ISSN 3093-5245

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Journal of Social Statistics

Volume 11, Issue 01

2025

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මුද්‍රණය 2025 සැප්තැම්බර්

ISSN 3093-5245

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Message from the Vice Chancellor

University of Kelaniya

It is with great pleasure that I write this congratulatory message for the 11th issue of the Journal of Social Statistics, organized by the Social Statistics Students' Association, Department of Social Statistics, University of Kelaniya.

Research activities are an important part in university culture, and they play a significant role when the undergraduates continue their postgraduate studies. Therefore "JSS – the 11th Journal of Social Statistics" will lead the new researchers on their way, in the correct path.

Throughout the last nine years the Department of Social Statistics has strongly encouraged students who are willing to share their research findings with others. The university itself encourages those who participate in this kind of work, and we hope that these research finings will help the future undergraduates also to improve their knowledge and interest in research work.

Therefore, I would like to extend my heartfelt gratitude to junior researchers who submitted their research to JSS for your invaluable contribution. Your rigorous research, innovative methodologies, and insightful analyses form solid foundation for your academic progress in the field of Social Statistics. I am confident that this journal will inspire further generations of young researchers and encourage further exploration into vital areas of study.

As the Vice Chancellor of the University of Kelaniya, I wish the Social Statistics Students' Association members, the organizing committee, the review panel, the editorial board and all the authors every success in their work.

Senior Professor Nilanthi de Silva

Vice Chancellor

University of Kelaniya

Message from the Dean

Faculty of Social Science

It is with great pleasure that I extend my congratulations on the 11th Volume of the Journal of Social Statistics (JSS), published by the Social Statistics Students' Association of the Department of Social Statistics, University of Kelaniya.

Undergraduates are the future scholars and researchers of our nation, and it is therefore vital to equip them with the necessary skills to conduct high-quality research. While undertaking research is important, disseminating findings through publication in reputable academic platforms is equally important. Such efforts not only enhance students' academic and analytical competencies but also make a meaningful contribution to national development.

The Faculty of Social Sciences remains committed to encouraging young researchers to actively seek opportunities that foster intellectual growth and professional advancement. In this regard, JSS serves as a valuable platform for aspiring scholars to present and publish their research work.

I would like to express my appreciations to all the undergraduates who have published their research in JSS – Volume 11, and I wish them continued success in their academic and professional pursuits.

Professor M.M. Gunatilake

Dean

Faculty of Social Sciences

University of Kelaniya

Message from the Head

Department of Social Statistics

As the Head of the Department of Social Statistics, I am honored to contribute this message to mark the publication of the *Journal of Social Statistics* (JSS).

The Department has consistently strived to foster an environment that nurtures inquiry, innovation, and critical thinking among its undergraduate students. It is deeply encouraging to observe how our students have embraced these opportunities and translated them into meaningful research endeavors.

The *Journal of Social Statistics* stands as a significant academic platform, enabling students to engage in the research process and share their findings with a wider audience. It plays an essential role in inspiring young researchers to pursue scholarly excellence and to contribute valuable insights to the discipline of social statistics.

I also wish to express my sincere appreciation to the panel of reviewers for their thoughtful and rigorous evaluations of the submitted manuscripts. My gratitude further extends to the editorial committee and the Social Statistics Students' Association for their unwavering dedication and hard work in bringing this volume to fruition.

Senior Lecturer L. W. Dasnayake

Head

Department of Social Statistics

University of Kelaniya

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Attitudes toward Cohabitation among Rural to Urban Migrants (Special Reference to Katunayake and Biyagama Free Trade Zones in Sri Lanka)

A.P.A. Thilini[1]

