IDENTIFYING THE FACTORS AFFECTING THE ADOPTION OF E-COMMERCE IN SRI LANKA: INTERNET USERS' PERSPECTIVE

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The dissertation was submitted to the Department of Computer Science and Engineering of the University of Moratuwa in partial fulfilment of the requirement for the Degree of Master of Business Administration in Information Technology

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ABSTRACT

Electronic commerce brings world economic market into a common portal where buyers and sellers could meet overcoming their economic and geographic barriers. Despite being one of the earliest adopters of the Internet in the region and several initiatives by stakeholders to promote e-commerce, e-commerce adaptation in Sri Lanka appears to be relatively low. Maturity level of e-commerce adoption in Sri Lanka, as well as any obstacles and hindrances preventing the widespread adoption are not clear. The objective of this research is to identify barriers that prevent Internet users from wide-spread adoption of e-commerce in Sri Lanka. We adopted a mix-method research methodology to identify Internet user related adoption factors and to understand e-commerce merchants' view on those factors. First, a preliminary survey was carried out by interviewing stakeholders to identify barriers affecting the adoption of e-commerce. Next, a survey was used to identify customer adoption factors. Survey data were analyzed using Structural Equation Modeling to identify key factors and their relationships. Finally, interviews were conducted with e-commerce merchants to identify their view on those factors and what actions had been taken to enhance the adoption level. Factors such as affordability, knowledge and awareness, and facilities expected from retailers were identified as the most significant factors contributing to the success of e-commerce adoption in Sri Lanka. Government and legal factors, consumer perception, and digital infrastructure are the least significant factors. Smoothening the delivery process, introducing convenient return policies, and enhancing government involvement to promote e-commerce are the key recommendations to enhance the e-commerce adoption.

Keywords: Internet users, e-commerce, e-commerce adoption, Structural Equation Modeling

ACKNOWLEDGEMENT

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LIST OF ABBREVIATIONS

AF   Affordability
AVE   Average Variance Extracted
CP   Consumer Perception
BOI   Board of Investment
CEO   Chief Executive Officers
CIO   Chief Executive Officers
DI   Digital Infrastructure
DV   Dependent variable
DW   Durbin-Watson
e-commerce   electronic commerce
e-economy   electronic economy
e-readiness   electronic readiness
e-marketing   electronic marketing
ERI   Electronic Readiness Index
FR   Facilities expected from retailers
GCE   General Certificate of Education
GDP   Gross Domestic Product
GLS   Government and Legal Support
GOF   Goodness of Fit
ICT   Information and Communication Technology
IT   Information Technology
IV   Independent Variable
KAF   Knowledge and Awareness Factors
LSA   Level of Success in e-commerce Adoption
LV   Latent Variable
ME   Micro Enterprises
NRI   Network Readiness Index
PLS   Partial Least Square
ROI   Return on Investment
SEM   Structural Equation Modeling
SME   Small and Medium-sized Enterprises

1. INTRODUCTION

1.1. Background

Electronic commerce or e-commerce brings world's economic market at your fingertips. It involves any commercial or business transactions which involve transfer of e-money and information of buyers and sellers throughout the Internet. Schneider and Perry (2000) stated that, e-commerce includes business activities such as serving customers, associating with business partners and exchanging business documents performed using the Internet. Broadly, e-commerce can be explained as a general medium which allows performing any form of commercial transactions over the Internet (Whitely, 1998). There is a potential ability in e-commerce to improve efficiency and productivity in many sectors; therefore, has gained significant attention across industries and states.

While it has become a part of life in some countries, it has not gained wide-spread adoption in many others. Sri Lanka has several popular e-commerce sites like Kapruka.com, MyDeal.lk, WoW.lk, and takas.lk. Based on the Central Bank 2017 annual report (Central Bank of Sri Lanka, 2017), even though there has been a rapid growth in Sri Lankan e-commerce industry, still overall sales are comparatively low when compared to similar countries (Kurnia, 2005). Informal information implies, maintaining inventory is one of the key issues. Most e-commerce sites rely on external partners to maintain inventory and this has led to several challenges such as reliability and limited inventory. Another issue is the delivery of products to customers, especially to customers outside Colombo.

Sri Lanka is still in a stage of transforming from the traditional transaction methods into e-commerce. Thus, there is significant opportunity to increase the level of adoption. Moreover, current level of e-commerce maturity in Sri Lanka and factors hindering the adoption are unclear. According to the literature, most of the studies were focused on organizational-level adoption of Sri Lanka and rest of the world (Senarathna et al., 2011; Suriyapperuma et al., 2015; Grandon et al., 2004; Choshin et al., 2015). A little amount of analysis seemed to exist on the Internet user perception on adoption (Javadi et al., 2012; Makhitha, 2014). Therefore, it is

imperative to identify the challenges according to Internet users' perception, to reach higher maturity levels.

1.2. Problem statement

34.66% of the total population in Sri Lanka, used either fixed broadband or mobile broadband (Telecommunications Regulatory Commission of Sri Lanka, 2018). But as per the 2017 annual report of the Central Bank (Central Bank of Sri Lanka, 2017), overall sales of most popular e-commerce sites in Sri Lanka are comparatively low. Also, peer discussions and customer rating on e-commerce sites reveal profit is only a part of the problem where the bigger problem seems to be Internet users not using them frequently or not buying high-value items. In this context, the problem to be addressed by this research can be formulated as:

What are the Internet user-centric factors affecting the adoption of e-commerce in Sri Lanka?

This study focuses on possible challenges that prevent Internet users from adapting to e-commerce (i.e., Internet user related factors) rather than the challenges affect organizational level. This would be benefitted for e-commerce companies, because both organizational perspective and consumer perspective goes hand in hand in attracting, interacting, and retaining the customers. Therefore, knowing the consumer perspective will be an advantage. According to the background search, most of the past research work conducted in other countries over the world including Asia, has studied organizational level factors but not in Sri Lankan consumer related factor.

1.3. Research objective

The key objective of the research is to identify the Internet user related factors that affect the e-commerce adoption in Sri Lanka. Apart from that, following are the sub-objectives to be achieved in this study.

- To identify factors that affect the e-commerce adoption from related research work and domain experts

- To examine the strength of association between the identified Internet user-related factors and indicators used to measure e-commerce adoption in Sri Lanka
- Solicit feedback from e-commerce business stakeholders regarding the identified Internet user-related factors

1.4. Research significance

The outcome of this research would be identification of a set of challenges that prevents Internet users from frequently using e-commerce in Sri Lanka. By looking at the identified challenges and recommendations given, relevant business stakeholders could consider about the actions that can be initiative to overcome those identified challenges. This could benefit them in regularizing and smoothening their e-commerce offerings and online processes.

1.5. Outline

The rest of the thesis is organized as follows; Chapter 2 presents the literature review on identifying the factors affecting the e-commerce adoption along with the justification of current research work. Chapter 3 contains a detailed description on research methodology, where research approach, data collecting methods, and tools are explained. Data analysis is presented in Chapter 4. Conclusion, research limitations, and future work are discussed in Chapter 5.

2. LITERATURE REVIEW

Section 2.1 presents the literature on organizational-level challenges in e-commerce adoption while Section 2.2 focuses on factors affecting online transaction and shopping behavior. e-commerce adoption in developing countries is described in Section 2.3. Section 2.4 presents the summary of related work.

2.1. Organizational-level challenges in e-commerce adoption

Small and Medium-sized Enterprises (SMEs) gives a major contribution to the national economy and Gross Domestic Product (GDP). These SMEs are often recognized as economy growth engines. A research has been conducted by Choshin and Ghaffari (2015) on determining the significant factors which affect the e-commerce adoption in small and developing business firms. Main objective of this study was to propose a framework to determine the effective factors for successful e-commerce adoption in SMEs. Infrastructure, costs, customers' satisfaction, and knowledge and awareness have used as four variables in constructing the model. Based on a survey of 180 staff employees; Post Bank, Eastern and Western Azerbaijan, authors concluded that customers' satisfaction, amount of costs, infrastructure, and knowledge and awareness significantly affect the success of e-commerce. Limitation of study was that, the data sample represented only a single organization.

Senarathna et al. (2011) examined the relationship between the organizational factors and e-commerce adoption in Sri Lanka using 200 SMEs in Colombo district. Authors concluded that there is a positive correlation between the ability to adapt quickly to changing conditions in SMEs and e-commerce adoption. Apart from that managerial attitude regarding innovation has a positive relationship with e-commerce adoption. However, no relationship between cultural characteristics and commerce adoption in SMEs was found.

A research by the Central Province, Sri Lanka (2004) pointed out the challenges faced by developing nations in e-commerce adoption. Even though the large-scale funding agencies such as World Bank and Asian Development Bank were

willing to help, the outcomes were not so appreciable. Moreover, there were only a few successful stories based on such funding. It suggested well-coordinated support between government sectors and the private companies, as well as greater participant of public are essential to formulate the e-economy system. e-readiness score of Sri Lanka is 3.66 (Economist Intelligence Unit, 2003). This is far below the countries like India and Thailand which have scores of over five. The factors influencing this low rating are due to low teledensity (i.e., number of telephone connections for every hundred individuals living within an area), outdated legislative framework, low level of computer literacy, and lack of human resources in the field. To overcome these deficiencies, authors suggested formulating favorable government policies including legal framework, enhancing knowledge of computer literacy and provide adequate infrastructure facilities through national GDP.

It has been accepted that Sri Lanka has the potential to adopt these concepts due to importance of geographical location, availability of human and natural resources. Majority of the economy is run by SMEs and Micro Enterprises (MEs) in Sri Lanka. Those will be benefiting from adapting ICT capabilities in improving their quality of services, as well as the overall economy. However, these researchers focused on large-scale organizations. Little was explored about consumer perception; hence, there is a need to explore the consumer- related factors.

Another research focusing on Board of Investment (BOI) companies in Sri Lanka has shown that compared with neighbor countries, usage of Information Technology (IT) by SME in Sri Lanka are yet at a lower level (Gunawardana, 2008). The main purpose of this study was to determine the firm-based characteristics on e-commerce adoption in SMEs in Sri Lanka. 30 SMEs in Colombo metropolitan area registered under BOI were used as sample population. Simple linear regression was preformed to identify the relationship between e-commerce adoption and firm-based characteristics. Among tested firm-based characteristics, involvement of the management has been identified as significant characteristic for e-commerce adoption. Supplier service factor was a critical success factor for both involvement of the management and adoption in IT. Moreover, e-marketing was another critical success factor that determines the involvement of the management.

There are several limitations of this study. Sample population was only restricted to SMEs in Colombo metropolitan area. Also, sample size was comparatively small, and research was narrowed down through Business-to-Business activities. Hence, there is a lack of identifying the needs and behavior of Internet consumers in e-commerce activities. Moreover, there was no consideration on demographic factors. Therefore, there is a necessity on conducting a research with more representatives analyzing the Internet consumer- related factors including demographic consideration as well.

Suriyapperuma et al. (2015) investigated the Internet adoption impact on SME performance in Sri Lanka by analyzing secondary data of 250 articles. Advantages of Internet, complexity, business orientation, new work practice adoptability and ICT costs were determined as direct influential factors on Sri Lankan SMEs and their performances. However, due to the use secondary data, there can be a mismatch with the current context. Therefore, there is still a need to understand Internet users' perspective in adopting e-commerce.

A study was carried by Kapurubandara et al. (2008) to understand and determine the challenges faced by developing countries in e-commerce adoption. It analyzed the internal and external challenges faced by SMEs and identified the support required to overcome them. The studied area was limited to Colombo district, as it has the highest density of companies where ICT is used. To have richness and validity in the research, authors carried out preliminary pilot interviews, a survey, and interviews with SMEs. It allowed for both qualitative and quantitative methods of analysis with good observations. They have identified lack of required skill in employees, security issues on Internet payment methods, cost spend on e-commerce and Return on Investment (ROI) from e-commerce as internal barriers. Absence of government coordination in legal and infrastructure facilities, social norms were found to be external barriers. With the findings they highlighted the necessity of providing support to SMEs if they are ready to successfully adopt ICT and e-commerce.

Though this research is based on Sri Lankan context, their focus was to cover enterprise level. They have not explored the consumer-related challenges. Also, sample size was not adequate to represent SMEs in Sri Lanka.

Grandon et al. (2004) focused on the contribution of top management of small companies in Chile towards the adoption into e-commerce concept. Data was collected through a survey questionnaire. A preliminary discriminant analysis was conducted to determine the factors with their respective order of importance. Organizational readiness, managerial productivity, external pressure, decision aids, compatibility, and perceived usefulness were the found to be significant in contributing to e-commerce adoption.

