12 weeks. While automaticity increased steadily over time, they found that it took 18 to 254 days for a habit to be formed, with an average of 66 days. When participants were motivated to create habits, approximately half did not perform the behaviour consistently enough to achieve habit status. Habit change takes time. In our experiment, the incentive was only offered for 14 days. Is it reasonable to expect consumers' old cash use habits to change? This leads to the third hypothesis:

- **Hypothesis 2a (The Customer Habit Hypothesis):** *If paying by cash for small value purchases⁹ is habitual on the customer's part, then cashless transactions as a proportion of total transactions will be small¹⁰ despite the incentives.*

Cashless payments operate in a two-sided market. They require both a consumer and a merchant to complete the transaction. If paying by cash for small value purchases is a habit by the consumer, how about the acceptance by the merchant? Just like the consumer, merchants in Singapore have been accepting cash for many years. Therefore, it is reasonable to assume that this behaviour that has been frequently performed in the past will likely be per-

⁹ *Small value purchases* are defined as those below US\$20.

¹⁰ *Small* here is defined as a value less than 5% for non-traditional merchant segments such as hawker centres

formed again (Ajzen, 2002). This leads to the fourth hypothesis:

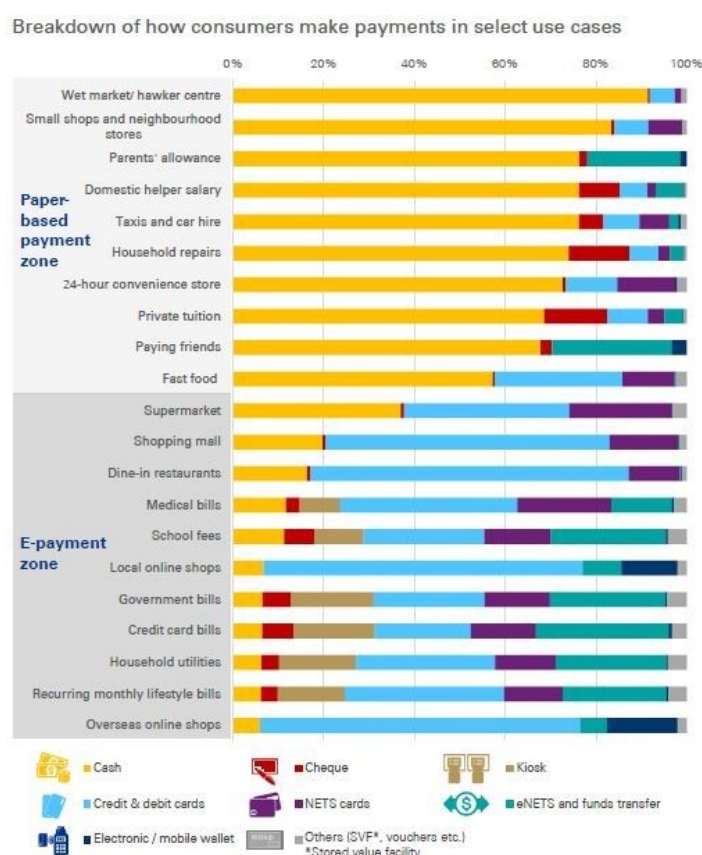
- **Hypothesis 2b (The Merchant Habit Hypothesis):** *If accepting cash for small value purchases is habitual on the merchant's part, then cashless transactions as a proportion of total transactions will be small despite the incentives.*

3.4. Research Design and Data

3.4.1. Field Experiment Design

Hawker centres were identified in a recent KPMG report commissioned by Singapore's central bank (KPMG, 2016) as places where cash currently predominates. This report highlighted that moving to cashless forms of payment in hawker centres and taxis alone could save society S\$150 million annually. Figure 3.2 identifies areas where e-payments and cash currently predominate in Singapore. (Refer to Appendix 9, Photos A1-A4 for photos of hawker centres.)

Figure 3.2. Hawker Centres Top List of Paper-Based Payment Zones



Source: KPMG Report (2016). Reproduced with permission.

A *field experiment design* was used for this research. The real-life setting of a field experiment offers better external validity compared to a laboratory experiment or a survey of preferences. A field experiment also allows measurement of effects in large-scale settings. Although they are not exactly similar experiments, other field experiment papers in adjacent areas were also consulted to ensure best practice was followed wherever possible (de Janvry et al., 2016 – technology adoption; Huber et al., 2017 – child behaviour; Hirschleifer, 2016 – student performance). The experiment took place in the Jurong Constituency, a large industrial zone in the western part of Singapore.

The partner organisation already had a few hawker centres accepting e-payments in this constituency. But adoption has generally been slow. They wanted to introduce a new hawker centre for cashless payments, but with a financial incentive to speed adoption. This new hawker centre would receive the experimental treatment.

3.4.2. Experimental Treatment and Control

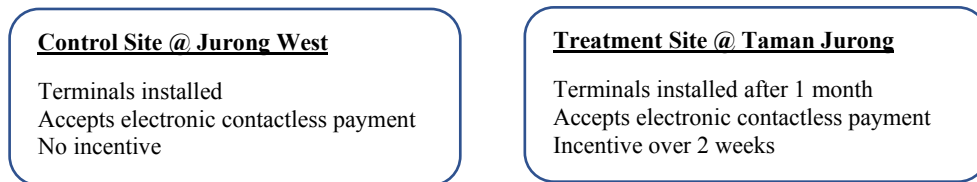
The experimental treatment was to offer a free cup of black coffee for purchases of S\$2 and above at the treatment hawker centre. The hawker centre at Taman Jurong was selected as the treatment site. It was chosen mainly because the partner organisation had good relations with local business leaders and the hawker centre management association. This was to help smooth implementation of the pilot. Furthermore, being next to a shopping mall, the Taman Jurong Hawker Centre was also relatively accessible by road and had reasonable customer volume that was representative of hawker centres in general. For reasons of equity and political correctness, all hawkers were offered the opportunity to participate in the e-payment pilot. More than half accepted the offer. Promotional materials informing consumers of the incentive were displayed at the treatment hawker centre, together with tissue paper packs given away during lunch to increase awareness. Customers were given a receipt for a purchase, which they then could take to a redemption point. This was a coffee shop on the third

floor of the hawker centre. Customers would then exchange the receipt for their cup of black coffee. This redemption had to be done on the same day as the purchase.

The Jurong West Hawker Centre was chosen as the experimental control site. It was in the same general locality as the Taman Jurong Hawker Centre, about a 20-minute drive away. Furthermore, I also wanted a control that was near but not too near to prevent leakage effects of the incentive¹¹, whereby consumers leave the control site for the treatment site to enjoy the incentive.

Figure 3.3 summarises the experimental design:

Figure 3.3. Control and Treatment Sites in Experimental Design



Care was taken to ensure the demographics, context and observable behaviours were similar between the treatment and control sites. These are listed in Appendix 12 – Similarity Between Taman Jurong and Jurong West Sites. Exogenous variables were also present with no controls in the field experiment settings.¹²

3.4.3. Phases of the Experiment

The field experiment was divided into three distinct phases as shown in Table 3.1

¹¹ This was estimated by calculating the transport cost between Jurong West and Taman Jurong to ensure that the transport cost would be greater than the value of the incentive to minimise leakage

¹² *Exogenous variables* or *unobservable behaviours* in this field experiment include business confidence, morale and conservatism. There may be differences in these variables between the treatment and control sites. But overall, a demographic study by Experian Singapore (Goh, 2012) and my personal observation of the context and behaviours do not suggest this to be the case. Otherwise, it would be reflected in some way through either the market context or the observable behaviours. Therefore, I am of the opinion that unobservable variables will not bias the outcome of the experiment. See Appendix 12.

Table 3.1. Phases of the Experiment

Phases	I	II	III
Objective	Pre-Treatment	Treatment	Post-Treatment
Period	1 July to 31 July 2018	1 August to 14 August 2018	15 August to 30 August 2018

3.4.4. Data Collection

The partner organisation provided electronic sales and transaction count data for the control and treatment sites from 1 July to 31 October 2018. Quantitative data measuring the volume of sales and transaction count were collected on a daily basis by an outsourced IT vendor of the partner organisation through electronic POS terminals at each participating merchant in the treatment and control sites. They were wirelessly connected to a central server through a wide area network (WAN).

Participant observation was carried out at various points before, during and after the treatment over an eight-week period. The objective was to gather insights into the process of making cashless payments and possible barriers. Participant observation was chosen because it provided insights into personal behaviours and motives within a social context that a normal interview would not be able to gather (Yin, 2018). From 15 July to 31 August 2018, I visited the hawker centres on numerous occasions and patronised the stalls to get a good feel of their ambience and atmosphere. During the pre-implementation phase, I observed the context, and the queuing and purchasing behaviour of consumers across the different categories of hawkers. I spent time as a customer to get the opportunity to speak casually to the hawkers and fellow customers as part of the purchase process. My time at the hawker centres became more frequent as the treatment phase approached. Just before and during the treatment, I would visit the shops almost daily. I would alternate the times that I visited, mostly either during lunch or dinner since these were the most crowded times. During the treatment phase, I also mingled with the customers as I shared a table with them, casually making small talk with them to find out their views of the incentive. During my fieldwork, I collected evidence,

both conventional and unconventional, to increase the validity of my observations¹³. I recorded my findings chronologically as I observed them and later collated them thematically.¹⁴

3.5. Results

The results from the field experiment are shown in Figures 3.4 and 3.5. Figure 3.4 tracks the average cashless sales per merchant. It shows the spike in daily average cashless sales in the treatment site after the incentive was introduced on 1 August. This supports the Incentive Effect Hypothesis (H1a) that the amount of cashless payment will be higher in the treatment site than in the control site during the incentive period. But once incentives were removed on 15 August, the average cashless sales per merchant at the treatment site fell below the levels of the control site. The Post-Incentive Effect Hypothesis (H1b) is therefore rejected.

¹³ Unconventional forms of evidence include casual conversations with customers and hawkers.

¹⁴ Some hawkers suspected I was working undercover for the police or the government agencies. But as time passed, they got used to my presence, with my little notebook. I started talking to them casually. Initial fears were overcome and they shared quite willingly their frustrations dealing with electronic payments. I noticed that the older hawkers were more forthcoming with their views. The younger hawkers, on the other hand, were quick to give me a politically correct answer and understandably so, since they might be fearful that their hawker licences may be suspended for not supporting a national initiative.

Figure 3.4 Daily Cashless Payment Sales: Treatment vs. Control

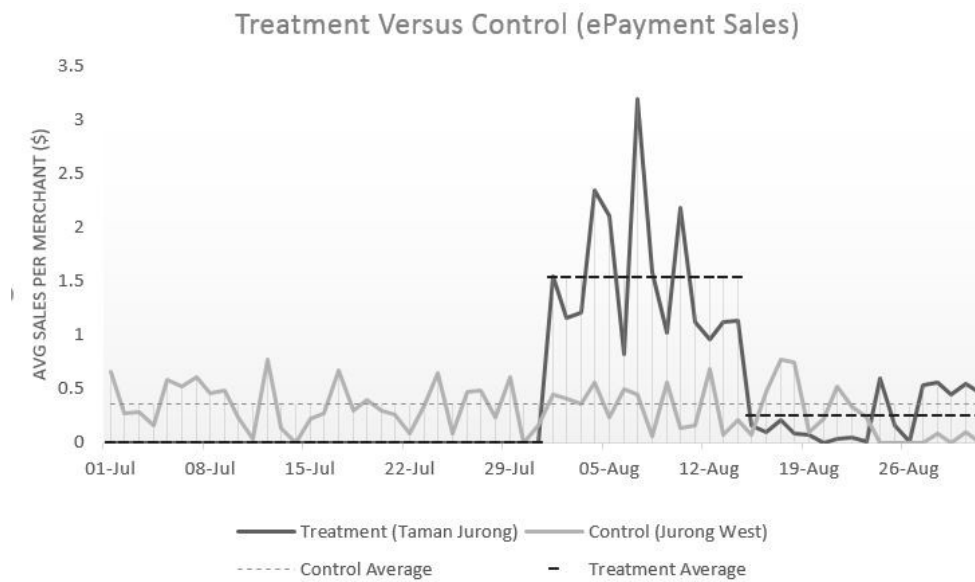
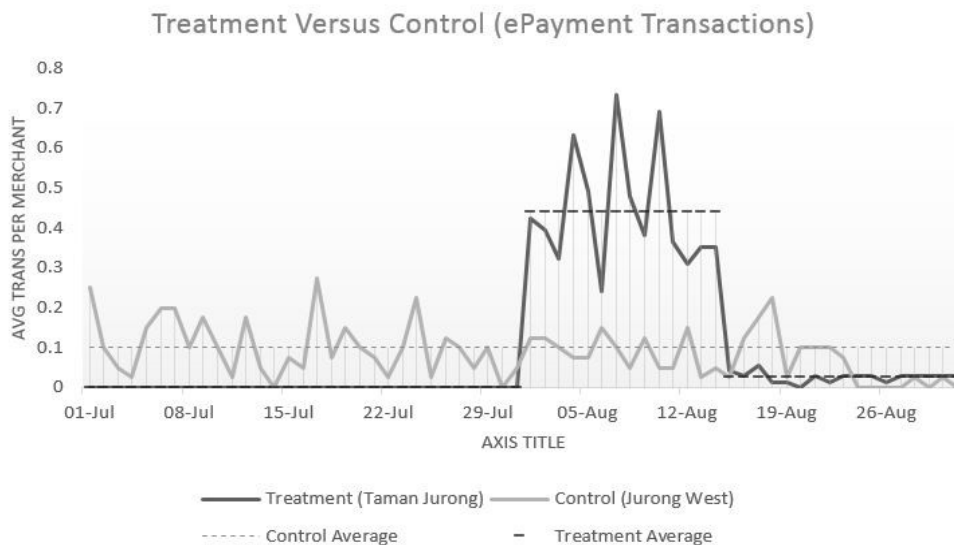


Figure 3.5. Daily Cashless Payment Transaction Counts: Treatment vs. Control



A similar pattern can be seen using transaction count. Figure 3.5 depicts the cashless transactions count per merchant. The period prior to the introduction of the incentive shows zero transactions at the treatment site because the cashless payment capability had yet to be enabled. But once the incentives were introduced on 1 August, there was a spike in transactions at the treatment site. This again supports H1a. The transactions then show a dip after the incentives were removed, hovering below the control site levels. And so H1b is therefore rejected again also.

A common expectation is that both sales and transactions should return to levels *higher* than the control since the incentives would have been successful in modifying consumer's behaviour beyond the incentive period. However, according to prior research findings on incentives, it takes an average of 66 days before a habit is formed (Lally et al. 2010). Is it then reasonable to expect any behaviour change after only 14 days of incentives, especially when cash was the frequent form of payment at hawker centres in previous years?

3.6. Extended Analyses

Extended analyses were performed to assess the Customer Habit Hypothesis (H2a) and the Merchant Habit Hypothesis (H2b). I begin with a discussion of the cash displacement rate, as a basis for further evaluation.

3.6.1. The Concept and Calculation of Cash Displacement

Cash use carries a cost, both to the consumer, the merchant, and more importantly, to society at large (de Heij and Kippers, 2004; Jonker, 2007; Brits and Winder, 2005; Hayashi and Keeton, 2012). It therefore makes sense to reduce cash use. Cash displacement is a common measure used by professionals in the payments industry, particularly the large global multinationals, Visa and Mastercard. It measures the percentage amount of cash a new cashless payment instrument was successful in displacing. The formula is:

$$\text{Cash Displacement Rate} = \frac{\text{Avg Cashless Transactions Per Hawker Per Day}}{\text{Avg Total Transactions Per Hawker Per Day}}$$

There was no way I could count the average transactions of every hawker every day of the month. So instead, I observed the transactions for the three common types of hawkers that the average Singaporean would patronise – the chicken rice stall, the noodle stall and the economy rice stall. As I could not spare the time to sit and observe them for twelve hours every day, I chose to observe them during the busiest times - one hour over lunch or dinner. I

then estimated their business volume for the other hours by observing each of them during a single full day. This is about transaction count rather than sales volume, as it would be difficult for me to observe the actual dollar amount changing hands. I could count the number of customers and their orders, but I could not estimate how much each customer paid. The average transaction observations during the peak hour is shown in Table 3.2 below.

Table 3.2. Average Peak Hour Transaction

Hawkers	Total Orders During Peak Hour ¹⁵	Days Opened	Average Peak Hour at
Taman Jurong			
Noodles	429	23	19
Chicken Rice	417	16	26
Economy Rice	303	16	19
TOTAL	1149	55	21

After this observation, I then proceeded to observe the full day transaction patterns for the average hawker in each of the hawker centres as shown in Table 3.3.

Table 3.3 Daily Transaction Patterns for Hawkers

Time	Proportion Peak	of Taman Jurong
10-11am	0.25	5.25
11am-12pm	0.5	10.5
12-1pm	1	21
1-2pm	1	21
2-3pm	0.5	10.5
3-4pm	0.2	4.2
4-5pm	0.2	4.2
5-6pm	0.5	10.5
6-7pm	1	21
7-8pm	1	21
Avg. Trans/Hawker Per Day		129.2

From the average transactions per hawker per day at the treatment site, I was then able to calculate the cash displacement rate as shown in Table 3.4.

¹⁵ Total orders at peak hour (either lunch or dinner) over the days the stall was opened

Table 3.4 Cash Displacement Rate

Measure	Transactions
Cashless Trans / Hawker Per Day	0.44
Average Trans / Hawker Per Day	129.2
Cash Displacement Rate	0.34%

From Table 3.4, it can be seen that only about 0.34% of total cash transactions in the treatment site was displaced. Cash remains the predominant method of payment despite the incentive. Together with the convenience of cash, habits are likely to be the reason for this result. Both the convenience of cash and ingrained habits together are so strong that even the presence of incentives is insufficient. The result therefore supports the Customer Habit Hypothesis (H2a). This also supports the Merchant Habit Hypothesis (H2b) that accepting cash is habitual and convenient for merchants as well.

Electronic payments are a two-sided market. On one side is the network of consumers and on the other side is the network of merchants. They are connected by the payment service provider. Overall transactions are influenced by the two sides' willingness to trade or transact. Therefore, the low cash displacement rate is a reflection of both the consumers' and merchants' habit.

3.6.2. Findings from Participant Observation

Another part of this research project involved a qualitative component with participant observation. I spent considerable time at both the control and treatment hawker centres observing the behaviour of hawkers and customers. The objective was to go beyond the confirmation from the experiment to investigate the *why's* and *how's* behind cashless adoption. I observed the operational implementation of the incentive as it was rolled out to the treatment site. My observation spanned the time before, during and after the incentive period. The objective was to uncover the causal processes and obtain deeper explanations for the results of the field experiment. (Refer to Appendices 13 and 14 for the observation journal and partner meetings.)

