ANALYSIS ON CASHLESS PAYMENT SYSTEM ADOPTION IN PUBLIC TRANSPORT IN SRI LANKA

Deshapriya Noyel Kumara Medawatta

189115D

noyel.18@cse.mrt.ac.lk

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Master of Business Administration in Information Technology

(Specialized in Business Analytics)

Department of Computer Science and Engineering

University of Moratuwa, Sri Lanka

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Submitted by:

Deshapriya Noyel Kumara Medawatta | 189115D | noyel.18@cse.mrt.ac.lk

Supervised by:

Dr. Kutila Gunasekara

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Department of Computer Science and Engineering

University of Moratuwa, Sri Lanka

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DECLARATION

This is to certify that to the best of my knowledge, the content of this thesis is my own work. This thesis has not been submitted for any other degree or other purpose. I certify that the intellectual content of this thesis is the product of my own work and that all the assistance received in preparing this and sources have been acknowledged.

25th May 2020

…… ……..

Date Deshapriya Noyel Kumara Medawatta

(Candidate)

The above candidate has carried out research for the Masters Dissertation under my supervision.

25th May 2020

…… ……..

Date Dr. Kutila Gunasekara

(Supervisor)

Master of Business Administration in Information Technology - 2018

Department of Computer Science and Engineering

University of Moratuwa,

Sri Lanka

May, 2020

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ABSTRACT

Use of cashless payment for purchasing transit tickets is a timely requirement in Sri Lanka. So far, many attempts have been made to introduce cashless payment systems to the public transport sector in Sri Lanka. However, none of them managed to achieve the intended objectives. Therefore, this study aims to analyze passengers' adoption of cashless payments within the public transport sector in Sri Lanka. In this case, deterministic factors that are assessed by passengers to decide whether to use or not to use cashless payment are analyzed.

The research was conducted as an applied, correlational and deductive research. Convenient sampling technique was used to collect survey responses of 404 participants representing the public transport passenger population in Sri Lanka. The data collection was conducted as a self-administered online survey and the collected data set was analyzed using quantitative techniques. Deterministic factors used by public transport passengers were identified from related literature and based on them 10 hypotheses were proposed. Factor analysis and hypothesis testing was done using Partial Least Squares-Structural Equation Modeling (PLS-SEM) technique. Data analysis was supported by IBM SPSS 25 and SmartPLS software tools.

Based on the constructs and hypotheses proposed by this research, a model was developed to describe the cashless payment adoption in the public transport sector in Sri Lanka. However, the explanation power of the model was limited to 34%. According to research outcomes, it was revealed that 69% of the variance of passenger's intention to use cashless payments is determined by passenger's attitude toward the use of it. In addition to that it was revealed that the passenger's attitude is directly influenced by the passenger's perception about the usefulness of the cashless payment alternative than by the perception about the ease of use of the payment method. However, passenger's perception about the ease of use of cashless payments can influence passenger's attitude indirectly. Also, it was empirically proven that subjective norms have no direct impact on passenger's attitude toward the use of cashless payments. But still subjective norms can have an impact on passenger's perception about the ease of use and their intention to use cashless payments within the public transport sector in Sri Lanka.

Keywords: Cashless Payments, Mobile Payments, NFC Payments, Automated Fare Collection, Cashless Transit Ticket Payments, Structural Equation Modeling.

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LIST OF ABRIVATIONS

AVE	-	Average Variance Extracted
A/L	-	Advanced Level
AFC	-	Automated Fare Collection
AU	-	Attitude towards the Use
BLE	-	Bluetooth Low Energy
BSMSR	-	Bus Service Modernization & Sahasara Reforms
CBSL	-	Central Bank of Sri Lanka
CR	-	Composite Reliability
CFA	-	Confirmatory Factory Analysis
DTPB	-	Decomposed Theory of Planned Behaviour
DOI	-	Diffusion of Innovations
GCE	-	General Certificate of Education
KMO	-	Kaiser Mayer Olkin
IU	-	Intention to Use
HTMT	-	HeteroTrait-MonoTrait
NFC	-	Near Filed Communication
NFI	-	Normal Fit Index
O/L	-	Ordinary Level
PC	-	Perceived Compatibility
PE	-	Perceived Ease of Use
PS	-	Perceived Security
PU	-	Perceived Usefulness
PLS	-	Partial Least Square
QR	-	Quick Response
SEM	-	Structural Equation Modeling
SN	-	Subjective Norms
SRMR	-	Standardized Root Mean Square Residuals
TAM	-	Technology Acceptance Model
TPB	-	Theory of Planed Behaviour
TRA	-	Theory of Reasoned Action
UTAUT	-	Unified Theory of Acceptance and Use of Technology

1. INTRODUCTION

1.1. Background

The rapid adoption of smart mobile phones or mobile computing was one of the most important technological events during the 1st decade of the 21st century (GSMA, 2018; Masamila, Mtenzi, Said, & Tinabo, 2010). Following on, mobile payments technologies continue to evolve at a great speed while significantly changing business models and decades of old operating mechanisms (Masamila et al., 2010). Many different industry sectors have been seriously affected by this evolution of mobile payment technologies. Among them, the service delivery process and the value proposition of public transport industry have faced revolutionary changes (M. Ferreira et al., 2012). For implementing this kind of smart mobile payment solutions, researchers have studied the potentiality of several technologies that can be used to develop cashless payment solutions. They include Wi-Fi, QR Codes, Near Field Communication (NFC) based Smart Cards, Host Card Emulation (HCE), Bluetooth Low Energy (BLE), Electronic Wallets, Credit Cards, and Debit Cards etc. (Couto, Leal, Costa, & Galvao, 2015; de Luna, Montoro-Ríos, Liébana-Cabanillas, & de Luna, 2017; M. C. Ferreira, Cunha, José, Rodrigues, & Miguel Pimenta Monteiro, 2014; M. Ferreira et al., 2012; Misango, 2016; Roy, 2017). Based on their findings, researchers have proposed various mobile technology-based cashless payment solutions. (Couto et al., 2015; de Luna et al., 2017; M. C. Ferreira et al., 2014; M. Ferreira et al., 2012; Misango, 2016; Roy, 2017). Among them, due to the technical characteristics, NFC technology has received a special attraction from the public transport industry.

When the public transport industry is considered, passengers' adoption of these cashless payment solutions is limited (Dahlberg, Mallat, Ondrus, & Zmijewska, 2008; de Luna et al., 2017). Passengers' adoption of cashless payment system for paying transit ticket fares depends on their perception about how useful, easy, reliable and secure the full system is. Therefore, understanding this perception is important for building up a successful cashless payment ecosystem in the public transport industry. As a result, this has become a hot topic in the field research thought the world (Cheng & Huang, 2013; Couto et al., 2015; de Luna et al., 2017; Di Pietro, Guglielmetti Mugion, Mattia, Renzi, & Toni, 2015; M. C. Ferreira et al., 2014; Fontes et al., 2017a; Liébana-Cabanillas, Molinillo, & Ruiz-Montañez, 2019; Misango, 2016).

1.2. Motivation

According to Financial System Stability Review - 2013, Central Bank of Sri Lanka (2013) the Central Bank of Sri Lanka encourages financial institutions to introduce cashless payment systems for enabling low-value transactions in the country. One of the main objectives behind this decision is to reduce the use of physical cash in the country. Also, the Sri Lankan government has identified that development of a smart, green and efficient public transport system as a highly demanded requirement of the country (*Bus Service Modernization & Sahasara Reforms Project (BSMSR)*, 2016; *The Megapolis Western Region Master Plan*, n.d.). As a result of these two strategic decisions, financial institutions of the country were in a competition to win the first-mover advantage by introducing cashless payment systems to the public transport sector in Sri Lanka. As the government is in the process of digitalizing and modernizing the public transport sector, the author believes that it is the ideal time to replace the cash-based fare collection system by a cashless fare collection system.

However, now it has been 7 years from the first introduction of cashless payments to the public transport sector. In 2020, even the existence of any of the above projects or products is no longer visible. One of the main reasons for this failure was that passengers could not enjoy the benefits of the cashless payment method as they were not widely accepted by the bus crew. It is understandable that, for a cashless payment ecosystem, becoming mature in the public transport sector is not an easy milestone, because it required to build up an interest, synergy and network of agreements between various stakeholders such as governments, banks, transport service authorities, technology service providers, merchants, consumers etc. (de Luna et al., 2017). In addition to that, in the case of public transportation, the growth of cashless payment ecosystem largely depends on the rate of user adoption as well. In the case of technology adoption, ultimately it is all about the users' perception about the technology or the instrument. Therefore, to make conventional payment to cashless payment migration a success story, it is required to understand what passengers actually expect from a cashless payment system in the transport sector. This motivated the author to study what passengers actually expect from cashless transit ticket purchase systems as it is timely needed by the industry.

1.3. Research Problem

While there is a drastic evolution in the global payments landscape, Sri Lanka finds itself in a unique situation. Though there is a population of nearly 22 million, Sri Lanka's mobile penetration rate is well above 100%. According to the Central Bank of Sri Lanka, by 2018, there were 21 million debit cards and nearly 1.6 million credit cards in circulation. This means that Sri Lanka appears to be in prime position to go cashless payments.

However, this is not the case with the public transport sector in Sri Lanka. It has been estimated that the Sri Lankan bus transport system generates a revenue of about LKR 110 Billion per year (Kumarage, 2018). Therefore, obviously, it is one of the industry sectors that need to harness the support of cashless payments. But still, even by 2020, the fare collection process in the public transport sector in Sri Lanka is predominantly cash-based. Compared to the consumer adoption of cashless payments in other industry sectors like retail, microfinance and banking, the public transport passengers' adoption of cashless payment systems is very poor.

As in any cash-based system, there are numerous issues and limitations. Leakage of revenue and the cost associated with handling cash are a few key issues that have been identified (*Bus Service Modernization & Sahasara Reforms Project (BSMSR)*, 2016). From the average passengers' perspective, the fare collection process within the public transport sector in Sri Lanka is severely criticized due to its inefficiencies of the system and inconveniences faced by the passengers. From 2011 onwards, there have been a few attempts at automating the fare collection process by introducing cashless ticket purchase mechanisms. Dialog Axiata in Western, Central and Southern Provinces; Mobitel with Inter-Provincial buses; and Hatton National Bank in the Uva Province, have done pilot runs of their own Automated Fare Collection (AFC) systems. However, none of them received the public attraction and as a result, none of them is functioning today. Thus, at present, there is no visible adoption of cashless payments in the Sri Lankan public transport sector.

It was observed that this problem area has not been properly investigated within the context of Sri Lanka yet. Therefore, in order to build up a successful cashless payment ecosystem in the public transport sector in Sri Lanka, it is important to understand **how passengers decide to use or not to use cashless payment systems for purchasing passenger tickets.**

1.4. Research Objectives

This research study aims to achieve the following objectives in relation to the public transport sector in Sri Lanka.

1. Identify main factors that determine passengers' intention to use cashless payment methods for purchasing passenger tickets.
2. Develop a model to explain how passengers decide to use or not to use cashless payment methods for purchasing passenger tickets.
3. Provide recommendations to implement a sustainable and competitive cashless payment ecosystem.

1.5. Contribution

1.5.1. Theoretical Contribution

The main contribution of this research is toward the existing literature of innovative technologies. In this case, the study focuses on cashless payment adoption in the public transportation sector. Currently, this has been studied by many researchers around the world. However, the number of studies to understand the Sri Lankan perspective of it is rare. Therefore, this research reveals about the Sri Lankan perspective. According to the literature, there are several theories that have been used often when describing this phenomenon of technology adoption. They include 1) Theory of Reason Action (TRA), 2) Theory of Planned Behaviour (TPB), 3) Technology Acceptance Model (TAM), 4) Diffusion of Innovations (DOI), and 5) Unified Theory of Acceptance and Use of Technology (UTAUT) etc. As described in the next chapters, in this study the author extends TAM by combining it with some other constructs which have been derived from other theories mentioned earlier.

1.5.2. Managerial Contribution

According to the CBSL reports ("Financial System Stability Review - 2013, Central Bank of Sri Lanka," 2013), it is clear that the government of Sri Lanka wants to reduce physical cash from all the industries where always people make large volumes of low-value transactions. However, so far all initiatives in the public transport sector have failed to achieve the said goal. One of the main reasons for this failure is passengers' poor adoption of the said initiatives. Therefore, the managerial contribution of this study is to address the reasons

which caused this failure. Accordingly, the main factors which play a deterministic role when a passenger decides to use or not to use a cashless payment system will be identified. And then they will be used to explain how passengers' perception about cashless payment systems correlates with their intention to use it. Eventually, the study will provide a set of recommendations to technology service providers and business owners in the field so that they can design and develop sustainable and competitive cashless payment ecosystems within the public transport sector in Sri Lanka.

2. LITERATURE REVIEW

2.1. Issues in the Existing Fare Collection Mechanism in Sri Lankan Public Transport

According to the industry experts in Sri Lanka, three main problems faced by bus operators in relation to fare collection are 1) Revenue Leakage: Cash transactions involve discrepancies on accounts between the bus owners and the bus crew. As per estimations, it's between 15% - 30% of the daily revenue. 2) Ticket Issue Delay: The time consumed in issuing tickets is challenging. Some passengers would alight the bus even without purchasing a ticket. 3) Due Balance: Tendency of bus conductors to not give due balance to commuters create an unpleasant experience to commuters (Thilleivasan, 2019). In the case of the train transport system, two main problems faced by the rail service operators in relation to fare collection are; 1) Ticket Issue Delay: Existing ticket issue mechanism is 160 years old and is inconvenient to both issuer and commuter. 2) Non-Payment Revenue Loss: Since ticket purchasing experience is time-consuming and unpleasant due to the limited availability of ticket counters, some commuters do not purchase tickets at all.

2.2. Why Government Should Promote Cashless Payments in Public Transport Sector in Sri Lanka

Industry experts also suggest that government should involve in promoting cashless payments in the public transport sector due to the advantages it returns. To name a few of them; 1) Cashless payments ecosystem will harvest the data required for better public transport planning and sustainable development of the country. 2) Also when data related to the public transport available, financial institutes can finance bus transport operators at a special low-interest rate since risk can be identified more accurately. So this will allow the bus operators to have well-equipped vehicles with better services. 3) Another indirect advantage of promoting a cashless payment ecosystem in the public transport sector in Sri Lanka is that it will advance the criminal investigations as AFC systems provide better visibility of the people movements. 4) Further, the most currency damaging industry is public transport. Therefore having a cashless payment ecosystem in the public transport sector will help to eliminate the cost of printing and replacement of cash. 5) Also, since the cashless ecosystem eliminates the use of physical currency usage will help to avoid the spread of infectious decease as well. In addition to that, 6) Cashless payment methods like Smart Card Payments,

NFC Payments can help to maintain special fare schemes for secure free passes, the concessionary fare for selected citizens etc.

2.3. Cashless Payments in the Public Transport Industry

Cashless payment is identified as all payments made without the need for physical cash. In other words, cashless payments are made by transferring money electronically. Although the cashless payment method has become very popular after the internet has expanded, even in developed countries, a large number of payments still take place through physical cash. For the first time in history, in 2015 the global volume of cashless payments exceeded cash payments. Therefore, cashless payments are becoming increasingly important in the economy. Governments consider public transportation as a top priority of their administration. They consider it as a cornerstone of sustainable development. (*Bus Service Modernization & Sahasara Reforms Project*, 2016). In this case, most of the public transport companies tried to reduce the use of physical cash while improving passenger convenience by introducing cashless payment methods for paying their transit ticket fare. This concept is also known as mobile ticketing systems and can be defined as using smart devices (E.g. Smart mobile devices like phones and tablets, Payment Cards, Mobile Applications etc.) to purchase and validate transit tickets (Liébana-Cabanillas et al., 2019). Among these, there are various cashless payment solutions developed using QR Code, NFC, Bluetooth, Contact or Contactless Cards, E-Wallet etc. However, the vast majority of cashless payment systems have been developed using NFC technology as it has been found as the ideal candidate to fulfil all the technical and business requirements associated with public passenger transit ticketing use case. One of the main reason for this success NFC payments is the tech giants who are involved in developing NFC based cashless payments products including Apple Pay, Samsung Pay, Vodafone Wallet, BBVA Wallet, and Android Pay, etc. (Liébana-Cabanillas et al., 2019). Therefore it is important to understand why NFC received this kind of tremendous attention as a technology to enable low-value cashless payments. Because of this reason, it is difficult to discuss cashless payment adoption within the public transport industry without talking about the NFC based cashless payments.