In this study there is no differentiation among the chosen executives. They categorized them all as managers/owners. This might lead to confusion in results as the knowledge about e-commerce is different from profession to profession. Since the sample was limited to Bio-Bio region of Chile, there were no national-wide representation of the entire population and sample size was small. Though the objective of this research is achieved, there is no attempt to identify the contribution to e-commerce on consumer perspective in a company. So, there is an emerging need of identifying consumer related factors relevant to the profession.

Grandon and Pearson (2004) identified the determinant factors of strategic value and e-commerce adoption as per the top managers in SME; Midwest region of the United States (US). Two independent research streams are combined in this study. Based on the previous research work, operational support, managerial productivity and strategic decision aids were the prominent facts in perception of strategic value while organizational readiness, external pressure, perceived ease of use and perceived usefulness were the four prominent categories in e-commerce adoption. Hypotheses were tested to find a link between these two streams. Sample population was surveyed using an online survey. Confirmatory factor analysis and Canonical analysis is used to test the model using collected data.

According to the findings, all three facts in perception of strategic value stream was found to be significant and perceived usefulness, perceived ease of use, compatibility and external pressure groups were identified as significant in e-commerce adoption. Among them, the perceived usefulness, compatibility and perceived ease of use pointed out to be most significant facts in e-commerce adoption. Number of employees considered to this research is a major limitation. They have used firms where number of employees varies between 10 and 200 as

their sample. In this context only five firms consisted of more than 200. Therefore, this sample was biased for smaller firms.

2.2. Factors affecting online transaction and shopping behavior

Javadi et al. (2012) analyzed factors affecting online shopping behavior of consumers in Iran. Using an email questionnaire 107 randomly selected consumers of five major online stores in Iran were surveyed. Results indicated that financial risk and non-delivery risk has negative impact on online shopping behavior while subjective norms, domain specific innovativeness have positive effect on online shopping behavior. Due to the time constraints, authors have not considered all possible factors affecting on online shopping behavior. The population represents only the consumers of electronic goods in Iran. Therefore, the results might not be applicable for other countries and other consumer goods.

Online shopping seems to be very popular among the younger generation. Makhitha (2014) identified factors that determine attitudes of Generation Y students on online shopping in South African context. Population for this research was Generation Y undergraduates and postgraduates at a main university of technology in South Africa. The questionnaire was designed based on related work. The findings stated that majority of students do not do online shopping even though they frequently use Internet. Convenience, perceived risk and security, shopping intention, ease of use and usefulness were the five factors identified based on the factor analysis. Among them shopping intention, convenience, ease of use, and usefulness factors had a significant positive impact on the attitude of online shoppers. Perceived risk and security had a negative impact on the attitude of online shoppers. Applicability of this research is limited because only undergraduate and post graduate students were considered as the sample.

The growth of online transactions goes hand in hand with an increase of rate in fraud. Today, most of the merchant activities take place through the Internet. In Kenya though the frequency of fraud activities is low, with the increasing e-commerce adoption, it is predicted to increase fraud related incidents. Based on this fact, a study has been conducted by Kanyaru and Kyalo (2015) to find the challenges

connected with Internet merchant activities and best practices that can be used to prevent such challenges. Secondary data collected from scholarly journals, books and credible publications were used.

Authors concluded that lack of customer awareness about online market security risks, increase of highly vulnerable mobile devices as the challenges in Internet merchant activities. Strong security systems, incident management plans and regular security assessments, continuous detection and conventional protection measures were identified as the best practices that can be used to prevent such challenges. Since this is based on secondary data, there can be reliability issues.

Lin and Lee (2005) identified the effect of organizational learning factors and knowledge management processes on e-business adoption. Data was collected from 202 information system executives in Taiwanese firms using a survey. Structural Equation Modeling (SEM) approach was used to test the research framework. The results confirmed that all three factors; knowledge level, training available, and technical expertise in organizational learning have a significant relationship with successful e-business adoption. Both knowledge acquisition and knowledge application in knowledge management processes has significant relationship with e-business adoption. But there is no significant relationship between knowledge sharing and e-business adoption. According to the authors, there were three major restrictions in this study. The sample population may reflect the cultural differences between Taiwan and other countries. Apart from that, this study has not considered the all organizational learning factors. Also, factors related to technological innovation can be changed over time. Another major limitation was the sample size. The sample population only included large enterprises in Taiwan. Also, in many cases large firms tend to be more mature in e-business adoption rather that the SMEs. Therefore, the results do not imply the entire e-business adoption.

2.3. e-commerce adoption in developing countries

It is important to know the world's trends and adoption towards e-commerce throughout the existing systems. Based on the Grounded theory, a research has been conducted by Kabango and Asa (2015) to determine the factors that support e-

commerce development in developing countries. This study aims to determine the association of attitudes and e-commerce adoption in developing countries. The development of e-commerce is measured along the four facts; trust and loyalty, accountability and awareness, quality and benefits, security and privacy. In conclusion they stated that, trust, security, fraud and hacking, awareness and perceived usefulness, accessibility, perceived quality and role of government has an association with e-commerce adoption. However, authors do not mention the population sampled and model adopted to analyze the data. Moreover, the investigation did not take place in multiple cities; especially in rural areas where the accuracy and richness could be enhanced for the results.

Bui et al. (2003) identified the importance of e-commerce in a nation. Authors considered eight factors such as macro economy, digital infrastructure, knowledgeable citizens, ability to invest, competitiveness, access to skilled workforce, culture and cost of living and pricing. Key objectives of this research were to identify the factors that contribute to increased e-readiness, develop measures that can quantitatively measure e-readiness and provide a framework to calculate e-readiness of a country across these eight factors. Based on possible indicators for each factor, following formula was derived to calculate composite e-readiness index for a given country:

$$e - readiness_i =_{1,n} W_{ij} E_{ij} / n \qquad (2.1)$$

Where e-readiness is the overall e-readiness value, i is country, j is each of the 52 measures, w_{ij} is relative weights assigned to the 52 measures, e_{ij} is individual score for each measure on a scale of 1 to 10, and n is the total number of measures. Several selected countries from East Asia, USA, and G7 were used to interpret the selected methodology. According to the results, they have concluded that selected East Asian countries need more improvement regarding the e-commerce area.

Even though they tested the concept among several countries, each country has their own unique set of e-readiness characteristics. Therefore, these eight factors can be different or there maybe additional factors than eight to be considered when applying this methodology. Also, with the rapid change, collected data can be outdated as well.

e-readiness of a country refers to the capacity and state of preparedness to participate in the electronic world. In other terms, it measures the quality of ICT infrastructure in a country and the capacity of consumers, businesses and governments to use that ICT to their benefit. Since the proposed research is aimed on e-commerce adoption of e-commerce in Internet user level, there can be different factors that should be considered in calculating the national e-readiness value (Center for International Development, 2002).

2.4. Summary

This chapter presented a detailed discussion of past research work done worldwide, based on identifying the factors affecting e-commerce adoption. Also, it discussed about strengths and limitations on the literature done and the importance of having a research work for consumer level as well. Related work on e-commerce adoption mainly focused on identifying the organizational factors. We identified twelve key factors through literature review that mainly contribute to a successful e-commerce adoption. Even though there were several research work on other countries identifying the factors affecting online shopping behavior of consumers, no such study exists for Sri Lanka. Also, they did not cover aspects such as bank and other financial transactions, health services. Moreover, consumer perspective can be changed with time, country and developing technology. Therefore, this research is conducted to fill that research gap. Apart from that, there were research work on calculating the national e-readiness and identifying the factors affecting on that. But national e-readiness does not represent the e-commerce adoption. Therefore, the factors that affect national e-readiness may relevant or may not relevant to e-commerce adoption. Hence, this research focused on identifying the consumer perspective factors while putting the maximum effort to address the limitations found in literature review.

3. RESEARCH METHODOLOGY

Section 3.1 presents the research process. Section 3.2 explains the conceptual framework used in the study. Section 3.3 explains the statistical technique used. Section 3.4 presents the population and sample selection while Section 3.5 presents data collection process. The summary is presented in Section 3.6.

3.1. Research process

Figure 3.1 illustrates the research approach used in the study. There are three phases. In the first phase, a preliminary survey (see Appendix A) was carried out by process of interviews with domain experts to find the factors that need to be considered apart from the factors identified during the literature study. In the second phase a detailed questionnaire (see Appendix B) was distributed among the potential consumers of e-commerce. This questionnaire covered the purpose of this study, as well as the indicators which has been gathered in the previous phase. In the third phase a qualitative approach was used to validate the results by interviewing relevant professionals to solicit expert feedback on the identified customer-related factors.

3.2. Conceptual framework

Based on the literature survey factors listed in Table 3.1 were identified as related to the adoption of e-commerce. Ability to invest (spending capacity), knowledgeable citizens, digital infrastructure, perceived usefulness, perceived ease of use, product risks, non-delivery risk, convenient product return policy, attitude, trust and loyalty, security and privacy and customer satisfaction were found as key factors that adopt e-commerce adoption.

Consumer perspective on e-commerce changes with time and advancing technology. Also, some of the pre-figured factors may not be relevant to the Sri Lankan context. Therefore, a pre-survey was also conducted to identify the additional factors that may need to be considered apart from ones identified from the literature study. Several CEOs and marketing managers of popular e-commerce retailers were interviewed during the pre-survey.
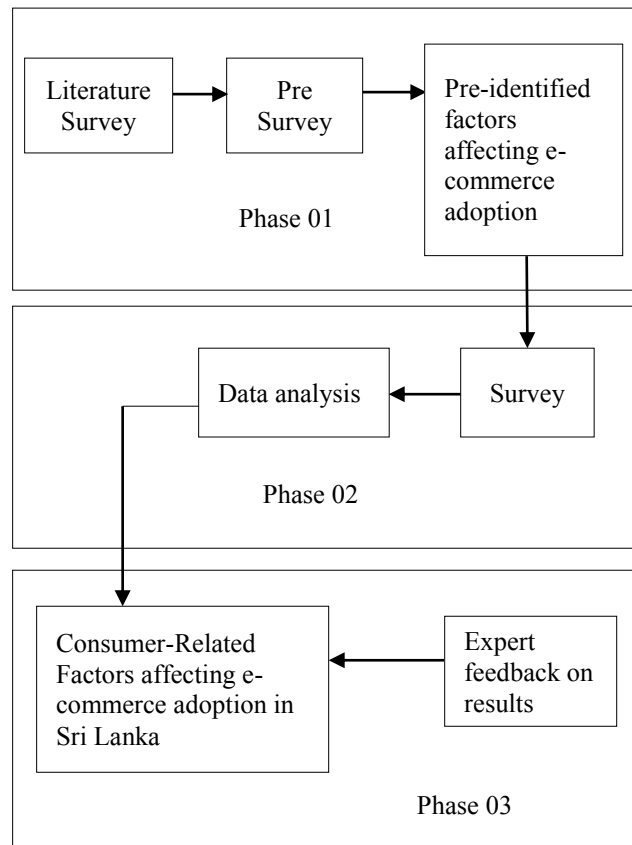
Figure 3.1: Research approach.

Focused business area, e-commerce role in the business, e-commerce strategies used to attract consumers and consumer performance in e-commerce were discussed in the interviews. Apart from those, challenges in growing and promoting online business, suggestions in overcoming those challenges and factors identified from the literature study were also discussed as well. Not having proper delivery mechanisms, lack of e-commerce exposure and knowledge of local merchants, lack of legislation and rules for e-commerce, and lack of awareness of available legal framework for e-commerce were pointed out as major challenges that they faced. Poor government involvement such as not having international payment methods, poor support in IT infrastructure and poor e-commerce promotion were also listed as challenges in promoting e-commerce among consumers. Improvement in government involvement in promoting e-commerce to public sector, enhancement in legislation and practices on e-commerce and having rating systems and consumer reviews displayed on the e-commerce web site were their suggestions to encourage consumers, as well as the service providers.

Table 3.1: Pre-identified factors.

Factors Affecting e-commerce Adoption	Related Sources						
	Bui et al; 2003	Lane et al; 2004	Grandon et al; 2004	[Lin et al; 2005]	[Javadi et al; 2014]	[Kabango et al; 2015]	[Choshin et al; 20157
Ability to Invest (Spending Capacity)	X						
Knowledgeable Citizens	X	X		X	X	X	X
Digital Infrastructure	X						X
Perceived Usefulness			X				
Perceived Ease of Use			X		X	X	
Perception about the quality of e-products and e- services					X	X	
Non-Delivery Risk					X		
Convenient product return policy					X		
Attitude					X		
Trust and Loyalty						X	
Security and Privacy					X	X	
Customer Satisfaction						X	X

After identifying the factors, the focus was to determine the association between these factors and e-commerce adoption in Sri Lanka. However, these variables were not directly measurable. Therefore, to develop a relationship between these unobservable measures and e-commerce adoption, a framework was developed using a set of observable measures.