3.6.2.1. Consumer and Merchant Behaviour

An interesting observation is that customers could be seen taking cash out from their wallets as they stood in queue waiting for their food to be prepared. Quoting from my journal entry:

“I join the queue for food. This is a popular stall so the queue is quite long. As they queue, I notice customers in front of me just habitually reach into their pockets and take cash out from their wallets despite seeing cashless acceptance displays.” 31 July 2018, 7.15pm

In other words, it seems they made the decision on payment choice long *before* they actually paid for their food. This evidence further supports the Customer Habit Hypothesis (H2a). It is possible that the contextual cues of hawker centres, the act of queuing, and the small purchase value collectively prompted a habitual response - which is to take out cash from one's wallet.

Detailed observation of merchant behaviour also yielded interesting insights into the habits of hawkers towards cash use. Here are my relevant journal entries:

“Overall, I have purchased about 15 meals over the two-week period at both hawker centres. But no hawker has prompted me to use cashless payments ever.” 15 August 2018, 12.45pm

“Notice hawkers do not prompt customers to use cashless payments. But when customers use cash, they will guide them how to insert the cash into the cash counting machine.” 1 August 2018, 7pm

“I overheard a group of customers (office colleagues out for lunch) grumbling that they feel cheated because the hawkers did not prompt for cashless use. They had already bought lunch and missed out on a chance to get free coffee as part of the promo.” 2 August 2018, 1.30pm

The journal entries show that hawkers do not prompt customers for cashless payment while they wait. Instead they continued the habitual response ingrained over time of accepting cash. This further supports the Merchant Habit Hypothesis (H2b).

3.6.2.2. Tax Incentives, Delayed Settlement and Cashless Pilot Marketing

Pending confirmatory research, my casual conversations with hawkers seem to indicate a deeper business issue that prevents them from adoption of cashless payments – issues relating to tax. The strange phenomena that the chicken rice stall accepts electronic payments, but only up to a certain point illustrates this issue. They may wish to show that they support cashless payments, but when it hurts them through additional taxes, they will stop accepting. This could be the reason for what was observed¹⁶. In short, the business tax regime must be aligned to support cashless payment behaviour.

Another issue is delayed settlement. It averages T+2 to T+3 and merchants casually mentioned that this might have contributed to their reluctance to use electronic payments¹⁷. Small hawker stalls operate on a tight cashflow and often use the day's takings to purchase raw materials for the next day. Therefore, every extra day of late settlement adds to the financial burden of running a very small business.

Another implementation issue is better marketing of the pilot around the hawker centres so that customers and merchants are aware of the promotion.

3.7. Overall Results of Hypothesis Testing

The overarching research question is: how do incentives and habits affect cashless payment adoption? This question was broken down into two sub-categories covering incentives and habits. I can now answer the research question using the results obtained in Table 3.5.

¹⁶ My journal entry on 1/8/2018 6.30pm is shown in Appendix 13.

¹⁷ "T" in transaction settlement refers to the date the purchase transaction took place. "T+2" means the receipt of funds two business days after the purchase transaction.

Table 3.5 Summary of Hypothesis and Results

Area	Hypothesis	Results
Incentives	Hypothesis 1a (The Incentive Effect Hypothesis): <i>If incentives are effective in promoting cashless adoption, then the amount of cashless payments used in the treatment site will be higher than that of the control site when the incentive is offered.</i>	Supported
	Hypothesis 1b (The Post-Incentive Effect Hypothesis): <i>If incentives are effective in promoting cashless adoption, then the amount of cashless payments used in the treatment site will be higher than the control site's level even after incentives are removed</i>	Rejected
Habit	Hypothesis 2a (The Customer Habit Hypothesis): <i>If paying by cash for small value purchases is habitual on the customer's part, then cashless transactions as a proportion of total transactions will be small despite the incentives</i>	Supported
	Hypothesis 2b (The Merchant Habit Hypothesis): <i>If accepting cash for small value purchases is habitual on the merchant's part, then cashless transactions as a proportion of total transactions will be small despite the incentives.</i>	Supported

From the field experiment on incentives, the average amount of cashless payment use per merchant at the treatment site was higher than the cashless payment use at the control site when the incentives were available. This supported H1a. When the incentives were removed, the average amount of cashless payment use per merchant at the treatment site was not higher than the levels of the control site. H1b therefore was not supported. The role of habit was measured by a cash displacement computation. The cash displacement rate at the treatment site was 0.34%. This overall cash displacement was extremely low, confirming the role of habits in hindering cashless adoption¹⁸. This supported both H2a and H2b.

3.8. Discussion

The field experiment has shown the effectiveness of incentives in promoting cashless payment adoption and the role of habits in hampering the move to cashless, causing tension between the two forces. Qualitative research through participant observation over eight weeks pointed to several possible reasons for the results, comprising consumer and merchant

¹⁸ Designing the experiment with a control and two different treatments with different incentive periods would have allowed me to better test the length of incentive required to change habits. But obtaining my partner organisation's approval would have been too challenging due to funding issues for a longer incentive period and some hawker equity issues.

behaviour, a short incentive period, tax alignment and cash flow issues. My research extends knowledge in this research domain in several ways.

3.8.1. Research Contributions

My main contribution is to demonstrate the application of the main theoretical ideas from the literature to a new context: the move to cashless payments in Singapore's hawker centres. I am the first to use a field experiment to test the effectiveness of incentives for cashless payment adoption. The research thus supports the results of Agarwal et al. (2010), who used transactional data in the U.S. to test the effectiveness of rewards on card spending. They found that an increase in rewards can result in changes to card spending levels. Although incentives are not rewards, they do belong to the same larger group of pecuniary incentives within payments research.

The Agarwal et al. (2010) study did not investigate the post-reward behaviour. My research extends payments research by showing that spending does not revert to levels higher than the control after the incentive ends, contrary to what many practitioners would hope for as the justification for using incentives. It also contradicts the findings of Goswami and Urmitsky (2017). There are three possible reasons for this. Firstly, the post-incentive period was too short to provide a more accurate estimate of post-incentive behaviour. Secondly, the promotion may have caused consumers to fear the loss of data privacy, leading them to reduce their cashless use afterwards. And thirdly, the experience of using the cashless solution was so unpleasant that consumers decided to use less of it.

My research contributes to new knowledge in payments research by highlighting how habits may be a major factor in cashless adoption in stable situations for small value purchases. The results from the Habit Hypothesis (H2a and H2b) show how habits can overpower the effects of incentives. Payment researchers may wish to investigate further how contextual triggers can perpetuate the habit cycle both from the consumer and merchant angles.

Related to habits is the period of time incentives required in a payment situation before it has a chance to change present cash habits. To the best of my knowledge, this has not been explored in previous payments research but will become increasingly important as countries embark on the cashless journey. Given that the incentives in my experiment were only available for 14 days, it comes as no surprise that the incentives did not lead to a permanent change in habit. This supports the work of Lally et al. (2010), who found that it takes an average of 66 days before new habits are formed. Specific to payments research, the results from my experiment contradict the findings of Kosse and Vermoulen (2014), who found that former payment habits were a weak predictor of remittance channel choices in a study of migrant workers in the Netherlands. A possible explanation for the contrasting results could be because remittance amounts were much larger than the cost of a meal in a hawker centre. Therefore, more thought should be given to remittance channel choices.

My experimental results on habits support the findings of Ji and Wood (2007), that environmental cues can activate practiced responses in the absence of conscious decision making. Participant observation of behaviour at hawker centres provide evidence that these environmental clues exist.

The results of my field experiment are also responsive to the call of Bolt and Chakravorti (2011) for more empirical evidence to guide public authorities on policy interventions. I supplemented the field experiment with qualitative and observational research which yielded many insights into the challenges of cashless payment adoption. This extends the current research on the barriers to digitizing payments in both the developed (World Bank, 2014; UBS, 2018) and developing countries (de Janvry et al., 2016).

3.8.2. Practice Contributions

In my years of payment experience, I have seen numerous examples of incentive programs being launched based on intuition and anecdotal evidence. The results of this experi-

ment provide the empirical evidence for practitioners that incentives work, at least while they are offered. It also confirms that the improvement in performance is temporary – behaviour returns to control levels thereafter. Practitioners can also benefit from the qualitative research that has uncovered many insights into areas that can be improved. In particular, there are five key take-aways that practitioners can implement to improve cashless adoption:

- **Take-away 1 (Break the Habit Loop):** *Provide merchant incentives to prompt for cashless use, without which, the habitual cycle of past and present cash habits on the part of both consumer and merchant is likely to continue in an endless loop.*
- **Take-away 2 (Implement Longer Customer Incentive Periods):** *Customer incentives should be provided for longer periods, preferably beyond 66 days to allow repetitive behaviour to become ingrained.*
- **Take-away 3 (Speedy Cashless Payment Settlement):** *Reduce the settlement period so that cashless payment adoption will not be a cashflow burden to small business owners like hawkers.*
- **Take-away 4 (Train the Merchant's Staff):** *Provide merchant training on how to use and place the POS terminals because assistants running the stalls may not be familiar with them and how it helps the businesses.*
- **Take-away 5 (Lobby for Tax Concessions on Cashless Sales):** *Work with governments to introduce merchant tax concession for cashless acceptance.*

Related to the government's long-term cashless strategy, one needs to ask if a disappointing cash displacement rate is normal. Even in developed countries that are advancing towards the cashless ideal, cash still accounts for a majority of transactions. Arango et al.'s (2011) report on Canada is a case in point. Consulting firm AT Kearney's view on the matter is quite incisive and concludes this research rather elegantly in a 2013 report, entitled "Cash Displacement: The Final Threshold":

"Cooperative competition among telcos, financial institutions, and payment systems has yet to produce a satisfactory replacement for cash, even in highly developed markets. Perhaps government regulation is the missing catalyst."

Government agencies may wish to consider how to make cash use and cash access like

ATM withdrawals more expensive, even as they provide incentives for cashless use. *A carrot and stick* approach may be more effective than just focusing on the carrot. Future research therefore may wish to investigate the importance of *disincentives towards cash payments*. China is a case in point, where cashless payments have been very successful. Industry practitioners have been quick to point out the disincentives or “push” factors at play, which are not in existence in other countries, making China’s model unlikely to work elsewhere. Ultimately, these factors may need to be present, together with incentives and other pull factors before cashless adoption picks up speed. Perhaps cash will have to be banned - together with chewing gum - before Singapore can become a cashless society.

3.9. Conclusion

This research has demonstrated that incentives are effective in increasing the use of cashless payment while an incentive exists. However, cashless payment use seems to drop to below control levels once the incentives are removed. Although this has been a contentious topic among economics and psychology researchers, who have obtained contradictory results, it is of particular importance to payment researchers. This is because incentives are typically offered with the hope that it will last beyond the incentive period. More research is required to better understand the forces at play after the incentives have ended, including the effect of the length of the period in which the incentive operates.

While incentives are effective when they are offered, this still seems insufficient to overcome the overpowering effects of habits, as seen from the overall cash displacement rate. My experiment seems to indicate that habits are a formidable barrier to cashless adoption. Therefore, more research should focus on habit theory in understanding cashless adoption in small value payments. The length of time that incentives need to be provided before ingrained cash habits can be changed should be extended and further investigated.

Obviously, the small sample size of this field experiment limits the generalisability of its results to other applications. Incentives were not offered long enough to assess its effects on habit change. Finally, because it was not possible to perform random allocation of merchants, so the effect of unobserved variables on the result cannot be eliminated, although my best effort was expended to ensure the similarity of the conditions in the treatment and control sites¹⁹.

¹⁹ Some examples of unobserved variables include business confidence, conservatism, and previous exposure to cashless payments.

Chapter 4: Cashless Payment Adoption In Low-Tech Settings

4.1. Introduction

Developed countries like Singapore who embark on a cashless journey often have to contend with the challenges of rolling out high-technology payment solutions in low-technology adoption settings. This is because the typical retail settings like shopping malls have already been converted to cashless payment, with credit and debit card point-of-sale terminals available at most shops. Instead the focus for cashless adoption is on acceptance locations where the purchase amounts are smaller in value and where cash predominates as the payment method, such as hawker centres (Appendix 9, Photos A1-A4). The adoption settings at hawker centres resemble the acceptance locations in developing countries like Kenya with dark and cramped shop spaces, cluttered table tops, retail staff with basic education and the presence of basic utilities.

Cashless payments are beneficial to both consumers and merchants as they provide more convenience. There has been increasing interest by many countries to move towards a cashless society. The number of cashless transactions has been on the rise worldwide, reaching 482.6 billion transactions in 2016, representing a 10.1% growth for that year alone (Capgemini, 2018). It is estimated that this growth will continue at a compounded annual growth rate of 12.7% globally from 2016 to 2021, with emerging markets growing at 21.6% over the same period. This has been driven by the governments' desires of emerging Asia, Central Europe, Middle East and Africa (CEMEA) and Latin America to achieve the G20 goal of financial inclusion, which directly contributes to strong, sustainable and balanced growth.

Recent technological innovations like mobile phones and cloud computing have allowed commercial and social organisations to offer their services to billions of *bottom-of-the-pyramid* (BOP) consumers in a cost-effective manner. Mobile technology has overcome the

obstacles posed by poor infrastructure in these developing countries. The success of the M-Pesa mobile payment service in Kenya since the 2000s is an example of how such innovation within the BOP market can bring huge benefits to humankind yet be commercially viable as well.

But what triggers the successful adoption of cashless payments? The Singapore government launched a cashless payment initiative in late 2017 called the Smart Nation E-Payment Initiative and the initial results have not been encouraging. Cash is still used in a majority of transactions and by most people (Deogawanka, 2019; Leow, 2018). Compare this to the M-Pesa launch in 2007 in Kenya whereby early success was evident. First month sign-up for the product exceeded business expectations. Within two years of launch, sales volume had reached US\$1.6 billion.

Little research has been published on the experiences of countries on their cashless payment journeys. Da Costa Nogami and Veloso (2017) noted the challenges of new technology adoption in the BOP segment, where the people often do not have the education, skills or aptitude to readily appreciate and adopt the new technology. The authors also noted a lack of research and academic literature on this subject, counting only five such papers that focused on business and marketing – all from one research project (Zilber and Silver, 2013).

This essay supplements the research on the challenges of introducing high-technology applications into low-technology adoption settings. The journey often involves using mobile and contactless technology in situations where cash predominates, in physical settings that resemble the situation in developing countries with basic amenities, low-educated users and purchase settings that are often crowded and physically uncomfortable. While these settings are predominantly found in developing countries like Kenya, there are also settings in developed countries like Singapore that are similar, especially when it comes to the last mile in the journey to be cashless since the focus will be on low purchase-value transactions performed

at small outlets with physical settings that are not conducive to cashless payments. The results from this study can help governments plan for their cashless payment journey by identifying the critical success factors necessary for cashless payment adoption.

4.2. Literature Review

4.2.1. Background

The literature showcases the different approaches used to compare technology innovation between countries. For example, Oliveira and Martins (2010) investigated the factors that affected the adoption of e-business by comparing two different industries in the European Union. They used factorial analysis of data collected from 2,459 firms, which was then used to formulate five hypotheses that suggest firm benefits, level of technology integration and adoption, firm size, competitive pressure and trading partner collaboration are predictors of e-business adoption. They combined the features of two models – the *technology, organisation and environment* (TOE) framework (Tornatsky and Fleischer, 1990) and the framework of Iacovou et al. (1995) to create an integrated model based on perceived benefits, technology, organisational readiness, and environmental and external pressure. The hypotheses were then tested by logistic regression analysis. This is an appropriate estimation tool when researchers have large datasets with clear hypotheses to test.

Zhu et al. (2006) studied the process of innovation assimilation by firms in different countries. The researchers used a large-scale survey of 1,857 firms in ten countries. A conceptual model consisting of the TOE framework and a three-stage e-business assimilation model of initiation, adoption and routinization was used. Survey data analysis and hypothesis testing were conducted with structural equation modelling. The researchers tested hypotheses covering technology readiness, technology integration, firm size, global scope, managerial obstacles, competition intensity and supportive regulatory environment, and how these are

related to e-business initiation, adoption and routinization.

Correa and Pavez (2016) investigated the interplay between contextual and individual factors related to internet adoption in ten isolated rural communities in Chile. Given the importance of contextual information, the research design was purely qualitative, consisting of in-depth interviews and informal conversations with participants. Interviews were open and unstructured, taking elements from the ethnographical approach. In this study, 48 people were interviewed. Transcripts of the interviews were then analysed using a thematic coding analysis guided by main topics determined by the literature and what emerged from the data. This research method was apt for the researcher's objective of uncovering contextual and individual factors that influenced the outcome.

In comparing the knowledge-based innovation systems of South Korea and the Netherlands, Park et al. (2005) used a Triple Helix model of multiple indicators consisting of technology, science and innovation to examine the state of innovation systems of the two countries²⁰. In the case of technology indicators, the data gathering was based on patent databases of the respective countries. Data collection for science indicators was based on the Science Citation Index. For innovation indicators, the degree of innovation in an economy was measured using a webometric approach consisting of using information contained in hyperlinks connecting different documents on the Web. In comparison to the previous two studies, this study used secondary and publicly-available data to assess the innovation systems of two countries. Both quantitative and qualitative research methods were used.

Zhong (2009) investigated the factors that affected the adoption, innovation and diffusion of mobile payments for Finland and China. He used a method consisting of three strategic, participatory and operational factors that were modified for the two markets. Using a case study approach, data for the comparison were gathered from five cases each of Finnish and

²⁰ The Triple Helix model allows investigation of network link among industry, academic and government leading to emerging knowledge-based economies, representing the state of innovation systems.

Chinese mobile service providers. Specific details of data collection for the ten cases were not provided. His research found the importance of a standardized, interconnected and widely-accepted mobile payment procedure as crucial for successful diffusion of mobile payment and mobile commerce. This approach is appropriate when the industry being investigated is mature and there are many players to support several case studies.

Using a comparative analysis approach, Lepoutre and Oguntoye (2018) investigated the differences in success of mobile money between M-Pesa of Kenya and Nigeria in Sub-Saharan Africa. Their research highlighted the elements that played a role in the development and survival of mobile money systems. Their comparative case study research design used a comparison of two extremes. Both Kenya and Nigeria are similar in many respects: size of economies, use of English language, former English colonies, mobile phone usage, and low access to banking infrastructure. However, the two countries differ in terms of the success of mobile money penetration. According to survey data, Kenyan adults enjoyed 80% access to mobile money in 2015 while only 1% of adult Nigerians enjoyed such access.