According to the NFC Forum (2011), from the passengers' perspective, NFC based cashless payments offers many advantages. Therefore, NFC based cashless payment technology has emerged as an ideal candidate for enabling mobile payment transactions within the public transportation industry (Couto et al., 2015; de Luna et al., 2017; Fontes et al., 2017b;

Liébana-Cabanillas et al., 2019; NFC Forum, 2011; Roy, 2017). However, the number of studies on the use of cashless transit ticketing systems is limited. The concept of cashless transit ticketing systems can be defined as "using smart payment devices to purchase and validate transit tickets" (M. C. Ferreira & Dias, 2015).

According to Liébana-Cabanillas et al. (2019), there are 4 lines of research on this subject. They are; (1) Identifying main problems that affect the commercial success of NFC mobile ticketing business models (Juntunen, Luukkainen, & Tuunainen, 2010); (2) NFC based cashless transit ticketing solutions that are more useful and easy to use than the existing transit ticketing solutions (Ghosal, Chaturvedi, Taywade, & Jaisankar, 2015); (3) Identifying and eliminating issues in mobile transit ticketing solutions that use proximity communication technologies for processing e-tickets (Ceipidor et al., 2013) and (4) Identifying security issues, privacy issues, and uncertainties in the associated technology layers and business models (Juntunen et al., 2012).

2.4. Evolution of Theoretical Perspectives on Technology Adoption

Nowadays, mobile phones have become ubiquitous systems of society. Therefore mobile technology plays an important role in all of our day-to-day activities. The public transportation sector also has no exception from this trend. Activities related to public transportation has got a huge impact due to mobile technologies. Especially, when the public transport sector is concerned, the power of mobile payment mechanisms has redefined the way people make payments for their transit tickets. However, according to the literature, the passengers' adaptation to use NFC based cashless payments within the public transport industry is limited (Fontes et al., 2017b; Liébana-Cabanillas et al., 2019; Pham & Ho, 2015).

This study aims to analyze how Sri Lankan passengers make their decision to use cashless payment systems to pay their transit ticket fare within the public transport system. The acceptance of NFC based mobile payment solutions within the transportation industry has been analyzed by many researchers (Dahlberg, Guo, & Ondrus, 2015; Fontes et al., 2017b; Liébana-Cabanillas et al., 2019; Pham & Ho, 2015; Ramos-de-Luna, Montoro-Ríos, & Liébana-Cabanillas, 2016). However, before focussing about NFC payment technology adoption, it is worth to study the origins of researches regarding technology adoption. According to the literature, a variety of theoretical perspectives can be identified. Some of the most popular and often used set of classical theories, that have received the attraction of researchers are listed below.

1. Theory of Reason Action (TRA)	(Ajzen, 2009, 2011; Madden, Ellen, & Ajzen, 1992; Schifter & Ajzen, 1985)
2. Theory of Planed Behaviour (TPB)	(Ajzen, 1991, 2009, 2011; Madden et al., 1992; Schifter & Ajzen, 1985)
3. Technology Acceptance Model (TAM)	(Davis, Jr., 1986; Davis, 1986, 1989; Venkatesh & Davis, 2000)
4. Diffusion of Innovations (DOI)	(Pham & Ho, 2015; Rogers, 1983, 2003)
5. Unified Theory of Acceptance and Use of Technology (UTAUT)	(Di Pietro et al., 2015; Venkatesh et al., 2003)

These earliest classical theories have laid a strong foundation in the field of technology acceptance research. Therefore the next few paragraphs will briefly explain the key points of these classical theories. Among them, the 1) TRA and 2) TPB can be considered as two widely used theories which were used to explain human behaviour about the adoption of new technologies (Ramos-de-Luna et al., 2016).

2.4.1. Theory of Reasoned Action (TRA)

TRA is derived from social-psychology theories. It is one of the most basic and prominent theories of interpreting human behaviour about technology adoption. (Venkatesh et al., 2003). According to TRA, a user's Behavioral Intention to accept an innovative product is determined by 1) Attitude Towards Behaviour and 2) Subjective Norms. It also explains that Attitude Towards Behaviour is formed by Behavioral Beliefs and Subjective Norms. And Subjective Norms are determined by Normative Beliefs (Liébana-Cabanillas, de Luna, & Montoro-Ríosa, 2017). Attitude Towards Behaviour is explained as a person's "positive or negative perceptions or evaluation about doing the intended action" (Fishbein and Ajzen 1975, p. 216). Normative Beliefs are known as "the social pressure made by an individual's close contacts or interested parties". (Fishbein and Ajzen 1975, p. 302). Therefore, the impact of these two type of factors on behavioural intention can vary from person to person (Yang, Lu, Gupta, Cao, & Zhang, 2012).

2.4.2. Theory of Planned Behaviour (TPB)

TPB was suggested by Ajzen in 1985 as an expansion to the TRA by adding the construct of Perceived Behavioral Control (Ajzen, 2011). According to TPB, Behavioral Intention is explained by two determinants called 1) Attitude Towards Behaviour and 2) Subjective Norms which are adapted from TRA. In addition to that, 3) Perceived Behavioral Control has been introduced as an additional deterministic factor of Behavioral Intention and Behaviour. In the context of Information Systems (IS), above Perceived Behavioral Control is explained as an individuals' perception of internal and external constraints on behaviour. TPB has been successfully used by many researchers for understanding an individual's adoption of technologies. Decomposed Theory of Planned Behaviour (DTPB) is nearly identical to TPB. DTPB decomposes the Attitude Towards Behaviour, Subjective Norm, and Perceived Behavioral Control further into its fundamental beliefs of the technology (Venkatesh et al., 2003).

2.4.3. Technology Acceptance Model (TAM)

With the influence of TRA and TPB, TAM was proposed by Davis (1986) and it is specifically tailored for the context of IS. TAM is one of the most referred models for studying user behaviour in accepting end-user information systems. According to the original TAM, 1) Perceived Ease of Use and 2) Perceived Usefulness is the main two constructs that influence the user's Intention to Use an end-user information system (Davis, 1986). Even though Subjective Norms were included in both TRA and TPB, it was excluded from the TAM (Davis, 1989). That is because; Davis believed that Subjective Norms should not influence individuals in the organizational setting. However, this construct indeed increases the explanatory power of the result if it is included in the model (Davis, 1986). According to the original TAM, 1) The Perceived Ease of Use is described as "the extent to which an individual believes that use of a particular system would be easy to use". Also, 2) the Perceived Usefulness is described as "the degree to which an individual believes that the use of a particular system would improve his or her job performance" (Davis, 1989). In this study Davis also explained that; 1) When a system has a higher Perceived Usefulness, the user keeps hopes about the presence of a positive use-performance association, and 2) When a user finds the Perceived Ease of Use in an application, and then the application is to be more acceptable by the user. (Davis, 1989) Therefore, it is concluded that both of the above two elements are based on each user's perception regarding the characteristics of the technology, and their personal past experiences of using them (Kaasinen, 2005). The original purpose of TAM was to develop techniques for enabling practitioners to, assess the impact of, 1) managerially controllable variables, 2) end-user information system characteristics and on the 3) motivation of intended users to accept and use end-user information systems (Davis, 1986).

2.4.4. Technology Acceptance Model 2 (TAM2)

Though TAM is one of the most referred models for studying technology acceptance, it has been also revised from time to time (Venkatesh & Davis, 2000). TAM2 is among the most discussed revised models of TAM and which was developed after reassessing the usage of Subjective Norms and the Unified Theory of Acceptance and Use of Technology (UTAUT). TAM was enhanced to TAM2 by introducing additional theoretical constructs representing 1) Social Influences Process (Subjective Norm, Voluntariness, and Image) and 2) Cognitive Instrumental Process (Job Relevance, Output Quality, Result Demonstrability, and Perceived

Ease of Use) (Venkatesh & Davis, 2000). Perceived Usefulness is comprised of items related to effectiveness, job productivity and other aspects related to work. According to TAM2, the Perceived Usefulness can be estimated based on Subjective Norms, Image, Job Relevance, Output Quality, Result Demonstrability and Past Experiences (Venkatesh & Davis, 2000). It is also observed that the Perceived Ease of Use mainly effects on the Perceived Usefulness than on the Intention to Use. Therefore, TAM2 highlights the importance of Perceived Usefulness as a predictive variable to decide on Intention to Use a technology (Venkatesh & Davis, 2000).

2.4.5. Diffusion of Innovation (DOI)

DOI is a well-known, old and often used Social Science theory in explaining the adoption of usage of innovative solutions. Diffusion is all about the spreading of the message about an innovative solution throughout the people in society (Rogers, 2003). In this case, "innovative solutions" can be explained as an idea, practice, or object which is found to be new compared to existing alternatives (Rogers, 2003). According to DOI, the rate of adoption of an innovation is explained by five variables. The first variable is known as 1) Perceived Attributes of Innovation and it explains about the Relative Advantage, Compatibility, Complexity, Trial-ability, and Observability. In addition to that, the 2) Type of Innovation-Decision, 3) the Nature of Communication Channels diffusing the innovation at various stages in the innovation-decision process, 4) the Nature of the Social System, and 5) the Extent of Change Agents' Promotion efforts in diffusing the innovation, determines the rate of adoption of an innovation (Rogers, 2003).

2.5. Theoretical Models in Relation Cashless Payment Adoption in Public Transportation

Based on the basic principles proposed by above-mentioned theories, various researchers (de Luna et al., 2017; Di Pietro et al., 2015; M. Ferreira et al., 2012) have conducted studies to develop models for explaining the cashless payment adoption within the public transport sector, throughout the world. In the majority of cited studies, the model has been developed using basic constructs proposed by the above-mentioned theories. In addition to the said basic constructs, the above researchers also have introduced various new constructs to improve the models they have proposed. Accordingly, DeLuna et al developed a model to explain NFC payment acceptance in the public transport sector in Brazil which had 71% of predictive power. There they found that the 1) Attitude towards the Use (74%), 2) Personal Innovation

in IT (56%) and 3) Perceived Usefulness (43%) has the greatest impact on passengers' determination to use or not to use NFC payments in the public transport sector (de Luna et al., 2017). Meanwhile, Liebana-Cabanillas et al (2019) proposed a model which does not depend on the constructs proposed by above-mentioned theories. Instead, this model explained the passengers' intention to use NFC payments within the transport systems using constructs including 1) Convenience, 2) Social Value, 2) Satisfaction, 3) Perceived Trust, 4) Service Quality, 5) Effort Expectancy, and 6) Perceived Risk. This model had a 72% of predictive power to explain NFC payment adoption in public transportation.

3. RESEARCH MODEL AND GENERATION OF HYPOTHESIS

When developing the conceptual framework of this study, the author followed the example set by Venkatesh (2000). Venkatesh formulated TMA2 by extending the TMA (Davis, 1986), which is one of the main theories used by many researchers to study the technology acceptance phenomena. In the same way, the conceptual framework of this study was built referring to the theories explained in the previous chapter. Most of the constructs of the proposed conceptual framework and the hypothesis were derived from, TRA (Madden et al., 1992), TPB (Ajzen & Madden, 1986), TAM (Venkatesh & Davis, 2000), and TAM2 (Venkatesh & Davis, 2000), DOI (Rogers, 2003).

3.1. Intention to Use (IU)

The Intention to Use (IU) can be described as "the probability, that person will adopt a technology" (Davis, 1989) and which was originally proposed by the TAM (Davis, 1989). It is a main dependent variable in researches on the adoption of mobile payment technologies (J. J. Chen & Adams, 2005; de Luna et al., 2017; Kim, Mirusmonov, & Lee, 2010). Therefore considering the close relationship between both mobile payments and cashless payments, the author proposes this construct as a main dependent variable of this study. The following section explains about the constructs which have been identified as the key factors those determine passenger's intention to use cashless payment systems for paying transit ticket fare, within the public transport system in Sri Lanka.

3.2. Attitude towards the Use (AU)

The Attitude towards the Use (AU) is defined as "the positive or negative assessment of the use of technology". Based on the results derived by Davis (1989), studies on mobile payments acceptance, have identified the AU as one of the main antecedent variable and as a key mediator variable which influences other variables towards IU (J. J. Chen & Adams, 2005; de Luna et al., 2017; Kim et al., 2010). In those studies, it has been proved that AU has a positive relationship with IU of certain technological innovations (J. J. Chen & Adams, 2005; de Luna et al., 2017; Kim et al., 2010). Therefore, since these cashless payments within the public transport industry also have a close relationship with the mobile payments, the author proposes the following relationship between AU and IU.

$H01_0$	The **Attitude towards the use** of a cashless transit ticket purchase system does not determine the passenger's **intention to use** it.
$H01_a$	The **Attitude towards the use** of a cashless transit ticket purchase system determines the passenger's **intention to use** it.

3.3. Perceived Ease of Use (PE)

Perceived Ease of Use (PE) is defined as "a person's perception about, use of a particular system will not demand extra strive to carry out a particular task" (Davis, 1989). This was originally proposed by the TAM (Davis, 1989). According to Davis, PE is one of the attributes which highest impact on the acceptance of new technologies (Davis, 1989). This influence is explained in two ways. First, the AU is influenced by self-efficacy and the instrumentality. The second is the AU, which is influenced due to the usefulness. This finding also has been supported by many studies on the acceptance of mobile payment technology (J. J. Chen & Adams, 2005; de Luna et al., 2017; Kim et al., 2010). Therefore following them, here in this study also the author proposes the following two relationships between 1) PE and AU, and 2) PE and Perceived Usefulness (PU).

$H02_0$	The **perceived ease of use** does not determine the passenger's **attitude towards the use** of a transit ticket purchase system.
$H02_a$	The **perceived ease of use** determines the passenger's **attitude towards the use** of a transit ticket purchase system.

$H03_0$	The **perceived ease of use** does not determine the passenger's **perceived usefulness** of cashless transit ticket purchase system.
$H03_a$	The **perceived ease of use** determines the passenger's **perceived usefulness** of cashless transit ticket purchase system.

3.4. Perceived Usefulness (PU)

Perceived Usefulness (PU) is drawn from TAM (Davis, 1989). According to Davis, PU is explained as "the extent to which a person believes that the use of a particular system would enhance his or her job performance". (Davis, 1989). This means that an individual's belief about the usefulness of a particular technological solution encourages his or her intention to use it. From the cashless payment perspective, when the users are convinced about the

usefulness of use of cashless payments over the other alternative ways of payments, it develops a positive intention to use cashless payments. For example, as a cashless payment method, when NFC payments are used, it offers many advantages over the other traditional methods. One such obvious advantage is quicker response time. As a cashless payment method, NFC payments can facilitate quicker check-in or checkout because an NFC payment transaction is just a matter of waving an NFC tag at an NFC antenna (Tan, Ooi, Chong, & Hew, 2014). Therefore this construct makes a huge impact on determining the intention to use cashless payments within the public transport industry (Pham & Ho, 2015; Ramos-de-Luna et al., 2016; Tan et al., 2014). Therefore this study also the user proposes a similar relationship between the PU and AU as below.