These immeasurable variables were described as Latent Variables (LV) / Constructs (Bentler and Bonnet, 1980). These hypothetical constructs are created by the researcher to understand the research area. We identified seven LVs / constructs based on the facts found in literature review and pre-survey. Those identified LVs are listed in Table 3.2.

Table 3.2: Definitions of constructs.

Construct / Latent Variables	Definition
Digital infrastructure (DI)	Degree to which a consumer believes that Digital infrastructure would impact their e-commerce adoption behavior
Government and Legal Support (GLS)	Degree to which a consumer believes that Government and Legal Factors would impact their e-commerce adoption behavior
Affordability (AF)	Degree to which a consumer believes that Affordability would impact their e-commerce adoption behavior
Facilities expected from retailers (FR)	Degree to which a person consumer believes that Retailers would impact their e-commerce adoption behavior.
Knowledge and Awareness (KAF)	Degree to which a consumer believes that Knowledge and Awareness would impact their e-commerce adoption behavior
Consumer Perception (CP)	Degree to which a consumer believes that perception would impact their e-commerce adoption behavior
Level of Success in e-commerce Adoption (LSA)	Consumer ability to use e-commerce

Figure 3.2 shows the research framework generated using the constructs / variables identified. Independent variables are represented in left while dependent variables are represented in right.
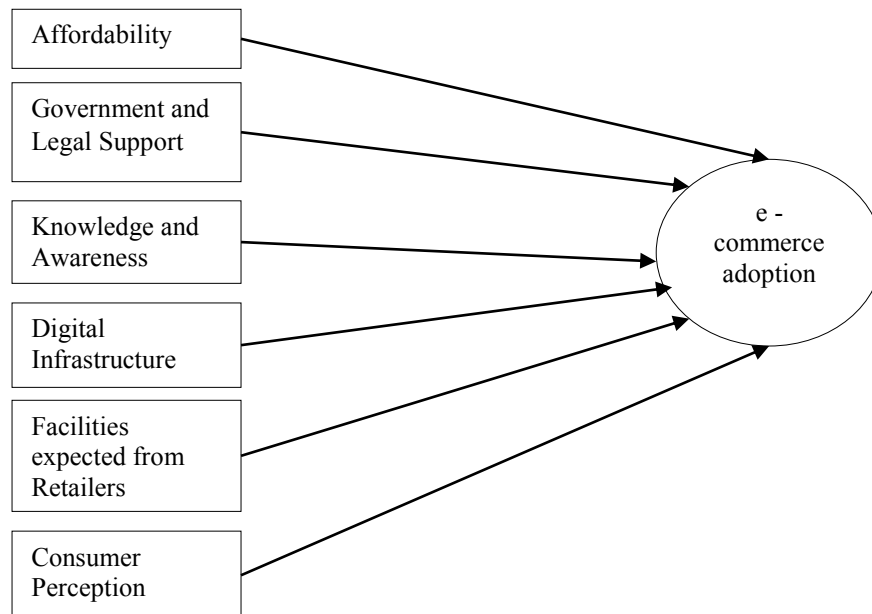
Figure 3.2: Conceptual framework.

Following hypothesis can be derived based on the research framework:

Let;

H_A: Alternative Hypothesis

H_0: Null Hypothesis

H_1

H_10. There is no significant relationship between the maturity of digital infrastructure and level of e-commerce adoption.

H_{1A}. There is a significant positive relationship between the maturity of digital infrastructure and level of e-commerce adoption.

H_2

H_20. There is no significant relationship between the government and legal support and level of e-commerce adoption.

H_{2A}.There is a significant positive relationship between the government and legal support and level of e-commerce adoption.

H_3

H_30. There is no significant relationship between the affordability and level of e-commerce adoption.

H_{3A}. There is a significant positive relationship between the affordability and level of e-commerce adoption.

H_4

H_40. There is no significant relationship between the facilities expected from retailers and level of e-commerce adoption.

H_{4A}. There is a significant positive relationship between the facilities expected from retailers and level of e-commerce adoption.

H_5

H_50. There is no significant relationship between the knowledge and awareness and level of e-commerce adoption.

H_{5A}. There is a significant positive relationship between the knowledge and awareness and level of e-commerce adoption.

H₆

H$_{60}$. There is no significant relationship between the Consumer Perception and level of e-commerce adoption.

H$_{6A}$. There is a significant positive relationship between the Consumer Perception and level of e-commerce adoption.

3.3. Structural equation modeling

The literature review showed that in such situation the concept of Structural Equation Modeling (SEM) can be used. Structural Equation Modeling (SEM) is a statistical method use to analysis relationship in between network of data. It is currently used in various social science analyses. It evolved from the earlier methods such as genetic path modeling. It includes composite analysis, factor analysis, path analysis and various model analyses. It involves measurement of directly immeasurable (unobserved constructs) latent variables using one or more observed (indicator/manifest) variables. SEM assesses relationships between such latent variables. SEM allows testing multiple constructs simultaneously. Also, it calculates the strength of association between constructs. When association among variables is tested, the associations are free of measurement error as it has been estimated and removed. Therefore, reliability of measurement is assured (Bentler and Ullman, 2003, Chapter 23).

To example the concept of educational level cannot be directly measured, instead college final year GPA, exam mark, and grades of subjects is used. Those are observed variables. Hence, SEM provides the relationship in numerical value. This value indicates the strength of the relationship among constructs. Ultimately it allows identifying good indicators to predict latent variables.

There are many advantages in using SEM. Since it estimates and eliminates error in data gathering, leaving only common variance, measurement error is removed. Reliability of measurement is accounted for estimating and removing the measurement error. Complex relationships would easily be analyzed with this technique. It allows simultaneous examination of several multidimensional constructs. Alternatively, it calculates the strength of association between constructs

(Bentler and Ullman, 2003, chapter 23). LVs are unobservable and not directly measurable. Therefore, to estimate the LV s in the model, the concept of indicator variables is adopted. Indictor variables are observable and empirically measurable. Table 3.3 shows the constructs along with the sub-factors and indicators used to measure the above constructs in the questionnaire (see Appendix B). Based on the factors, collected from the literature and pre-survey, a detailed questionnaire was distributed to collect sample data. Random responses were excluded using the answers for question number 04 and 05 (see Appendix B).

3.4. Population and sample selection

The focused population represents the potential Internet users' in Sri Lanka. According to the statistical data from the Telecommunications Regulatory Commission of Sri Lanka (2018) by December 2018, there were 7,263,161 fixed broadband, narrowband, and mobile broadband subscriptions. This represents 34.67% from the total population. Given this population, the sample size was determined to be 384 sampels based on the Cochran's formula (Bartlett et al., 2001) with a confidence interval of 0.05 and confidence level of 95%. This technique is more appropriate for large populations (Bartlett et al., 2001; Glenn, 1992).

Convenience sampling (availability sampling) is a non-probability sampling method. It depends on data collection from population members who are conveniently available. Samples are selected because they are easiest to recruit for the research. It is the most common of all sampling techniques. It is fast, inexpensive, easy, and the subjects are readily available. Simplicity of sampling and the ease of research. It is helpful for pilot studies, hypothesis generation, and data collection can be facilitated in less time (Etikan et al., 2015). Therefore, we used convenience sampling for the survey. Even though random sampling may cover all the social groups in the sample population, it takes quite long time to collect data. Also, the subjects may be unavailable due to the technical diiculties (i.e., geographical distance) and limited available time for data collection. Also, there are cases where it is difficult to divide the population into strata (i.e., we can study on equal number of males and feales eventhough sex distribution is not equal) (Showkat

et al., 2017). Therefore, to collect data within the given time frame, convenience sampling was the most appropriate method.

3.5. Data collection

Data were collected using both survey and interview approach. Due to the time constraints, Internet users who were readily accessible or available were targeted to collect the data. For online data collection process, e-mail addresses were selected as per the convenience.

The questionnaire was divided into three sections. The first section contained questions related to the purpose of the study. In the second section some questions were closed ended questions. There the respondents were able to make their response on a 5-point Likert scale, differ from strongly disagree to strongly agree and some questions were designed to rate the answer on 1 -10 scale according to the respondent preference. Questions to collect demographic details of the respondents were included into third section. Post research interviews were carried out with information officers in popular organizations to validate the obtained results.

3.6. Summary

We proposed to use a mix method of both qualitative and quantitative methods to identify the factors affecting e-commerce adoption in Sri Lanka. Primarily a survey was carried out and later a set of interviews was done to validate the results. Structural Equation modeling statistical techniques was proposed to analyze the gathered data. Internet users' population of Sri Lanka was taken as the population and the calculated sample size was 384. Convenience sampling method was used as the sampling method. A detailed analysis of the methodology adopted for this research was presented including conceptual framework and hypothesis used.

Table 3.3: Sub-factors and indicators used to measure the constructs.

Construct	Sub-Factors	Indicators (Survey Questions)
Digital Infrastructure (DI)	Having Internet connectivity issues (i.e., speed, break downs)	1. Q.10(6)
Government and Legal Factors (GLF)	Poor safety and return policies	1. Q.10(9)
	Poor security and privacy issues	2. Q.10(10)
	Awareness on Sri Lankan laws regarding e-commerce	3. Q.11(1)
	Satisfaction on government involvement with regards to e-commerce	4. Q.11(4)
	Trust in payment methods	5. Q.11(8)
	Satisfaction on confidentiality maintained by the online service providers in Sri Lanka	6. Q.11(9)
Affordability (AF)	Importance of Price	1. Q.09(1)
	Income level	2. Demography Q.06
Facilities expected from retailers (FR)	Having Home delivery and multiple pick up options	1. Q.09(4)
	Promotions	2. Q.09(2)
	Low delivery fess	3. Q.09(5)
	Delivery time	4. Q.09(6)
	Having lack of choices and services	5. Q.10(1)
	Payment issues	6. Q.10(3)
	Delivery Issues	7. Q.10(4)
	Good Customer support	8. Q.10(8)
	Degree of satisfaction with quality of products/services	9. Q.11(7)
Knowledge and Awareness (KAF)	Lack of knowledge in using the technology	1. Q.10(2)
Consumer Perception (CP)	Time taken for checkout	1. Q.09(3)
	Peer reviews	2. Q.09(8)
	Brand and quality	3. Q.09(7)
	Customer reviews	4. Q.09(9)
	Availability of options	5. Q.09(10)
	Lack of confidence on the product quality	6. Q.10(5)

	Cost associated with online transactions	7. Q.10(7)
	Trust on Online Transaction methods	8. Q.11(3)
	Satisfaction in user-friendliness of e-commerce web sites in Sri Lanka	9. Q.11(5)
	Satisfaction with the number, variations, and quality of payment methods offered by e-commerce web sites in Sri Lanka	10. Q.11(6)
Level of Success in e-commerce Adoption (LSA)	Cost for of all online purchases over the last 12 months (in rupees)	1. Q.06
	Number of online purchasing, transactions, and service websites know and use	2. Q.03

4. DATA ANALYSIS AND DISCUSSION

Section 4.1 presents the analysis of pre-survey interviews. Data preparation for analysis is explained in Section 4.2. Section 4.3 illustrates the demographic analysis. Section 4.4 presents the questionnaire analysis. Section 4.5 describes the validity and reliability analysis of the data while Section 4.6 explains the relationship between results and e-commerce adoption. Section 4.7 illustrates relationship between results and the demographic data. Post-interview analysis is presented under Section 4.8. Chapter summary is presented in Section 4.9.

4.1. Analysis of pre-survey interviews

Some of the pre-figured factors in literature study may not be relevant to the Sri Lankan context (see Table 3.1). Also, they can be outdated as consumer perspective on e-commerce changes with time and advancing technology. Therefore, pre-survey interviews were conducted to identify unique contributory factors in the Sri Lankan context that may need to be considered apart from ones identified from the literature study.

Two interviews were conducted to identify the unique factors that might affect Sri Lankan Internet users' behavior. Table 4.1 presents the profile of the interview participants. Challenges in growing and promoting online business, suggestions in overcoming those challenges, and future e-commerce adoptions were discussed.

Table 4.1: Summary of company profiles.

	Participant 1	**Participant 2**
Designation	Marketing manager of an online retailing company	CEO from a financial solution providing company
Focused business area	Leading retailers in home appliances (i.e., TV, washing machine), mobile phone and tabs	
Customer base	Island-wide consumer base (mostly online users in their mid-30s)	

Because the retailer does not have any regional offices, deliveries are handled by the central store located in Colombo. Therefore, handling delivery and returns island-wide has become a serious matter for them. This increases consumer frustration and loss of their trust in business. Lack of IT exposure and lack of IT knowledge of their merchants in online transactions was another challenge. These merchants still rely on paper documents rather than digital transactions. This has lengthened the primary purchasing procedure and result in out of stock conditions which makes buyers unhappy.