Data for their comparative case study were gathered from various sources to build a historical narrative, including both quantitative and qualitative data. The data for the Kenyan M-Pesa case are well-documented, ensuring rigor in data collection through secondary data sources, including academic publication, newspaper articles and blogs. The data for Nigeria, being less successful, had to be gathered by combining secondary and primary data consisting of semi-structured interviews of 25 informants, covering various stakeholders in the country. The comparative case study approach employed in this study is appropriate given the ample and rigorous secondary data from various sources, including academic publications, practitioner reports, newspaper articles and other public source data.

This literature review has provided information on the different approaches and research methods that were used to compare the factors leading to the success of e-business and cash-

less payment adoption in a country. The methods discussed are appropriate to the specific research questions, resources and data availability in each case. When there are specific hypotheses that require testing within a narrow area, then quantitative methods are probably the appropriate research method, as they are better able to function in a confirmatory capacity. However, when the research questions are exploratory, then it is better to use either qualitative or mixed method research. Comparative analysis is a method which uses both qualitative and quantitative data. It is suitable when a holistic and exploratory perspective is required to assess complex issues within a larger context. This essay seeks to explore the key success factors of cashless adoption within complex ecosystems, including the historical, cultural and social context in two countries. Comparative analysis is therefore suitable for this essay.

4.2.2 Information on Comparative Analysis

Early social science research was dominated by the distinction between qualitative and quantitative research. Qualitative research was associated with case-oriented research while quantitative research was associated with variable-oriented research

In 1987, Ragin published a book, *The Comparative Method*, which introduced a new research approach to the social sciences called *qualitative comparative analysis*. It combines the strengths of the qualitative and quantitative research methods (Marx et al., 2014). Ragin (2014) stated that comparing cases across countries includes taking into consideration historical, cultural and geographically-defined social phenomena. The issues that cause the differences between outcomes from one country to the other are often complex. How can two cases from different nation states be compared especially when the research needs to answer questions that cover multiple and complex issues?

One such method is *case-oriented comparative analysis*. Martin (2017) states that the comparative analysis method has a qualitative orientation. It is interested in complexity, specific historical outcomes and processes. However, it is limited in its data base as the ques-

tions are only relevant to a small number of countries. When qualitative researchers use comparative analysis, they study how the different conditions or causes come together in one setting. They then contrast this by analysing the way they fit together in another setting. In other words, they analyse each entity or case as a combination of parts together as a whole.

Some of the benefits of comparative analysis include its ability to be holistic and to understand causation conjuncturally, when a combination of events or circumstances causes an outcome (Ragin, 2014). This allows for researchers to interpret cases historically and explain how qualitative changes in the settings are important to the case outcome.

In comparing and contrasting two things as part of comparative analysis, it is necessary to consider the way in which the comparison is done. In the comparison (sometimes also called the “keyhole” comparison), one case is used as a lens to view the other. For example, Case A can be used as a base-case for understanding Case B. This can bring new light to issues and problems in Case B. Comparisons also are good for critiquing or challenging the understanding of issues that may seem perfectly clear previously.

Ragin and Amoroso (2011) explained the process for conducting a comparative analysis:

- Step 1: Selecting the cases - the reason for comparing the two cases, including the degree to which the cases belong to the same category and are therefore comparable.
- Step 2: Using analytic frames – a frame is chosen when the researcher specifies the specific feature or characteristic about the case that is of interest.
- Step 3: Analysing the patterns of diversity – how different configurations of causes produce different outcomes. There is a dialogue between the ideas and evidence. In comparative analysis, the emphasis is on using contrasts among cases to help the researcher understand their diversity.

A limitation of the case-oriented comparative analysis approach is that it only works well

with a small number of cases. As the number of cases increases, it becomes more challenging for the researcher to establish an intimate familiarity with the cases.

In summary, the case-oriented comparative analysis is appropriate when researchers are looking for a rich dialogue between their ideas and evidence. It also allows them to consider their cases as whole entities. This allows complex issues and conjunctural causality to be explored more fully when only a few cases are available (Ragin, 2014).

4.2.3. Preliminary Basis for Comparative Analysis

This essay seeks to better understand the challenges of implementing high-technology payments in low-technology adoption settings, using the Singapore Smart Nation E-Payment Initiative and M-Pesa in Kenya as case comparisons.²¹ Comparative analysis was also used by Lepoutre and Oguntoye (2018) in investigating the lack of success of mobile money in Nigeria compared to the resounding success in Kenya of the M-Pesa mobile money. Using comparative analysis allows a deeper analysis of the possible reasons for the lack of success within a complex ecosystem consisting of government policy, socio-economic development, banking infrastructure and access, adoption of innovation and many other consumer behaviour factors.

Using M-Pesa in Kenya as one case, and the Singapore Smart Nation E-Payment Initiative as another case, my comparative analysis is useful in highlighting how different factors acting together can lead to previously unexplained results. Since the research question is about understanding the reasons for the lack of success of the Singapore cashless initiative, the comparison is for M-Pesa to be a lens to view the Singapore case. It allows me to illuminate various issues that may have been taken for granted in the Singapore case, allowing for a more critical analysis to occur.

The comparison begins with a full review of M-Pesa to create a base-case of what a suc-

²¹ The focus of this essay is on the B2C low purchase value retail component of the Singapore Smart Nation E-Payment initiative at hawker centres.

successful cashless payment adoption would look like. It then can be used as a lens to view the Singapore case. In creating the base-case, a list of factors are produced that are likely to have led to M-Pesa's success. These factors then form a set of evaluative dimensions to assess the Singapore case.

4.3. The M-Pesa Case

4.3.1. Background of M-Pesa

M-Pesa was started by Vodafone through its subsidiary Safaricom in 2007 in Kenya. The idea was to create a means of micro-credit payment and money transfer using mobile phones to circumvent the poor banking infrastructure (Ndung'u, 2018). M-Pesa stands for Mobile "Pesa," the Swahili word for money. Vodafone received funding from the Department for International Development as it developed M-Pesa as a pilot program to extend the growth of financial markets to the unbanked in East Africa (Lonie, 2010).

M-Pesa facilitated a number of financial transactions through the mobile phone. A simple registration was required at authorised M-Pesa retail agent outlets. Customers could use their mobile phones to transfer money to both registered and non-registered users, check their account balances, pay bills, purchase mobile phone credit, and transfer such credit to other users. When a customer transferred money to another mobile phone, the receiver received an instant notification with a unique code through a *short message service* (SMS) message. The receiver then visited the closest agent to collect the cash. Alternatively, the receiver could leave the money as a deposit in his mobile wallet. Deposits and withdrawals of cash could be made from the M-Pesa account through an authorised M-Pesa agent (Mas and Morawczynski, 2009). In other words, M-Pesa was like a branchless banking service, where the agent network acted like branches or ATMs. These agents consisted of existing airtime resellers and the retail outlets of Safaricom (Centellegher et al., 2018).

After a short pilot, the product was officially launched in March 2007. The project faced many financial, social, cultural, political and technological challenges in the beginning. Vodaphone had to coordinate the various divergent cultures of telecommunication companies, banks, and agents, and cope with the massive and often contradictory regulatory requirements (Hughes and Lonie, 2007). The early demand from the unbanked segment was a clear indication that this mobile banking money transfer service was meeting an unmet need in the country. Within four months of the official launch, customer sign-up for the product had reached 268,499 users. By July 2007, the monthly transactions amounted to 1.065 billion Kenya shillings or US\$14.2 million (Kimenyi and Ndungu, 2009). Within two years of the launch, six million customers had registered with the service, representing nearly half the customer base of Safaricom. During that period the person-to-person dollar transfer volume for the service was over US\$1.6 billion (Mas and Morawczynski, 2009).

Beyond the money transfer service, the M-Pesa platform also allowed the provision of virtual savings accounts and a menu of other financial services in the comfort of the customers' homes, without a trip to the bank. Therefore, it also became an instrument to push financial inclusion in Kenya (Ndung'u, 2018). To date, M-Pesa has expanded beyond Kenya and is now currently available in eight countries: Congo, Egypt, Ghana, India, Kenya, Lesotho, Mozambique and Tanzania (Centellegher et al., 2018).

4.3.2 M-Pesa Case Analysis

Various academicians and practitioners have provided their views on the key success factors leading to M-Pesa's success.²²

Hughes and Lonie (2007) used a case study approach to analyse the background of the M-Pesa project to launch an innovative payment service for the unbanked in Kenya. This included getting top-level sponsorship and funding for the project. Once the project pre-

²² While identifying key success factors was not the primary aim of many of the articles discussed here, many of them indirectly mentioned the factors that, in the authors' views, contributed to M-Pesa's success.

implementation was over, the executives then turned their attention to numerous implementation challenges, including buying/building decisions, understanding the system capabilities of Safaricom and their telco partner, reconciliation issues, targeting of customers, and POS/magnetic stripe decisions. There were also issues related to technological knowledge, the training environment and the complexity of the task. While there were many challenges, the pilot turned out well with excellent early adoption rate of M-Pesa in Kenya, strongly suggesting the service met a need in the market.

Usage was also significantly above expectations. Within the first month of official launch, 20,000 customers had registered for M-Pesa, which was well ahead of the target. The authors summarised their experience with the advice that there was no substitute for spending a significant amount of time on the ground assessing customers' needs well ahead of designing the functional specification of any technology-based solution.

Mas and Morawczynski (2009) summarised the key success factors more succinctly as relating to a latent demand for remittance services, poor alternatives, and the size of Safaricom. The demand was driven by the flow of rural-to-urban migration in Kenya. It is common for one member of a household to seek employment in the city to support the household finances. There also were alternative methods of transferring money: Posta Pay, the national postal service, the more traditional form of human remittances, consisting of bus drivers and *matatu* (shared taxi) companies, and friends going back to the rural area. Thus, both a pull and a push factor were at play to make M-Pesa successful right from the start. Although these alternatives were the cheapest, they were also risky as some or all the money could be lost along the way. Safaricom had a 77% market share, which played a significant role in rolling out the service to the mass market quickly.

Kimenyi and Ndung'u (2009) investigated the key success factors contributing to the un-

precedented success of M-Pesa from a macro policy perspective.²³ Firstly, the government took a more liberal stance and made possible the competitive supply of mobile telephony, especially removing the state monopoly. This enabled the private sector to take the initiative in mobile telephony. Secondly, the authors noted that there was a major shift in the way the government of Kenya approached policy making; they opened up to dialogue with the private sector. Relevant authorities included the Central Bank of Kenya, Ministry of Finance, Communication Commission of Kenya, and the Ministry of Information and Communication.

Thirdly, the central bank policy towards innovation was to balance access with stability by allowing technological innovations in mobile banking, but with prudent monitoring and review to ensure the integrity of the financial system. Lastly, the authorities also ensured that the market remained competitive, even with the success of M-Pesa. They allowed other providers to enter the market for mobile banking, resulting in pricing that was competitive. In summary, the proactivity of the central bank was a contributing factor to M-Pesa's success.

Burns (2018) identified socio-economic factors from the Kenyan experience that contributed to its success. These included a local telecom provider with a dominant share, a country enjoying a fair degree of economic and financial development, and strong demand for domestic remittances. He noted that the new markets where mobile money had succeeded beyond Kenya do not meet all or even any of these criteria, suggesting a missing success factor. He argued that the key differentiating factor was an enabling regulatory approach typified by liberalising laws to allow non-banks to provide basic financial services and streamlining legacy regulations, which may repress financial inclusion. Regulators also should refrain from mandating specific business models or tie-ups with government-led banks or telcos.

Sen (2014) noted that the success of M-Pesa in India is nowhere close to the Kenyan experience. He attributed this to the Indian regulator who was slow to grant mobile wallet li-

²³ Ngund'u was Central Bank Governor at that time.

cences to telcos like Vodaphone. Also, users were required to open a bank account and make a one-time payment of Rs100 (US\$1.45) and file KYC (know-your-customer) forms. All these requirements added up to inconvenience for users, as bank branches were not ubiquitous in rural India.

Centellegher et al. (2018) noted the lack of quantitative studies surrounding the success of M-Pesa. Analysing millions of anonymized mobile phone communications and M-Pesa transactions in an African country, they found that M-Pesa adoption and use in a developing country could be predicted by the customer's mobile phone activity, the presence of M-Pesa users in a customer's ego-network and the customer's mobility.

Heinrich (2014) noted that Vodafone did not achieve the same level of success elsewhere as it had in Kenya. The Kenyan success was built on the unique circumstances in the country's cell phone industry – Vodaphone's dominant share of the country's mobile market, and the support of a large network of agents.

IFC (2009) presented the factors contributing to the overwhelming success of M-Pesa. These include high mobile penetration, high literacy levels, medium access to finance, high demand for money transfers, the conducive regulatory environment, strong marketing campaigns by Safaricom, the ecosystem of an extensive agent network, and the low competition that Safaricom encountered during launch. The report also noted the importance of product simplicity, a scaled rollout beginning with a pilot and the dominant market share of Safaricom as contributing factors to the overall success.

Analysing M-Pesa's success from the technology perspective, Kingiri and Fu (2019) used the *technological innovation system* (TIS) framework to provide useful insights into the functions that led to M-Pesa's success in Kenya. Using both secondary materials (literature, media reports) and supported by interviews with selected actors in the industry, they found that three factors played a role in stimulating the functional aspects of M-Pesa: the leadership and

coordination role played by Safaricom, the interlinked network of entrepreneurs (e.g., M-Pesa agents, banks and other service providers) and the pro-innovation facilitative and boundary-spanning role played by the government.

Lashitew et al. (2019) used mixed methods to research the success of mobile money across developing countries. Using regression analysis from publicly available data, they found that demand-related factors have a statistically weak effect on the adoption rate of mobile money. Supply-related factors like mobile penetration had similar effects. Telecom sector regulation seemed to have the largest positive effect on the adoption. And, greater mobile money diffusion seemed to occur where the telecom regulator had greater transparency, independence, resource access, and enforcement capacity.

Masinde (2016) argued why M-Pesa was successful in Kenya but not so in South Africa, which had higher mobile phone penetration and perceived awareness of banking services. The author listed three key factors. Firstly, there was a huge gap in banking services in Kenya in 2007. Secondly, the service was hassle-free and accessible due to Safaricom's dominant market share, which led to many agents all over the country. Thirdly, the service was also simple to operate.

A simple consumer proposition was also mentioned by Christensen et al. (2015). They stated that disruptive innovations like M-Pesa must use a simple technology and offer a valuable consumer proposition to be successful.

Unibul (2017) further explained why M-Pesa was hugely successful in Kenya and less so elsewhere. While he listed several reasons, the main takeaway from his blog post was that the M-Pesa service was not as needed elsewhere as it was in Kenya. He mentioned that only 10% of Kenyan's have access to financial services while it is 48% in India and 46% in South Africa, countries where M-Pesa had launched but had not encountered success like it had in Kenya.

Finally, Soyres et al. (2018) mentioned that the success was due to many factors, including the ease of setting up an account, its simplicity of use, its affordability, the high literacy rate of the population, and the high penetration of mobile phones.

4.3.3 Preliminary Observations and Full Base-Case Model Extension

Summarising from the literature, it is possible to list the key factors that various researchers and commentators have proposed for the success of M-Pesa in Kenya. After considering different ways of describing the same factors and grouping similar factors, the simplified list of factors is listed in Table 4.1 below. Each factor has been tagged with a short commentary, explaining the factors and its importance from my professional perspective.

Table 4.1. Base-case for Success Using M-Pesa as Model

Proposed Success Factors	Source	Remarks
Funding	Hughes and Lonie (2007)	Funding is key as investments in technology trials and rollout are costly. Banking technology investments are often large and adoption may be slow in its early stages. New entrants must be able to secure funding to last through the slow adoption in the early years.
Top level sponsorship	Hughes and Lonie (2007)	Top-level sponsorship helps resources to be allocated and prioritised so that the pilot and commercialisation will be within projected timelines.
Unmet need in market/latent demand	Hughes and Lonie (2007) Mas and Morawczynski (2007) IFC (2009) Masinde (2016) Unibul (2017) Burns (2018)	This is a hygiene factor. The unmet need must be present, otherwise the presence of all the other success factors will make little difference.
Simple technology and value proposition	Christensen et al. (2015)	This helps to speed up the diffusion process.
Poor alternatives	Mas and Morawczynski (2007) IFC (2009)	Poor alternatives force consumers to seek out better options.
Market share/size of provider/leadership (Safaricom)	Mas and Morawczynski (2007) Heinrich (2014) IFC (2009) Kingiri and Fu (2009) Lashitew et al. (2019) Masinde (2017) Burns (2018)	Dominant size of the incumbent is critical because it can easily roll the product out to its entire existing customer base, compared to a small player that must acquire new customers.
Extensive physical agents	Lonie (2010) Heinrich (2014) IFC (2009) Kingiri and Fu (2009)	Having real people on the ground to explain and train early users is critical in the rollout of new technology to get good word-of-mouth out into the market for quicker adoption.
Proactive government regulations	Kimenyi and Ndung'u (2009) Burns (2018) Sen (2014) IFC (2009) Kingiri and Fu (2009) Lashitew et al. (2019)	This is a critical factor, especially in developing countries, where governments need to review legacy legislation on banking services so they do not encumber the growth of new banking technologies.
Market-led growth	Kimenyi and Ndung'u (2009)	Innovation and market adaptability are best performed by competition within market players. In this case, the thousands of agents were instrumental as they competed with each other, although there was only one overall provider in Safaricom. The central bank's policy to allow the market to take the lead is a key aspect.
Customer conveniences (no need to open bank account/fill up KYC forms)	Sen (2014) Masinde (2016) Soyres et al. (2018)	Although mentioned in only one article, this can be a deal breaker from an operational point of view. The agent network replaced bank branches. This is especially important in rural places where a bank branch is often inaccessible.
High mobile penetration	IFC (2009) Soyres et al. (2018)	Report displays low credibility due to lack of justification.
High literacy levels	IFC (2009) Soyres et al. (2018)	Report displays low credibility due to lack of justification.
Strong marketing	IFC (2009)	Report displays low credibility due to lack of justification.
Low competition	IFC (2009)	Report displays low credibility due to lack of justification.
Scaled rollout	IFC (2009)	Report displays low credibility due to lack of justification.
GDP per capita	Lashitew et al. (2019)	GDP per capita was not significant as a predictor of mobile money accounts in a country. Removed from base-case.