$H04_0$	The **perceived usefulness** does not determine the passenger's **attitude towards the use** of cashless transit ticket purchase system.
$H04_a$	The **perceived usefulness** determines the passenger's **attitude towards the use** of cashless transit ticket purchase system.

3.5. Subjective Norms (SN)

Subjective Norms (SN) can be described as "the extent to which a person gets the social pressure from his or her close or important contacts" (Ajzen & Madden, 1986; de Luna et al., 2017; Kim et al., 2010; Venkatesh & Davis, 2000) and the author derived this construct from TRA (Madden et al., 1992), TPB (Ajzen & Madden, 1986), TAM (Venkatesh & Davis, 2000), TAM2 (Venkatesh & Davis, 2000). SN is also known as the social influences and it has been identified as the main construct of various most referred researches on technology adoption (Ajzen & Madden, 1986; Venkatesh & Bala, 2008; Venkatesh & Davis, 2000)

SN comprises of two fundamental facts. 1) An individual's perception of people who are important to him/herself. 2) The temptation of the individual to behave by the wishes of the people who he/she considered as important to him/herself. Many studies on technology acceptance have identified a direct positive relationship between SN to PE, SN to PU, and SN to IU. Therefore in this study also the author proposes the following relationships between SN to IU, SN to AU and SN to PE.

$H05_0$	**Subjective norms** do not determine a passenger's **attitude toward the use** of the cashless transit ticket purchase system.

$H05_a$	**Subjective norms** determine a passenger's **attitude toward the use** of the cashless transit ticket purchase system.

$H06_0$	**Subjective norms** do not determine the passenger's **intention to use** cashless transit ticket purchase system.
$H06_a$	**Subjective norms** determine the passenger's **intention to use** cashless transit ticket purchase system.

$H07_0$	**Subjective norms** do not determine the passenger's perception of the **ease of use of** the cashless transit ticket purchase system
$H07_a$	**Subjective norms** determine the passenger's perception of the **ease of use of** the cashless transit ticket purchase system

3.6. Perceived Security (PS)

Perceived Security (PS) of a technology-based payment system is one of the major aspects that both business and the consumers concerned about. Most of the recent studies on acceptance of mobile payment systems have identified PS as an important determinant for the user to decide the intention to use technology-based payment systems (Al-Amri et al., 2018; de Luna et al., 2017; Jenkins & Ophoff, 2016; Liébana-Cabanillas et al., 2017). These studies reveal that the security of a payment application must be a top priority to be successfully adopted (Al-Amri et al., 2018; de Luna et al., 2017; Jenkins & Ophoff, 2016; Liébana-Cabanillas et al., 2017). Since most of the cashless payment systems used in the public transport industry use NFC technology, the security of NFC application is also an important aspect this study taken into consideration. In that case, the security of an NFC based payment application must be a priority to be successfully adopted (Grassie, 2007). When users assess the value of a particular product, they essentially assess the immediate outcomes of using it. In addition to that, they also evaluate intermediate outcomes that might lead to possible benefits or negative effects of using it (Cho, 2004). Therefore PS can affect the user's decision to adopt a payment technology in two ways. First, PS can affect the user's perception of IU. Secondly, it affects the perception of its utility. Since all these points are also important for a passenger to use cashless payment systems within the public transport system, the author suggests the following relationship between the PS and IU.

$H08_0$	The **perceived security** does not determine the passengers' **intention to use a** cashless transit ticket purchase system.
$H08_a$	The **perceived security** determines the passengers' **intention to use a** cashless transit ticket purchase system.

3.7. Perceived Compatibility (PC)

As an extension to the TAM, Schierz et al. (2010) proposed Perceived Compatibility (PC) as a crucial variable in determining the user acceptance of mobile payment services. They further explained that the PC has the greatest impact on the intention to use mobile payment services (Schierz, Schilke, & Wirtz, 2010). This introduction of PC was quite interesting as researchers have not given much importance to this construct previously. However, after that, many studies on mobile payment acceptance, have revealed that the PC as a key construct in determining the acceptance of mobile payment systems (de Luna et al., 2017; Kim et al., 2010; Liu & Yi, 2017). PC encompasses the reconcilability of innovation with existing values, user's behavioural patterns, and experiences. Studies show positive effects of PC on both the AU and the PU(de Luna et al., 2017; Kim et al., 2010; Liu & Yi, 2017; Schierz et al., 2010). Therefore considering these points and the close nature of mobile payments and cashless payment systems within the public transport industry, the author proposed the following relationships between PC to AU and PC to PU.

$H09_0$	The **perceived compatibility** does not determine passenger's **attitude towards the use** of a cashless purchase system.
$H09_a$	The **perceived compatibility** determines the passenger's **attitude towards the use** of a cashless purchase system.

$H10_0$	The **perceived compatibility** does not determine passenger's **perceived usefulness** of the cashless transit ticket purchase system.
$H10_a$	The **perceived compatibility** determines passenger's **perceived usefulness** of the cashless transit ticket purchase system.

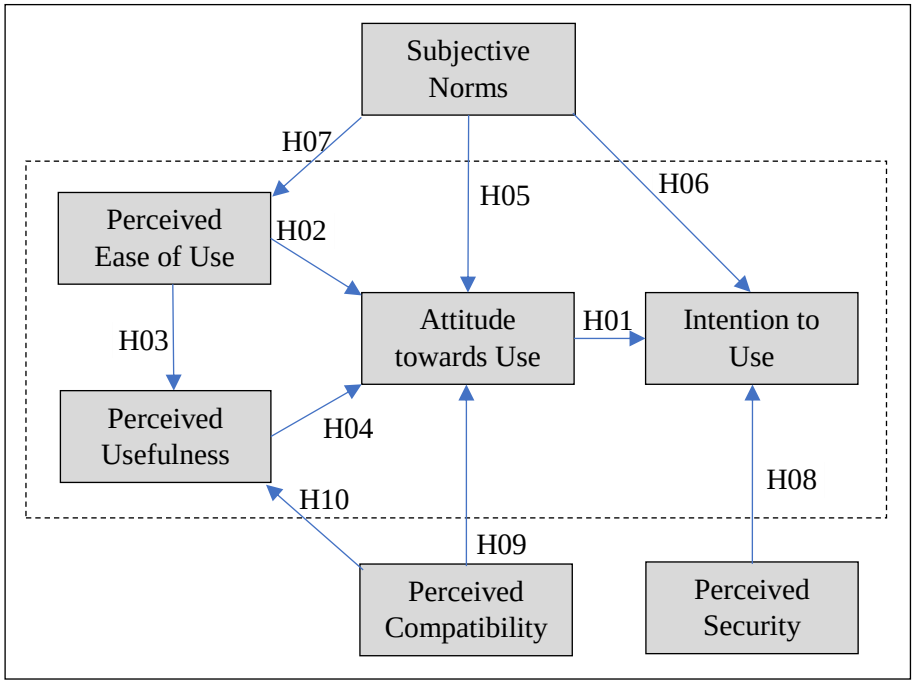

Figure 1 - Proposed Model – Factors Affecting Passengers' Intention to Use Cashless Payments for Purchasing Transit Tickets

4. RESEARCH METHODOLOGY

4.1. Research Design

Almost all the cashless payment systems that were introduced to the public transport sector in Sri Lanka failed to sustain. This failure motivated the author to conduct this research to identify weak points and propose suggestions to design a sustainable and competitive cashless payment ecosystem within the public transport sector in Sri Lanka. Therefore, from the application perspective, this research can be positioned as an Applied Research. Also, the aims of this study are to find and analyze deterministic factors and their relationships in relations to the passengers' adoption to use cashless payment systems in the public transport sector. Therefore, from objectives point of view, this research was designed as a Correlational Research.

Research Application	Fundamental			**Applied**
Research Objective	Descriptive	Exploratory	**Correlational**	Explanatory
The Logic of Scientific Method	**Deductive**			Inductive
Research Framework	Conceptual			**Empirical**
Enquiry Mode	Qualitative	Mixed		**Quantitative**

Figure 2 - Research Design

4.2. Operationalization of Measurement Instruments

Most of the managerial researches are built upon constructs. Constructs are intentionally created for specific scientific purposes (Kerlinger, 1986). Since these constructs are selected and defined by the researcher, it is required to standardize this process. This is known as the operationalization of constructs. The purpose of operationalization is to make the constructs meaningful in terms of its definition and measurement approach. This means that the operational definitions can be explained as a set of specific rules used for measuring the constructs in the study. Therefore, with regard to this research, the author conducted the operationalization as described below.

As listed in the previous chapter; this study is built upon 7 constructs; namely 1) IU, 2) AU, 3) PU, 4) PE, 5) PS, 6) PC, and 7) SN. These 7 constructs were well-found in and accepted by many other scholars. Among them IU was a dependent variable, AU was merely a mediator variable and rest of the variables were independent variables. However, in certain scenarios, it was found that PU and PE act as mediator variables as well. To measure each of these constructs a questionnaire was designed and where it used two types of measurement scales. Since 1) IU was a measured variable it was presented as MCQ type question. Rest of the constructs were latent variables. Hence (2) AU, 3) PU, 4) PE, 5) PS, 6) PC and 7) SN were measured by assessing the survey participants agreement about a set of statements on the construct. In this case, participants were asked to mark their agreement or disagreement to a set of statements using a five-point scale ranging. This Likert-Scale was varying from 'strongly agree' (1) to 'strongly disagree' (5). Ability to use technology-based payment systems and prior familiarity with the use of mobile phones were evaluated by using scale type of questions. Table 1 shows the measurement instruments of this study and the supporting literature for each of them. As shown in Table 1, each of 1) IU, 2) AU, and 3) PU was measured using 4 instruments. Each of 4) PE, 5) PS, 6) PC, and 7) SN was measured using 3 instruments. The initial version of this measurement instruments was subsequently refined with the help of several academics and professionals who have experiences in the field of AFC systems. These measurement instruments were further tested with 30 persons who have sufficient technical and internet literacy. Several rounds of refinements and restructurings were conducted to develop the final measurement model. This helped to establish the internal consistency and validity of the measurement model.

Construct	Code	Measurement	Authors
Intention to use cashless payments (IU)		I believe that, if I get a chance to use cashless payment methods for purchasing passenger tickets;	(Davis, 1989; de Luna et al., 2017; Perera, 2007; Schierz et al., 2010; Venkatesh & Davis, 2000)
	IU1 IU2 IU3 IU4	- I will definitely use it - I am likely to use it - I will probably try it - I will never try it	
Attitude towards the use of cashless payments (AU)		I believe that the use of cashless payments for purchasing passenger tickets;	(Davis, 1989; de Luna et al., 2017; Di Pietro et al., 2015; Perera, 2007; Schierz et al., 2010)
	AU1 AU2 AU3 AU4	- Is a good idea - Is convenient - Is financially beneficial to the passenger - Is an interesting experience	
Perceived usefulness of cashless payments (PU)		I believe that the use of cashless payment methods for purchasing passenger tickets;	(de Luna et al., 2017; Di Pietro et al., 2015; Perera, 2007; Schierz et al., 2010)
	PU1 PU2 PU3 PU3	- Is a useful alternative - Is easier - Will reduce the time spent on purchasing a passenger ticket - Will improve the quality of my travel experience	
Perceived ease of use of cashless payments (PE)		I believe that, using cashless payments for purchasing passenger tickets;	(Davis, 1989; de Luna et al., 2017; Di Pietro et al., 2015; Perera, 2007; Venkatesh & Davis, 2000)
	PE1 PE2 PE3	- Is easy to learn - Is easy to understand - Is easily guidable (when someone needs any assistance)	
Perceived security of cashless payments (PS)		I believe that when I use cashless payment systems for purchasing passenger tickets;	(de Luna et al., 2017; Di Pietro et al., 2015; Perera, 2007; Schierz et al., 2010)
	PS1 PS2 PS3	- The risk of failing my payment should be lower. - The risk of hacking my payment should be lower. - The risk of misuse of my personal information should be lower. (E.g. name, age, address, travel information etc.)	

Construct	Code	Measurement	Authors
Perceived compatibility of cashless payments (PC)	PC1 PC2 PC3	I believe that the use of cashless payment methods for purchasing passenger tickets; - Fits well with my lifestyle - Is consistent with my daily payment methods - Is recommendable over traditional methods	(de Luna et al., 2017; Di Pietro et al., 2015; Schierz et al., 2010)
Subjective norms (SN)	SN1 SN2 SN3	I believe that the people who are important to me, will find the use of cashless payments for purchasing passenger tickets; - Is convenient - As financially beneficial to themselves. - Is something they would recommend to me	(de Luna et al., 2017; Schierz et al., 2010; Venkatesh & Davis, 2000)

Table 1 - Measurement Instruments

4.3. Pilot Study

To achieve the first two objectives of the research, firstly, a literature study was conducted in order to identify the main factors that determine the passengers' adoption of cashless payments. After that, a preliminary study was conducted to get a high-level idea about passengers' awareness about the use of cashless payments for purchasing transit tickets in Sri Lanka. It was realized that average passengers have no idea about the existence of any such system in Sri Lanka. This means, though there were few cashless transit ticketing systems in Sri Lanka, the level of passengers' awareness about them is not sufficient to support a research study. Therefore, if try to measure the above-identified deterministic factors based on the experience of passengers it is highly unlikely to give any reliable outcome. Hence, rather than measuring above constructs based on passengers' experience or the awareness, the author decided to measure passengers' perception about the use of cashless payments for purchasing transit tickets.

Therefore, after identifying these deterministic factors, a pilot study was conducted to ensure if the measures are applied in the context. The main purpose of this pilot study was to asses and validates the acceptance level, dimensionality, reliability, and consistency of the proposed scales. During the pilot survey, the questionnaire was distributed among 33 personals through a social media group. All participants are in the same age, employed in different industry sectors as they have achieved different levels of educational qualifications including GCE O/L, GCE A/L, Diploma, Degree, Postgraduate, and Doctor of Philosophy. Then the responders were asked to provide their opinion on any aspect of the survey content. The most common opinion was about the use of some "complicated and technical" English terms. The length of the questions also was criticized. Therefore, they were re-worded and re-arranged slightly so that an average survey participant also can understand the meaning and intention of the question easily. The order of the questions also was changed in such a way so that it gives a clear idea about the intention of the study. After that, the survey questionnaire was validated by several academics and professionals to see if they are aligned with the research context.

4.4. Validity and Reliability Evidence (Pilot Study)

In management researches, the evidence in relation to the measurement errors and the instruments used for measurement is required to be disclosed. Measurement errors can be in two forms; 1) Systematic Errors and 2) Random Errors. These random errors are assessed during the study and corrected by doing reliability and validity analysis (Vishwanthan, 2005). Therefore, in this research, the author conducted a reliability and validity analysis over the results of the pilot survey.

4.4.1. Reliability Evidence (Pilot Study)

Internal Consistency is one of the first assessment to do in order to check if items in the scale are consistent with other items in the same scale (Vishwanthan, 2005). In simple terms, Internal Consistency assesses whether the items in a construct fits together with other items in the construct (Vishwanthan, 2005). To assess this, it is suggested to collect a sample of responses through a pilot study and measure the internal correlations and correlations between each item observed and then to use the total score to fine-tune the measures considering the overall scores of internal consistency reliability and co-efficient alpha (Vishwanthan, 2005). Accordingly, the author used data collected from the pilot study. These data were collected from the responses given by 33 participates. Then using the IBM SPSS 25, the researcher assessed the Cronbach's alpha to check if the internal consistency of the scales is preserved. As shown below, according to the pilot study data analysis, the Cronbach's Alpha value of all the latent constructs was greater than 0.7. According to the general acceptance criteria, higher the Cronbach's alpha then higher the internal consistency of the items in the scale(George & Mallery, 2003).