According to the domain expert, when it comes to Sri Lankan consumers, lack of legislation and lack of awareness of available legal framework act as a strong challenge. They have suggested enhancing the legislation and practices from internal affairs to court on digital forensic evidence and IT crimes to encourage consumers, as well as the service providers. Moreover, poor government support such as not having international payment methods, poor IT infrastructure, and poor e-commerce promotion framework were pointed out as challenges by both interviewees.

Hence, government involvement in promoting e-commerce to the public was listed as an essential factor to consider in improving the e-commerce adoption of consumers. Also, to give more transparency to the online business they suggested having rating systems and consumer reviews displayed on the web site. In summary, following factors were also found to be essential in promoting e-commerce adoption:

1. Knowledgeable citizens
2. Non-delivery risk
3. Attitude
4. Lack of legislation and rules for e-commerce
5. Lack of awareness of available legal framework for e-commerce
6. Poor government involvement

4.2. Data preparation for analysis

414 responses were collected between November 19, 2018 to January 20, 2019 using both online and paper-based questionnaire. 239 responses were collected from online survey while the remaining 175 responses were collected from paper-based

survey. No missing values were recorded. Among them 12 responses were excluded due to unreliability of the answers for question number four and five (see Appendix B). In question four, those who have responded as "nothing" for "Which types of goods/services do you typically purchase/consume online?" question, have continued to complete the questionnaire. As those responses were unreliable, those cases were excluded. In question five, those who have responded that they never perform any kind online transaction, have continued to complete the questionnaire. Therefore, those cases were also excluded and finally 402 responses were used for the data analysis.
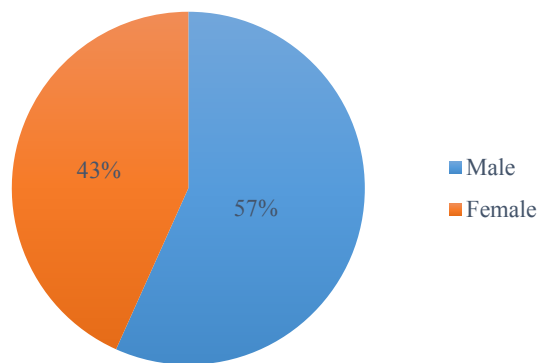
4.3. Demographic analysis

Figure 4.1: Gender distribution of the sample.

Figure 4.1 shows the gender distribution of the sample. Based on the statistical data from Census of Population and Housing 1911-2012 (Census of Population and Housing, 2012); Department of Census and Statistics, 51.59% of the Sri Lankan population was male and 48.41% were female. Therefore, the sample population is somewhat biased in terms of gender distribution.

According to a study by "AdWeek and "Washington Post" (Moses, 2013; Lu, 2014), men rely on online purchasing rather than women as they think it saves times and cost whereas for women there are various reasons behind this behavior. Women are mostly hedonic shoppers. Women want to know more about brand, how products are going to make them feel and need more tactile selection rather than visual

selection. Thus, women like manual shopping. Alternatively, women tend to consider both customer reviews and objective information. They behave in a more comprehensive manner. Men tend to take objective information over subjective information into consideration. So it has been shown that men favor mobile shopping which save their time and cost, while women enjoy browsing products and catalogs, and sharing information within their networks (Moses, 2013; Lu, 2014).
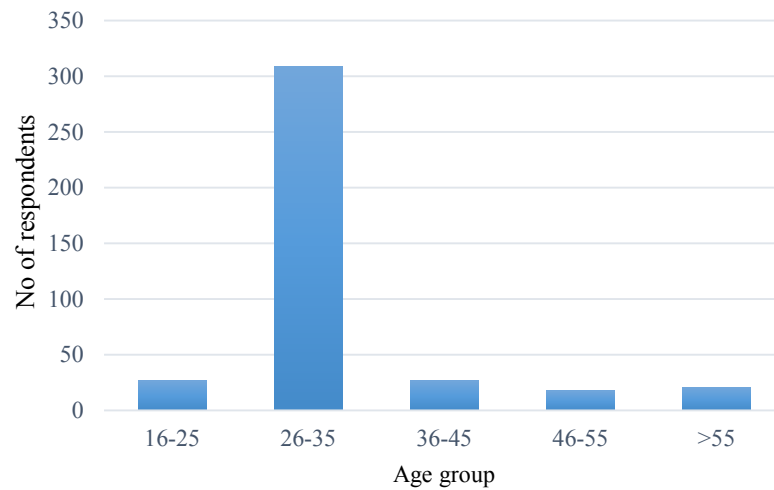

Figure 4.2: Age distribution of survey responders.

As seen on Figure 4.2 majority (76.9%) of the survey participants were between 26-35 years age category. According to the statistical data from Census of Population and Housing 1911-2012 (Census of Population and Housing, 2012); Department of Census and Statistics, majority (23.54%) of the population belong to more than 55 years age category. But in the sample, majority is belonged to 26- 35 years age group. Therefore, the sample data is towards younger customers. The key reason for this might be respondents whose age between 26-35 years was ready to answer the questionnaire than the other generations. They may have more hands-on experience in e-commerce. Most respondents over 46-years were reluctant to answer the questions as they stated that they are not involved in online purchasing and transaction services.

252 (62.7%) respondents were having bachelor's degrees. Only a few responders were educated below GCE Advanced Level. This distribution is presented

in Figure 4.3. Therefore, the sample is biased along the educated population. To overcome this, stratified sampling would be a better sampling method.
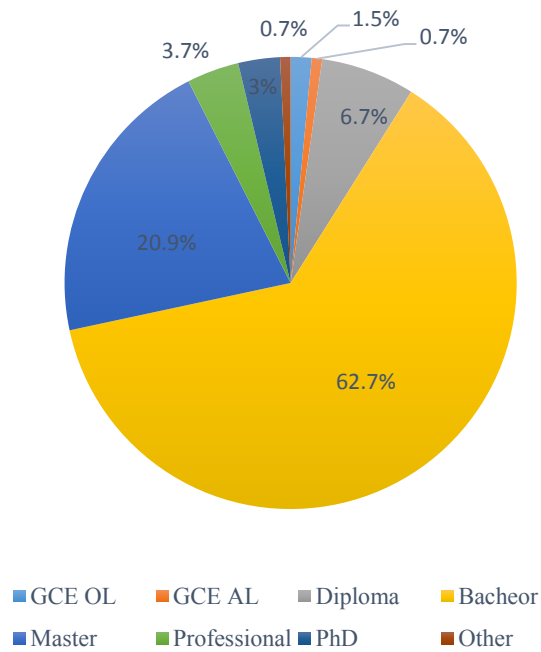
Figure 4.3: Educational qualification distribution of participants.

Full-time employment was defined as being employed 35 hours or more per week and who has permanent single occupation. Based on Sri Lanka Labor force Survey 2015 (Sri Lanka Labour Force Survey, 2015), majority of the labor force belonged to 26-35 years age category. Because most of the samples were from this age category, 87.3% of the sample population was full-time employed (see Figure 4.4). Part-time employment was defined as occupying a job less than 35-hours or less per week and who do not have permanent single occupation. 5.2% belong to this category. Among the population 3.0% were housewives and 0.8% belong to the retired category.
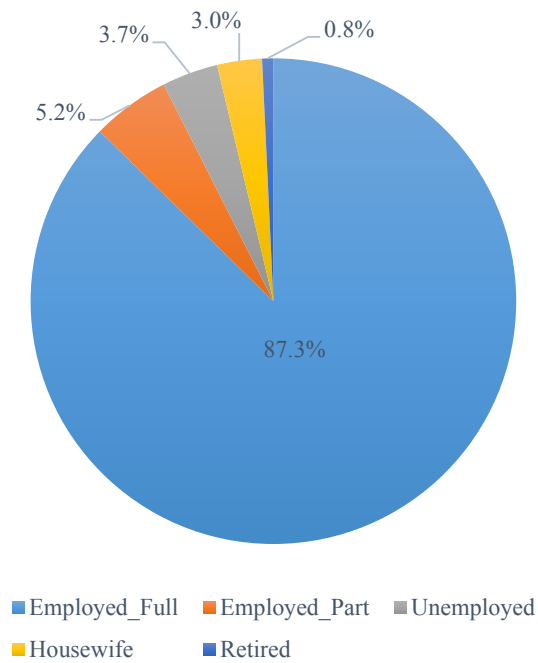
Figure 4.4: Employment status of the sample.
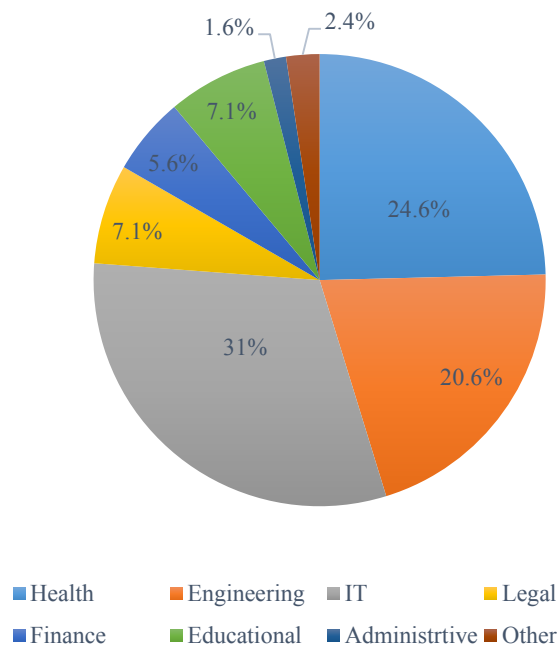
Figure 4.5: Summary of the employment sector (no of samples = 378).

378 respondents were employed at the time of data collection. Among them, 31.0% of respondents were belonging to IT sector. Health sector employees and Engineering sector employees represented 24.6% and 20.6%, respectively. Research

students, tourism sector employees and armed forces employees were categorized into the other category. These details are summarized in Figure 4.5.
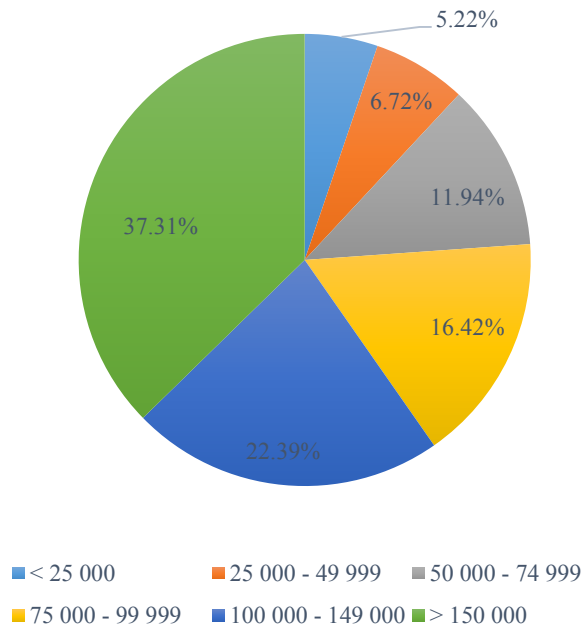
Figure 4.6: Income level distribution of the sample.

Income level of the participants was categorized according to the World Bank income classifications and household income and expenditure survey - 2016 (Fantom et al., 2016; Household Income and Expenditure Survey, 2016). These were varied between less than LKR 25,000 to more than LKR 150,000. Income level distribution is represented in Figure 4.6. 37.3% of the sample population was having more than LKR 150,000 monthly incomes.
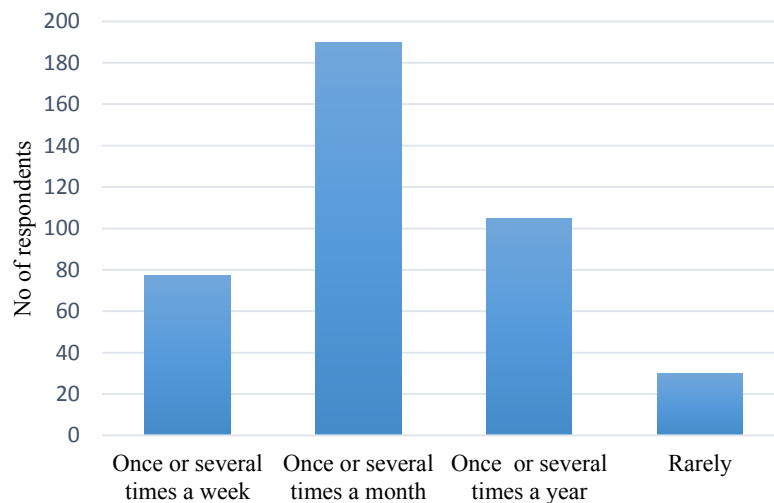
Figure 4.7: Online purchasing frequency distribution.