4.4. Singapore's Smart Nation E-Payment Initiative

4.4.1. Background

Singapore's ongoing shift to a knowledge-based economy led to interest in the possibilities of digitisation and big data (Calder, 2016). Meanwhile, rapid urbanisation and increasing urban density gave rise to complex and intertwined policy issues in the small city-state. The idea of a smart city concept was proposed. This idea eventually took the official form of the Smart Nation Initiative, representing a means through which Singapore could explore areas of growth associated with the new digital economy (Kua et al., 2017). Officially launched in 2014, the Smart Nation Initiative reflects a broad digital transformation that aims to digitise all aspects of urban life in Singapore. Making up the Smart Nation Initiative are five key National Projects (Smart Nation Singapore, 2018):

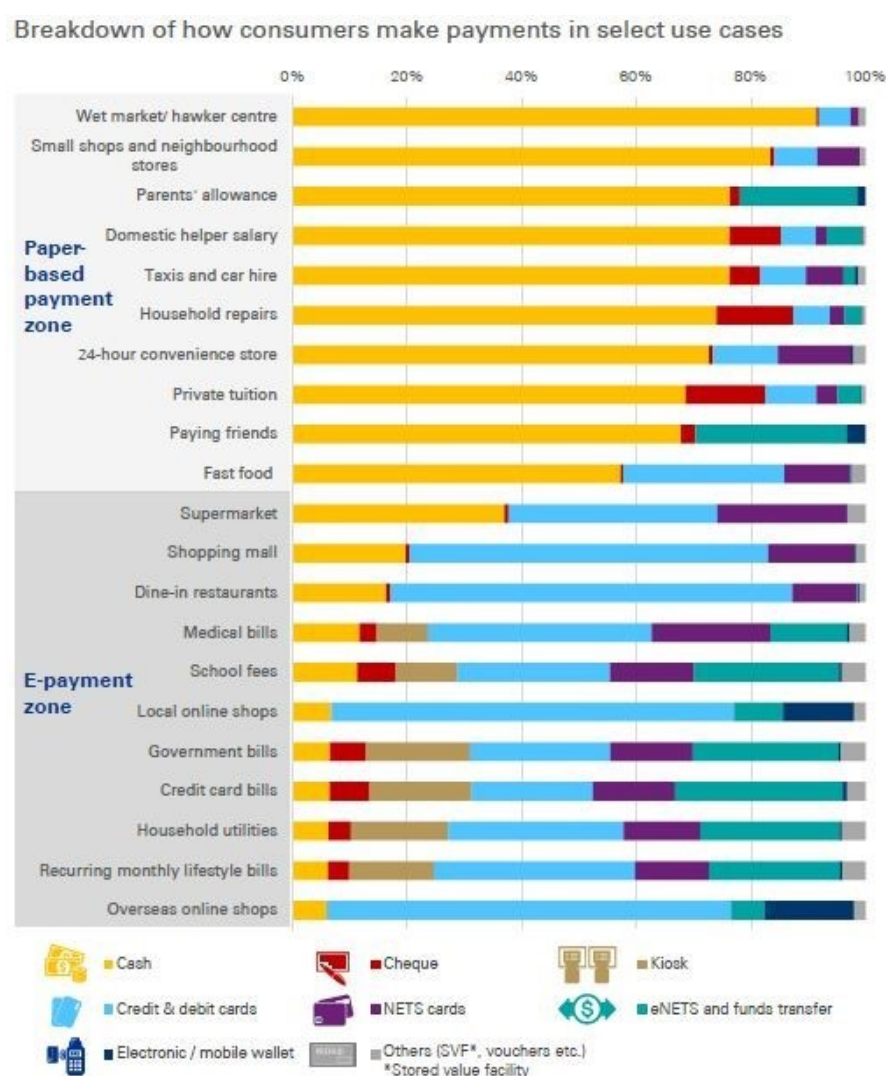
- 1) National Digital Identity
- 2) E-Payments
- 3) Smart Nation Sensor Platform
- 4) Smart Urban Mobility
- 5) Moments of Life

A key initiative within E-Payments is to encourage e-payment use in hawker centres. Hawker centres are open-air complexes that house many stalls selling a wide variety of affordably-priced food (Tung, 2016). Each hawker centre would house between 10-70 individual stalls. These food stalls are typified by their inconducive and congested workspaces. (Refer to Appendix 9, Photos A1 to A4), which bears similarities to the work spaces where M-Pesa was launched in the BOP segment. Most retail establishments in Singapore were already accepting e-payments. But places that still did not accept e-payments were locations where payments were of low value, like hawker centres.

Hawker centres sell food with prices typically averaging S\$4 per meal. Hawker centres

were highlighted in a 2016 KPMG report commissioned by the Singapore central bank titled “Singapore Payments Roadmap: Enabling the Future of Payments 2020 and Beyond.” This report was supposed to expand on the E-Payment Project within the Smart Nation initiative. The report pointed out that hawker centres topped the list of places where paper money predominated (KPMG 2016).

Figure 4.1. Paper-based Payment Zones in Singapore



Source: KPMG Report (2016). Reproduced with permission.

The movement towards e-payment was heightened in August 2018 when the Singapore Prime Minister, in his National Day message (akin to a State of the Nation speech), la-

mented how the country was backward compared to China, which had overtaken Singapore in e-payment adoption. He noted efforts by the Singapore central bank to achieve progress with the current situation by urging payment providers to work together for a quick solution, including creating a unified POS infrastructure since there were disparate players, each with its own system and standards. Echoing the Prime Minister, Piyush Gupta, the chairman of the Association of Banks in Singapore and current CEO of DBS Bank said, “the early indications are positive for Singapore to eventually transform into a cashless society.”

4.4.2 Singapore’s Smart Nation E-Payment Analysis

While there was no official launch date, cashless payment pilot projects were observed around the country from late 2017. This included many school canteens in Republic Polytechnic, Temasek Polytechnic, Singapore Polytechnic, Ngee Ann Polytechnic, National University of Singapore, Nanyang Technological University and the Singapore Management University. A few of the hawker centres scattered across the country, which were managed by the National Environment Agency, a government body, also started to offer cashless payments.

While no official data have been published by the government on the results of the Singapore Smart Nation E-Payment Initiative, a quick review of the publicly available media reports on the status of the cashless adoption drive can provide a reasonable estimate of the success thus far. If we take January 2018 as the rollout of the Singapore Cashless initiative, then the media reports are an assessment of the progress between 6 months to 15 months after the pilot rollout.

Leow (2018) mentioned that Singaporeans’ affection for cash is a formidable barrier to cashless payment adoption. Cash remains a viable alternative for most. She indicated that, with the country’s high smartphone penetration, moving to digital payments should be smooth. Unfortunately, this is not the case. She quoted from a 2017 PayPal study that found 9

out of 10 Singaporeans preferring cash as their first payment choice.

Boh (2018) reported that China had overtaken both Hong Kong and Singapore in cashless payment usage, though both these countries started their cashless journey much earlier. One possible reason for this is the fragmentation in the small Singapore market. Unlike China, where there are only two technology giants, Alibaba and Tencent, catering to a very large market, Singapore has many separate providers in a small market. The author quoted a Singapore hawker who said she only received one cashless payment for every ten bowls of porridge she sold.

Huong and Lin (2018) studied the cashless payment initiative at hawker centres in Singapore and found that there was persistent low adoption. They surveyed 236 hawkers and only 39.8% said they accepted cashless payments. Among them, only 19.6% had been using them for more than one year. The authors found that hawkers want to embrace cashless payments but said they needed help in tackling various barriers.

Four barriers were highlighted: cost barriers, traditional barriers, usage barriers and value barriers. *Cost barriers* refer to the additional merchant discount fee that hawkers had to pay for accepting cashless payments. *Traditional barriers* refer to the inconvenience of changing existing routines of accepting cash. *Usage barriers* arise from the inconvenience of using cashless payments, like the need to top up the wallets regularly. *Value barriers* point to the reluctance of consumers and merchants to adopt a new innovation unless it is cheaper than their incumbent choice. Of the four barriers, 69% of hawkers felt that cost barriers were of concern, making it the key barrier for them. Next came traditional barriers with 60% of hawkers saying they preferred to use cash.

Deogawanka (2019) wondered if faster settlement would get hawkers on board with cashless payments. Even with the rollout of various electronic payment solutions as part of the Smart Nation Initiative, transactions at hawker stalls still took too long to be processed. She

provided the example of payments made on Friday, which would take the entire weekend to be processed. The hawker would only receive the monies early the following week. She reported that one payment provider had recently taken the initiative to provide settlement on the same day, giving new hope that merchants will be more receptive to adopting cashless payments. But she wondered if this would really help to improve the situation.

Singapore Business Review (Mar 10, 2019) reported that cash was still king in Singapore as elders shun new technologies. Even with the full backing of the government to encourage the country to become cashless, a number of sectors and demographics have seemed hesitant to adopt mobile and cashless payment alternatives as they found comfort in hard, cold cash. The report highlighted hawker centres, food courts and wet markets as the sectors most hesitant. The ageing Singapore population is likely to be more resistant to change. The article also opined that the availability of digital alternatives was unlikely to change consumer attitudes soon. And neither would government efforts to integrate the disparate payment systems in Singapore. Rather the transition to a cashless society may take time and likely be a gradual shift.

The Singapore-based *Spectrum* (2019) journal questioned why the nation's fintech innovation was failing to create a cashless society. It noted that China and many African countries, such as Kenya, Tanzania and Uganda, had made better progress on this journey. Kenya's M-Pesa was mentioned as a role model whose volumes account for almost 50% of Kenya's GDP now. It wrote that the lack of counterfeit currency in Singapore and Singaporeans' reluctance to trust technological modes of payments were possible barriers to faster adoption.

The various media articles are summarised in Table 4.2 which also lists the cashless adoption statistics from each article.

Table 4.2. Media Articles on Success of Singapore Smart Nation E-Payment Initiative

Date	Source	Author	Article Title	Statistics
April 2019	Spectrum	Staff	Why is Singapore's fintech failing to create a cashless society?	88% of Singaporeans still prefer to withdraw cash from ATMs.
March 2019	Singapore Business Review	Staff	Cash is still king in Singapore as elders shun mobile apps	40% of payments still by cash or cheque
January 2019	Asean Today	Deogawanka	Will faster settlements get Singapore's hawkers on board with cashless payments?	Cash is still used in 60% of transactions.
December 2018	Channel News Asia	Huong Ha and Carey Lin	Commentary: Hawkers want to embrace cashless payments but say they need help tackling barriers	Out of 236 hawkers polled, only 39.8% said they accept mobile payments. Of this, only 19.6% had been using them for more than a year.
October 2018	South China Morning Post	Samantha Boh	How cashless mainland China made Hong Kong, Singapore look backward	Only 1 out of 10 transaction is e-payment at hawker centres
May 2018	Business Times	Annabeth Leow	The future of money	More than 80% of people make payments in cash

Overall, the articles seem to indicate that a majority of Singaporeans still prefer cash due to various reasons ranging from habits, the convenience of cash, slow settlement for merchants and the ageing demographic of Singapore's population.

4.4.3 Comparison of Singapore Case against Base-Case of M-Pesa

Using the M-Pesa case as a base-case of success, I then compared how the Singapore cashless case fared (refer to Table 4.3 below).

Table 4.3 Comparison with Singapore Smart Nation E-Payment Initiative

Base-case Success Factors	M-Pesa Base-case	Singapore Smart Nation E-Payment
Funding	Yes	Yes
Top level sponsorship	Yes	Yes
Unmet need in market/latent demand	Yes	No
Simple technology and value proposition	Yes	Yes
Poor alternatives	Yes	No
Market share/size of provider/leadership (Safaricom)	Yes	Yes
Extensive physical agents	Yes	No
Proactive government regulations	Yes	Yes
Market led growth	Yes	Yes
Convenient (no need to open bank account/fill up KYC forms, top up wallets)	Yes	Moderate
High mobile penetration	Yes	Yes
High literacy levels	Yes	Yes
Strong marketing	Yes	Yes
Low competition	Yes	Yes
Scaled rollout	Yes	Yes

** Differences with success factors from base-case are highlighted..*

From the table above, four factors that were present in the M-Pesa case were not present in Singapore.

Unlike M-Pesa, there was no unmet need in the Singapore market for cashless payments at hawker centres. There was no latent demand for cashless payments since hawkers had already been comfortable with using cash for their small value transactions. Singapore is a small country measuring only 716 square kilometres in geographic size. This is less than half the size of the city of London which is approximately 1,752 square kilometres. ATMs are conveniently located everywhere around the small island. ATM cash withdrawals are free of charge. An example of how convenient cash is in Singapore is the failed rollout of cashback services in mid-2000. While cashback was very popular in the US, this service provided at major retailers did not take off in Singapore.

In terms of poor alternatives, the use of cash in Singapore is considered a good alternative since cash can be carried around safely without fear of theft. Singapore has been ranked as number one globally for order and security (WJP, 2018). Cases of counterfeit currency is also rare (Spectrum, 2019). This is partly due to the number of security features that the central

bank has built into the Singapore notes and coins to combat counterfeiting (Monetary Authority of Singapore, 2018). These factors combine to make cash a good alternative to cashless and other electronic forms of payment, especially for low value transactions like those in hawker centres which typically average \$4. The Singapore dollar note has many denominations ranging from S\$1 to S\$10,000. This makes cash a convenient way to pay for a variety of big and small transactions.

The use of physical agents in the M-Pesa case was instrumental to its success for a variety of reasons. Firstly, the physical agents replaced bank branches for customer withdrawals of their remittances. Besides, these physical agents also provided a human interface to explain new technology to low educated consumers. In contrast, the hawker centre cashless adoption did not use the equivalent of physical agents, which can be translated to the equivalent of an agent on the ground to help guide the hawkers and consumers on how to use the POS machines and allay their fears of using the new technology. The payments market is a two-sided market requiring an equal amount of resources to build up the ‘supply’ side of the equation. The ‘supply’ does not only require the hardware like POS terminals but also the software of merchant attitude, receptiveness and influence. The number of merchants and their willingness to adopt the new technology play a critical role in cashless adoption, especially since they are generally of low educational backgrounds and may not appreciate the benefits that cashless payments bring to their business. This negative attitude is also transferred to subjective norms or social influence, and affects early adopters planned behaviour according to various technology adoption models.

Convenience when applied to the hawker centres would apply to both consumers and merchants. Overall the experience of paying by cashless methods is quite convenient for consumers since cashless payment instruments are held by almost everyone because they also function primarily as a mass transit card or a general-purpose prepaid card. Topping up these

cards can also be done at all ATMs and other automated self-service kiosks located conveniently across the island. But this convenience cannot be said to apply to merchants who choose to accept cashless payments. Funds are paid about T+3 to T+5 days after the transaction date. This is a problem for many hawkers because they are small businesses who run on tight cash flow. Cash collections allow them to use the takings to purchase the next day's raw materials. Another issue faced by merchants is the cluttered table top of a hawker stall whereby they struggle to find a visible location to place the POS terminals. Many merchants hide the terminals behind rice cookers, adding to the low presence and awareness of the availability of cashless payment options. There is also the possibility of higher tax liability when cashless payments are accepted.

In general, proactive government regulations that led to the phenomenal growth of M-Pesa were also present in Singapore. As part of the Smart Nation Initiative (Smart Nation Singapore, 2018), the government has put in place five key pillars to transform the country. This includes initiatives to promote cashless payments for low value transactions at places like hawker centres. In fact, the general impression of the Singapore government's efforts is echoed by one Chinese banker I spoke to. He had this to say when asked why cashless payment has taken off in China while not in Singapore: "In Singapore the government want cashless payments.....but Singaporeans don't want". He meant that the government seemed to be taking all the effort to encourage cashless adoption. The average Singaporean, on the other hand, is happy with cash and have no need for alternatives.

In summary, the comparative analysis has provided many insights as to why Singapore Smart Nation E-Payment Initiative did not perform well, using the M-Pesa case as a reference. At the larger market level, Singapore has no unmet needs in the area of small value payments. Cash is doing a reasonably good job as an alternative since ATMs are conveniently located in a small country and there are no fees for cash withdrawals. Singapore enjoys

low crime and counterfeit currency rates. Of course, having more proactive government regulations, and even the use of physical agents can be advantageous. But these factors can only accomplish so much in the absence of unmet needs and presence of convenient alternatives.

4.4.4 Extended Analysis on Singapore

Some common factors that surfaced from media reports of the Singapore case analysis that were not mentioned as part of the comparative analysis above is worthy of investigation. While the M-Pesa base-case provided a list of factors that must be present for success, the factors brought up in the Singapore media analysis surfaced barriers that must be removed or addressed for cashless adoption to happen. These barriers are listed in Table 4.4 below.

Table 4.4. Extended Factors from Singapore Smart Nation E-Payment Analysis

Extended Factors	Authors	Remarks
Tradition of paying by cash and preference for cash	Huong and Lin (2018) Leow (2018) <i>Singapore Business Review</i> (2019)	This is the habit of paying by cash that has become part of “automatic” behaviour due to repeated action in the past. Cash is also a good alternative to other forms of payment. This factor is mentioned by various authors as the reason for the low cashless payment adoption in Singapore.
Lack of counterfeit currency	<i>Spectrum</i> (2019)	This is an important push factor that did not appear in the M-Pesa case analysis but is extremely relevant to explain China’s sudden growth in cashless payments compared to Singapore.
Cost barriers for customers and merchants	Huong and Lin (2018) Deogawanka (2019)	This affects the merchants more since they are charged a merchant fee for accepting cashless payments. Customers do not incur any additional fee for cashless payments.
Market fragmentation in a small market	Boh (2018)	On the fragmentation issue, the government has begun to address this by creating interoperability within the disparate players. Unfortunately, size remains a formidable barrier from a commercial perspective. This is a relevant issue as Singapore is a city-state. It is very different in geographic and population size from Kenya. Commercial providers would find it difficult to breakeven from their infrastructure investments.

4.5. Findings and Discussion

4.5.1. Primary Findings

These are the primary findings from the comparative analysis:

- **Finding 1 (Unmet Needs Lacking).** *While there was an unmet need in the M-Pesa case, there were no unmet needs in the Singapore case.*

Various researchers, including Hughes and Lonie (2007) and Mas and Morawczynski (2009), who were personally involved in the M-Pesa case, highlighted the clear indication of an unmet need. This was apparent even during the early pilot stage. The unmet need was exacerbated by the flow of rural-to-urban migration occurring at that time in Kenya, which required city workers to remit money back to their families still living in the villages.