Construct	Code	Number of Items	Cronbach's Alpha
Attitude towards the Use	AU	4	0.790
Perceived Usefulness	PU	4	0.735
Perceived Ease of Use	PE	3	0.872
Perceived Security	PS	3	0.930
Perceived Compatibility	PC	3	0.865
Subjective Norms	SN	3	0.908

Table 2 - Internal Consistency - Cronbach's Alpha (Pilot Survey)

According to the above Cronbach Alpha values, it is notable that the PE, PS, PC, and SN corresponding to an alpha value which is greater than 0.8. This demonstrates a good level of internal consistency. In addition to that, AU and PU also correspond to an alpha value of greater than 0.7 and which is also an acceptable level of internal consistency. In other words, these Cronbach's alpha values imply that the existing scale is consistent enough to proceed with the data collection. Details of the Cronbach's alpha are presented in Appendix B and according to that, there are few instances which indicate that the above Cronbach's alpha values can be further improved by discarding certain measurement instruments. However considering the two facts that, 1) above mentioned Cronbach's alpha values are beyond the general acceptance level and 2) all the mentioned measurement instruments are validated in the literature, the researcher decided to conduct the data collection while sticking to the existing scale.

4.4.2. Validity Evidence (Pilot Study)

Validity assessment is one of the most fundamental consideration in evaluating research data to check if the scale truly measures what it is supposed to measure. There are a number of methods in use to evaluate validity. According to the American Psychological Society, validity is defined as the degree to which evidence and theories support the interpretation of a test (Eignor, 2013). There are different approaches to investigate validity. Among them 1) Content validity, 2) Criterion-Related Validity, 3) Construct Validity are mostly used by researchers. Since investigating the validity is an open-ended process, it depends on the research and the researcher's choice. From the Content Validity point of view, the face validity assessment is used to evaluate a questionnaire in terms of readability, feasibility, consistency, language clarity, quality of the wording, question arrangement, language style and formatting used in the questionnaire (Devon et al., 2007). In relation to the Construct Validity, Convergent Validity and Discriminant Validity are often used by researchers (Krishnaswamy, K. N., Sivakumar, A. I., & Mathirajan, 2006). In addition to that factor analysis is also heavily used by researchers to evaluate the Construct Validity (Goodwin & Leech, 2003).

In this research, as explained under the previous section (Pilot Study), the author evaluated the content validity of the questionnaire with the support of subject matter experts and improved the validity of the content. In relation to the Scale Validity, the author had no

intention to generate new scales. Instead carefully selected available standard scales were modified to measure the intended constructs. Therefore, it was not required to assess the validity of the scales used to measure intended constructs. In relation to the Construct Validity, this study chose to undergo a Confirmatory Factory Analysis (CFA) to assess the Convergent and Discriminant Validity of the scales used in the study. According to the acceptance criteria of Convergent Validity, items in a scale that supposed to measure a particular construct, need to have a relatively high positive correlation with other items in the same scale (Devon et al., 2007; Hettiarachchi, 2017). Accordingly, in this study, the author conducted a factor analysis on the main survey data set and found (Table 15) that the majority of the factors were having more than 0.5.

4.5. Sample Selection

The objective of this study is to identify passengers' perception of the key factors that determine passengers' intention to use or not to use cashless payments in the public transport sector in Sri Lanka. Therefore, technically the target population of this study would be all passengers in Sri Lanka, who use public transport systems in the country. However, since this study is on a technology-based payment mechanism, the quality of the responses significantly depends on the participants' awareness of the context. At the same time, as described in the first chapter, almost all the cashless transit ticketing systems deployed in Sri Lanka are no longer in function. Hence the average passengers' awareness about the use of cashless payment systems for purchasing transit tickets is not significant. In addition to these reasons, considering budget and time constraints, the author decided to employ Convenient Sampling Technique to select a sample from the population.

Therefore, the author decided to reach the sample through an email campaign. Also, the invitation and the survey questionnaire was shared in English language only. Therefore, the sample is subject to people who use emails and understand English. Nearly about 6000 direct emails were sent requesting to participate in the online survey questionnaire. In addition to that, the survey questionnaire link was distributed through 3 social media groups which altogether consists of more than 1000 users.

4.6. Data Collection

A self-administrative survey was conducted to collect primary data set on which this study relies on. The questionnaire (Appendix A) was published as a Google form in the English language. Accordingly, the survey was conducted using people who have sufficient technology and the English language literacy to use emails, social media groups etc. Therefore, the questionnaire was distributed among people through emails and social media groups. The survey questionnaire was organized under three main sections for capturing three types of socio-demographic information. The three sections were dedicated for capturing 1) Personal Information, 2) Technical and Payment Expertise and 3) Use of cashless payments for purchasing passenger tickets. The first section collects socio-demographic information about the sample. The second section collects information about technical and payment expertise of the sample. Finally, the third section collects passengers' perceptions about the constructs, which determines their intention to use cashless payments for purchasing transit tickets in the public transport sector in Sri Lanka. Accordingly, 404 responses (Appendix A) were collected and 3 out of them were found to be incomplete due to some technical failure. 3 of them were excluded from the analysis and the rest of the 401 were selected for the analysis. The socio-demographic information about the sample will be described later.

4.7. Data Analysis Technique

This study employs multiple statistical techniques to analyze different types of data collected during the research under 3 different sections as described above. Descriptive statistical techniques were used to analyze socio-demographic information of the sample. It was done using IBM's SPSS 25. In the survey questionnaire, there were very few underlying measurement items for measuring the latent constructs (4 item scale for AU and PU, 3 item scale for PE, PS, PC, and SN). Also, all of the latent constructs were formative constructs. In addition to that, during the data collection, it was identified that the distribution of the data was highly skewed. This means that the distribution normality is not preserved. Considering all these facts the data analysis and model development of this research was done using Structural Equation Modeling (SEM) technique.

SEM is a statistical technique built upon mathematical concepts including 1) Factor Analysis, 2) Path Analysis and 3) Regression Analysis. SEM is used for examining and evaluating causal relationships using a mixture of statistical data and qualitative causal hypotheses. It connects multi-item scales into constructs and defines relationships between constructs.

SEMs consists of two types of models in itself including 1) Measurement Model and 2) Structural Model. The Measurement model is used as the factor analysis equivalent for understanding how underlying items measure a particular construct. Structural Model is used as the regression equivalent for understanding how different constructs relate with each other. Therefore, SEM is able to handle complex relationships between latent constructs and is able to handle multiple dependent constructs within a single model. In the case of SEM, there are two schools of SEM 1) Covariance Based SEM and 2) Partial Least Square (PLS) SEM. However, in this research, the ultimate aim is to maximize the described variance of endogenous latent variables (Sharma & Kim, 2012). Therefore, this research will be conducted following PLS-SEM principles with the support of SmartPLS 3 software. In the case of SmartPLS 3, it does not assume the normality of the data distribution. SmartPLS 3 also can be used with fewer indicator variables per construct. In addition to that SmartPLS is considered as a preferred alternative for assessing formative constructs (Ringle, Da Silva, & Bido, 2014).

5. DATA ANALYSIS

5.1. Socio-Demographic Analysis

A total of 401 valid responses (Appendix A) were utilized in the data analysis. Majority of the survey participants are between the 19 years to 25 years age category and the percentage is 40.6%. When the entire sample is considered 94.3% of the sample are between 19 years to 40 years. Also, this sample is a male-dominated sample where the male participation is 61.6% and hence the female participation is 38.4%. With regards to the highest education qualification obtained, the entire sample can be considered as having adequate literacy because 80.8% of the sample was having at least a diploma as the higher education qualification. Also, 78.8% of the participants use the bus as a mode of transportation. This means that the vast majority of the sample at least have had the experience of using public transport service for transportation purpose. In addition to that, 66.8% of the participants have more than 1 payment cards. Also, 94 % of the participants have at least one payment card. That means 94% of the participants are aware of the use of at least one type of cashless payment method. In addition to that statistics shows that 91.8% of them have used their payment cards at least once. However, the use of mobile payment applications for payment purposes is less compared to the use of payment cards. As a percentage, it is 83.3% and yet it is a considerably large portion of the sample.

Age Category	Frequency	Percentage	Cumulative Percentage
Below 18 Years	7	1.7	1.7
19 – 25 Years	163	40.6	42.4
26 – 30 Years	118	29.4	71.8
31 – 40 Years	97	24.2	96.0
41 – 50 Years	9	2.2	98.3
51 – 60 Years	3	0.7	99.0
Above 60 Years	4	1.0	100.0
Total	401	100.0	

Table 3 - Age Categories

Gender	Frequency	Percentage	Cumulative Percentage
Male	247	61.6	61.6
Female	154	38.4	100.0
Total	401	100.0	

Table 4 - Gender

Qualification	Frequency	Percentage	Cumulative Percentage
GCE O/L	9	2.2	2.2
GCE A/L	68	17.0	19.2
Diploma	28	7.0	26.2
Degree	232	57.9	84.0
Postgraduate	59	14.7	98.8
PhD/PostDoc	4	1.0	99.8
None of Above	1	0.2	100.0
Total	401	100.0	

Table 5 - Highest education qualification obtained

Use/Do Not Use	Frequency	Percent	Cumulative Percent
No	85	21.2	21.2
Yes	316	78.8	100.0
Total	401	100.0	

Table 6 - Use of buses as a transport method

Use/Do Not Use	Frequency	Percent	Cumulative Percent
No	289	72.1	72.3
Yes	111	27.7	100.0
Total	400	99.8	
Missing	1	0.2	
Total	401	100.0	

Table 7 - Use of taxies as a transport method

Use/Do Not Use	Frequency	Percent	Cumulative Percent
No	244	60.8	61.6
Yes	152	37.9	100.0
Total	396	98.8	
Missing	5	1.2	
Total	401	100.0	

Table 8 - Use of personal vehicles as a transport method

Number of Cards Possesses	Frequency	Percentage	Cumulative Percentage
0	24	6.0	6.0
1	109	27.2	33.2
More than 1	268	66.8	100.0
Total	401	100.0	

Table 9 - Number of payment cards possessed

	Frequency	Percentage	Cumulative Percentage
Daily	102	25.4	25.4
Weekly	90	22.4	47.9
Monthly	51	12.7	60.6
Selectively	89	22.2	82.8
Rarely	36	9.0	91.8
Never	33	8.2	100.0
Total	401	100.0	

Table 10 - Frequency of use of payment cards

	Frequency	Percentage	Cumulative Percentage
Daily	58	14.5	14.5
Weekly	99	24.7	39.2
Monthly	51	12.7	51.9
Selectively	75	18.7	70.6
Rarely	51	12.7	83.3
Never	67	16.7	100.0
Total	401	100.0	

Table 11 - Frequency of use of mobile payment applications

Have Used/ Haven't Used	Frequency	Percentage	Cumulative Percentage
No	286	71.3	71.3
Yes	115	28.7	100.0
Total	401	100.0	

Table 12 - Prior experience of using payment cards in Sri Lankan public transport sector

5.2. Assessment of Outer Measurement Model

The purpose of assessing the measurement model is to evaluate how the measurement instruments load on the hypothetical-defined construct (Ab Hamid, Sami, & Mohmad Sidek, 2017). When analyzing the measurement model, the link between the measurement instrument and the latent constructs is evaluated. Generally, there are two distinct types of measurement models such as formative models and reflective models (Becker, Klein, & Wetzels, 2012). In this research, all the measurement models are formative. Hence it is required to test, 1) Indicator Reliability, 2) Internal Consistency, 3) Construct Reliability, 4) Construct Validity, 5) Convergent Validity and 6) Discriminant Validity (Ab Hamid et al., 2017; Becker et al., 2012).

However, even before evaluating the measurement model by doing above mentioned tests, it is important to identify the nature of the data set properly, so that the analysis approach and the tools to be used in the research can be identified. Also, it helps to determine remedial actions to take when a basic underlying assumption is not met. This research will be conducted as a non-parametric analysis as it is multivariate analysis. In addition to that, the data set is an ordinal data set. Therefore, it is not required to do a distribution normality test due to the fact that non-parametric analysis is distribution-free. Also measuring the skewness and kurtosis of a set of ordinal data set is meaningless yet evaluating the adequacy and suitability of the sample dataset is very much important.

5.2.1. Assessment of Sample Adequacy and Suitability

The researcher conducted a Kaiser-Mayer-Olkin (KMO) and Bartlett's test of Sphericity to evaluate the sample adequacy and the suitability. In the case of KMO measurement, the value varies between 0 and 1, and values closer to 1 are considered as better (IBM Corporation, 2018). According to the results, the sample adequacy was at an acceptable level as the KMO was 0.894. In the case of Bartlett's Test of Sphericity, it is used to evaluate if the variables are unrelated and therefore unsuitable for structure detection. If the significance value is small it indicates that the factor analysis may be useful. Ideally, the value should be less than 0.05 (IBM Corporation, 2018), and in this study it was satisfied. This KMO and Bartlett's test was done using IBM SPSS 25.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.894
Bartlett's Test of Sphericity	Approx. Chi-Square	5034.406
	df	190
	Sig.	0.000

Table 13 - Sample Adequacy Test (KMO Test)

5.2.2. Assessment of Indicator Reliability

Indicator reliability is assessed to check the proportion of variance of the latent construct, which is described by the underlying indicator. The proportion can vary from 0 to 1. To be an indicator to be accepted, the value of the outer loading of it should be higher than 0.7 (Ab Hamid et al., 2017). In the case of indicator loading value is between 0.4 and 0.7, it should be deleted if it contributes to the increment of the Composite Reliability (CR) and Average Variance Extracted (AVE). Also if the loading of the indicator is less than 0.4, it should always be deleted (Ab Hamid et al., 2017). In this research, during the outer model analysis, it was found that 6 of the underlying indicators (AU3 - 0.595, AU4 -0.686, PU3 - 0.586, PU4 - 0.666) were having poor loading estimates. And also it was noticed that deleting them contributes to increasing the CR and AVR as well. Therefore, they were deleted and discarded from further analysis.

5.2.3. Assessment of Internal Consistency

Internal consistency reflects how far the measurement instruments within a construct measure the different aspects of the same construct (Hair, Black, Babin, & Anderson, 2010). In other terms, it is done to assess the reliability based on the interrelationships of the observed indicators of a latent construct. It is generally measured using Cronbach alpha and CR. These values range from 0 to 1 and high values indicate a high reliability and consistency level. In the case of exploratory research, if the values of Cronbach's alpha and CR are between 0.60 and 0.70, then it is considered acceptable. In advance researches, the value needs to be greater than 0.70 (Ab Hamid et al., 2017). As shown in the below table (Table 14), the Cronbach's alpha value of the latent constructs in this study is in between 0.766 and 0.926. At the same time, CR values are ranging from 0.767 to 0.925.

5.2.4. Assessment of Convergent Validity

Convergent Validity is a sub-type of Construct Validity and it is designed to assess if a particular construct actually measures the said construct. In other words, it measures if two measurement instruments of the same constructs are truly related to each other (Ab Hamid et al., 2017; Hair et al., 2010). In order to establish the convergent validity, the factor loading estimates of the observed indicator, CR, and AVE) have to be considered (Ab Hamid et al., 2017). In order to establish the CR and AVE, the values should exceed 0.7 and 0.5 respectively (Ringle et al., 2014). Accordingly, as shown in Table 14, convergent validity is established.