Figure 4.7 presents the how frequently the participants perform online purchasing or transactions. Majority of the sample population (47.3%) performed online purchasing or transactions at least once a month. 26.1% performed at least one transaction per year.
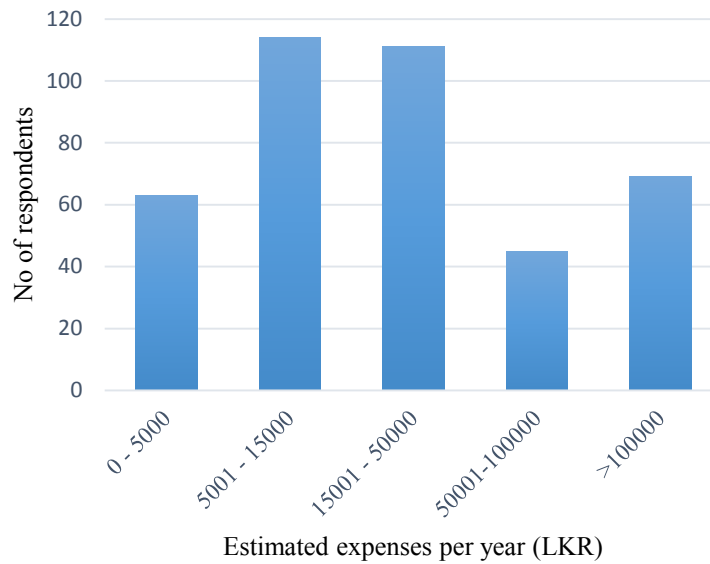
Figure 4.8: Estimated online transaction or purchases value distribution.

Figure 4.8 shows the estimated value of transactions or purchasing performed within a year. Among the 402 respondents, 28.4% respondents estimated between LKR 5,001 – 15,000 value online purchases or transactions, where 27.6% respondents estimated between LKR 15,001 – 50,000 values.

Because most of the responders belonged to health, IT, and engineering professions the sample is bias. Therefore, the income-level distribution does not represent the income distribution in Sri Lanka.

Estimated percentage of online expenses compared with total expenses related to purchases is present in Figure 4.9. 67.9% of the sample population mentioned that they spent less than 10% of their income for online purchases over the last 12 months. 5.9% spent over 50% of their income on online purchases.
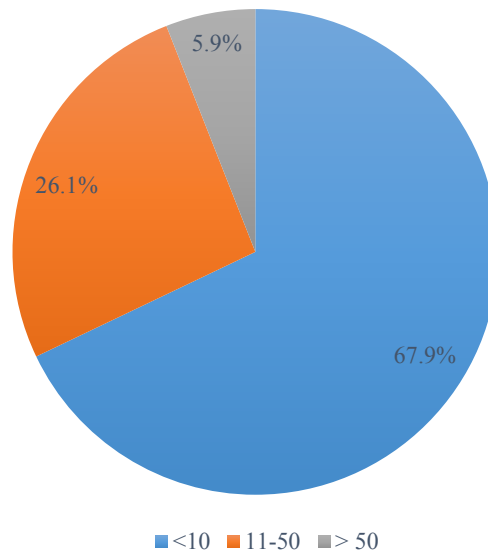
Figure 4.9: estimated percentages of online purchases.

4.4. Questionnaire analysis

Based on that analysis (see Appendix C), majority of the sample, have a neutral opinion on awareness of Sri Lankan customer laws regarding e-commerce. Significant sample stated that, they are not aware with the laws as well. Further, analysis showed that, having knowledge and awareness on performing online purchasing/transactions is an essential factor. Many of the respondents stated that government involvement in promoting online business in poor. These statements are consistent with feedback from pre-survey interviews. Major portion of the sample was satisfied with the facilities provided by the retailers such as user-friendly web environment, number of variations, and quality of payment methods, and secure payment methods. However, most of the respondents were uncertain about the quality of the products, customer support, and confidentiality maintained by the service providers.

4.5. Validity and reliability of the data

Table 4.2: Criteria for validity and reliability.

Consideration	Constructs Value
Cronbach Alpha Coefficient	> 0.6
Composite Reliability	> 0.7
Average Variance Extracted	> 0.4
Significance Level (p value) (For 95% confident interval)	< 0.05
Discriminant Validity	<0.85

Quality of the research is improved with scientifically accepted methodology, validity and reliability of gathered data. On the other hand, for better statistical analysis, validity and reliability of data set must be above the agreed standards. Cronbach alpha coefficient, composite reliability, and average variance extracted are used to determine the validity and reliability of the gathered data. Desired thresholds are represented in Table 4.2 (Fornell et al., 1981). In SEM, there are various methods to test the validity and consistency of a data set. In smart PLS Composite Reliability and Average Variance Extracted are used for this purpose. These criterion are the most widely used methods. The accepted threshold for each test are listed in Table 4.2 (Fornell et al., 1981).

Based on literature, Cronbach alpha coefficient is the most used method to test such parameter in Structured Equation Modeling (SEM). In Smart PLS 3.0 statistical software composite reliability and average variance extracted are considered to be superior compared with traditional Cronbach alpha coefficient. In Cronbach's alpha, it is assumed that all the indicators used have the same importance on the construct. But in general, some indicators will be more important while some are not. Therefore, these differences are considered when you determine the composite reliability of the construct (Hair et al., 2013).

Table 4.3: Critical considerations regarding validity and reliability.

Construct Criterion	AF	CP	DI	FR	GLS	KAF	LSA
Cronbach alpha coefficient	0.632	0.785	1.000	0.788	0.565	1.000	0.705
Composite reliability	0.724	0.841	1.000	0.834	0.592	1.000	0.831
Average variance extracted	0.573	0.401	1.000	0.402	0.340	1.000	0.631

Table 4.3 lists details of critical considerations regarding validity and reliability. Cronbach alpha, composite reliability, and average variance extracted for affordability (AF), knowledge and awareness (KAF), level of success adoption (LSA), Consumer Perception (CP), facilities expected from retailers (FR) and digital infrastructure (DI) were above the expected threshold level. In government and legal construct Cronbach alpha (0.565), composite reliability (0.592) and average variance extracted (0.340) were below the threshold. Therefore, out of seven, six constructs were above the expected threshold.

Discriminant validity test was carried out to determine whether the constructs used in the model are correlated or not. It checks the degree in which a construct is distinct from other constructs (Hair et al., 2013). Table 4.4 shows the discriminant validity values for the constructs used in the model.

Table 4.4: Discriminant validity values of the constructs.

	AF	CP	DI	FR	GLS	KAF	LSA
AF	0.757						
CP	0.649	0.624					
DI	0.052	0.247	0.624				
FR	0.664	0.830	0.333	0.608			
GLS	0.181	0.350	0.004	0.307	0.583		
KAF	0.049	0.209	0.361	0.320	0.039	0.298	
LSA	0.422	0.424	0.031	0.419	0.238	0.169	0.794

As seen in Table 4.4, none of the constructs were correlated; hence, are distinct from each other. Since the moderate values were < 0.85, those were taken into account as well (Henseler et al., 2012). These metrics prove that the data set is

consistent and the constructs we used to measure the adoption are accurate except the data set used in Government and Legal Analysis (GLS). Therefore, to maintain the reliability and validity of the data set, those data were removed and the analysis was proceed further.

4.6. Relationship with factors affecting successful e-commerce adoption

SMART PLS 3.0 Partial Least Square (PLS) based software is used for the data analyzes. Compared to the covariance and structural analysis, PLS provides both reflective and formative scales easily. Also, no prior distributional assumptions are needed, and comparatively small sample size is acceptable in PLS.

Figure 4.10 shows the model used to analyze the dataset using Smart PLS. Constructs are indicated in Blue while yellow squares represent the indicator variables. To estimate the constructs, indicator variables are used.
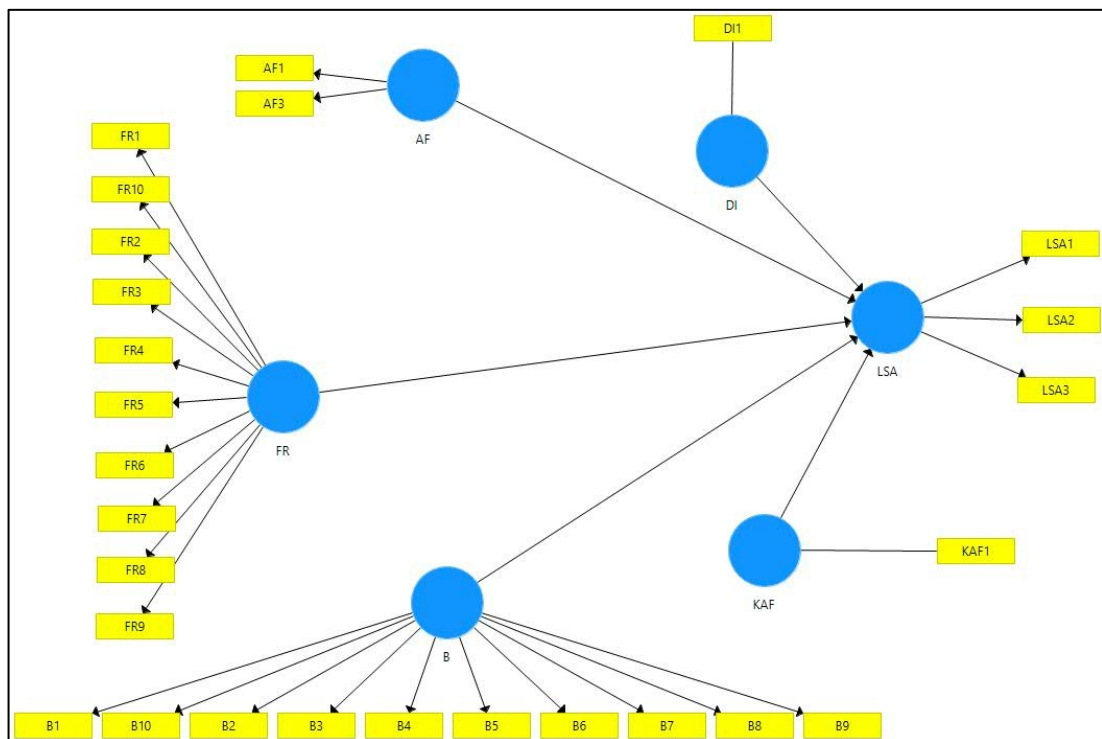
Figure 4.10: Structural model.

The PLS regression algorithm was used with boot strapping method to estimate the model. It estimated statistical significance of various PLS-SEM results including path coefficients with p values, factor scores and indicators' weights/loadings. The

estimated model with bootstrapping, including corresponding *p* values in inner model and outer weights and *p* values in outer model is showed in Figure 4.11. Inner model represents the relationship between a construct and level of adoption (i.e., AF -> LSA). Outer model represents the relationship between a construct and indicators related to that. (i.e., AF -> AF1 & AF-> AF2).
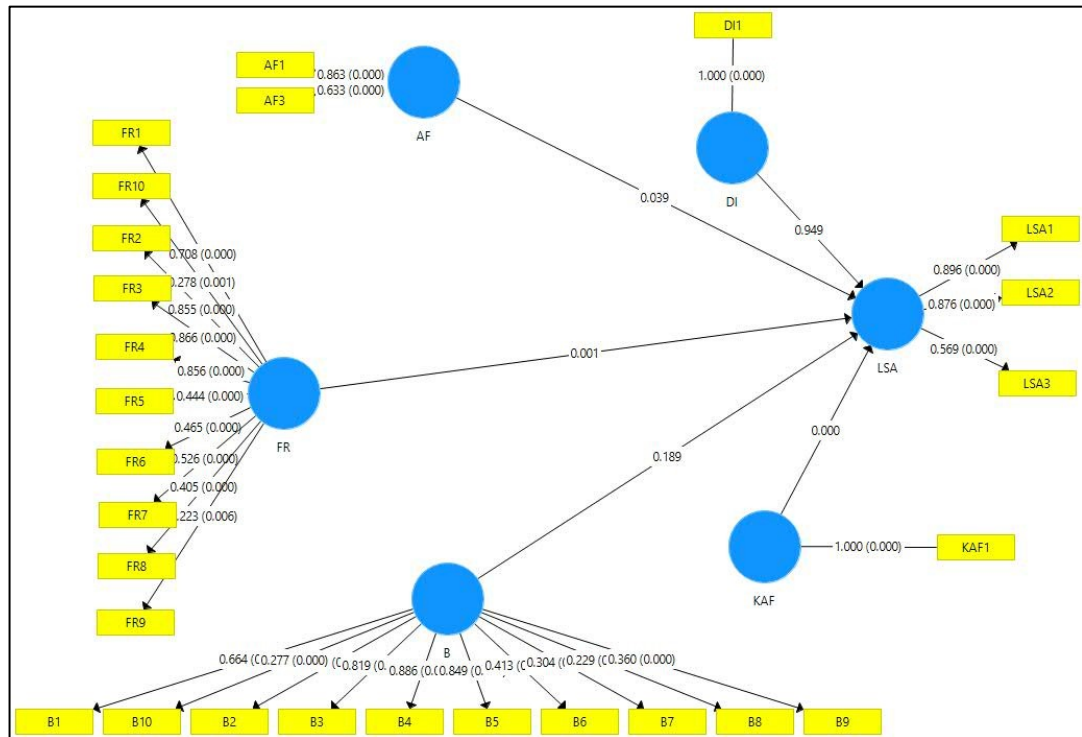
Figure 4.11: Estimated model with bootstrapping.