Marketing principles point out that an unmet need forms the basis of any successful business proposition. Without an unmet need, any other marketing or government efforts would be futile to shore up the business. An unmet need is also closely related to what Huong and Lin (2019) defined as value barriers. This is because customers would not place significant value on a product or service that they do not need.

- **Finding 2 (Good Alternatives Available).** *While the M-Pesa case was launched in a market with poor alternatives, cash was a convenient alternative in the Singapore case.*

Mas and Morawczynski (2009) elaborated on the situation prior to the launch of M-Pesa. They highlighted that the two alternatives at the time were the national postal service, Posta Pay, and the human remittance channel, matatu, comprised of bus drivers and taxi drivers, noted earlier. Although they were cheap, they carried the risk that all the money could be lost along the way.

In Singapore, its small and compact size plus the low crime and currency fraud made the use of cash an alternative which was both convenient and cheap. ATMs are conveniently available at every block. There are also no fees for ATM withdrawals. All these factors, unique to Singapore, made cash a convenient alternative.

- **Finding 3 (Physical Agents Not Used).** *While the M-Pesa case used physical agents extensively to guide early adopters of the service, the Singapore case did not use physical agents during the launch.*

Kingiri and Fu (2019), in particular, mentioned this as a key success factor. The inter-linked network of entrepreneurs, including the M-Pesa agents, banks and other service pro-

viders, contributed to the generation of knowledge development and diffusion. Positive word-of-mouth was created and this was spread to the broader social network of early adopters, leading to good impressions and quicker adoption of the new service.

The Singapore case did not use physical agents other than for the initial deployment of POS terminals to the merchants. This possibly led to merchants struggling to use the terminals and understanding how these terminals could be relevant to their businesses. Providing physical agents to assist these merchants would have provided critical face-to-face guidance and assurance of its usefulness. This in turn would create positive word-of-mouth that would help to get more merchants onboard, accepting cashless payments.

- **Finding 4 (Merchants Inconvenienced).** *While M-Pesa use was convenient for both consumers and retail agents, merchants in Singapore were inconvenienced by the need to wait a few days before they received their money, and other reasons.*

Masinde (2016) mentioned the inconvenience of opening a bank account in Kenya due to the related requirements, and the fact that banks in remote Kenya were not accessible. M-Pesa did not require the opening of a bank account and was therefore perceived favourably by early users. The merchants had bank accounts as they were existing retail agents of Safaricom.

While Singaporean consumers and merchants participating in cashless payments already held a bank account, merchants in particular experienced inconvenience when they accepted cashless payments because they would only receive the monies between 3-5 days later. This is a serious inconvenience to small business owners like hawkers, who use the takings of the day to pay for the next day's supplies.

From the media reports, it is possible to identify barriers and issues uniquely relating to the Singapore Smart Nation E-Payment Initiative from media reports.

- **Finding 5 (Cash Payment Habit Ingrained).** *Consumers' habit of paying by cash is a likely barrier to cashless payments.*

There are many reports of the Singapore case, highlighting the ingrained habit of cash use

as a barrier to cashless adoption. Huong and Lin (2018), for example, mentioned habits as a barrier which they referred to as traditional barriers. The old habit of paying by cash constituted a traditional barrier, related to how cash has been used. Other reports (Leow, 2018; *Singapore Business Review*, 2019) allude to habits by noting that consumers prefer cash.

- **Finding 6 (Cost Barriers).** *The importance of cost barriers may be related to the perceived lack of value that both consumers and merchants place on cashless payments.*

Huong and Lin (2018) mentioned the high cost barrier to cashless adoption. But this is directly related to the concept of value. High cost is relative to the perceived value. Consumers and merchants may see little value in using cashless payments. When there is low value attached to a service, any cost may be perceived to be high.

Cost barriers would be more an issue to the merchants compared to the consumers. Merchants pay a fee for accepting cashless payments while consumers do not pay a fee for using them. Therefore, the value merchants receive from the service (convenience, speed) must be sufficiently high before it makes sense for them to embrace cashless payments. There is also the possibility of incurring a higher tax liability when they pay by cashless means.

4.5.2. Additional Findings

The comparative analysis approach allows us to move to a higher level of abstraction, to analyse events holistically, and to explore patterns which may be less obvious at first sight. This resulted in the following findings:

- **Finding 7 (Many Technical Solutions Complicate Adoption).** *For a small market, Singapore has many disparate players offering different proprietary solutions, which has slowed cashless payments adoption.*

The availability of many different cashless platforms, including NETS, DBS PayLah, GrabPay and AliPay, often creates confusion and could possibly discourage consumers from going cashless. Merchants have also been confused. They have to maintain several different POS machines for each platform (*Singapore Business Review*, 2019). The government has

taken early steps to resolve this issue by combining the various platform into a national Singapore Quick Response Code, but more can be done to control the easy entry of mobile players into an already congested and small market.

- **Finding 8 (Victim of Its Own Broader Financial Success).** *Singapore's earlier success as a financial centre may have created its own problems with achieving cashless payments adoption rapidly.*

Spectrum (2019) mentioned the lack of counterfeit currency in Singapore as a possible reason why cashless payments did not take off in Singapore. Another was the low crime rate which made carrying cash safe in Singapore. ATMs are also conveniently located around the small island, making cash a convenient form of payment (*Singapore Business Review*, 2019). Besides, there is no cost to cash withdrawals. All these otherwise positive factors in the country's development may have hampered cashless adoption. So Singapore could be a victim of its own success.

- **Finding 9 (Government and Citizens Out of Synchrony).** *The Singapore government seems to want a cashless society more than its citizens.*

From the media reports analysing the Singapore Smart Nation E-Payment Initiative, a picture emerges of a government that wants the cashless initiative to succeed. The citizens, on the other hand, seem to be satisfied with the status quo of cash. From the national digital transformation strategy (Smart Nation Singapore, 2018), to making an effort to encourage the many payment providers to work together through the creation of an interoperable standard, the government seems to be working to ensure success. Even the Prime Minister was involved to rally the whole nation towards cashless use by making it a key issue in his National Day Speech in mid-2018.

Unfortunately, all these proactive efforts have yet to show results. This relates to the earlier finding that there is no unmet need in Singapore. An extension of this point is that no amount of proactive government or good marketing can replace the fundamentals of business: the lack of unmet needs is a problem that doesn't need to be solved.

4.6. Contribution

4.6.1. Contributions to Research

The results from this research confirm the findings of prior research, that unmet needs and latent demand in the market are important factors contributing to the success of cashless payment adoption (Hughes and Lonie, 2007; Mas and Morawczynski, 2007). Both of these were clearly absent in the Singapore case. A key research contribution of this essay is the recognition that, while there may be other factors at play that made the M-Pesa a success, there must fundamentally be latent demand before cashless adoption can be successful. Otherwise, all other forces -- a proactive government and the role of the market leader -- may not make a difference nor have the ability to overcome the lack of demand. This is evident from the Singapore case, where the government strategized an initiative of digital transformation and even nudged providers for faster settlement. This research also confirms the lack of poor alternatives as an important factor that forces consumers to proactively look for better options to the current solutions (Mas and Morawczynski, 2007).

A novel contribution to theory is the possibility that a developed financial economy may be a stumbling block to cashless adoption because it provides alternatives to cashless payment. In the Singapore case, the lack of poor alternatives could be due to the success in financial efficiency, corruption, transparency and low crime rate. In other words, Singapore could be the victim of its own success such that cash has become a convenient and safe way to pay - there is no push for consumers to try another payment option. Unfortunately, these small points make a key difference in the cashless adoption equation. This essay contributes to the research on payments by highlighting these small but important factors. This new knowledge has not been discussed before to the best of my knowledge.

The results of this research contradict the claim that proactive government regulation seemed to have the largest positive effect on adoption (Kingiri and Fu, 2009; Lashitew et al.,

2019; Kimenyi and Ndung'u, 2009; Burns, 2018). My research finds that, despite its importance, proactive government regulations cannot overcome the lack of latent demand and presence of alternatives. Similarly, our findings are contrary to those of others, who stated that leadership and coordination role played by Safaricom, the network of entrepreneurs consisting of agents and other service providers, and the boundary spanning role of the government were key factors leading to M-Pesa's success. One reason for this contradiction could be because the prior research that I noted earlier assumed that demand was present for the service, while my research demonstrated how these factors would not make a difference when there was the lack of latent demand.

By analysing the various reports on the Singapore Smart Nation E-Payment Initiative, this research also has highlighted the importance of habits as a potential barrier to cashless adoption in situations where cash is the dominant form of payment.

4.6.2. Contributions to Practice

It is understandable that governments would seek to focus their attention on areas dominated by paper money in their quest for greater cashless adoption as the payback is great if successful. There are many settings around the world still using paper money that could likely benefit from cashless adoption but would likely face similar challenges as the Singapore case due to the low-tech adoption setting (See Appendix 9, Table A1). The learnings from this essay can therefore be extended to practitioners and governments to smoothen this journey.

First, it is important to assess the presence of unmet need and lack of alternatives in the early stages of the launch or pilot before embarking on large scale strategy and commercialisation plans for cashless adoption. The M-Pesa evaluation in the early days of the project illustrated how unmet needs were obvious in the market at the beginning. This continued throughout the first nine months of the pilot into the commercial rollout leading to its suc-

cess.

Second, governments and payment providers may be wise to hold off placing too many resources on marketing a cashless society project until the presence of clearly unmet needs can be ascertained. Governments typically have resources and are keen to grow cashless payments for the benefits they bring to society. However, it is recommended to perform an early evaluation before committing millions of dollars in resources to a potentially slow-moving project. This is relevant to countries in Asia as they take advantage of new and cost-efficient digital technologies to bypass traditional banking infrastructure. Their leadership should carefully assess the presence of latent demand for cashless payments before investing huge sums into efforts to promote cashless society projects. Governments are also advised to accept a longer adoption timeframe, if their analysis reveals the presence of barriers that may slow the adoption process.

Third, governments may wish to analyse the wider financial landscape to understand how it makes cash convenient, safe and cheap. A country's success in many areas, particularly the financial sector, may be the reason for cashless adoption to fail. Understandably, each country would have a unique history in its financial infrastructure development. Those that are further down the road, unfortunately may find their success to be a stumbling block to cashless adoption. Ironically, it may be those countries that are further behind in their financial sector and infrastructure development that may find the cashless journey to be more straightforward and less painful.

Fourth, governments may wish to introduce penalties for cash and ATM use to make it more costly to carry cash, if they wish to see quicker results on cashless adoption.

Fifth, governments may wish to consider tax incentives to encourage merchants to accept cashless payments. Their current practice of accepting cash allows them to be excluded from the formal tax system, providing little motivation to support cashless payments.

Lastly, both payment providers and governments may wish to consider the use of physical agents in the early stage of adoption as they can help to establish a good word-of-mouth for quicker adoption.

4.6.3. Limitations

As with all research methods, comparative analysis has its limitations. The small sample size limits generalizability. While care has been expended to ensure the two cases are similar, the effect of unobserved variables affecting the result cannot be totally eliminated. Also, findings from comparative analysis cannot confirm cause-effect relationships.

Chapter 5: Conclusion

This dissertation has provided evidence and insights that are valuable in furthering payments research, assisting practitioners in managing their payments business, and providing guidance to governments on their move towards a cashless future. Payment service providers in particular can make better strategic product portfolio and business decisions knowing how payment choice over the life cycle can affect customer lifetime value. The efficacy of financial incentives in encouraging cashless payment adoption and the role of habits in hampering them have also been demonstrated. The chapters also examined various drivers of payment choice and barriers to cashless adoption. At a higher level, the results of a comparison between M-Pesa and the Singapore Smart Nation E-Payment Initiative can inform governments of the more strategic factors that drive success when a country embarks on a cashless journey, often requiring the implementation of high technology in low technology environments.

Increasingly today, we are witnessing the use of technology to create new opportunities for payments to become cashless. Mobile and contactless technology, in particular, has allowed convenience and speed for both the consumer and the merchant in payment transactions. Mobile technology has also allowed wireless access point-of-sale devices to be introduced into otherwise inaccessible merchant acceptance points. Cost and speed efficiencies brought about by cloud computing and near-field communication technologies have also played a part such that even first world countries are exploring how these technologies can allow them to convert low-value transactions to cashless ones. Technology has also offered consumers more payment choices. Payment service providers therefore need to gain a better understanding of how consumers make payment choices if they wish to succeed in the market.

Chapter 2 began with the question: “Do consumers hold different payment instruments over their life?” A small dataset was collected from a commercial consultancy project which

allowed for rich insights from qualitative research using focus groups and interview. This was supplemented by a survey and research using secondary data. I used relevant theories in Marketing, including life cycle theory and customer relationship management theory to make my research relevant and related to how payment service providers should manage their products across the life cycle.

The research provided preliminary evidence that consumers prefer different payment methods across the life cycle. This is a new contribution to payments research since previous payment researchers have not applied a CRM perspective to consumer payment choice over the life cycle. The findings extends the results of Mallat (2007), who did not find payment adoption differences in mobile payment customers across the life cycle. This has implications for customer lifetime value maximisation. A payment provider has to either enhance its value offering so that it becomes relevant to every stage in the life cycle, or acquire other payment providers to fill the product portfolio.

The essay also contributed to payments research by finding new factors at play during payment choice decision making, including regulations, parental supervision, and financial, psychological and social needs, which differed across the life cycle. Past payment research work focused on the economic, financial and demographic aspects, and Schreft (2006) encouraged broader investigation into the complex decision making in payments. Payment providers should investigate these new factors highlighted in my research to understand how they determine payment choices, and work on them to ensure their products fulfil these needs.

Another research contribution is the categorization of payment products into spender and saver categories. This is new knowledge and furthers the initial work of Zelizer (1989) on the meaning of money. This means that, in practice, there may be less flexibility in how products are deployed – products that are perceived as saver products may not gain traction when they

are positioned or re-positioned as spender products, and vice versa.

The essay also contributes a new perspective on how a mass transit card can function as a general-purpose payment card that can be relevant throughout one's lifetime. This has not been suggested before in the academic literature. This suggests that there may be opportunities for mass transit providers to position their products to a broader segment, beyond transit use.

In Chapter 3 my research question was: How do incentives and habits affect cashless payment adoption? Firstly, I wanted to find out if incentives are effective in promoting cashless payment use. Secondly, I wanted to learn whether habits overpower incentives during adoption promotion. Practitioners have often relied on anecdotal evidence on incentive effectiveness. I wanted empirical evidence to show that incentives actually work. A field experiment was used to test the effectiveness of a small financial incentive on cashless payment use. The field experiment design allowed me to control for observable factors that may affect the results through comparing the effectiveness against a control group that was located close to the treatment group. Data were collected from 111 merchants over a two-month period, with the actual incentive experiment taking place over a 2-week period. This was supplemented with participant observation over a two-month period.

Overall, the experiment provided evidence that incentives are effective in encouraging cashless payment use, but only while the incentives are offered. This is new knowledge in payments research. Previous researchers have focused on the effect of card rewards rather than pure financial incentives (Hayashi, 2009; Valverde and Linares-Zegarra, 2009; Agarwal et al., 2010). Once the incentives were removed, cashless payment use dropped below control levels, suggesting that short-term incentives may not be effective in changing long-term payment behaviour. This contradicts the findings of Goswami and Urminsky (2017) on post-incentive behaviour. Previous payments research has not investigated post-incentive behav-

behaviour. Therefore, this finding is a new contribution to payments research.

The concept of cash displacement was introduced for the first time in the payment research literature. A low cash displacement rate and participant observation results provided evidence that cash use may be habitual. This has important ramifications for government cashless strategy and payment service providers who often use financial incentives to promote early cashless adoption.

The effect of incentives may be temporary. But more important is the role of habits in inhibiting cashless behaviour. My research is the first instance in payments research where habits are highlighted as a key consideration in payment adoption.

On a practical level, I provided five practical takeaways for service providers to improve success by providing:

- merchant incentives to prompt for cashless use;
- longer customer incentives to break repetitive habits;
- effective merchant transaction settlement periods;
- merchant training; and,
- encouragement for governments to consider merchant tax concessions for cashless acceptance.

Governments are also recommended to consider the use of disincentives to change cash habits.

The experiment has its limitations though. Since it was not possible to perform random allocation of merchants, the effect of unobserved variables affecting the result cannot be totally eliminated. Incentives were also not offered long enough to assess their effects on possible habit change.

Chapter 4 investigates the implementation of high-technology payment applications in low-technology adoption settings. I used the comparative analysis approach, comparing the

Singapore Smart Nation E-Payment Initiative with M-Pesa, a successful project implemented in Kenya. The use of comparative analysis allowed for a deeper and more holistic analysis of the possible factors for lack of success in Singapore. Secondary and public sources of data were used, including research and media reports.

I found that the lack of unmet needs and presence of reasonable alternatives to cashless payment prevented the Singapore Smart Nation E-Payment Initiative from achieving greater success. The country's low crime, lack of counterfeit fraud and excellent banking infrastructure allow for the safe and convenient use of cash. The small domestic market with many disparate players also poses a challenge. I provided planning recommendations to governments and practitioners for more effective cashless adoption. The following paragraphs list the specific research contributions from this essay.

Firstly, it confirmed the findings of Hughes and Lonie (2007) and Mas and Morawczynski (2009) that unmet needs and latent demand are important prerequisites to cashless adoption success. Secondly, the findings also confirm that the lack of alternatives play a crucial role in cashless payment deployment success (Mas and Morawczynski, 2007). Thirdly, it contradicted the findings of Lashitew et al. (2019) that proactive government regulation is an important factor on cashless adoption. Finally, and mostly importantly, the essay suggested that financially-developed countries may find that their efficient infrastructure may be a barrier to cashless adoption by making the use of cash convenient, accessible and low-cost. This suggests that more novel approaches must be adopted by these countries if they wish to succeed, including the use of disincentives.

The essay proposed practical suggestions for governments and practitioners when considering high-tech payment system adoption in low-tech adoption settings. These include the need to check for unmet needs and a lack of alternatives before large sums of public monies are budgeted for national cashless projects. Penalties for cash and ATM use were suggested

to make cash more expensive to use. Tax incentives for merchants were also suggested to encourage the acceptance of cashless payments.

Through the three essays, this dissertation has provided new knowledge and fresh insights into cashless payment use and adoption. Although the three essays have investigated a broad range of subjects related to cashless payment adoption, one area which should attract more focus in future research is habits. Future studies should explore more deeply the role of habits and how the duration of incentives affect habit change. The effectiveness of disincentives versus incentives is also an area worthy of future investigation as more countries begin to explore ways to replace paper money with cashless payments for greater financial inclusion and social benefits.