From		To	Estimate (β)	Cronbach's Alpha	CR	AVE
IU	→	IU	1.000	1.000	1.000	1.000
AU	→	AU1	0.817	0.766	0.767	0.622
	→	AU2	0.759			
PU	→	PU1	0.807	0.794	0.794	0.658
	→	PU2	0.815			
PE	→	PE1	0.872	0.891	0.895	0.741
	→	PE2	0.930			
	→	PE3	0.773			
PS	→	PS1	0.941	0.926	0.925	0.805
	→	PS2	0.837			
	→	PS3	0.911			
PC	→	PC1	0.851	0.849	0.848	0.652
	→	PC2	0.727			
	→	PC3	0.838			
SN	→	SN1	0.829	0.838	0.840	0.639
	→	SN2	0.702			
	→	SN3	0.858			

Table 14 - Convergent Validity

5.2.5. Assessment of Discriminant Validity

The difference between the measurement models of two different constructs is an important aspect of the study. As explained by Hair et al. (2009), the discriminant validity is used to ensure if a set of measurement instruments of a particular construct truly measures the intended construct or rather the measurements are more related to some other construct in the measurement model (Ab Hamid et al., 2017; Hair et al., 2010). The discriminant validity of a construct can be assessed by using 1) Cross-Loading of indicator, 2) Fornell-Larcker

Criterion and 3) Heterotrait-Monotrait (HTMT) Ratio of correlations (Ab Hamid et al., 2017) (Ringle et al., 2014).

When determining the discriminant validity by looking at the 1) Cross-Loadings, the factor loading estimates of the indicator has to be higher than the factor loading estimates with other constructs. In this case, the factor loading estimates should be higher than 0.7 (Ab Hamid et al., 2017). As shown in Table 15, it is clear that all the measurement instruments have loaded into only one latent construct with a higher factor loading estimation which exceeds 0.7 (Ab Hamid et al., 2017; Ringle et al., 2014). Therefore it can be considered as that the discriminant validity is established.

	AU	IU	PC	PE	PS	PU	SN
AU1	0.817	0.445	0.512	0.497	0.271	0.675	0.437
AU2	0.759	0.439	0.455	0.432	0.307	0.612	0.405
IU	0.560	1.000	0.576	0.472	0.285	0.577	0.404
PC1	0.511	0.480	0.842	0.587	0.245	0.568	0.550
PC2	0.437	0.469	0.718	0.483	0.270	0.484	0.474
PC3	0.533	0.449	0.854	0.587	0.248	0.564	0.593
PE1	0.525	0.436	0.611	0.872	0.208	0.554	0.524
PE2	0.569	0.440	0.593	0.93	0.209	0.622	0.518
PE3	0.419	0.337	0.571	0.773	0.188	0.465	0.530
PS1	0.360	0.269	0.302	0.224	0.941	0.303	0.240
PS2	0.322	0.239	0.282	0.214	0.837	0.250	0.230
PS3	0.300	0.260	0.259	0.196	0.911	0.233	0.243
PU1	0.680	0.494	0.522	0.500	0.255	0.820	0.394
PU2	0.646	0.443	0.565	0.537	0.220	0.803	0.409
SN1	0.478	0.323	0.568	0.512	0.206	0.465	0.829
SN2	0.369	0.278	0.479	0.430	0.210	0.341	0.702
SN3	0.429	0.363	0.556	0.508	0.221	0.378	0.858

Table 15 - Measurement Instruments Cross Loadings

The next criterion used to determine the discriminant validity is Fornell-Lacker criterion. In this case, the AVE of the latent construct is compared with the relationships with other variables. For the establishment of discriminant validity, the square root of the AVE of a particular construct is required to be higher than all the correlations that particular construct has with other constructs (Ab Hamid et al., 2017; Chin, 1998).

In this research, it was identified that between the AU and PU there is a minor dispute. However, the difference is too small, (0.028), and can be ignored (Ab Hamid et al., 2017). And there is enough evidence in the literature, which proves that the AU and PU are very important two distinct constructs that are important to determine the IU (de Luna et al., 2017; Liébana-Cabanillas et al., 2017). And at the same time, SmartPLS 3.0 also does not recognize this ignorable dispute as a failure of discriminant validity. Therefore, though there is a small dispute in empirical evidence, giving higher importance to the literature, it can be considered as that the discriminant validity of the scale is established. Hence the researcher conducted the analysis with the existing measurement model because, as described earlier, (according to the Cross-Loading of indicator method) also it has been already proved the discriminant validity of data measurement model. Also the variance was significantly different from 0. At the same time, the correlations between any pair of values have not exceeded 0.9 (Hair et al., 2010).

	AU	IU	PC	PE	PS	PU	SN
AU	0.789						
IU	0.560	1.000					
PC	0.614	0.576	0.807				
PE	0.590	0.472	0.687	0.861			
PS	0.365	0.285	0.313	0.235	0.897		
PU	0.817	0.577	0.669	0.639	0.293	0.811	
SN	0.534	0.404	0.670	0.607	0.265	0.495	0.799

Table 16 - Fonnel-Larcker Criterion

The third method used to assess the discriminant validity is the use of Heterotrait-Monotrait (HTMT) ratio of correlation. HTMT is said to be offering greater specificity and sensitivity rates (97% to 99%) as opposed to other methods like 1) Cross-Loadings Criterion (0.00%) and Fornell-Lacker Criterion (20.82%). When assessing the discriminant validity using HTMT; if the value is closer to 1, it indicates a lack of discriminant validity. When using this HTMT criterion, the HTMT value is compared with a predefined threshold. In this case, if the HTMT value is greater than the predefined threshold, then it is considered as a lack of discriminant validity. According to the acceptance criteria, all values were lower than the conventional threshold of 0.85 (Kline, 2011). Hence it can be considered that the discriminant validity is established.

	AU	IU	PC	PE	PS	PU	SN
AU							
IU	0.561						
PC	0.612	0.578					
PE	0.589	0.473	0.689				
PS	0.366	0.285	0.315	0.236			
PU	0.818	0.577	0.668	0.639	0.292		
SN	0.535	0.403	0.669	0.613	0.267	0.495	

Table 17 - Hetarotrait - Monotrait Ratio (HTMT)

5.3. Assessment of Inner Structural Model

After confirming the reliability and validity of the Outer Measurement Model, the next step is to assess the Inner Structural Model. This assessment includes examining the proposed model's prediction power. Also, it examines the correlations between the identified constructs. To assess the Inner Structural Model it is required to estimate several measurements including, 1) Coefficient of Determination (R^2), 2) Path Coefficient (β Value) and T-Statistic Value, 3) Effect Size (f^2), 4) The Predictive Relevance of the model (Q2), and 5) Goodness of Fit (GoF) indices.

5.3.1. Estimation of Coefficient of Determination (R^2)

The R2 or the Coefficient of determination is used to measure the overall effect size. And also it measures the described variance of the endogenous construct of the structural model. Eventually, it measures the predictive accuracy of the model. According to acceptance criteria, R^2 values greater than or equal to 0.75 is considered substantial. An R^2 value of 0.50 is considered as moderate. If R^2 value is less than or equal to 0.26 is considered as weak (Hair et al., 2010). According to the results of this study, the R^2 value was 0.34 and which is above the weak level and close to the moderate level. It means that the selected constructs were able to explain 34% of the variance of IU. In other words, it suggests that there are another set of constructs or measurements which is able to explain 66% of the variance of IU.

Endogenous Variable	R Square	R Square Adjusted
IU	0.335	0.330
AU	0.691	0.688
PE	0.368	0.367
PU	0.509	0.507

Table 18 - Estimation of the Coefficient of Determination (R^2)

5.3.2. Estimation of Path the Coefficient (β) and T-Statistics

The path coefficient in the PLS and the standardized β coefficient in the regression analysis is similar to each other. The β value indicates the weight of the hypothesis being tested. Also, the β value denotes the explained variance in the dependent variable, when a unit variation is done at the independent construct(s). The greater the β value, the higher the substantial effect on the dependent variable (Hussain, Fangwei, Siddiqi, Ali, & Shabbir, 2018). The significance of β value was evaluated using the T-statistics test. The significance of the research hypothesis was evaluated using bootstrapping procedures and where the researcher used 2000 subsamples.

Path			Hypothesis	Path Coefficient (β)	T - Statistic	p -Value	Status
AU	→	IU	H01	0.457	4.433	<0.001	Accepted
PE	→	AU	H02	0.034	0.423	0.672	Rejected
PE	→	PU	H03	0.340	3.950	<0.001	Accepted
PU	→	AU	H04	0.712	7.595	<0.001	Accepted
SN	→	AU	H05	0.154	1.710	0.087	Rejected
SN	→	IU	H06	0.137	2.084	0.037	Accepted
SN	→	PE	H07	0.607	14.013	<0.001	Accepted
PS	→	IU	H08	0.082	1.238	0.216	Rejected
PC	→	AU	H09	0.010	0.101	0.919	Rejected
PC	→	PU	H10	0.436	4.840	<0.001	Accepted

Table 19 - Estimation of Path Coefficient (β) and T-Statistics

In H01, it was proposed that the AU has a positive relationship in determining the IU. According to the above results (β=0.457, T=4.433, p<0.001) H01 is empirically supported. It means that an individual's attitude about using cashless payments has a direct impact on determining his\her intention to use it. In H02, it was proposed that PE has a direct impact on AU. According to the above results, (β=0.034, T=0.423, p=0.672) path coefficient of

PE→PU is not significant. And the path significance is also not acceptable. Hence H02 is empirically not supported. This means that an individual's attitude towards the use of cashless payments is not impacted by the ease of use of the cashless payment method. In H03, it was proposed that PE has a direct impact on determining the PU. According to the results, (β=0.340, T=3.950, p<0.001) H03 is empirically supported. It means that, when an individual finds a particular cashless payment method as easy to use, then there is a temptation to consider as a useful payment alternative in the public transport sector in Sri Lanka. In H04, it was proposed that PU has a direct impact in determining AU. According to the results, (β=0.712, T=7.595, p<0.001) H04 is empirically proved. In this case, the results show that there is a strong correlation between PU and AU. It means that, when an individual finds a cashless payment method as useful, then there is a high probability to have a positive attitude towards using it as a cashless payment alternative in the public transport sector in Sri Lanka. In H05, it was proposed that SN has a positive impact on determining AU. According to the results, (β=0.154, T=1.710, p=0.087) H05 was not empirically supported. It means that subjective norms do not make an impact on an individual's attitude towards the use of cashless payments as an alternative payment method in the public transport sector in Sri Lanka. In H06, it was proposed that SN has a direct impact on IU. According to the results, (β=0.137, T=2.048, p=0.037) H06 was empirically supported. It means that subjective norms can make an impact on an individual's intention to use cashless payments in the public transport sector in Sri Lanka. However, this impact is less significant. In H7, it was proposed that SN has a direct impact on PE. According to the results, (β=0.607, T=14.013, p<0.001) H07 is empirically supported. It means that subjective norms can make a significant impact on an individual's perception about the ease of use of a cashless payment method within the public transport sector in Sri Lanka. In H08, it was proposed that PS has a direct impact on determining IU. According to the results, (β=0.082, T=1.238, p<0.216) H08 was not supported by empirical evidence. It means that an individual's perception about the security aspect of cashless payment methods has no direct impact in determining the intention to use it within the pubic passenger transport sector in Sri Lanka. In H09, it was proposed that PC has a direct impact on determining AU. According to the results, (β=0.010, T=0.101, p=0.919) H09 was not empirically supported. It means that an individual's perception about the compatibility of a cashless payment method has no direct impact on determining the attitude to use it. In H10, it was proposed that PC has a direct impact on determining PU. According to the results, (β=0.436, T=4.840, p<0. 001) H10 was empirically supported. It means that an

individual's perception about the compatibility of a cashless payment method can make a direct impact on the perception of the usefulness of it.

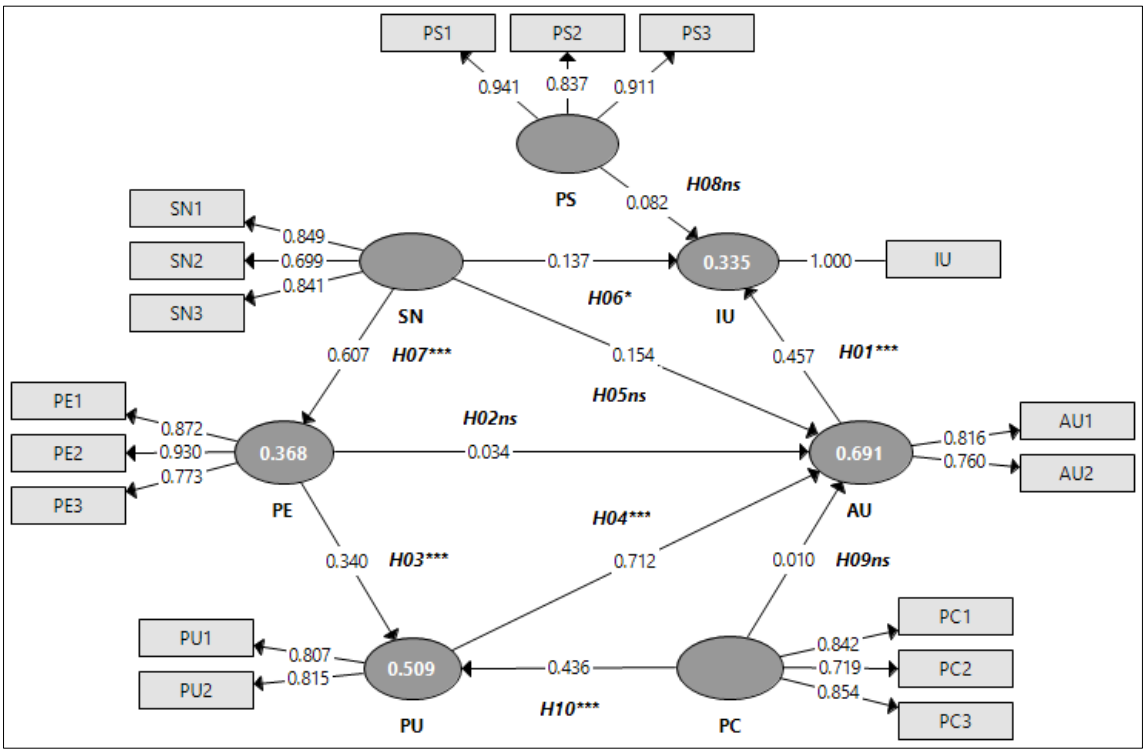

Figure 3 - Proposed Model – Path Analysis Results

5.3.3. Estimation of Effect Size (f^2)

The f^2 Effect-Size is a quantitative measurement which is used to explain the magnitude of the experimenter effect. It means that, the degree of the impact that an exogenous construct has on an endogenous construct. According to the acceptance criteria, 1) f^2 values greater than 0.35 indicates a strong effect, 2) f^2 values greater than 0.15 indicates a moderate effect, and 3) f^2 values less than 0.02 indicates a weak effect (Jacob Cohen, 1988). According to the f^2 values obtained in this research, each of H04 and H07 has got a considerably large f^2 value which is greater than 0.35 and a highly significant p-value ($p<0.001$). That means in H04 and H07, exogenous variables have a significant impact on respective endogenous variables. In H01, H03, H05, H06 and H10, each of them has got a very significant p-value ($p<0.001$), but their f^2 values are less than 0.350. This indicates that, in H01, H03, H05, H06 and H10, the exogenous variable has a moderate impact on the endogenous variable. With regard to the H02, H08 and H09, each of them has very large p-values which are greater than 0.05 and very small f^2 values which are less than 0.02. Hence it can be concluded that in H02, H08 and H09, respective exogenous variables have a very weak impact on their respective endogenous variables.