Table 4.5: Path coefficients.

AF -> LSA	0.039
CP-> LSA	0.189
DI -> LSA	0.949
FR -> LSA	0.001
KAF -> LSA	0.000

Affordability (p=0.039), facilities expected from retailers (p=0.001), government and legal (p=0.022), and knowledge and awareness (p=0.000) constructs have *p* values less than 0.05 (see Table 4.5). Both Consumer Perception (p=0.189) and digital

infrastructure (p=0.949) were having *p* values below the threshold. Therefore, out of the six hypotheses tested using the SEM technique, three were found to be significant. Therefore, following three hypotheses were proven and shown to be significantly affecting the level of successful e-commerce adoption:

- H_3. There is a significant positive relationship between the affordability and level of success in e-commerce adoption.
- H_4. There is a significant positive relationship between the facilities expected from retailers and level of success in e-commerce adoption.
- H_5. There is a significant positive relationship between knowledge and awareness and level of success in e-commerce adoption.

No significant positive relationship between the maturity of digital infrastructure and Consumer Perception and level of e-commerce adoption (hypotheses H_1 and H_6) were observed. Therefore, digital infrastructure and Consumer Perception were not shown to be significantly affecting the level of successful adoption of e-commerce.

Loading and weights indicate the strength of association between construct and indicators. It should be more than 0.5 and the corresponding *p* should be less than 0.05 to achieve minimum corresponding association. Strength of the association is increased with high loading and weight value. Table 4.6 shows the indicators considered for each accepted hypothesis with corresponding weight and *p* value for each indicator. Affordability construct consisted with two indicator variables. Among those two indicators, both importance of price factor and income level was considered as highly relevant indicators.

Corresponding loading/weights and *p* values for lack of knowledge in using the technology were above the threshold. Hence, the lack of knowledge in using the technology indicator in knowledge and awareness were considered as a relevant indicator. Among the nine indicators used facilities expected from retailers, promotions, having home delivery and multiple pick up options, low delivery fees, delivery time, and delivery issues were considered as highly relevant indicators.

Table 4.6 – Corresponding weight and *p* value for each indicator.

Construct	Indicator	Weight of indicator	*p* value for each indicator
Affordability	Importance of Price	0.863	0.000
	Income level	0.633	0.000
Facilities expected from retailers	Having Home delivery and multiple pick up options	0.855	0.000
	Promotions	0.707	0.000
	Low delivery fess	0.866	0.000
	Delivery time	0.856	0.000
	Having lack of choices and services	0.455	0.000
	Payment issues	0.466	0.000
	Delivery Issues	0.528	0.000
	Good Customer support	0.406	0.000
	Degree of satisfaction with quality of products/services	0.223	0.006
Knowledge & Awareness	Lack of knowledge in using the technology	1.000	0.000

This implies that most of the online consumers are not highly concerned on brand and quality of the product/services that are advertised. Their purchasing manner is highly depending on the price, benefits offered by retailers, and delivery options. Lack of knowledge about the technology is a key technical barrier. Digital infrastructure is not much of a concerned, as there are many means to access e-commerce. Behavior norms are not highly considered as relevant to e-commerce adoption.

4.7. Factor analysis of different demographics

Demographic characteristics such as gender, age group, educational level, and employment sector were tested separately using multi-group analysis to determine whether the behavior changes across demographics (see Appendix D). Multi-group analysis determines whether pre-defined data groups have any significant differences. If the determined *p* value in parametric test is smaller than 0.05 the data

groups are having significant differences (Henseler et al., 2012). Effect size of the association is determined by the path coefficient value. Higher the value represents higher the effect. Using this method, multiple data groups can be tested simultaneously, and it allows doing a comparison between them as well.

With regards to gender, it was found that there is a significant ($p = 0.012$) difference between male and female with respect to affordability. Females (0.379) were more concern about affordability than males (0.031). Most of the time females prefer to do bargaining (Gupta, 2015). Therefore, the price factor is significant in their purchasing behavior where males are more concerned on the convenient and easiness than the price (Gupta, 2015). Knowledge and awareness, as well as facilities expected from the retailers constructs did not indicate any significant difference with regards to gender.

While 26-35 years age group showed consistent results with findings obtained in Section 4.3, other age groups (16-25, 36-45, 46-55, and above 55) did not contained adequate data to calculate significance for each age group with good reliability and validity. Therefore, we could not interpret the results based on the age group.

As majority of the participants had Bachelor's and Master's Degrees we analyze factors related to these sub-groups. Results showed that Bachelor's degree holders and Master's degree holders have a significant ($p = 0.021$) difference based on facilities expected from the retailers' factor. The effect of this fact was a higher value to the Bachelor's degree category (0.298) where it was a lower value to the Master's degree category (-0.250).

When it comes to the employment, majority of participants were from engineering, IT, and health sectors. Other employment categories did not contain adequate data to calculate significance difference for each sector. Engineering sector employees (0.484) is significantly ($p = 0.040$) concerned about the affordability factor than the IT sector employees (0.043). All three sectors are keen on facilities provided by retailers. Health sector (0.689) has a significant higher effect with regards to facilities provided by retailers than engineering (0.588) and IT sectors (-.0039).

4.8. Analysis of expert feedback

Post-validating enables verifying the relevance and accuracy of the research findings. This helps to make correct decisions in applying the results into action. The literature had no proven evidence to show that the Internet user behavior in e-commerce in Sri Lanka. Hence, post-interviewees were the best representatives we had as they were experts in the domain. Therefore, to validate the results, a set of post interviews were carried out with two professionals; two information officers of reputed e-comerce retailing companies. According to them affordability, facilitates expected from retailers, and having knowledge and awareness are the significant factors which affect e-commerce adoption which are consistent with our findings. Moreover, their discussion revealed that the Internet user whose monthly income is more, do more online purchasing compared to the person whose monthly income is less. Income plays a major role to purchase online products. Higher income people prefer to purchase online more, as it gives them reliability and convenient.

Because we have considered potential Internet users as the population, we tried to collect more responses from them. Generally younger generation is more updated with the technological revolution than the old generation. Therefore, most of the responses were between 26-36 years category. This category is more likely to consider the price, rather than the quality of the product (Nanson, 2018).

This fact has been found to be true from current research works. Therefore, importance of price and income level became significant than the behavioral norms. Legal factors were not highlighted as significant in this study. According to interviewees, consumers in this age category most of the time used to avoid dealing with legal matters such as formal complaining to legislative institutes because they were unlike to get into such legal matters as they considered them to be a waste of time and money.

Delivery is the most common for any age category. In Sri Lanka, still e-commerce-based companies are not wealthy enough to have their own delivery mechanisms. Therefore, they must rely on external parties. These external parties are not much reliable. Quality of the service is not assured either. Therefore, delivery is the main concern of any age category in e-commerce purchasing.

To improve e-commerce adoption in general, they suggested making aware of the benefits in online purchasing. Also, address the issues from their side such as delivery as well.

4.9. Summary

This chapter presented a detailed description about how the data were analyzed and a detailed discussion on the results obtained through the analysis. Except data for government and legal support, rest of the data for digital infrastructure, affordability, facilities expected from retailers, knowledge and awareness, consumer perception, and level of success in e-commerce adoption have found to be valid and reliable. Out of the six constructs tested using SEM technique, three were found to be significantly affecting the e-commerce adoption. Importance of price and income level, promotions, having home delivery and multiple pick up options, low delivery fees, delivery time, and delivery issues, lack of knowledge in using the technology indicators were pointed to be highly relevant indicators. Results were also analyzed based on demographic data and indicators were identified for each demographic category. Finally, results were verified with post interviews conducted with several experts.

5. RECOMMENDATIONS AND CONCLUSION

Section 5.1 presents the summary of research with the conclusions drawn from the data analysis. Research limitations are described under Section 5.2. Recommendations for future studies are presented in Section 5.3.

5.1. Conclusion

Even though the Internet usage is rapidly increasing, still there is a lag in widespread adoption of online purchasing/transactions compared to traditional transaction methods. Therefore, the main objective of this study was to identify the factors affecting the e-commerce adoption in Sri Lanka from Internet users' perspective. Without being confined to the literature survey, a preliminary survey was conducted to identify additional factors. A comprehensive questionnaire was then developed as the research instrument. It was shared with a small sample of potential Internet users in Sri Lanka, and both Sinhala and English versions were used to reduce potential language barriers affecting the collected responses. Then data cleaning and re-validation processes was followed. Missing values were removed to maintain the integrity of the dataset. Accuracy was improved by excluding question answer mismatch. Finally, data were analyzed using structural equation modeling technique. The aim was to increase the validity and reliability of the data set with suitable values for Cronbach Alpha coefficient, Composite Reliability, Average Variance Extracted, and Discriminant Validity. Based on the analysis it was conclduded that a all constructs were valid and reliable, except for government and legal construct.

Out of six hypotheses tested, affordability, facilities expected from retailers, and knowledge and awareness were turned out to be significantly impacting the adoption of e-commerce in Sri Lanka. Consumer behavior and digital infrastructure were not found to have a significant impact on the e-commerce adoption among Internet users. Importance of price and income level appeared to be strong indicators in affordability construct while having home delivery and multiple pick up options, low delivery fees, delivery time, and delivery issues were turned out to be the strongest indicators in facilities expected from retailers construct. Having knowledge

and awareness on using the technology was the strongest indicator for knowledge and awareness construct.

During the literature survey and pre-survey interviews several potential key factors were highlighted that may contribute to the e-commerce adoption. Because we were concerned about the Internet users' perspective, digital infrastructure factor was not significant in our study. When people in developing countries get involved with online purchasing, they concern more about factors like affordability and facilities given by the retailers (Kabango & Asa, 2015). Because Sri Lanka goes into developing country category (World Economic Situation and Prospects, 2018) this fact is applicable to us as well. Therefore, even though literature highlighted the consumer perception as a challenge, it did not apply for Sri Lankan Internet users' e-commerce adoption.

Results were further analyzed based on demographic data and the following key points were identified:

- Affordability was having a significant impact on the e-commerce adoption of female population than the male population.
- Bachelors' degree holders were more concerned by the facilities given by the retailers than the Masters' degree holders.
- Engineering sector is more concerned about affordability than the IT sector. All three sectors are keen on facilities provided by retailers while health sector had a higher effect with regards to facilities provided by retailers than engineering and IT sectors.

The key conclusion of this results and analysis is that the population under 26-35 age in years with higher educational qualifications and relatively higher income are more likely to be the main e-commerce consumer base among Internet users in Sri Lanka. Their online transactions and purchasing decisions are affected by price, income level, having home delivery and multiple pick-up options, low delivery fees, delivery time, delivery issues, and having knowledge and awareness on using the technology.

Results were verified with a set of interviews carried out with domain experts. According to their opinion, the results were acceptable, and some indicators were

biased based on age category. During the discussion, they suggested that stakeholders should be looking more into smoothen their product delivery process Such as decreasing the delivery time, having convenient delivery policies and having multiple options or multiple centers to deliver island wide to reduce the delay. Moreover, they stated that government should take initiatives to motivate people to transfer into online transactions by reducing traditional transaction methods (e.g., bill payments and bank transactions) as well.

5.2. Research limitations

Sample population was biased based on the gender, age category, and profession. Sample population was restricted to urban geographic areas in Sri Lanka as well. Education and economic wealth of the people explains people's improvement in technology. Also, the living area which is more advanced in facilities and technology is likely to have more involvement with online business rather than the less or underdeveloped geographic area. Moreover, this study is only focused on Internet users' perspective on e-commerce adoption. Non-Internet users were not included to this study.

Spiritual and cultural norms were not analyzed in the study. There was a possibility that, the prior perceptions may change with the real experience and time. Other scenarios like factors from merchants, government, were not considered as well.

5.3. Future work

To ensure the presence of key subgroups within the sample population, it is recommended to use stratified random sampling in future studies. This method will prevent the sample from being biased towards one or few social groups. Since this study was limited to urban geographic areas in Sri Lanka, Sample with more representatives might give a broader representation to get more significant results.