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APPENDIX 1. IRB APPROVALS



SMU Classification: Restricted

17 January 2018

Dennis Ng Chong Meng
SMU Student
Lee Kong Chian School of Business

Dear Dennis,

IRB APPROVAL OF RESEARCH
CATEGORY 2A: Expedited Review
Title of Research: Payment Research
SMU-IRB Approval Number: IRB-17-185-A007(118)

Thank you for your IRB application for the above research that we received the latest revised copy on 16 January 2018.

I am pleased to let you know that, based on the description of the research in your IRB application, the IRB has determined that your research falls under Category 2A and has approved your application.

Please note the following:

1. Indicate the above SMU-IRB approval number in all your correspondence with the IRB on this research.
2. If any adverse events or unanticipated problems involving human subjects occur during the course of the research project, you must complete in full the SMU-IRB Unanticipated Problem/Adverse Events Report Form (see SMU-IRB website) and submit it to the SMU-IRB within 24 hours of the event.
3. If you plan to modify your original protocol that was approved by the SMU-IRB, you must complete in full the SMU-IRB Protocol Modification Request Form (see SMU-IRB website) and submit it to the SMU-IRB to seek approval before implementing any modified protocol.
4. This IRB approval for your research is valid for one year (12 months) from the date of this letter. If you plan to extend your research project beyond one year from the date of the IRB approval, you must submit a request to renew the research protocol using the Continuing Review Form (see SMU-IRB website) or Protocol Modification Request Form *prior to the IRB approval expiry date*.
5. Please be reminded to be compliant with Singapore's Personal Data Protection laws in carrying out your research activities.

If you have any queries, please contact the IRB Secretariat at irb@smu.edu.sg or telephone +65 6828-1925.

Yours Sincerely,

Forrest Zhang
Chair
Institutional Review Board



8 Mar 2018

Dennis Ng Chong Meng
SMU Student
Lee Kong Chian School of Business

Dear Dennis,

IRB PROTOCOL MODIFICATION REQUEST APPROVAL
CATEGORY 2A: EXPEDITED REVIEW
Title of Research: Payment Research
SMU-IRB Exemption/Approval Number: IRB-17-185-A007(118)
SMU-IRB Modification Number: IRB-17-185-A007-M1(318)

Thank you for your IRB Protocol Modification Request application for the above research in which we received on 5 Mar 2018.

I am pleased to let you know that, the IRB has approved your application for the modification based on the description of modified research protocol stated in your Modification Request form.

Please note the following:

1. Indicate the above SMU-IRB approval number and SMU-IRB modification number in all your correspondence with the IRB on this research.
2. If any adverse events or unanticipated problems involving human subjects occur during the course of the research project, you must complete in full the SMU-IRB Unanticipated Problem/Adverse Events Report Form (see SMU-IRB website) and submit it to the SMU-IRB within 24 hours of the event.
3. If you plan to modify your original protocol that was approved by the SMU-IRB, you must complete in full the SMU-IRB Protocol Modification Request Form (see SMU-IRB website) and submit it to the SMU-IRB to seek approval before implementing any modified protocol.
4. This IRB approval for your modified protocol is valid one year from the date of this letter. For Expedited Review applications, if you plan to extend your research project beyond one year from the date of the IRB approval, you must submit a request to renew the research protocol using the Continuing Review Form (see SMU-IRB website) or Protocol Modification Request Form *prior to the IRB approval expiry date*. Please note that for Full Review applications, continuing review applications must be submitted and approved until the research study is closed (i.e., at least one research paper has been published or presented).
5. Please be reminded to be compliant with Singapore's Personal Data Protection laws in carrying out your research activities.

If you have any queries, please contact the IRB Secretariat at irb@smu.edu.sg or telephone +65 6828-1925.

Yours Sincerely,

Forrest Zhang
Chair
Institutional Review Board



18 February 2019

Dennis Ng Chong Meng
SMU Student
Lee Kong Chian School of Business

Dear Dennis,

IRB CONTINUING REVIEW APPROVAL
CATEGORY 2A: EXPEDITED REVIEW
Title of Research: Payment Research
SMU-IRB Approval Number: IRB-17-185-A007(118)
SMU-IRB Continuing Number: IRB-17-185-A007-C1(219)

Thank you for your IRB Continuing Review application for the above research, in which we received the latest revised copy on 15 February 2019.

I am pleased to let you know that, based on the information provided in your IRB Continuing Review application, the IRB has decided to grant you the one-year extension.

Please note the following:

1. Indicate the above SMU-IRB approval number and SMU-IRB continuing number in all your correspondence with the IRB on this research.
2. If any adverse events or unanticipated problems involving human subjects occur during the course of the research project, you must complete in full the SMU-IRB Unanticipated Problem/Adverse Events Report Form (see SMU-IRB website) and submit it to the SMU-IRB within 24 hours of the event.
3. If you plan to modify your original protocol that was approved by the SMU-IRB, you must complete in full the SMU-IRB Protocol Modification Request Form (see SMU-IRB website) and submit it to the SMU-IRB to seek approval before implementing any modified protocol.
4. This IRB approval for your research is valid for one year (12 months) from the date of this letter. If you plan to extend your research project beyond one year from the date of the IRB approval, you must submit a request to renew the research protocol using the Continuing Review Form (see SMU-IRB website) or Protocol Modification Request Form *prior to the IRB approval expiry date*.
5. Please be reminded to be compliant with Singapore's Personal Data Protection laws in carrying out your research activities.

If you have any queries, please contact the IRB Secretariat at irb@smu.edu.sg or telephone +65 6828-1925.

Yours Sincerely,

A handwritten signature in black ink, appearing to read "Forrest Zhang", is positioned above the printed name.

Forrest Zhang
Chair
Institutional Review Board

APPENDIX 2. SAMPLE OF PERSONAS FOR THE COSMETICS INDUSTRY

The commercial consultancy agreement does not allow me to share details of the personas created for my client. Therefore, I will share an example from the cosmetics industry instead below:

PERSONA #1 SOCIAL - MEDIA

Demographic:

Millennial woman age 17-34

Mid-to-high income range

Behavior & Interests:

Finds out about new beauty products through social media

Reads online reviews by Youtube influencers before making a purchase

Is always up-to-date on up and latest beauty trends and products

Will usually have a handful of “influencers” they look to for beauty tips

Content Tips: Videos, influencers, Instagram posts, close friends. social, social! Li Choo loves to discover new things, create your own video reviews where you invite influencers (or even normal women randomly chosen to try out your product) and film your own product reviews. Share them and advertise them all over social media not just for exposure but also to give it a chance to go viral and follow it up with content and other social content related to that same product. This persona is all about living and breathing online and the thrill of discovering something new that’ll make them feel great once they try it. They are online creatures.

Brand Affinities:

Body Shop

Sulwhoasoo

Lancome

Laneige

SK-II

PERSONA #2 PRICE - SENSITIVE

Demographic:

Wide age range between 17-47

Low-to-mid income range

Behavior & Interests:

Mostly concerned with sticking to her beauty budget

Doesn’t want to compromise quality for price

Expects to get good-quality products at an affordable price

Will typically shop for skin care and makeup products at shop like Watsons and Sasa

Content Tips: Because of the want for quality at an affordable price, you can have blog posts from influencers comparing your product to more high-end products if they’re comparable. Things like “(Your Brand)’s List of Products That Feel Luxurious Without The Price Tag”, which can then be turned into a video and shareable images on Facebook and Pinterest.

Brand Affinities:

EtudeHouse

Innisfree

The Face Shop

APPENDIX 3. SUMMARIES OF THE LITERATURE REVIEWS

Table 1. The Life Cycle

Authors (Year)	Research Question	Context and Data	Research Approach	Relevance to Topic
Arango et al. (2011)	What is the role of consumer demographics, payment and transaction attributes on consumer payment choice?	Context: Proliferation of electronic payments over past decade Data: Bank of Canada 2009 Method of Payment	Discrete-choice modelling	Compared to fees, rewards, interest rates, speed and security, demographics and transaction values play a limited role in payment choices.
Baek and Hong (2004)	What are the factors relating to instalment and credit card debt?	Context: No study has used life cycle concept to study concept debt Data: U.S. Study of Consumer finances, 3,974 observations	Double-hurdle model	Life cycle stages and other factors were significant factors leading to instalment credit card debt.
Bodie et al (2007)	How can life cycle model provide guidance to everyday financial decision making for households?	Context: Recent need for sensible financial planning Data: Nil	Nil.	Practical advice of life cycle model application to household financial planning.
Browning and Crossley (2001)	How can the life cycle framework be defended as a source of models that can be taken to the data?	Context: Life cycle framework facing criticism within economics profession Data: Various U.K. and Canadian government macroeconomic data	Analysis of macroeconomic data	Although not a perfect tool, the life cycle model can provide good insights when heterogeneity can be accommodated in the model
Fulford and Schuh (2015)	How does unsecured credit vary over the life cycle?	Context: Little work on how unsecured consumer credit varies over life cycle Data: Equifax/NY fed Consumer Credit Panel	Econometric modelling	Life cycle concept to explain unsecured credit explained household savings.
Good and Moutinho (1996)	Does ATM satisfaction model developed for UK apply to Hungary?	Context: High use ATM satisfaction drivers Data: 102 consumers in Hungary, 380 in UK	Ordered probit model	ATM satisfaction could be related to consumer's age.
Lopez (2008)	What is the effect that stigma and credit limit have on default rates?	Context: Increasing concern over bankruptcy levels Data: 10,000 U.S. households over the life cycle	Regression analysis	Householders with less education are more likely to borrow strategically.
Mallat (2007)	Do consumer adoption of mobile payments vary over life stages?	Context: Many new mobile payment options Data: Focus group interviews in Helsinki, Finland in 2002 by life stages	Qualitative research using focus groups	Diff's of use of m-payments over life cycle stages. Parents made the decisions on children's behalf.
Mittal and Kamakura (2001)	Are satisfaction ratings related to actual repurchase behaviour?	Context: No research linking satisfaction ratings to actual repurchase Data: 100,040 automotive customers in U.S.	Model development and testing	Consumers with different demographic characteristics have different repurchase probabilities.
Modigliani (1986)	What is the relationship of savings to variations in income and needs over a family life cycle?	Context: 3 landmark contributions requires revisit of lifecycle and permanent income hypothesis Data: Nil	Theoretical and mathematical discussion	Early use of life cycle concept in economics
Rader et al. (2014)	What is the relationship between stage of life cycle and consumer's desire/ability to purchase?	Context: Consumer purchasing behaviour Data: Nil	Theoretical research	Integrating life cycle with Comish/Rader Desire/Ability model can provide further insights into consumer purchasing behaviour
Schaninger et al. (1993)	Is Bartos classification viable for households and consumption diff's?	Context: Entrance of women into the workforce Data: Survey of 444 households in the U.S.	Variance analysis, log model tests	Life cycle stage allows capture of lifestyle, income and expenditure pattern differences brought about by family role transitions
Simon et al. (2010)	What is the effect of rewards on credit, debit and cash use?	Context: Increase in e-payments in Australia Data: Transaction-level, 662 individuals in 2007	Econometric modelling	Age and income determines card use. Debit use is highest in younger group.
Wells and Gubar (1996)	How is "life cycle position" used as an independent variable in marketing?	Context: Review life cycle papers from conference Data: Michigan Survey of Consumer finances	Descriptive statistics	Analysis of how life cycle position used as an independent variable in marketing.

Table 2. Payments

Authors (Year)	Research Question	Context and Data	Research Approach	Relevance to Topic
Akhand and Milbourne (1986)	What is the effect of credit cards on the aggregate household money holding?	Context: Growth of credit cards in 1970s and 1980s Data: No data	Theoretical discussion	Early payment research on how credit cards affected the total household money.
Arango et al. (2015)	What effects do rewards have on shift towards credit card over debit and cash?	Context: Isolate merchant acceptance Data: Bank of Canada 2009 Method of Payment Survey 3,405 diaries.	Discrete-choice modelling	Credit card rewards affects payment choice. Inelastic relationship. Cash is king under \$25.
Briglevics and Schuh (2014)	How does payment choice affect withdrawals and family cash management?	Context: New payment choices in recent decade Data: 2012 U.S. Diary of Consumer Payment Choice	Econometric analysis and modelling	Rewards matter for choosing payment modes.
Ching and Hayashi (2010)	What is the effect of payment card rewards on consumer choice of payment methods?	Context: Rapid growth of U.S. credit card payments Data: 2005/2006 U.S. Study of Consumer Payments	Econometric modelling	Rewards affect payment choice. Demographic characteristics of consumers analysed.
Foster et al. (2011)	Do econ conditions, new government regs, payment services pricing affect cash use?	Context: Recession in the U.S. Data: U.S. Survey of Consumer Payment Choice	Analysis of descriptive stats, 2006-2009	All factors affect move towards cash.
Hedman et al. (2017)	What and how do features in new payment instruments influence payment choice?	Context: Features of new payment types may influence payment choice Data: 15 payers' perception of 6 payment instruments	In-depth interviews using repertory grid technique	Developed a four-category taxonomy of payments comprising 16 payment characteristics.
Hirschman (1979)	How can the relationship between alternative payment systems be conceptualised, and how do these affect the purchase amount?	Context: Previous research primarily on credit cards Data: Survey of customers shopping in several branches of a department store in the U.S totalling 3,024 interviews	Exploratory and bivariate testing of hypothesis	Early payment research exploring how credit cards affected the purchase amount.
Jonker (2007)	What importance does price and non-price features play to encourage the use of electronic payments?	Context: Social cost of different payment instruments on Dutch society Data: DNB Household Survey of 2,000 households	Regression analysis	Early payment research on how size of transactions affected payment choice.
Khan et al. (2015)	How do consumers' perceive the different payment modes?	Context: Little research on consumers' cognitive and emotional associations with payment modes Data: Three samples from New Zealand university, household and city respectively.	Variance analysis of 19-item PPM scale	Reliability and perception of payment modes influence spending behaviour and ownership of payment modes.
Klee (2006)	What is the effect of time on the choice of payment instrument?	Context: Theoretical models predict time has significant effect on payment type in the U.S. Data: Scanner data from regional grocery store chain and 2000 U.S. Census	Econometric specification and estimation	Early payment research. Time difference affect the choice of payment.
Schreft (2006)	How has payment research affected the regulatory landscape?	Context: Progress update on payment research Data: Literature review and central bank data	Content analysis	Payment choice is a complex decision best understood by attacking from many angles including behavioural economics, psychology and marketing rather than just econometric modelling.
Wang and Wolman (2016)	What is the threshold transaction size and its effect on payment choice?	Context: Fundamental change in past decade in U.S. payments market with new electronic forms available Data: Transaction data from large discount retailer from 2010-2013	Fractional multinomial logit model to analyse four payment instruments used	Consumers choose between cash and cashless payments by transaction size. For larger amts: opportunity cost of lost reward points for cash. Relevance high as consumers grow up. They move for card-based reward points. Age, race and education are related to payment choices.

APPENDIX 4. DETAILS OF RESEARCH

Table 1. Breakdown of Respondents for Each Segment

Segment	Planned	Interest to Participate	Actual
Students	8	11	7
Youths	8	31	8
Working Adults	8	19	8
Retirees	8	13	11
Total	32	74	34

Table 2. Focus Group Interview Details

Segment	Date, Time & Venue of Focus Groups and Interviews	Venue
Students	17 June 2017, 9am-11pm	J8 Bishan Road, Singapore
Youths	31 May 2017, 9am-11am	21 Tampines Ave 1, Singapore
Working Adults	31 May 2017, 11am-1pm	21 Tampines Ave 1, Singapore
Retirees	16 June 2017, 3pm-6.30pm	385 Beach Road, Singapore

Table 3. Interview with a Parent

Interviewee	Date, Time & Venue of Focus Groups and Interviews	Venue
Parent	17 June 2017, 11am-12pm	J8 Bishan Road, Singapore

APPENDIX 5: RESEARCH SURVEY FORM

The information on this form will be used strictly for the purpose for selecting and sorting candidates for the focus group and any subsequent research. As the research involves financial aspects of your lifestyle, there may be some sensitive questions in this form. You may choose not to disclose them as **participation is strictly voluntary. Information collected will be confidential** and used only for its intended purpose. Once you have been selected, you will be contacted and provided with the necessary information for the focus group. You will be compensated for your time in the participation of the focus group or depth interview. Please ☒ where appropriate. Thank you.

Name: _____ **Age:** _____ **Gender:** M / F

Occupation: _____ **Race:** _____

Income / Allowance: (per month to the nearest dollar based on last month)

Status of housing: ☐ Owned ☐ Mortgaged ☐ Rented ☐ Staying with parents

Type of housing:

- ☐ Detached House ☐ Semi-Detached ☐ Terrace
- ☐ Condominium ☐ Private Apartment ☐ 3-room HDB
- ☐ 4-room HDB ☐ 5-room HDB ☐ Executive Flat

Highest Education: ☐ PSLE ☐ O Level ☐ A Level ☐ Certification

☐ Diploma ☐ Bachelor ☐ Master ☐ Doctorate

Cardholdings (Check all that applies):

- ☐ Credit card ☐ Debit card ☐ Discount cards ☐ CashCard
- ☐ NETS ☐ EZLink card
- ☐ Retail Stored Value Card (like Starbucks, KopiTiam,...etc)

Most Frequently used: (choose only 1)

- ☐ Credit card ☐ Debit card ☐ Discount cards ☐ CashCard
- ☐ NETS ☐ EZLink card

☐ Retail Stored Value Card (like Starbucks, KopiTiam,...etc)

Main bank: (Choose only 1)

☐ DBS ☐ POSB ☐ OCBC ☐ UOB ☐ HSBC ☐ StanChart

☐ Citibank ☐ Maybank ☐ CIMB ☐ Bank of China ☐ Others

Main XXX Product: (Choose only 1)

☐ AAAAA ☐ BBBB card ☐ XXXPay

☐ DDD Cards ☐ EEEEE Card

Relationship with banks: (Choose all that applies)

☐ Current Account ☐ Saving Account ☐ Debit card

☐ Credit card ☐ ATM

☐ Other online accounts eg Internet Banking, PayPal (Specify: _____)

Are you more of a spender or a saver? : ☐ Spender ☐ Saver

Estimated Monthly expenses: (to the nearest Dollar): _____

Most commonly spent places: (List the 3 *places* where you spent the most money on monthly)

(1) _____ (2) _____ (3) _____

Most commonly paid bills: (List the 3 *bills* where you spent the most money on monthly)

(1) _____ (2) _____ (3) _____

Name One Place You Think Should Accept XXX Cards so that your life would be more convenient: _____

Thank you for your time for completing this form.

We will be in touch with you shortly for the focus group should you be shortlisted.