Path			Hypothesis	Path Coefficient (β)	p -Value	Effect Size (f^2)	Effect
AU	→	IU	H01	0.457	<0.001	0.207	Moderate Effect
PE	→	AU	H02	0.034	0.672	0.002	Weak Effect
PE	→	PU	H03	0.340	<0.001	0.125	Moderate Effect
PU	→	AU	H04	0.712	<0.001	0.805	Strong Effect
SN	→	AU	H05	0.154	0.087	0.039	Moderate Effect
SN	→	IU	H06	0.137	0.037	0.020	Moderate Effect
SN	→	PE	H07	0.607	<0.001	0.538	Strong Effect
PS	→	IU	H08	0.082	0.216	0.009	Weak Effect
PC	→	AU	H09	0.010	0.919	0.000	Weak Effect
PC	→	PU	H10	0.436	<0.001	0.205	Moderate Effect

Table 20 - Estimation of Effect Size (*f*2)

5.4. Assessment of Model Fit

As described by Hair, et al. (2017) researchers should be very cautious in reporting model fit in PLS-SEM ("Model Fit," n.d.). Because the proposed criteria are still in the early stage of their researches they are often not useful for PLS-SEM ("Model Fit," n.d.). Therefore SmartPLS does not encourage to report and use these model fit criteria for PLS-SEM result assessments.

5.4.1. Standardized Root Mean Square Residuals and Normal Fit Index

The Standardized Root Mean Square Residuals (SRMR) is an index, which is derived from the average of standardized residuals between the observed covariance metrics and the hypothesized covariance matrices (F. F. Chen, 2007). The SRMR measures the estimated model fit of the proposed model. According to the acceptance criteria, if SRMR < 0.08, then the model is considered as having a good fit (Hu & Bentler, 1998). The lower SRMR the better the fit. However, in this research model has got an SRMR value of 0.078 confirming the goodness of model fit. Also, the Chi-Square of this model was 602.029.

In addition to these, the Normal Fit Index (NFI) is also one of the earliest fit measures used in the literature of SEM (Bentler & Bonett, 1980). NFI results in a value between 0 and 1 and when the value is closer to 1, the better the model fit. Usually, NFI greater than or equal to 0.9 represent an acceptable model fit (Kroonenberg & Lohmoller, 1990). NFI does not

penalize the model for its complexity. It means that the higher the parameter count in the model, the better the model fit. Therefore this is not recommended for measuring the model fit when the number of parameters is less. In this research also there are very few parameters and hardly achieve the model fit criteria by reaching a rounded NFI value of 0.9.

Index	Estimated Model
SRMR	0.078
d_ULS	0.941
d_G1	0.364
d_G2	0.308
Chi-Square	602.029
NFI	0.866

Table 21 - Model Fit

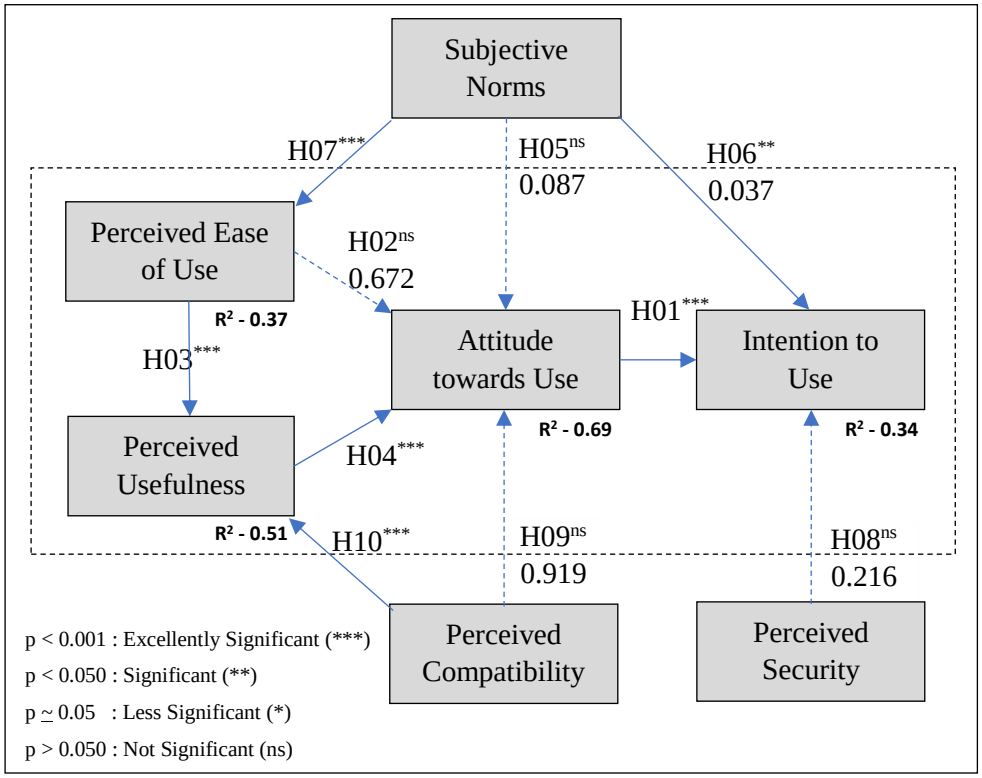

Figure 4 - Proposed Model – Passengers' Intention to Use Cashless Payment Systems to Purchase Transit Tickets

6. CONCLUSION AND FUTURE WORK

The first general observation from this research is the very positive (99.3%) attitude of passengers towards the use of cashless payments for purchasing passenger tickets. A vast majority of the survey participants have expressed their positive perception about the advantage, usefulness, ease of use and compatibility with their own lifestyle. This reveals the available demand for a cashless passenger ticket purchase mechanism in Sri Lanka. Therefore, it is recommended to initiate a project towards introducing a cashless payment mechanism to reduce the use of cash from the public transport sector of Sri Lanka. However, in this case, before introducing cashless payment methods to the public transport sector in the country, it is recommended to consider following findings and recommendations.

6.1. Conclusions and Recommendations

6.1.1. Empirical Findings and Recommendations

- **Attitude is everything: Attitude towards the use of cashless payment has the highest impact on determining passengers' intention to use it.**

According to the above data analysis, AU, PU, PE, PS, PC and SN can represent only 34% of the variance of IU. This indicates that there are another 66% of variables that determines the passengers' intention to use or not to use cashless payments in the public transport sector in Sri Lanka. Out of the identified factors, the AU has the greatest impact on IU which is 69% of the total impact on IU. Therefore, when introducing cashless payment systems to the public transport sector in Sri Lanka, it is very much important to consider this fact. Before introducing a cashless payment system, it is highly recommended to carefully analyze passengers' attitude toward the use of them in the public transport sector. This means that business owners should conduct programs to improve public awareness about the usefulness of adopting cashless payments for purchasing transit tickets within the public transport sector.

- **Usefulness is more important than the ease of use of payment method: Awareness about the usefulness of, use of cashless payment methods can influence passengers' attitude toward the use of cashless payments. Just ease of use is not enough.**

According to the above results, it was evident that PE has no direct impact on AU. Rather PE has an indirect impact on AU through PU. This indicates that the ease of use of a cashless payment method has no strong direct impact on making passengers' attitude to use them.

Rather passengers find cashless payment methods useful as they become easy to use and understand. This indicates that, in order to improve passenger's attitude towards the use of cashless payments, it is required to improve the awareness about the usefulness of adopting cashless payment systems. In other terms, though the cashless payment method is easy to use, still it will be not adopted by the passengers if they are not aware of the usefulness of it. Therefore, it is recommended for the business owners to highlight the usefulness of use of cashless payment methods rather than highlighting the ease of use of those methods during the marketing process. And also, business owners are suggested to develop business models which can offer useful features and functionalities for the end users because higher the usefulness, higher the passengers' attitude to use it. Therefore, cashless payment methods should be used for multiple purposes. For example, a single cashless payment method should be able to use for multiple types of low-value payments (purchasing passenger tickets, purchasing season tickets, paying supermarket bills, paying utility bills, purchasing movie tickets, purchasing event tickets etc.). In the case of using smart cards as cashless payment alternatives, in addition to payments, they can be used for identity or authentication purposes as well. (Employee identity cards, access passes, gate pass, membership or loyalty cards, library cards etc.). Also, technology service providers are also advised to design and develop a cashless payment instrument to be useful across multiple industries including, micropayment, identity and authentication, retail payment, and transportation.

Therefore, when business owners or technology service providers design a cashless payment solution for the public transport sector, it is recommended to design them as a multiservice product (M. C. Ferreira & Dias, 2015). From a business perspective, Multiservice Approach is very important as it enriches and enlarges the business model by creating links between city services (including but not limited to grocery, supermarket, hospital, school, sport, parking, restaurant, bank, leisure etc.) and transport system (M. C. Ferreira & Dias, 2015). These links can be created through discounts, loyalty points, offers etc. given to passengers who use a cashless payment system for purchasing transit tickets. This Multiservice Approach encourages passengers' mobility and the volume of transactions they make.

- **Individual compatibility influences the usefulness: When passengers find cashless payment methods more compatible with their own lifestyle, then they find it more useful.**

A passenger's perception about how compatible the cashless payment with their own lifestyle has a direct impact on their perception about the usefulness of the payment method. When passengers find a cashless payment method is compatible with their own lifestyle and payment behaviour, they find it useful. Because of the positive perception about the usefulness, passengers build up their attitude towards the use of cashless payments in the public transport sector in Sri Lanka. Therefore, it is suggested for business owners and technology service providers to study passenger's lifestyle and payment behaviour when designing and planning cashless payment option to the transport sector in Sri Lanka.

- **Subjective norms can make an impact: A passenger's intention to use cashless payments, and the perception about the usefulness, can be inspired by people who are mattering to the passenger.**

Above data analysis reveals that passenger's intention to use cashless payment methods can be inspired by people who are mattering to the passenger. However, this impact is not so significant. According to the results, it was clear that subjective norms cannot make a strong direct impact on changing a passengers' attitude towards the use of cashless payments but their perception about the ease of use of cashless payment methods. Also, spreading the awareness about ease of use and therefore the usefulness of cashless payment methods through subjective norms is more effective than just spreading the message to the general public through advertisements. Therefore improving the awareness about the usefulness of the cashless payment methods can be done through subjective norms. Therefore, promotion campaigns should be designed considering this finding.

- **Security of transport information is less important: Passengers are not aware of the security impact of the misuse of their transport-related information.**

The data analysis revealed that the passengers' perception of the importance of transport information is less. It means that passengers are not aware of the gravity of the threat that can be raised due to the misuse of personal transport data. Hence it is recommended to conduct awareness programs to improve passengers' awareness about the importance of transport data.

Also, this indicates technology service providers need to design and develop cashless payment systems to meet the minimum required security of transit ticket related information because if otherwise when security measures are unnecessarily imposed on cashless payments, it might introduce an additional overhead on the system functionality and performance. For example, when cryptographic systems are used for preserving data security, it introduced system performance issues as cryptographic operations are expensive in terms of processing time and resource usage. This has a negative effect on the end-user experience because when the transaction process complexity and when the transaction processing time is higher, it introduces operational issues. Eventually, this can affect passengers' perception of the ease of use and the usefulness of the cashless payment system.

By implementing these recommendations, it will be easy to address the issues mentioned by the industry experts which is highlighted in the section 2.1.

6.2. Limitations

Despite its contribution to the public transport sector and cashless payment domain, this study has its limitations as well. The main limitation is regarding the sampling and data gathering. Cashless payment adoption within the public transport sector affects the passengers who use all types of public transport method available in Sri Lanka. Namely, all people who use busses, trains, boats, ferries, and aero-planes for domestic movement belong to this population. However, due to the time, budget and other limitations, only people who have access to the internet were selected to conduct this survey. One of the main reasons to select this group of people was that the nature of this context of this study. When cashless payments are considered, in most of the cases, the user is required to have some kind of knowledge and skill to use the internet and technology. Therefore, the questionnaire has to be completed by people who at least have the minimum level of technical and internet literacy. In addition to that, another limitation is that the questionnaire was published in the English language only. In Sri Lanka, there are 3 main languages used by citizens. Generally, there is a high chance that people who use Sinhala or Tamil will also respond to English. But, also there are people who understand Sinhala or Tamil only and therefore their views are not captured in this research. At the same time, since this study was conducted as an online survey, people who have no access to the internet might have a different perception about the use of cashless payments in the public transport sector. That also needs to be considered by future researchers.

Another limitation of this study is that it has studied only the passenger's perspective of the context. But when determining passengers' adoption of cashless payments in the public transport sector, it is not the only perspective that has to be considered. It is important to study the factors from other perspectives like vehicle owner's perspective, merchant's perspective, government's perspective, technology provider's perspective, community groups' and unions' perspective, service provider's perspective etc.

6.3. Future Work

The proposed model explains only 34% of the variability of a passenger's intention to use cashless payment methods in the public transport sector in Sri Lanka. Which indirectly means there are another 66% of facts that explain the phenomena. Hence further research is required to uncover these factors with regard to the cashless payment adoption in the public transport sector in Sri Lanka. Therefore, it is required to study this phenomenon avoiding the above-mentioned research limitations.

In this case, it is recommended to extend the research by taking a more representative sample of the public transport service users in Sri Lanka. Also, it is suggested to extend the research to other perspectives that have a direct impact on cashless payment adoption in the public transport sector in Sri Lanka. In this case, it is recommended to study: 1) transport service providers' perspective (Bus, train, boat, ferry services etc.), 2) transport service employees' perspective (Conductors, drivers, ticket checkers, supervisors etc.), 3) perspective of governing bodies (Ceylon Transport Board, National Transport Commission, Private Bus Owners Union etc.) etc.

This research study was conducted considering all cashless payment methods as the same. However, there are different cashless payment alternatives including (but not limited to) card-based payments, NFC payments, QR payments, mobile payments, token-based payments etc. Therefore, passengers' intention to adopt different cashless payment alternatives may be different from one to another. Hence, it is suggested to study this phenomenon considering different cashless payment alternative as well.

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8. APPENDIXES

Appendix A: Survey Questionnaire and Results

Responses cannot be edited

Use of Cashless Payments for Purchasing Passenger Tickets

*Required

Survey Questionnaire

Dear Sir/Madam,

I am a postgraduate student of the Department of Computer Science and Engineering, University of Moratuwa. As partial fulfillment of the Master of Business Administration (MBA in IT) program, currently, I am engaged in a research study on;

"Adoption of Cashless Payments in the Public Passenger Transport Sector in Sri Lanka".

Therefore, I would appreciate if you could spare a few minutes of your precious time to complete and submit the below questionnaire. It contains 17 simple questions which should take about 10 minutes to answer. Your complete response will be very important and helpful for me to conduct my research study.

All the information you provide will remain completely confidential and will be used solely for academic purposes only. Further, I am not requesting any of your personal identification information, as I want to assure your anonymity.

Thank You,

Noyel Medawatta | noyel.18@cse.mrt.ac.lk
MBA – IT (2018)
Department of Computer Science and Engineering,
Faculty of Engineering.
University of Moratuwa.

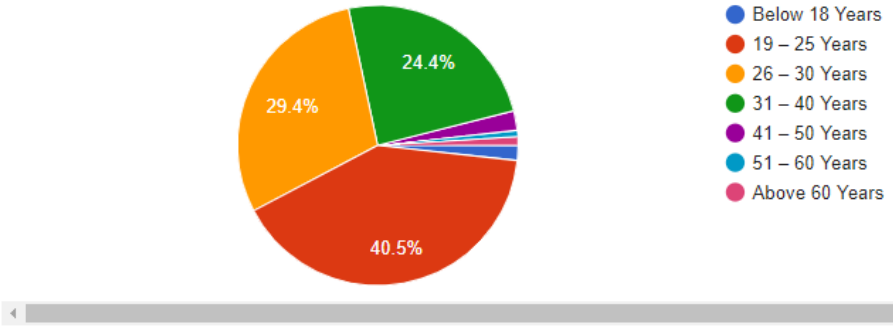
Personal factors

(Please select the most suited answer for you)

Personal factors

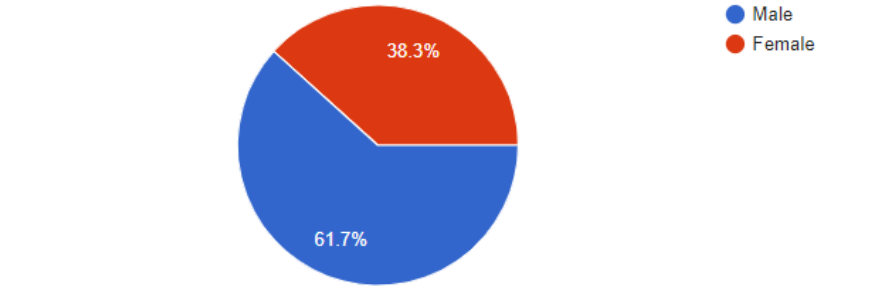
01. What is your age?