It is necessary to design a cross sectional descriptive study to explore the matters of none e-commerce users. Their believes (e.g., hidden charges, privacy in danger, compulsory registration, difficulty in reversing process if a mistake happens),

fears and factors which limit e-commerce behavior must be researched. This will facilitate us to understand practical issues which they might face. By addressing those aspects, e-commerce adoption can be improved.

Metrics to measure the impact of cultural beliefs would improve the understanding of e-commerce adoption behavior in those aspects as well. Also, questions to measure the percentage who are not involved with e-commerce would give a representation of status of e-commerce usage in Sri Lanka.

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APPENDIX A: PRE- SURVEY QUESTIONNAIRE

1. Could you please explain the type of business your organization is engaged in? (Focus areas, types of products, customer base, etc.)

2. Could you please explain the role that e-commerce plays in your business? (How critical e-commerce is for success)

3. Could you please explain your e-commerce strategy? (i.e., your approach to e-commerce)

    a. What type of items your business focuses on?

    b. What items are easier to sell online?

    c. Is the business also supported by shop or an experience center?

4. What do you think about customer bases?

    a. Are they e-commerce savvy/ready?

    b. Are there any problems due to customer knowledge, attitude and practices?

        • Knowledge – Lack of e-commerce knowledge, competencies in using modern tools, return policies, lack of awareness of available legal framework for e-commerce in Sri Lanka, etc.

        • Attitude -No confident in online transaction, Resistance to change, thinking that it causes extra cost

        • Practice - Lack of e-commerce experience

    c. As per your experience, are Sri Lankans ready for online only or mostly online type of businesses?

5. Do you think they are mature?

    a. Are they concerned about convenience, options, and time saving that e-commerce provide or just looking for bargains?

    b. Who would be your ideal customer?

6. What are the challenges you face in promoting and growing your online business?

    a. Any issues in handling delivery and returns?

    b. What about stock management and product options?

c. Are you satisfied with the available online payment options? If not suggestions.

d. Is your online business highly affected by the customers' buying capacity?

e. Do you see the absence of a strong legal framework as a hindrance?

7. How do you propose to overcome those challenges?

a. What steps you have taken to minimize the customer complaints?

b. How about government involvement? (facilitating strong ICT infrastructure)

8. What should the government, ICTA, or industry bodies (CA Sri Lanka), banks, or even ISPs/Telcos could do to help your business?

9. What do you think about the impact of factors such as:

Factors	How Relevant (1-3)
Cause extra cost	
No confident on delivery service	
Poor return policies	
No confident on online transaction	
Resistance to change	
Lack of e-commerce experience	
Lack of legislations and rules for e-commerce in Sri Lanka	
Lack of awareness of available legal framework for e-commerce in Sri Lanka	
Could not check the quality of items manually	
Accountability of service providers	
Current customer habits of people in Sri Lanka does not suit online transactions	
Lack of online payment options in sales desk	
Low capacity in e-money expense	
Poor ICT infrastructure	

10. Anything else you wish to share?

11. Professional Title

a. MD, CEO, CIO, CTO

b. IT Manager

c. Mobile operator

APPENDIX B: SURVEY QUESTIONNAIRE

Survey on Identifying the factors affecting the Adoption of E-commerce in Sri Lanka: A Customer Perspective

Main purpose of this study is to identify your experience as a consumer of e-commerce services in Sri Lanka.

1. I have *(You may select multiple options)*

    ☐ One or more Social Media Accounts

    ☐ One or more Email Accounts

    ☐ My own computing device (e.g., smartphone, Laptop, Tablet, or Desktop computer)

    ☐ My own Internet connection (e.g., Wi-Fi connection, dial-up connection, ADSL connection, 3G/4G dongle)

    ☐ Online Bank Account / PayPal Account

    ☐ Mobile Banking Account (e.g., Easy Cash or M-Cash)

2. How do you get to know about online purchasing? *(You are able to select multiple answers)*

    ☐ SMS by retailers

    ☐ Social media promotions by retailers

    ☐ Social media posts that others share

    ☐ Email flyers by retailer

    ☐ TV and radio advertisements

    ☐ Credit card promotions

    ☐ Other; Specify……………………………………….

3. How many online purchasing, transactions, and service websites do you know and used? *(e.g., – Sampath vishwa, WOW, Pick me)*

Number I'm aware of	1	2	3	4	5	6	7	8	9	10	10+
Number I have used	1	2	3	4	5	6	7	8	9	10	10+

4. Which types of goods/ services do you typically purchase/ consume online?
(You may select multiple answers)

- ☐ Clothing and accessories
- ☐ Electronic equipment
- ☐ Sport items
- ☐ Stationary
- ☐ Bank and other financial services
- ☐ Tourist services (hotels, transport, car hire)
- ☐ Health-care services
- ☐ Other; Specify……………………………………….

5. How often do you execute online purchasing/transactions?

- ☐ Once or several times a week
- ☐ Once or several times a month
- ☐ Once or several times a year
- ☐ Rarely
- ☐ Never

6. What is the estimated value of all your online purchases over the last 12 months (in rupees)?

- ☐ 0 – 5,000
- ☐ 5,001 – 15,000
- ☐ 15,001 – 50,000
- ☐ 50,001 – 100,000
- ☐ Above 100,000

7. How do you pay for your online purchases? *(You are able to select multiple answers)*

- ☐ Using Credit or Debit card
- ☐ Prepaid card
- ☐ Online Account (PayPal, Paytm)
- ☐ Cash on delivery
- ☐ Mobile phone payment (e.g., – Dialog easy cash, Mobitel Mcash)
- ☐ Crypto currency (e.g., bitcoin)

8. Compared to your all expenses related to purchases, what percentage is carried out as online purchases over the last 12 months (please provide best guess)?

☐ 0 - 2%

☐ 3 - 5%

☐ 6 - 10%

☐ 11- 25%

☐ 26 -50 %

☐ 51% or above

From following question onward, please rate your perception on a scale of 1-10. "1" indicates the lowest important/relevant whereas "10" indicates the highest important/relevant.

e.g., –

1	2	3	4	5	6	7	8	9	10

9. Following factors are important to me in deciding what to purchase online:

	1	2	3	4	5	6	7	8	9	10
1. Price	1	2	3	4	5	6	7	8	9	10
2. Promotions(e.g., – 10% off)	1	2	3	4	5	6	7	8	9	10
3. Time taken for checkout	1	2	3	4	5	6	7	8	9	10
4. Home delivery and multiple pick up options	1	2	3	4	5	6	7	8	9	10
5. Low delivery Fees	1	2	3	4	5	6	7	8	9	10
6. Delivery time	1	2	3	4	5	6	7	8	9	10
7. Brand and quality	1	2	3	4	5	6	7	8	9	10
8. Peer reviews	1	2	3	4	5	6	7	8	9	10
9. Customer reviews	1	2	3	4	5	6	7	8	9	10
10. Availability of options	1	2	3	4	5	6	7	8	9	10

10. I have faced difficulties in online purchases/transactions due to:

''Record the relevance 1 – least relevance, 10 – most relevance''

1. Lack of choices and services	1	2	3	4	5	6	7	8	9	10
2. Lack of knowledge in using technology	1	2	3	4	5	6	7	8	9	10
3. Payment issues (e.g., –pay with a different currency, lack of payment options)	1	2	3	4	5	6	7	8	9	10
4. Delivery issues	1	2	3	4	5	6	7	8	9	10
5. Lack of confidence on the product quality	1	2	3	4	5	6	7	8	9	10
6. Internet connectivity issues (e.g., – speed, break downs)	1	2	3	4	5	6	7	8	9	10
7. Cost associated with online transactions (e.g., – Internet charges)	1	2	3	4	5	6	7	8	9	10
8. Customer support	1	2	3	4	5	6	7	8	9	10
9. Safety and return policies	1	2	3	4	5	6	7	8	9	10
10. Security and privacy issues	1	2	3	4	5	6	7	8	9	10
11. Personal Financial Difficulties	1	2	3	4	5	6	7	8	9	10

11. To what extent you agree or disagree with following statements about Sri Lankan websites/applications related to online purchases/transactions?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1. I am well aware of Sri Lankan customer protection laws with regard to online transaction / purchases					
2. I have necessary knowledge and skills to perform online transactions/purchases					
3. I trust online transaction methods than traditional methods					
4. I'm satisfied with the government involvement in promoting online business					
5. I believe websites/applications are user friendly					
6. I'm satisfied with the number, variations, and quality of payment methods offered to me					

7. I'm satisfied with the quality of products/services offered to me					
8. I believe available payment methods are secure					
9. I'm satisfied with the confidentiality and privacy level maintained by the online service providers					
10. I believe websites/applications provide good customer support					

Demographic Questions

1. Gender

   ☐ Male

   ☐ Female

2. Age Group (in years)

   ☐ 16 – 25

   ☐ 26 – 35

   ☐ 36 – 45

   ☐ 46 – 55

   ☐ Above

3. What is the highest level of formal education you have completed? *(If you're currently enrolled in school/university, please indicate the highest degree you have received.)*

   ☐ G.C.E. O/L

   ☐ G.C.E. A/L

   ☐ Certificate level

   ☐ Diploma level

   ☐ Bachelor's degree

   ☐ Master's degree

   ☐ Professional degree (e.g., MD)

   ☐ Doctorate (e.g., PhD)

   ☐ Other

      o Please specify

....

4. What is your current employment status?

☐ Employed full time (35 or more hours per week)

☐ Employed part time (up to 35-hours per week)

☐ Self-employed

☐ Unemployed

☐ Housewife

☐ Student

☐ Retired

5. If you are employed, which employment category your occupation belongs to?

☐ Health Sector

☐ Engineering Sector

☐ Information Technology Sector (including IT engineers)

☐ Legal Sector

☐ Finance Sector

☐ Educational Sector

☐ Administrative Sector

☐ Other

   o Please specify

   ....

6. What is your monthly income level (In rupees)?

☐ Below 25,000

☐ 25,000 – 49,999

☐ 50,000 – 74,999

☐ 75,000 – 99,999

☐ 100,000 – 149,999

☐ Over 150,000

7. Anything you would like to share about your experiences related to e-commerce in Sri Lanka and how it should improve?

APPENDIX C: HISTOGRAMS FOR LIKERT SCALE QUESTIONS

SURVEY QUESTIONNAIRE; Question 11 - To what extent you agree or disagree with following statements about Sri Lankan websites/applications related to online purchases/transactions?
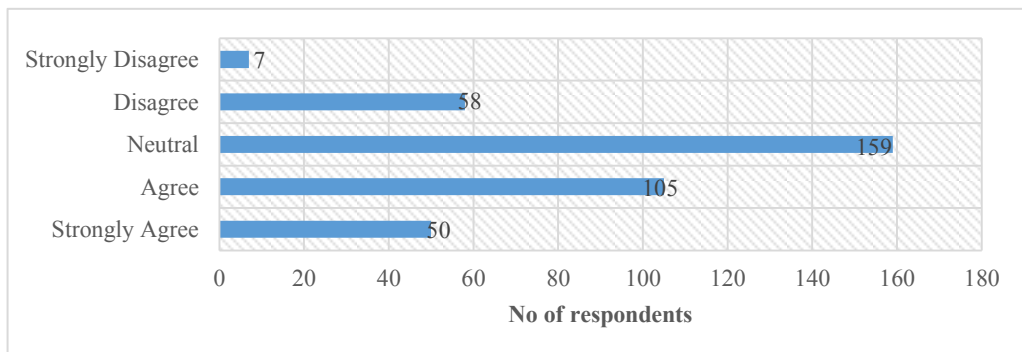
Statement 01: "I am well aware of Sri Lankan customer protection laws with regard to online transaction / purchases"
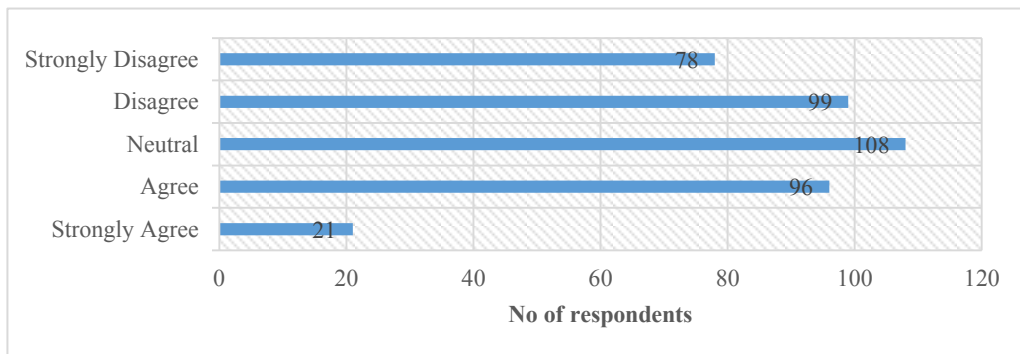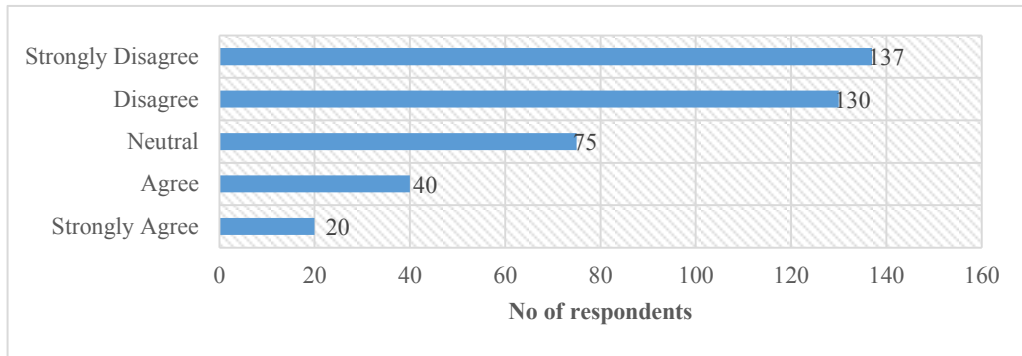