APPENDIX 6. FOCUS GROUP QUESTIONS

Opening Question – Please give a brief introduction and background about yourself .

Question 1 – What do you like best about your XXX card?

Question 2 – What are some of the issues when using your XXX card?

Question 3 – Think about your lifestyle on a daily basis. Name one place you think should accept XXX cards so that your life would be more convenient.

Question 4 – Which cashless payment do you use most often and why?

Question 5 – What makes you decide on which payment method to use?

Question 6 – How familiar are you with any other payment products? Can you name some of them?
(rephrased) What other XXX products are you familiar with?

Question 7 – In closing, if there is anything for XXX to improve on what would it be?

APPENDIX 7. EXAMPLES OF LIFE CYCLE RESEARCH AROUND THE WORLD

Rules governing debit and credit card ownership are readily found in the websites of central banks of each country around the world. Typical life cycle classes or stages for payments can be synthesized from data derived from the larger sociological research that has already been performed in the respective countries and these are listed in Table C1 below. These studies can uncover the unique social and cultural drivers in each country that will contribute to different categories of life cycle stage, and possibly also different life course for each country. Academic models of life cycles are robust and may need to be simplified for use in industry practitioner settings. Even if there is no academic research into life cycles in a particular country, life cycle information can also be gathered from industry research firms such as Nielsen or Ipsos or the market research departments of payment market leaders in each country. Practitioners are likely to be using some form of life cycle classification as part of their market segmentation and targeting. In summary, creating such a framework of payment choice for other countries is possible with reasonable effort and some qualitative work to flesh out the consumer process occurring in each life cycle stage.

Table 1. Life Cycle Research Around the World

Country	Authors	Year	Research Question	Methods Used
Canada	Putler et al.	2007	Why do studies reach contradictory conclusions concerning the value of the household life cycle model?	Microeconomic modelling of household's life cycle stage and other socioeconomic and demographic factors.
U.S.	Brown et al.	2006	How is technology used in household contexts?	Regression analysis using constructs from the model of adoption of technology in households (MATH).
South Africa	Van Rooyen and Du Plessis	2003	Is the household life cycle theory a valuable basis for segmentation in the South African environment?	Multivariate analysis of variance used to test for significant differences between various stages of the household life cycle.
Spain	Redondo-Bellon et al.	2001	How can the family life cycle be adapted to the particular features of the Spanish social environment?	Predictive model based on U.S. households adjusted to the local Spanish environment by including the extended family like co-habitation and single parents with/without children.
Norway	Arndt	1979	How can the family life cycle concept contribute to the study of consumer behaviour today?	Predictive model using Norwegian household data to for a broad range of household expenditures

APPENDIX 8. VALIDATION BY DEBIT CARD PROVIDER EXAMPLE

The overall framework is also useful for strategic marketers as they increasingly adopt a CRM perspective with a view to maximise profits over the customer lifetime. Take, for example, a debit card provider with 5 million cards with youth customers as in Table D1. below.

Table 1. Sample Portfolio of a Debit Card Provider

Stage	Student	Youth	Working Adult	Retiree
Number of debit cardholders	450,000	3,500,000	100,000	50,000
Percentage of debit cardholders	9%	70%	20%	0%

The framework highlights that customer lifetime value can be improved by focusing on why working adults and retirees are less likely to hold the debit card as youths transition to these stages when they get older. Using the framework to focus on the financial, social and psychological needs of working adults as the next transition stage, marketers can further zoom in to the provision of rewards and entertainment benefits that working adults are looking for, and thus provide insights into the areas of a debit card that will need to be improved for it to appeal to the next evolutionary stage for youths who already are their main customers. Similarly, this customer lifetime value approach can be applied to the last stage of retirees to uncover unmet needs of the retirees and how debit cards can become more relevant to their life cycle stage. This would force the provider to think of new products that could better meet the unique needs of retirees. In summary, using this framework can provide marketers insights to the key issues around each life cycle stage, and more specifically how customers make decisions on their preferred card.

APPENDIX 9. SINGAPORE'S HAWKER CENTRES AND SIMILAR SETTINGS

My incentive experiment took place in a hawker centre which is characterised by its informal open-air setting, loud ambient noises, hurried customers, cramped quarters for food preparation, and a target customer site made up mostly of working class and lower-educated customers who patronise it for its value-for-money meals. Compared to restaurants and fast food outlets found in shopping centres, the hawker centre physical environment can be described as a 'low-context' environment as it is not conducive to the carrying out of an electronic or cashless transaction, especially those involving high technology like contactless or mobile payments. (See Photos A1, A2, A3 and A4.) There are other markets and retail situations around the world that share similar characteristics, where the results of this experiment are applicable. (See Table A1 and Photos A5, A6 and A7.)

Situations such as these benefit from cashless payments, especially if it is carried out wirelessly since it speeds up the purchase. Unfortunately, these situations also present unique challenges due to the physical environments and merchants who may not have the training to process the high technology nature of contactless and mobile payments. The results from this experiment can inform future cashless adoption attempts at these places.

- Singapore Hawker Centre Photos (A1-A4)**





<p>A1. Typical Hawker Stall</p> 	<p>A2. Taman Jurong Hawker Centre</p> 
<p>A3. Jurong West Hawker Centre</p> 	<p>A4. Crowded Table in Hawker Stall with Hidden POS Terminal</p> 

Table A1. Similar Kinds of Places Around the World and Their Descriptions

Setting	Characteristics
Tsujiki Fish Market, Tokyo	A wholesale fish market that is open in the early hours of the morning to lunch for both wholesale and retail sales of seafood. It is a wet market where fishermen, wholesalers, retailers and housewives bargain for the best seafood on offer in cramped quarters and wet floors in the fish market. Transactions are done fast and furious, often taking place using hard cash. See Photo A5.
Half time during an Italian soccer match	During the short break, spectators would have to rush to purchase their food and drinks while also taking a smoke and a quick toilet break before the game resumes. Again, the ambience is not conducive to cashless transactions, but at the same time, cashless transactions could possibly speed up the transactions, thus saving spectators' precious time. See Photo A6.
Chatuchak Market, Bangkok	What started as a wholesale and trading market, has become an extremely popular landmark for tourists when visiting Bangkok. Just about everything is on sale here, from live frogs, fried insects, gold, fake CDs and of course Thai silk. It is characterised by an open air and crowded ambience, with smoke and exotic smells in the air. See Photo A7.

APPENDIX 10. SYSTEMATIC REVIEW APPROACH TO THE PAYMENTS LITERATURE

Electronic payment use has similarities to new technology adoption. This is especially true when electronic payments are being implemented in low-tech settings like hawker centres. Hawker centres are unique to Singapore and the Southeast Asia region. They are buildings which house about 20-70 small shops selling food priced between S\$1 to S\$10 (Tung, 2016). A literature search to include incentives for technology adoption was undertaken to include any learnings from this perspective.

Much payment research has been carried out by the central banks of the U.S. and Europe, and a few by the Reserve Bank of Australia. In particular, the U.S. Federal Reserve Bank has over time produced much valuable research in this area. So beyond just searching within academic databases, I looked at the database of the Consumer Finance Institute, maintained by the Philadelphia Fed. It contains many papers which may not appear in academic databases but are relevant to payments research. Beginning with the academic databases, I used specific search phrases. Table 1 shows the search phrase used and the results.

Table 1. First Search Results

Source	Step	Search phrase	Results	Relevant References
Academic databases	1	<i>incentive for card use</i>	41,581 results	Ingene and Levy (1982)
				Hayashi (2009)
	2	<i>incentive for card payment</i>	14,826 results	Arango et al. (2015)
				Bolt et al. (2010)
				Simon et al. (2010)

Despite the large number of results returned, most of the articles were not relevant, as they were related to incentives for medical trials. Only five articles were relevant to the thesis topic as listed above. A different phrase was then used: *incentive for technology adoption* and *incentive for card behaviour*. Table 2 shows the second search results.

Table 2 Second Search Results

Source	Step	Search Phrase	Results	Relevant References
Academic databases	3	<i>incentive for technology adoption</i>	68,760 matches	Atkin et al. (2017)
				Li et al. (2013)
	4	<i>incentive for card behaviour</i>	29,102 results	Nil

This produced two more new articles that were relevant to the thesis topic as listed above. Again, thinking of other ways the keywords could be rephrased, the search was conducted using – *intervention for card use*, *intervention for card payments* and *intervention for card behaviour*. This produced two articles listed in Table 3.

Table 3. Third Search Results

Source	Step	Search Phrase	Results	Relevant References
Academic databases	5	<i>intervention for card use</i>	86,346 matches	Loughrey et al. (2013)
				Li et al. (2013)
	6	<i>intervention for card payment</i>	12,785 matches	NA
	7	<i>intervention for card behaviour</i>	55,899 matches	NA

Next, the search was narrowed to the database of the Consumer Finance Institute of the Federal Reserve Bank of Philadelphia. This was a good approach as it generated eight new articles. See Table 4.

Table 4. Fourth Search Results

Source	Step	Search phrase	Results	Relevant References
Consumer Finance Institute Database	8	<i>incentive for card use</i>	64 matches	Sung et al. (2017)
				Welte (2016)
				Herbst-Murphy (2013)
				Agarwal et al (2010)
				Arango et al. (2011)
				Carb-Valverde and Linares-Zegarra (2009)
	9	<i>incentive for card behaviour</i>	16 matches	NA
	10	<i>incentive for card payment</i>	53 matches	Shy and Stavins (2014)
	11	<i>incentive for technology adoption</i>	7 matches	Bolt and Chakravorti (2011)

	12	<i>intervention for card</i>	35 matches	Koulayev et al. (2016)
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In total, I was able to retrieve 17 unique academic articles related to my field study on incentives for payment instrument use. These articles are reviewed to give a better perspective of the history and development around the area of incentives for cashless payment adoption. As mentioned earlier, to the best of my knowledge, there is no comparable research in effectiveness of incentives for cashless payment adoption. But these articles below are reviewed so as to give a better overview of the research landscape around incentives for cashless payment adoption. They also provide insights and inform my research findings and recommendations.

APPENDIX 11. SUMMARY OF LITERATURE REVIEW

Table 1. Payments

Authors (Year)	Research Question	Context and Data	Research Approach	Relevance to Thesis
Agarwal et al. (2010)	What is the impact of rewards on spending and debt among credit cards?	Context: US credit card market Data: 12,000 credit card accounts from a financial institution	Regression analysis of transaction data over 2-year period	Study found 1% cashback reward led to increase in spending by \$68.
Arango et al. (2011)	What roles do consumer demographics, payment instrument attributes and transaction attributes play on consumer choice of payment instrument?	Context: Canadian payments market Data: Bank of Canada's 2009 Methods-of-Payment Survey	6,800 questionnaires and 3,190 diaries analysed using discrete-choice models	Study found reward-driven credit card usage is inelastic. A 10% increase in monetary rewards leads to an increase in probability of using a credit card by only 1.9-3.7%.
Arango et al. (2015)	How can consumer payment instrument choice be modelled?	Context: Aim to disentangle effect of merchant card acceptance from credit card reward Data: Bank of Canada's 2009 Methods-of-Payment Survey	6,800 questionnaires and 3,190 diaries analysed using discrete-choice models	Credit card rewards tend to be high and lead to over-usage of credit cards for "non-credit" purchases, when debit cards may be socially more efficient, especially for low-transaction purchases. Also, cash is used extensively for low-value transactions even after controlling for merchant card acceptance and rewards, primarily for its convenience.
Atkin et al. (2017)	What is the effect of incentives on new technology adoption?	Context: Observers of technology diffusion has observed how slow it is Data: Cluster of 135 soccer ball producers in Pakistan	Field experiment. Two experiments, one after the other – one with incentive contract and the other without.	Technology adoption increased by 27-32% with the incentive, from a baseline of 13%. Cashless payment is similar in many respects to technology adoption.
Bolt and Chakravorti (2011)	Should banks intervene in the retail payment market with surcharging policies and interchange regulation?	Context: Payment markets of the US, Netherlands, Spain and the EU Data: Central bank data of respective countries	Macro policy discussion using empirical data of the respective central banks	Empirical literature on payments insufficient to provide much guidance to public authorities on policy intervention. Need more empirical research in this area of payments.
Bolt et al. (2010)	What is the impact of surcharging on consumer payment choice?	Context: No-surcharge rules on Netherlands payments market Data: 2006 DNB householder survey of 1,863 consumers	Linearly ordered probit model. Dependent variable is the reported share of debit card payments.	Research was on solely on surcharging, included her as background information on early works relating to rewards and surcharging and payment choice.
Carb-Valverde and Linares-Zegarra (2009)	What effect does reward programs have on card spending?	Context: Card holders in Spain Data: Spanish 2005 national survey of 2,961 individuals	Mean-difference tests	Rewards modified preferences for card payments relative to other payment instruments.
Hayashi (2009)	Do U.S. consumers really benefit from payment card rewards?	Context: Popularity of payment card reward programs in the U.S. Data: US central bank data on interchange, merchant fees, cost, fee revenues and profit for payment service providers	Comparative analysis and cost studies using central bank data	Early works on payments reward research. Study results inconclusive.
Herbst-Murphy (2013)	Do payment education and incentive called PayPerks affect take-up rates of US government prepaid cards?	Context: US government agencies requiring to distribute welfare benefits through prepaid cards Data: Payroll card pilot involving 8,000 people over 10-weeks in 2011	Comparative analysis of take-up rates using sweepstakes-like incentive and gamification in low-income merchants in low-income neighbourhood	Provides larger picture of what is required for positive behaviour change among low-income and under-served merchants. Sweepstakes and consumer education are possible recommended actions.

Authors (Year)	Research Question	Context and Data	Research Approach	Relevance to Thesis
Ingene and Levy (1982)	Do discounts offered to retail customers paying in cash change their credit card payment behaviour?	Context: US Cash Discount Act came into effect in July 1981 Data: Random telephone survey of 248 respondents	Hypothesis testing using t-tests on different discounts	A large percentage of customers were willing to change from credit cards to cash to obtain the discount, so long as the purchase amount was of a moderate size. Some background relevance to thesis as it shows consumer's receptivity to incentives, at least for larger purchase amounts.
Koulayev et al. (2016)	How do consumers substitute between payment instruments as a result of policy interventions?	Context: Recent policy interventions in the U.S. Data: 2009 Survey of Consumer Payment Choice with 997 observations	Structural modelling to analyse substitution changes between payment instruments	Background literature as it focuses on how consumers substitute in response to policy interventions in debit and credit card market.
Li et al (2013)	What role does herd behaviour play in IT adoption?	Context: Incorporating recent advances in behavioural economics and game theory in IT adoption Data: Concept paper	Concept paper	Provides new insights on herd behaviour in IT adoption.
Loughrey et al. (2013)	What is the effect of video modelling, prompting and feedback to improve card promotion in a retail setting?	Context: Despite evidence supporting video modelling, it has not been researched as a training strategy Data: Experiment carried out in a retail setting over a 7-week period	Analysis over a baseline phase, a treatment phase, and a follow-up phase. No control.	Key finding that consumer incentive is best accompanied by a merchant incentive for a more holistic approach to changing consumer behaviour towards new technology adoption. This is relevant to the thesis as there are no merchant incentives for my experiment, only a customer incentive. This could possibly be a barrier to cashless adoption.
Sung et al. (2017)	Can tax incentives for electronic payments reduce the shadow economy?	Context: Korea's attempt to reduce underreporting in retail businesses Data: Korea Central Bank and secondary data sources	Micro-simulation methods through counterfactual analysis	Relevant findings that tax legislation offering incentives for businesses to use electronic payment is required for move to cashless.
Stavins and Shy (2014)	Do U.S. merchants discount or surcharge for use of various payment options?	Context: New U.S. legislation allowing merchants to surcharge Data: 2012 Diary of Consumer Payment Choice covering 2,468 individuals	Regression analysis to estimate probability of respondent to receive a discount or surcharge.	Background information on merchant behaviour in relation to discount or surcharging.
Simon et al. (2010)	Do card rewards have an effect on consumer payment patterns?	Context: Interchange reforms in Australia by central bank Data: RBA survey covering 662 Australians in 2017	Econometric model for holding and use of various payment instruments	Participation in loyalty program tend to increase credit card use over other payment options like cash and debit cards.
Welte (2016)	What is the effectiveness of merchant steering by pecuniary and non-pecuniary incentives?	Context: Surcharging prohibited by associations in most countries including Canada Data: Canadian 2009 Methods-of-Payment Survey	Multivariate logit model for consumer choice	Use of non-pecuniary incentives like convenience of cash are used by merchants to steer customers towards using cash.