402 responses



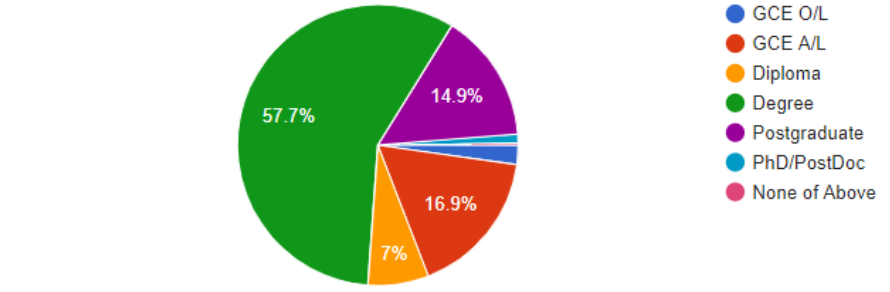
02. What is your gender?

402 responses



03. What is the highest level of education qualification you have obtained so far?

402 responses

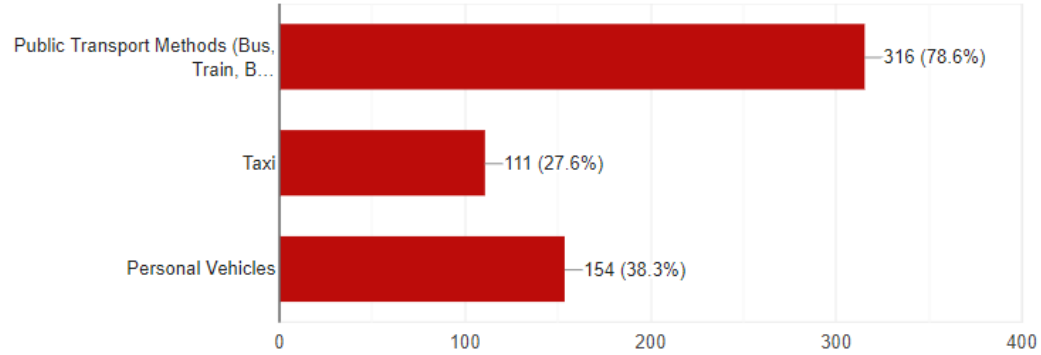


Technology and payment expertise

(Please select the most suited answer for you)

04. What do you use as the main method of transportation for your day to day traveling needs?

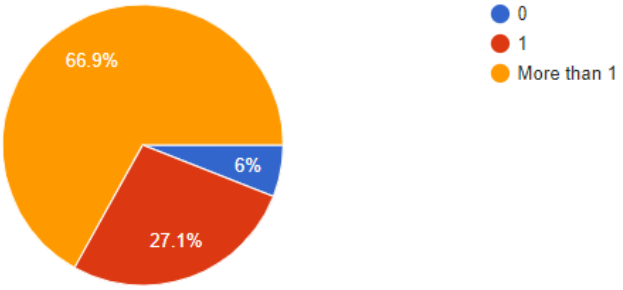
402 responses



Technology and payment expertise

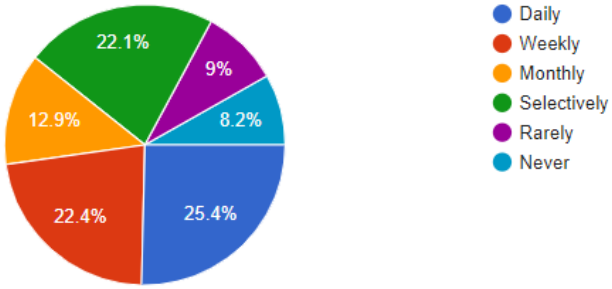
05. How many payment cards do you have?

402 responses



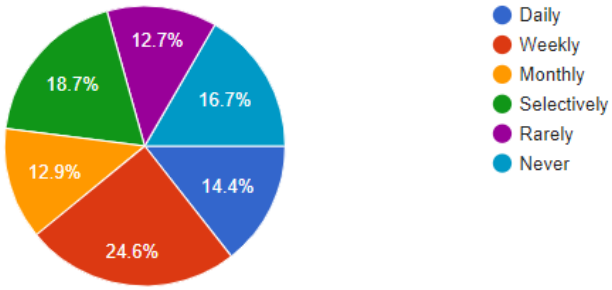
06. How often do you use payment cards to settle your payments?

402 responses



07. How often do you use mobile applications do your payments?

402 responses



Use of cashless payments for purchasing passenger tickets

✸Passenger Ticket

- A ticket that allows a passenger of the service to take either a certain number of pre-purchased trips or unlimited trips within a fixed period of time.

(Eg. Bus Tickets, Train Tickets, Boat Tickets, Season Tickets etc...)

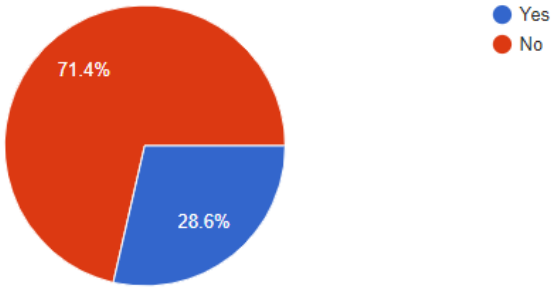
✸Cashless Payment Methods

- In all following questions, "Cashless Payment" refers to payment methods used within the pubic passenger transport sector for paying passenger ticket fare.

(Eg. Credit / Debit / Smart Card Payments, E-Wallet Payments/Mobile Payments , QR Payments, Bank Transfers etc...)

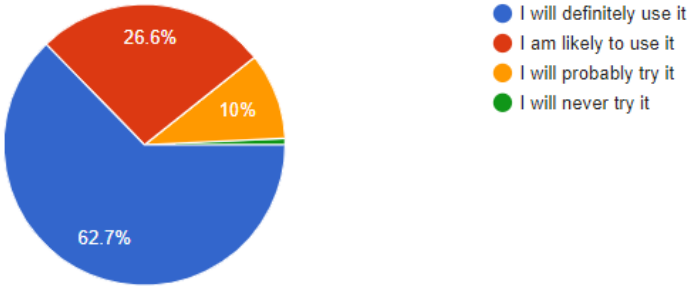
08. Have you ever used any cashless payment methods for purchasing passenger tickets in Sri Lanka?

402 responses

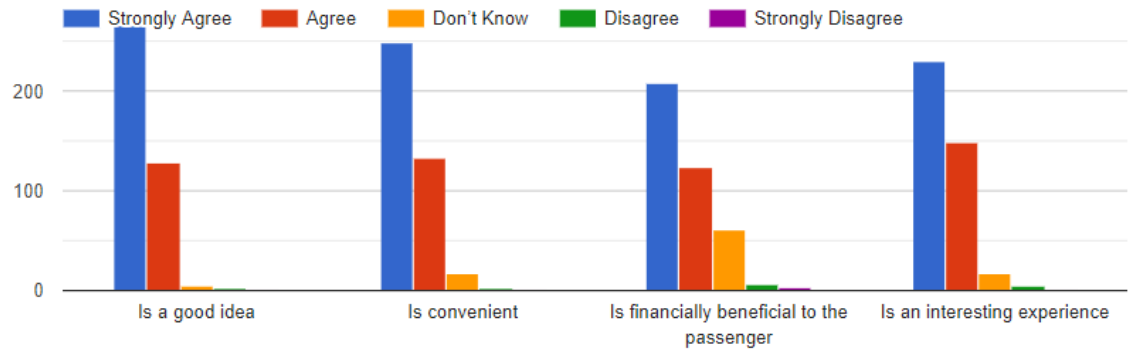


09. I believe that, if I get a chance to use cashless payment methods for purchasing passenger tickets;

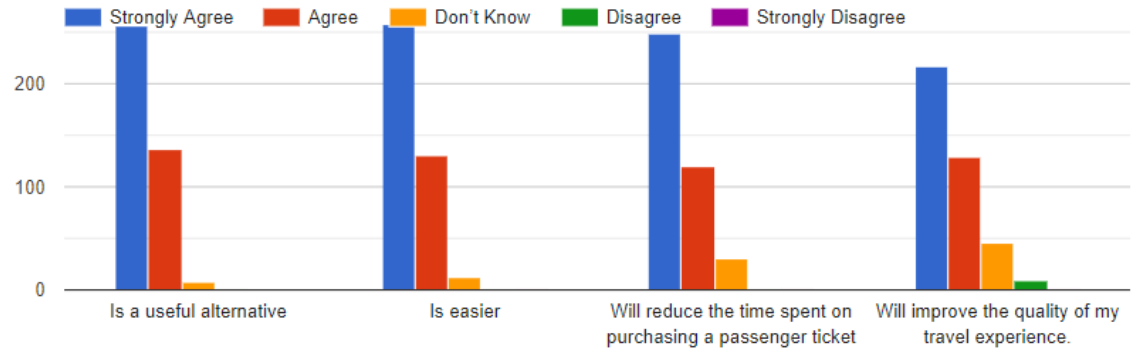
402 responses



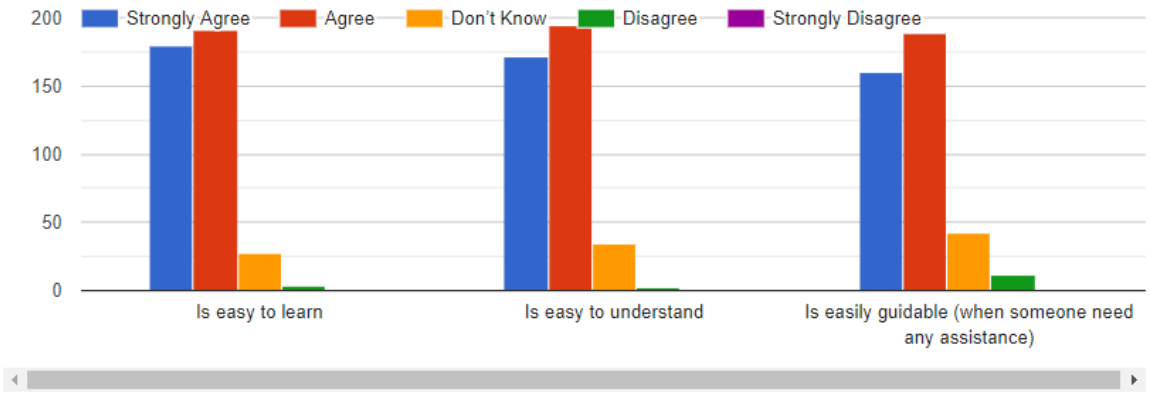
10. I believe that the use of cashless payments for purchasing passenger tickets;



11. I believe that the use of cashless payment methods for purchasing passenger tickets;

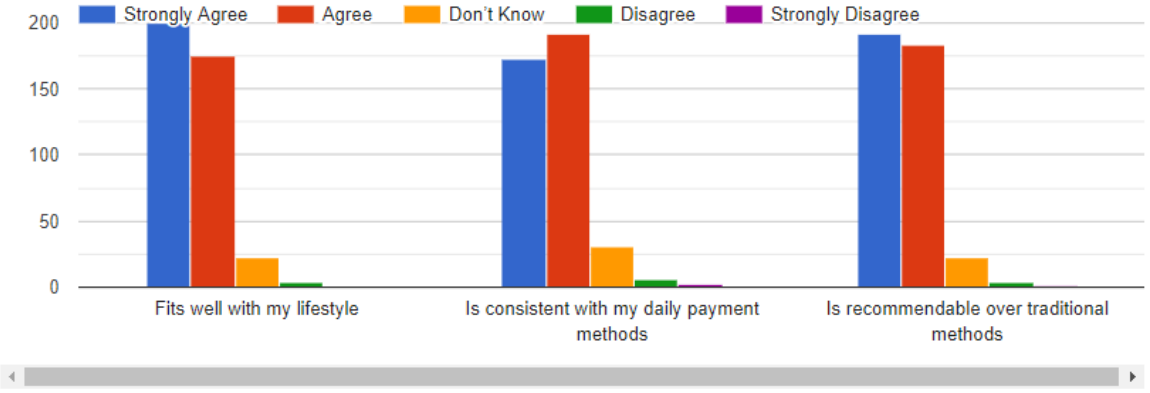


12. I believe that, using cashless payments for purchasing passenger tickets;

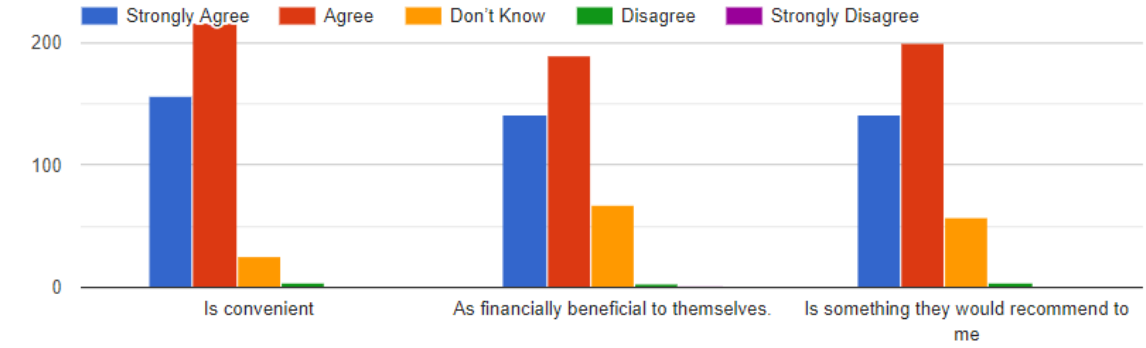


13. I believe that when I use cashless payment systems for purchasing passenger tickets;

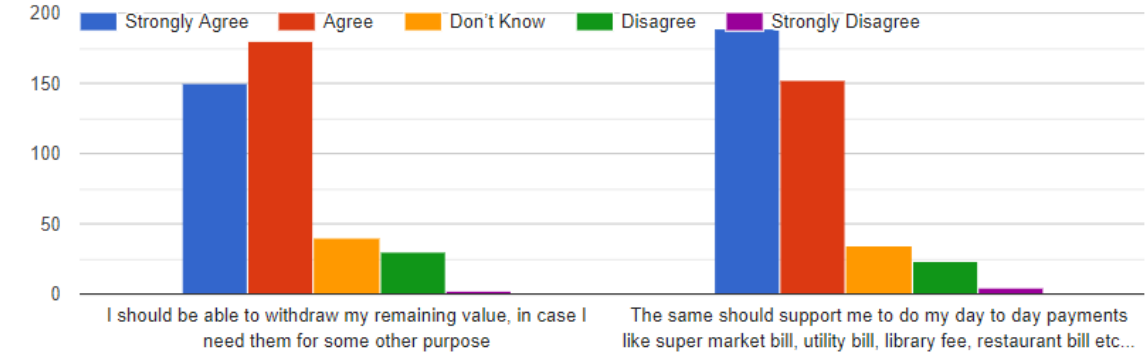
14. I believe that, the use of cashless payment methods for purchasing passenger tickets;



15. I believe that, the people who are important to me, will find the use of cashless payments for purchasing passenger tickets;



16. I believe that, when I use a cashless payment method for purchasing passenger tickets;



17. Please state your past experiences and/or suggestions on "purchasing passenger tickets using cashless payment methods".