Statement 02: "I have necessary knowledge and skills to perform online transactions/purchases"
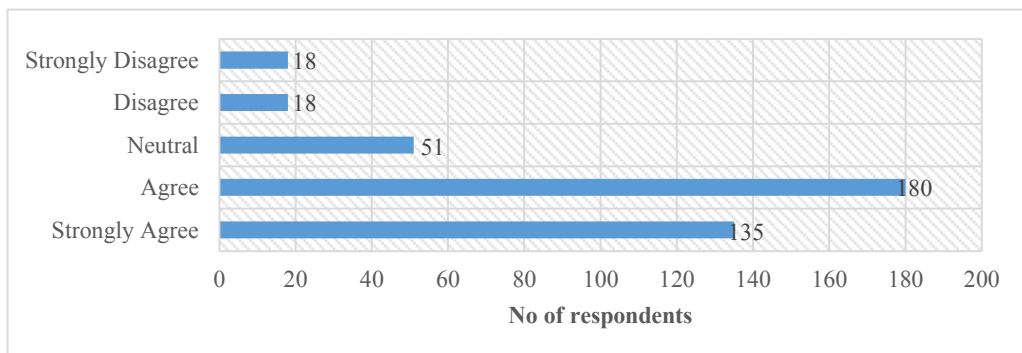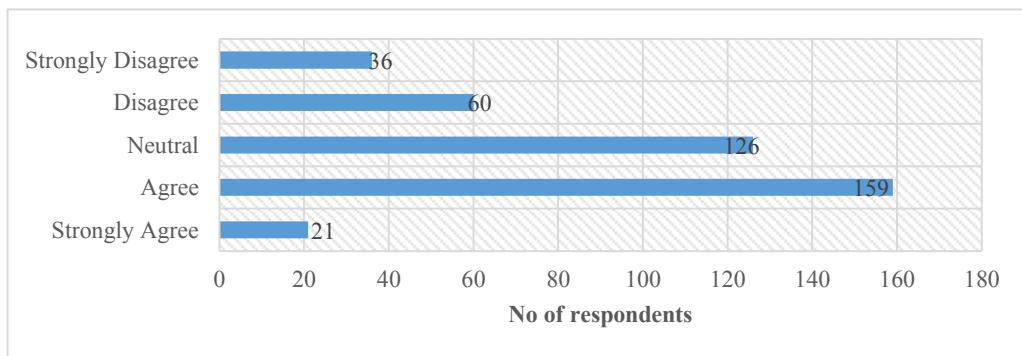

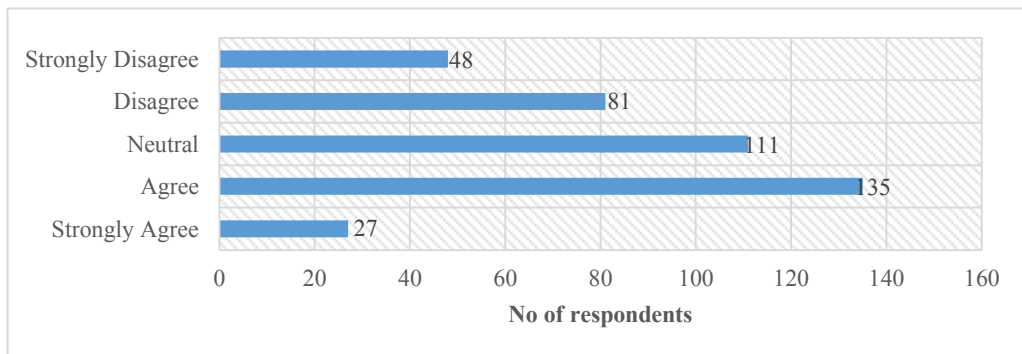*Statement 03: "I trust online transaction methods than traditional methods"*

Statement 04: "I'm satisfied with the government involvement in promoting online business"
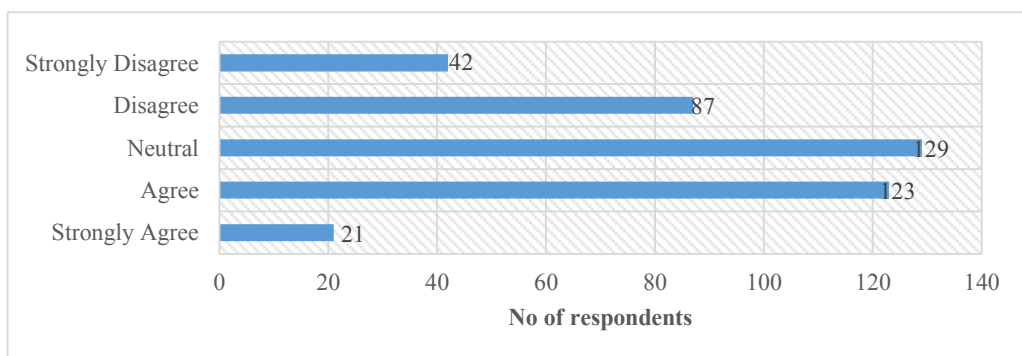

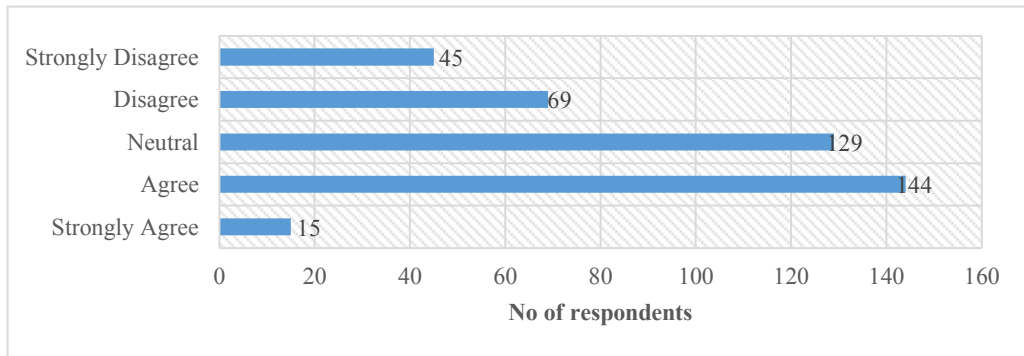*Statement 05: "I believe websites/applications are user friendly"*

Statement 06: "I'm satisfied with the number, variations, and quality of payment methods offered to me"
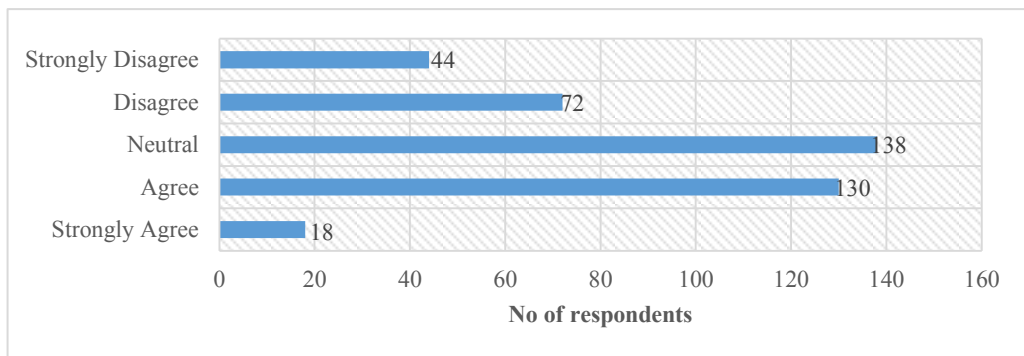

Statement 07: "I'm satisfied with the quality of products/services offered to me"
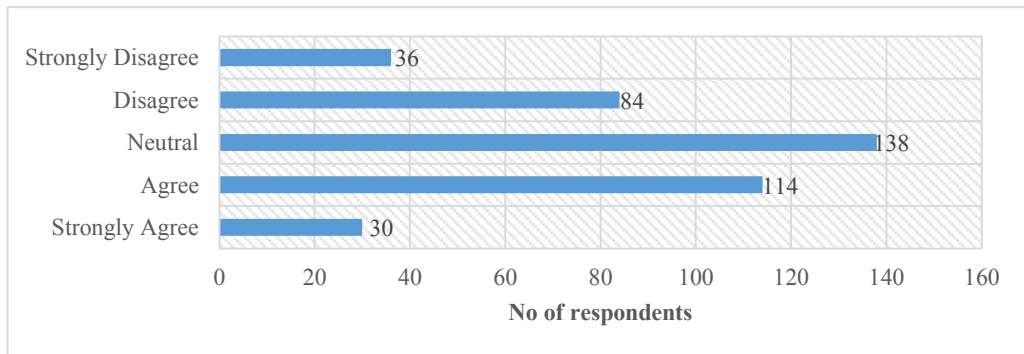
Statement 08: "I believe available payment methods are secure"

Statement 09: "I'm satisfied with the confidentiality and privacy level maintained by the online service providers"

Statement 10: "I believe websites/applications provide good customer support"

APPENDIX D: FACTOR ANALYSIS BASED ON DEMOGRAPHGIC CHARACTERISTICS

1. Gender

	Path Coefficients (Female)	Path Coefficients (Male)
AF -> LSA	0.379	0.031
B -> LSA	0.060	0.199
DI -> LSA	0.018	-0.014
FR -> LSA	0.092	0.420
KAF -> LSA	-0.389	-0.258

	Path Coefficients-diff (Female - Male)	t-Value (Female vs Male)	P Value (Female vs Male)
AF -> LSA	0.348	2.538	0.012
B -> LSA	0.139	0.715	0.475
DI -> LSA	0.032	0.380	0.704
FR -> LSA	0.328	1.730	0.084
KAF -> LSA	0.131	1.619	0.106

2. Educational Level

	Path Coefficients (Bachelors)	Path Coefficients (Masters)
AF -> LSA	0.213	0.161
B -> LSA	0.115	0.611
DI -> LSA	0.103	0.004
FR -> LSA	0.298	-0.250
KAF -> LSA	-0.362	-0.331

	Path Coefficients-diff (| Bachelors - Masters |)	t-Value (Bachelors vs Masters)	p-Value (Bachelors vs Masters)
AF -> LSA	0.051	0.244	0.807
B -> LSA	0.495	1.882	0.055
DI -> LSA	0.099	0.899	0.359
FR -> LSA	0.548	2.296	0.021
KAF -> LSA	0.031	0.280	0.779

4. Employment Sector

	Path Coefficients (Engineering)	Path Coefficients (Health)	Path Coefficients (IT)
AF -> LSA	0.484	0.125	0.043
B -> LSA	0.167	-0.150	0.091
DI -> LSA	-0.345	0.008	0.597
FR -> LSA	0.588	0.689	-0.039
KAF -> LSA	-0.443	-0.396	-0.325

	Path Coefficients-diff (Engineering - Health)	Path Coefficients-diff (Engineering - IT)	Path Coefficients-diff (Health - IT)	t-Value (Engineering vs Health)	t-Value (Engineering vs IT)	t-Value (Health vs IT)	p-Value (Engineering vs Health)	p-Value (Engineering vs IT)	p-Value (Health vs IT)
AF -> LSA	0.358	0.440	0.082	1.652	2.068	0.429	0.100	0.040	0.669
B -> LSA	0.352	0.942	0.589	1.142	3.177	1.898	0.255	0.020	0.059
DI -> LSA	0.317	0.076	0.241	1.956	0.446	1.405	0.052	0.656	0.161
FR -> LSA	0.102	0.627	0.729	0.339	2.128	2.809	0.735	0.035	0.005
KAF -> LSA	0.047	0.118	0.071	0.406	0.833	0.504	0.685	0.406	0.615