Table 2. Incentives

Author (Year)	Research Question	Context and Data	Research Approach	Relevance to Thesis
Atkin et al. (2017)	What is the effect of incentives on new technology adoption?	Context: Observers of technology diffusion has observed how slow it is Data: Cluster of 135 soccer ball producers in Pakistan	Field experiment. Two experiments – one with incentive contract and the other without.	Technology adoption increased by 27-32% with the incentive, from a baseline of 13%. Cashless payment is similar in many respects to technology adoption.
Boning et al. (1998)	How does adoption of problem-solving teams and group incentive pay affect productivity?	Context: Need to understand why some businesses adopting “innovative” HR practices while others do not Data: 34 production lines owned by 19 different U.S. mills	Regression analysis of 10 independent variables for the dependent variable	Early research directly linking provision of incentive to productivity
Frey and Oberholzer-Gee (1997)	Do incentives contain detrimental effects?	Context: Economists should consider possible detrimental effects of incentives Data: First survey of 305 interviews in Switzerland, and a second survey of 206 interviews	Binary logit analysis of Swiss residents reaction to monetary compensation	Reward or incentive might get in the way of intrinsic joy of the task, otherwise called the crowding-out effect.
Gneezy and Rustichini (2000a)	Do monetary incentives improve performance or the opposite?	Context: Economist believe monetary incentives improve performance, but psychologist believe the opposite Data: 160 undergraduates	Laboratory experiment consisting of four different treatments	Central to thesis, forming theory behind hypothesis one that incentives improve performance.
Gneezy and Rustichini (2000b)	Will a fine be effective to change behaviour?	Context: Psychology literature on effectiveness of fines is controversial Data: Field experiment using 10-day care centres in Israel	Field experiment where fine introduced midway for parents who arrived late to pick up their toddlers	Introduction of a fine increased the behaviour that was fined. The new behaviour was not reduced even when the fine was removed. May inform recommendations for a fine for cash use.
Gneezy et al. (2011)	What is the interaction between extrinsic incentives and intrinsic motivation?	Context: Heated debate that incentives can backfire for some behaviours in education Data: From other author’s papers	Theoretical discussion and literature review	Clarifies when and why incentives do not work to modify behaviour
Kamenica (2012)	How can monetary incentives backfire while nonstandard interventions such as framing can effectively influence behaviour?	Context: Paying for inherently interesting tasks can be counter-productive Data: Review of other literature	Literature review	Importance of considering the whole choice architecture and not just the incentive.
Lazear (1996)	What is the effect of change in pay on productivity?	Context: Firms change pay from hourly wages to piece rates Data: Large auto glass company between 1994 and 1995	Regression analysis using productivity measured as units-per-associate per day as the dependent variable	Early research directly linking pay to productivity.
Halpern et al. (2015)	What is the effectiveness of financial incentives to modify health-related behaviour?	Context: Study different types of incentives to encourage smoking cessation Data: 2,538 participants	Randomised controlled trial	Post reward behaviour showed positive long term effects.
Paarsch and Scherer (1996)	What are the effects that compensation policies have on worker productivity or “incentive effects”	Context: Need to isolate endogenous variables to better estimate incentive effects Data: Tree-planting firm in British Columbia covering 983 observations	Econometric modelling to estimate incentive effect	Early research directly tying pay to productivity
Prendergast (1999)	How can we critically examine the existing work on provision of incentives?	Context: Despite wide-ranging claims about importance, little empirical assessment of incentives Data: Data from other researchers	Literature review of other research in incentives	Summarises earlier research in incentives
Skinner (1953)	How can we understand human behaviour through cause and consequences?	Context: Early works on human behaviour circa 1930s Data: Experiment involving rats in a laboratory	Experimental design, rats hit a lever which produced food pellets.	Early and seminal works on incentives and behaviour

Table 3. Habits

Authors (Year)	Research Question	Context and Data	Research Approach	Relevance to Thesis
Ajzen (2002)	Can the residual effect of past on later behavior be attributed to habituation?	Context: Habituation versus reasoned action Data: Various	Theoretical discussion	Whether we adopt the habituation or reasoned action perspective, so long as the situation remains stable, a behaviour that has been performed frequently in the past is likely to be performed again.
Chen and Chao (2010)	Does reasoned action or habit affect public transport behaviour?	Context: How to reduce private vehicle use and to encourage public transit in Taiwan Data: Survey of 550 commuters in Kaohsiung in 2009	Confirmatory factor analysis and structural equation modeling	Results indicate habitual behaviour of private vehicle owners hinder their intentions to switch to public transport
Ehrenberg (2000)	How can certain aspect of consumer behaviour – repeat-buying – be described?	Textbook. Various context and data.	Not applicable	Provides introductory concepts and empirical evidence in repeat-buying.
Evans and Stanovich (2013)	How to identify and respond to 5 main lines of argument made by critics against the dual-process and dual-system theories in both cognitive and social psychology?	Context: dual-process theories subject to number of criticisms Data: Nil	Theoretical discussion	Habit and automaticity, how habits differ from other automatic, implicit processes like classical conditioning
Ji and Wood (2007)	Can environmental cues activate practiced responses in absence of conscious decision making?	Context: Everyday life events of purchase of fast food, watching TV news and taking the bus in the U.S. Data: 233 students in large southwestern university	Longitudinal study and regression analysis	Consumers' intentions did not predict future performance when they had repeatedly purchased fast food, watched TV and taken the bus in the same context. Behaviour tends to be cued by context features.
Kosse and Vermeulen (2014)	What are the determinants in migrants' choice of remittance channel when transferring money to relatives abroad?	Context: Dutch remittance market Data: Survey of migrants in Netherlands in 2009	Multinomial logit model to predict channel choice	Payment habits were only weak predictors of remittance channel choices.
Lally et al. (2010)	What is the process of habit formation in everyday life?	Context: Interest in habitual behaviour within social psychology Data: SHRI self report survey of 96 university students over 84 days	Regression analysis and idiographic approach	It took participants who were incentivised with a participation fee of £30 from 18 to 254 days for habitual behaviour to form, with an average of 66 days of repetitions.
Verplanken (2018)	What is the progress made on the psychology of habits covering theory, mechanisms, change and contexts?	Textbook. Various context and data.	Not applicable	Theory of Habit
Verplanken and Aarts (2011)	Is habit an empty construct or an interesting case of goal-oriented automaticity?	Context: Theoretical discussion Data: Various	Theoretical discussion	Research is reviewed that contrasted habit with deliberate action, as approached from the theory of planned behaviour.
Wood and Runger (2016)	How can habits be characterized in terms of their cognitive, motivational and neurobiological properties?	Context: Review of fast-growing research on habits. Data: Nil.	Framework development of habit formation	Overview of current research status on habits and framework of habit formation

APPENDIX 12. SIMILIARITY BETWEEN TAMAN JURONG AND JURONG WEST SITE

Type	Taman Jurong	Jurong West
Demographic (Goh, 2012)	Both Taman Jurong and Jurong West are group together under an area called Jurong, sharing similar demographics: -More likely to work in the manufacturing industry -54% take home an income less than S\$3,000 -1.3X more likely to speak Malay ²⁴ at home	
Context	Non-airconditioned Run by the government Located within a HDB ²⁵ estate Selling basic food such as chicken rice, noodles and economy rice Standard plate of chicken rice cost S\$3.50-\$4.00 A cup of kopi-O cost \$0.90 Next to a small shopping centre Has a wet market on the ground floor	Non-airconditioned Run by the government Located within a HDB estate Selling basic food such as chicken rice, noodles and economy rice Standard plate of chicken rice cost S\$3.50-\$4.00 A cup of kopi-O cost \$0.90 Next to a small shopping centre Has a wet market on the ground floor
Observable behaviour	Working class Higher proportion of retirees Higher proportion of blue collar workers Higher proportion of Malaysian workers Customers use public transport or ride motorcycles (the men)	Working class Higher proportion of retirees Higher proportion of blue collar workers Higher proportion of Malaysian workers Customers use public transport or ride motorcycles (the men)

²⁴ A language spoken by the Malay racial group in Singapore. Malay is the official language of Malaysia.

²⁵ HDB or Housing Development Board flats are heaviliy subsidised, government-built homes

APPENDIX 13. PARTICIPANT OBSERVATION IN QUALITATIVE SIDE OF THIS RESEARCH PROJECT

Date/Time	Location	Description	Interpretation	Theme
30/7/18 11.45am	Taman Jurong HC, 2 nd floor	Nearly half of men at the hawker centre are wearing factory boots, some others in uniforms and overalls in various colours of white, orange, blue and black. The overalls are stained with machine oil.	These people who do not like early adopter types. More likely to be late majority as described in the Rogers (1995) diffusion curve.	Demographic
30/7/18 11.50am	Taman Jurong HC, 2 nd floor	As I look around me, I wonder how many here are foreigners as they do not look like the typical Singaporean.	There may be a substantial portion of people here who come from neighbouring Malaysia as it is also quite close to Johor which enables them to commute over daily.	Demographic
30/7/18 12.30pm	Taman Jurong HC, 2 nd floor	I walk around the hawker centre to observe the lunch crowd buying their food. I notice terminals are not visibly displayed on the counter tops of the hawker stalls.	There may be a delay in implementation. Need to check with partner organisation. Or hawkers are not displaying them. Need to find out more.	Implementation
30/7/18 1pm.	Taman Jurong HC, 3 rd floor	As I queue up to buy my lunch, I notice few decals or promotion materials seem to visible.	Perhaps implementation has been delayed. Or perhaps hawkers do not know they need to display the materials prominently.	Implementation
30/7/18 1.15pm	Taman Jurong HC, 2 nd floor	Fair number of mothers with young kids start to appear for lunch. Also, quite a number of retirees are seen making their way to the stalls.	Nursery classes have just ended. Stay-at-home mothers collect their kids and come to the hawker centre for lunch. Similarly, retirees with a leisurely lifestyle appear for a late lunch.	Demographic
30/7/18 1.30pm	Taman Jurong HC, 2 nd floor	I finish my lunch and proceed to buy my drink. Notice one young girl, unlikely to be Singaporean from her dressing. Looks like a shop assistant, also a job unlikely to be held by a Singaporean.	Further evidence of the nationality of the crowd here. They are Chinese but may not be Singaporean Chinese but rather Malaysian Chinese.	Demographic
31/7/18 6pm	Taman Jurong HC, 2 nd floor	A quick walkaround do not show any terminals on display. Only cash transactions are noticed.	There may have been be a delay in implementation. Need to check with partner organisation.	Implementation
31/7/18 7pm	Jurong West HC, 2 nd floor	Prominent display of cash counting machine and electronic POS terminals. Electronic payment option staring at customer. Some terminals are covered with plastic. When asked, the hawker tells me it is spoilt but nobody has come to fix it for quite some time.	Good display of reminders and acceptance signs. Hawkers and partner organisation may need time to get their act together to prominently display acceptance signs. Servicing of faulty terminals still an issue. Cashless adoption may require time before operations reach a point of acceptable conditions operationally.	Implementation
31/7/18 7.15pm	Jurong West HC, 2 nd floor	I join the queue for food. This is a popular stall so the queue is quite long. As they queue, I notice customers in front of me just habitually reach into their pockets and take cash out from their wallets despite seeing cashless acceptance displays.	Taking cash out of their wallets seem to occur out of habit, despite the signs showing cashless payment acceptance. What is the mental process that consumers go through that associate cash with this context and purchase situation? May be worthwhile to research this area further for insights.	Consumer behaviour
31/7/18 7.15pm	Jurong West HC, 2 nd floor	It is common to queue during peak hours. True also for popular hawkers. The waiting time can be used to persuade customers to use cashless payments. Also, cashless payments are more important for popular hawkers to speed up transactions. But hawkers do not prompt customers to use cashless payments.	There is opportunity to offer not just a customer incentive, but also a merchant incentive to encourage merchant to prompt for cashless payments.	Consumer behaviour

Date/Time	Location	Description	Interpretation	Theme
7/8/18 10.30am	Jurong West HC, 2 nd floor	As I pay for my food with cashless payment, the hawker complains that they are charged \$300 per month for the total package of cash counting machine and electronic POS terminals.	There is a cost to accepting cashless payment for the merchants. Do the benefits outweigh the cost?	Transaction Costs
1/8/18 11.30am	Taman Jurong HC, 2 nd and 3 rd floors	I casually and randomly ask four hawkers if they are aware of the promotion. Two were unaware (#02-93 and #02-117) and another two were aware (#03-180 and #03-163). I also have my lunch there.	Awareness of the promotion is an important factor to success, both to customers and merchants. What can be done to improve hawker awareness?	Implementation
1/8/18 6.30pm	Taman Jurong HC, 2 nd and 3 rd floors	Chicken rice stall tells me I cannot use cashless payments now. I was able to do so during lunch earlier. He cannot explain why, probably receiving instructions from his boss? Why did his boss tell him to stop? There was no sign of a terminal anywhere. Is there a reason for a hawker to accept cards but only up to a point?	There seems to be deeper reasons for this and further research should be done to explain this strange phenomenon. Is it related to tax issues? Or is it a political issue - want to be seen to be supporting govt cashless initiative, but at the same time do not want to incur extra tax beyond what they were currently paying.	Merchant behaviour— Government Tax Alignment
1/8/18 7pm	Jurong West HC, 2 nd floor	Notice hawkers do not prompt customers to use cashless payments. But when customers use cash, they will guide them how to insert the cash into the cash counting machine.	Again, it may be a good idea to provide merchant incentive together with consumer incentive to encourage cashless use.	Implementation Merchant behaviour
2/8/18 1.30pm	Taman Jurong HC, 2 nd and 3 rd floor	Promotion ambassadors are seen walking around to encourage customers to use cashless payments during lunch. I overheard a group of customers (office colleagues out for lunch) grumbling that they feel cheated because the hawkers did not prompt for cashless use. They had already bought lunch and missed out on a chance to get free coffee as part of the promo.	The incentive pilot seems to be well underway. Merchant not prompting has other ramifications in terms of customer unhappiness of missing out of the promotion.	Merchant behaviour
2/8/18 2.30pm	Jurong West HC, 2 nd floor	I notice a bay for automatic washing of crockery and utensils. Obviously, the government is pushing the use of technology in this hawker centre, and thus the explanation of the use of cash counting machines and ePOS to improve productivity.	The government has the cashless initiative high on the agenda, as part of a greater efficiency and productivity national agenda.	Government policy
3/8/18 5.30pm	Taman Jurong HC, 2 nd and 3 rd floor	Today I notice the large promotion banner on each of the second and third floor of the hawker centre. There are also 2-3 smaller standees of the promotion on each floor.	Again, the treatment seems to be in full swing at the treatment hawker centre as the decals and promotion banner seem to indicate.	Implementation
3/8/18 7pm	Jurong West HC, 2 nd floor	I notice the chicken rice stall seems to have 1-2 customers paying with cashless means despite Jurong West not running any promotion. What makes a person use cashless even without a promotion? Would be interesting to find out if its driven by being an early adopter, or if there are reasons for such as: convenience, hygiene? My wife casually asks him. He says he gets about 3-30 cashless transactions per day. He says its usually the young people who are more likely to use cashless payments. He does not know why his stall has a higher rate of usage for cashless payments. As a hawker, he does not en-	Highlights key success factors on cashless payment adoption, both on the consumer and merchant side. For the consumer, having the right trait (e.g. innovativeness) towards new technology may be one factor. On the merchant side, sorting out financial and other inconveniences to adopting cashless payments is critical.	Consumer behaviour Merchant behaviour

Date/Time	Location	Description	Interpretation	Theme
		courage nor discouragement. He suggests one reason hawkers do not encourage e-payments is because they are scared that they cannot collect the money later since cashflow for e-payment transactions are typical T+2 or T+3 days after the actual transaction.		
7/8/18 11.30am	Taman Jurong HC and Jurong West HC	I have my lunch at Taman Jurong and coffee at Jurong West Hawker Centres. At Taman Jurong, I notice two teams of ambassadors dressed in red and black walking around during lunchtime to promote the use of cashless payments by giving out flyers. Notice some office workers using cashless payments at Taman Jurong.	The treatment at Taman Jurong is definitely at full swing. In fact, there are cashless transactions taking place at the treatment location. The initial fears of no awareness and operational failures have subsided.	Implementation
13/8/18 12.30pm	Taman Jurong HC 2 nd and 3 rd floors	I redeem by voucher at the coffee stall after purchasing a \$3.50 lunch. I casually ask the coffee stall hawker if he sees many redemptions. He tells me he gets around 30 plus redemptions per day mostly during lunch time.	Further confirmation that the treatment is working with a reasonable number of redemptions for the free coffee.	Implementation
15/8/18 12.45pm	Taman Jurong HC and Jurong West HC	Overall, I have purchased about 15 meals over the two-week period at both hawker centres. But no hawker has prompted me to use cashless payments ever.	Would be interesting to understand why this lack of prompting. Is it cultural? Or is it a lack of business reason. Or lack of incentives. Or both.	Merchant behaviour

APPENDIX 14. MEETINGS, CLOSING INTERVIEW WITH PARTNER ORGANISATION

Meetings were carried out with key members of the partner organisation throughout the period of the field experiment. These were necessary to help me better understand their constraints and also for them to better appreciate the conditions necessary for a good field experiment. Inadvertently, some issues would crop up and some actually did. Like the issue about the acquirer firing test transactions through the system. Although everyone on the partner organisation knew about the experiment, this message was not communicated to the outsourced acquirer. Thankfully, these transactions could be isolated and removed post reporting so as to maintain the integrity of the field experiment. Listed here are the key points arising from these meetings.

A closing tele-conversation was also held with the CEO of the partner organisation as a wrap up of the field experiment in late October 2018. He was quite sanguine about the whole cashless situation, saying that it is a long journey. He had expected that consumers would revert back to their baseline behaviour after incentives end. It was difficult to sustain the incentives indefinitely. The reason they provided incentives was more as a form of getting awareness for cashless payment. They would do it again after more merchants are terminalized. Otherwise it would be counterproductive if, after getting the required awareness, consumers are not able to use e-payments elsewhere. This would defeat the purpose of long-term behaviour change.

On the issue of apparent merchant reluctance to use e-payment, he thought it was obvious since they do face at least one-day delay for e-payment settlement compared to cash. Another issue he is aware is the tax anonymity issue which he has brought up to the relevant government authorities. He gave the example of Australia where the government had to introduce tax amnesty to encourage small merchants to adopt e-payment.

He was also of the opinion that, whilst we provide incentive for e-payment use, there must also be a *disincentive* for cash use. That includes making ATM withdrawals costlier and more inconvenient. In short, there must be both push and pull factors. There just might not be sufficient push factors in Singapore compared to China where ATMs are not ubiquitous and cash is inconvenient to use due to fraud and safety issues. Singapore lacks these push factors. He was also of the view that it is not possible to be totally cashless. He gave the example of Japan with its developed infrastructure but about 75% of transactions are still in cash. He felt that the China model was quite different and may not be relevant to other countries.

In summary, the top executive of the partner organisation seems to be aware of the issues surround the results of this experiment. Many of the critical factors affecting e-payments are outside their control. They have brought these factors up to the relevant authorities for their consideration.

Table 1. Meetings with Partner Organisations

Date	Type of Meeting	Description	Theme
19/7/18	Face-to-face	Met with partner organisation to be briefed on mechanics of roll-out at Taman Jurong including details of incentive, terminalisation and activities surrounding rollout. Details of Jurong West Hawker Centre were also provided.	Experiment briefing
30/7/18	Telecon	Spoke to Manager in charge of the incentive plan. Asked him if the promotion was going on as the promotional signs and terminals were not very visible to me. He assured me all terminals and signages were deployed and set for rollout the next day. He would double check with his acquirer whether there were any issues.	Rollout details
1/8-14/8/18	Several telecons and messaging	Many short telecons with Manager to clarify experimental conditions and operational details surrounding implementation especially since quite a few terminals were not visible and merchants were not prompting for electronic payments.	Experimental conditions
5/9/18	Email	First report from partner organisation of early results including initial findings and early learnings from the experiment of incentives.	Early findings and input on incentives
8/10/18	Face-to-face	Post experiment briefing on reports required and issues relating to some experimental conditions. Briefed about acquirer accidentally fired some test transactions of \$0.01 during experiment, affecting transaction count after the incentive between 23-31 August. Also clarified some outlier numbers at Jurong West between 24 Aug to 27 Aug with partner. Partner also clarified that statistics could not be provided from September onwards due to their acquirer not creating a separate record for Taman Jurong, resulting in all merchants from September onwards being grouped as one.	Debriefing and experimental conditions