162 responses

1) Sometimes back I had a touch travel pass, but conductors did not accept it. 2) Its good if government enforce passengers and bus operators to adopt this kind of a system 3) Its beneficial to the passenger, bus operator and country in many ways
I have experienced this kind of a system at Singapore. It Would be a good idea if can implement in Sri Lanka too
I have experienced this kind of a system at Singapore. It Would be a good idea if can implement in Sri Lanka too
I am likely to use if it is a must. Normally I am not much in to use technology when I can do something without using technology
It should be acceptable for all over the Island, otherwise it will be useless
-
Obtaining passenger tickets via online payment was very convenient and hassle free. It should be made available for all public transport methods.
Should have a convenient way to top up the cards or mobile apps securely. Should reduce the queues. Should be very easy to use. Affordable. Most rides should accept it.
no
It was so good. I always use cashless payments.
It is method that is used is developed counties. I have used it when I was in Singapore.
Using public transportation (private buses), bus conductors doesn't have motivation on using ticketing machines and cards (most probably because of they doesn't have extra benefit on using cashless payments and they cant cheat on passengers and bus owners). If we ask that we are going to pay with cashless card, they are trying to reject it with some some reasons. Terminals / cards not functioning very well for some times.
If you introduce new cashless payment card , it should be more secure card & it should has ability to use another (day to day payments) payments. As well as it should has ability use as ATM card to withdraw remaining balance of the card.
I Live in Dubai, here we mostly use cashless transactions, which is very much successful. I wish you all the best for your efforts.
Some countries such as Germany, offer this service. The ticket can be used weekly monthly etc. No need to purchase every time. It is really helpful.
Past experience was in Singapore which utilised NFC. About the experience; To put it simply, I found it extremely convenient and made my multiple transportation method easy. Definitely would do anything to have a similar system here.
I believe it should be a dynamic card or an app which can be used for different purposes. The need for a common transportation fee collection system is needed so that we can pay it with any method by topping up the master card.

It's a convenient method for customers & It should implement as soon.
Must for Sri Lanka.
Convenient, Haze-less, Time and Cost Saving
In cash payments are difficult for me. Sometime I have issue with cash payment. When we pay with cash in some shops want exact change. So I have trouble with that. Tickets payments also like that.
Online systems should be user friendly and reliable without failures
Easy
I remember using the London Tube. Just one card! You purchase your card from a counter, put it into a machine and deposit notes into the machine. The amount you put in is then deposited into your card. Thed special feature of this card was that you could use it on all public transport. I used it not only on the tube but also the bus. Wish this kind of multi-mode transport payment system is implemented in Sri Lanka.
It is good
Its a very good idea. but with tecnologhy there is always a risk.good luck with your future.gbu
this must be implemented for bus service in sri lanka
I have used cashless payment method in Australia. They have different cards for different regions (ex - Victoria and Sydney they got different cards). It will be easy to transfer money to card using banking app
In Singapore tour, I have experienced this cashless payment method for purchasing travel tickets. It was very interesting and easy method to use. So I believe if we have same kind of way for purchasing travel tickets in Sri Lanka, it is very high achievement in Sri Lankan travel industry.
In Singapore tour, I have experienced this cashless payment method for purchasing travel tickets. It was very interesting and easy method to use. So I believe if we have same kind of way for purchasing travel tickets in Sri Lanka, it is very high achievement in Sri Lankan travel industry.
Online bus/train/Air tickets
Very convenient but not all the transportation methods and people accept it, most of them are saying the instrument is broken.
NFC based entrance gates allowing passengers to enter to travelling locations, i.e. train stations, using usual credit / debit cards will be very convenient.
In Abroad
Good luck!
I have used Dialog Touch Travel Pass in Sri Lanka, EzLink in Singapore.
.
No
Should be implemented in our country
That would more convenient way and save more time.
I can remember there was a time that Travel card was implemented by Dialog but not successful. If the Conductors also have that facility of receiving payments through cards people may encourage to use. First that environment should be available to use as a passenger.

I used this method previously(Dialog touch travel cad). It is a very helpful for purchased the ticket
When introduce the system should be continued irrespective to protests such as bus ticketing system.
It was really convenient to use cashless payment me this. No hassle of carrying money specially coins. And I could pay the exact amount which is incurred. No hassle of asking for the balance.
Implement for online train booking
Should be easy to understand and number of steps must be minimal of the procedure of purchasing tickets. Multiple payment methods must be support such as Credit card, Debit card, Online Wallet/Banking systems and Mobile App based systems.
No idea
No idea
There should be option for customer make an inquiry to revert the payment made against vendor via cashless payment methods due to service/product was failed to provide
We dont have to seek for change money any more and we will be able to pay the most accurate amount when paying through cashless methods.
This might be a best and effective solution for our current daily busy schedules. Well done.
According to the my experience , NFC cards are not working properly and the real time their accounts won't update are the biggest complaints of the most of the customers and conductors(Mainly i mention the private bus transportation system). So I think your can give a satisfy solution for this it will help to increase the trustful of the system.
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Definitely it should be available everywhere to use, faster than cash, secure than cash. Need strict rules for conductors too.
It's a must requirement for SriLankan public transport system.
The system need not to ask for passenger details.
have no experience of that sort
Australia's Myki system was something I experienced in the past, and it had definitely made public transport there so much easier.
It is very convenient and time saving.
I haven't had that experience. Make it easy and smart system for it.
In abroad I have used this method several times. It was very convenient.
I have done it in different cbuntries (Oyster card in London) and it is a much user friendly trustworthy system

Dialog introduced a card for busses few years back. But it died because they didn't do much promotions to promote it. And also since I used that card, sometimes conductors try to avoid card payment saying machine is broken bla bla bla. So I think there must be a way to handle these things. Otherwise all the money spent to promote and implement these things will go to waste. And all these cards are prepaid, if we can create a card which is postpaid then customer can purchase it using there NIC and at the end of the month they'll get a full travel bill sent to them with all the travel details and prices like a normal phone bill, then the continuous recharging of cards can be avoided. These are just my thoughts 😀😊
No specific incident to include
I have used cashless payments for transport in overseas but not in Sri Lanka. Instead of using a debit or credit card to purchase the ticket, I would suggest using a separate topup card specific to transportation. This might reduce the risks associated with using credit or debit cards
I haven't used cashless payments to buy tickets, would like to. I would also like to be able to pay for taxis using cashless payment methods, but a lot of drivers do not accept cards.
no
Don't have past experience
Having a cashless payment method is convienient when travelling on public transport or threewhelers when you do not have any change money to pay exact amounts.
Handy
No experience
I had a Dialog touch card. But conductors refused the payments saying the payment from Dialog to them takes time. Now no one uses it!!
Better if we can have it in Sir Lanka too
It would be great alternative for make payments in Sri Lanka
My parents had two travel cards sometimes back. But couldn't use it much as it was not accepted by conductors
When it comes to getting the balance, conductors used to cheat us all the time. They do various things to cheat balance. Every day I am losing 5 to 10 rupees in this way. Therefore having a this kind of solution is very beneficial to all passengers. Therefore pleas introduce this kind of project soon. Good luck for your effor
I have used such a coupon while traveling in Geneva
Well i would like if current payment apps in sri lanka require less amount of confirmations. thanks
It is a best suggestion for cashless payments
I am living abroad, and experiencing the hassle free risk free convenient life with this method already. Hence I am in 200% agreement with the suggested method. A very useful, research.

It should have a feature to refund money in a case like if we had to end the journey in a middle point. Meantime it would be nice if we have a facility to booking seats.
Timely needed solution. Good luck for your research
not good experience, should improve a lot
A swipe card is given and you top up the card on a regular interval when the balance becomes low. Also the card should be swipe at the entrance of the bus before the trip starts. Further, the fare for the distance should be fixed and no cash should be involved throughout the journey which removes the role of Conductor in the bus.
good to have, should ensure booking are reliable.
Yes
No idea
I have used these methods in foreign countries, and it's very convenient and efficient
If that system going to design by considering time period as an example for monthly renewal , people should be able to use the balance of turns of this month to next month. Cashless Ticket Purchasing methods should be easy to all people in sri Lanka.
I have used them in other countries such as China and Australia. My opinion is people in this island should have the benefit.
I believe that though its not widely used in Sri Lanka, it is a very efficient method. However the security aspect should be given a lot of importance when implementing such a system.
I think it's best idea to develop our transports system. Good job go a head.

I think it's best idea to develop our transports system. Good job go a head.
Network issues may occur. Better to mitigate that as well
should train the conductors as well.
I have never used this method, but I really thank you for doing this, and hope you to make this successful. Thank you!
I haven't past experiences, but I wish
I pay for taxi with debit card it is well worthy
It's a good idea. Day to day everything is digitalizing. Developed countries already executed this cashless payment method. So it's must executing this idea in developing country like sri lanka.
I have been to a developed country where they use cashless payments for all forms of their public transport. I used it for about a week there and found it very convenient and wondered when would sri lanka ever become like that. In sri lanka we have cashless payments for flight tickets which I have used. Nothing else
I have not experience yet

This will be benefited for those who have an understanding about the technology up to some extent. But for the rural community, it won't as they don't have much knowledge or practise with the use of cashless payment methods. So it will be better to do some awareness programs about this subject and an attitudinal change in the community to adopt new methods other than traditional methods.
This idea is really good.But sometimes we give money to conductor urgently when we get off the bus or sometimes we can not find the conductor in a crowded bus when we need to get off urgently.So we normally tell another person to give money to conductor.
I think you know about "Sahasara" project. It is very close to all passenger but it has large errors and cheat. Hope recommend better method than "Sahasara " project.
I'm in abroad and I'm using this type of cashless ticket.so by my experience I know that how easy this for our day today life. It's goog suggestion for purchasing it in sri lanka LK
It is very easy for everyone to use than normal paying
i think its good for sri lanka, even we can try it for only train, because train is good method increasing public transportation in our country,
It's may be good for the people who have more knowledge and electronic literacy yet people with poor literacy face difficulties when they are going to use.
No
this is a good idea. but when the passenger cancel the ticket it would be more difficult to return the money and reallocate the available seats
It was very convenient.
never have

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It's may be good for the people who have more knowledge and electronic literacy yet people with poor literacy face difficulties when they are going to use.
No
this is a good idea. but when the passenger cancel the ticket it would be more difficult to return the money and reallocate the available seats
It was very convenient.
never have

I think it's very good for our society.
Once in japan i used something like that, which can use to pay not only in public transport but in supermarket too. But it is not a credit card or debit card. When i want to recharge money there is specific machine to recharge
In Sydney Australia where I live, we have a card called Opal that can be tapped on all public transports (busses, trains and ferry) People very rarely use cash. We have configured it to be automatically topped up when the balance goes low. We can also use credit cards/apple pay in the same way.
I think it's a very good idea. Because I saw in many countries, they are using this type of cashless payment methods while I watching TV series.
GOOD AND EASY METHOD FOR OUR BUSY TIME.
it was very easy and we could book train tickets at night

Appendix B: Internal Consistency Reliability Test (Pilot Study)

Reliability – Attitude toward the Use (Pilot Survey)

Case Processing Summary			
		N	%
Cases	Valid	33	8.2
	Excluded[a]	370	91.8
	Total	403	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics	
Cronbach's Alpha	N of Items
.790	4

Item-Total Statistics				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
AU1 - I believe that the use of cashless payments for purchasing passenger tickets; [Is a good idea]	4.12	2.047	.672	.719
AU2 - I believe that the use of cashless payments for purchasing passenger tickets; [Is convenient]	4.12	1.922	.793	.668
AU3 - I believe that the use of cashless payments for purchasing passenger tickets; [Is financially beneficial to the passenger]	3.88	1.672	.450	.871
AU4 - I believe that the use of cashless payments for purchasing passenger tickets; [Is an interesting experience]	4.06	1.871	.649	.715

Reliability – Perceived Usefulness (Pilot Survey)

Case Processing Summary			
		N	%
Cases	Valid	33	8.2
	Excluded[a]	370	91.8
	Total	403	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics	
Cronbach's Alpha	N of Items
.735	4

Item-Total Statistics				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
PU1 - I believe that the use of cashless payment methods for purchasing passenger tickets; [Is a useful alternative]	4.36	2.364	.428	.737
PU2 - I believe that the use of cashless payment methods for purchasing passenger tickets; [Is easier]	4.36	2.426	.605	.641
PU3 - I believe that the use of cashless payment methods for purchasing passenger tickets; [Will reduce the time spent on purchasing a passenger ticket]	4.33	2.354	.490	.696
PU4 - I believe that the use of cashless payment methods for purchasing passenger tickets; [Will improve the quality of my travel experience.]	4.30	2.155	.611	.623

Reliability – Perceived Ease of Use (Pilot Survey)

Case Processing Summary			
		N	%
Cases	Valid	33	8.2
	Excluded[a]	370	91.8
	Total	403	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics	
Cronbach's Alpha	N of Items
.872	3

Item-Total Statistics				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
PE1 - I believe that, using cashless payments for purchasing passenger tickets; [Is easy to learn]	3.21	1.672	.836	.759
PE1 - I believe that, using cashless payments for purchasing passenger tickets; [Is easy to understand]	3.21	1.797	.840	.776
PE1 - I believe that, using cashless payments for purchasing passenger tickets; [Is easily guidable (when someone need any assistance)]	3.03	1.343	.678	.953

Reliability – Perceived Security (Pilot Survey)

Case Processing Summary			
		N	%
Cases	Valid	33	8.2
	Excluded[a]	370	91.8
	Total	403	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics	
Cronbach's Alpha	N of Items
.930	3

Item-Total Statistics				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
PS1 - I believe that when I use cashless payment systems for purchasing passenger tickets; [The risk of failing my payment should be low.]	2.82	2.466	.808	.937
PS2 - I believe that when I use cashless payment systems for purchasing passenger tickets; [The risk of hacking my payment should be low.]	2.79	2.047	.856	.908
PS3 - I believe that when I use cashless payment systems for purchasing passenger tickets; [The risk of misuse of my personal information should be low. (E.g. name, age, address, travel information etc.)]	2.82	2.278	.924	.850

Reliability – Perceived Compatibility (Pilot Survey)

Case Processing Summary			
		N	%
Cases	Valid	33	8.2
	Excluded[a]	370	91.8
	Total	403	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics	
Cronbach's Alpha	N of Items
.865	3

Item-Total Statistics				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
PC1 - I believe that, the use of cashless payment methods for purchasing passenger tickets; [Fits well with my lifestyle]	3.06	1.559	.754	.809
PC2 - I believe that, the use of cashless payment methods for purchasing passenger tickets; [Is consistent with my daily payment methods]	2.97	1.530	.872	.683
PC3 - I believe that, the use of cashless payment methods for purchasing passenger tickets; [Is recommendable over traditional methods]	3.18	2.153	.640	.902

Reliability – Subjective Norms (Pilot Survey)

Case Processing Summary			
		N	%
Cases	Valid	33	8.2
	Excluded[a]	370	91.8
	Total	403	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics	
Cronbach's Alpha	N of Items
.908	3

Item-Total Statistics				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
SN1 - I believe that, the people who are important to me, will find the use of cashless payments for purchasing passenger tickets; [Is convenient]	3.18	1.466	.783	.894
SN2 - I believe that, the people who are important to me, will find the use of cashless payments for purchasing passenger tickets; [As financially beneficial to themselves.]	3.12	1.360	.797	.886
SN3 - I believe that, the people who are important to me, will find the use of cashless payments for purchasing passenger tickets; [Is something they would recommend to me]	3.15	1.383	.871	.822