Abstract

Sri Lanka, with a special focus on the Katunayake and Biyagama Free Trade Zones (FTZs). As internal migration continues to increase, especially for economic reasons, new social behaviors and family patterns, including cohabitation, are becoming increasingly common in urban settings. The main objective of this study has been to identify the attitudes of those who are willing compared to those who are unwilling to cohabit. A sample of 372 rural-tourban migrant workers was selected using stratified random sampling in Biyagama and Katunayaka FTZs, and primary data were collected through a structured questionnaire. The analysis used binary logistic regression. When examining the attitudes of those who like and dislike cohabitation, the study shows that factors such as age, migration period, and family type have influenced the willingness of migrants to cohabit. Although many people resort to cohabitation based on economic needs, the results show that cohabitation is influenced by social needs and cultural influences. The study shows that there are positive and neutral attitudes towards gender perspectives, positive attitudes under traditional and religious values, and positive and neutral attitudes towards family expectations and social pressure. The findings highlight the need for legal recognition of cohabitation unions, inclusive housing policies, and migrant sensitive welfare provisions. This study contributes to the limited body of research on cohabitation in Sri Lanka and provides insights for policymakers aiming to address the socio-cultural dynamics of migration and urbanization in Sri Lanka.

Keywords: Cohabitation, Migration, Free Trade Zones, Attitudes, Socio-economic Factors, Sri Lanka.

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1. Introduction

Cohabitation is a consensual, non-legal sexual union between two adults who choose to share housing, economic resources, and perhaps even procreate, without any marriage ceremony (Popoola & Ayandele, 2019). Cohabitants are fundamentally similar to married couples in that they share households and can live socially as a couple, with a normal scale economy (Smock, 2000). Cohabitation is mainly based on three main concepts: commitment, testing, and freedom (Perelli-Harris et al., 2014). Cohabitation has different meanings in different countries (Keizer & Hiekel, 2015). The meaning and usage of cohabitation vary depending on the cultural context in which it occurs (Kiernan, 2002). As previous studies have shown, :(i) Marginal and random fact (ii) Alternative to marriage (iii) Prelude to marriage (iv) Stage in the marriage process (v) Alternative to single (vi) Indistinguishable from marriage six types of symbiosis are found (Rontos et al., 2019; Heuveline & Timberlake, 2004). Currently, this concept of cohabitation is rapidly spreading throughout the world, and this can be pointed out as the reason for its spread number of young people delaying marriage to complete their education or pursue a career, the increasing prevalence and acceptability of cohabitation and having children out of wedlock, the rising divorce rate, and the increasing number of single earner families (Cherlin, 2004). Before the late 1980s, the world was at a very low ebb Murrow and Shi (2010) but the rise in the rate of unmarried cohabitation over the past thirty years can be seen as a striking feature of the major social changes taking place across the industrialized world today (Giulio et al., 2019). Compared to nations that claim a Western culture, non-Western nations have a different attitude towards this cohabitation (Uprety, 2023).

Cohabiting individuals engage in many of the same shared lifestyles as married couples and benefit from economies of scale, income pooling, relationship-specific capital production, and joint consumption without marriage (Lundberg & Pollak, 2013).

The study mainly selected the rural-urban migrant community. A greater tendency towards cohabitation is found in migrant communities (Mu & Yeung, 2023). This is because migrant communities tend to be modern and cosmopolitan and are therefore more easily exposed to different social norms, including openness to cohabitation (Mu & Yeung, 2023). Migrant

communities with origins that have a long migration history tend to be more cohesive than non-migrant communities (Mu & Yeung, 2023). Cohabitation and other unconventional living arrangements may become more acceptable as a result of this change, peer pressure, and exposure to varied lifestyles (Mu & Yeung, 2018). When people move from rural to urban settings, they frequently face major obstacles such as social isolation, culture shock, and trouble fitting in with metropolitan peer groups or workplaces because of cultural differences (Mu & Yeung, 2023). Individuals from close-knit rural communities with strong traditional values may experience these problems more acutely. Cohabitation or shared living arrangements can provide emotional, social, and financial support in such adverse or alienating urban surroundings, providing migrants with a useful adaptation strategy as they traverse unfamiliar social landscapes (Liang et al., 2014). Migration from rural to urban areas affects cohabitation attitudes. Factors such as higher urban incomes, better living conditions, and rural economic instability drive migration (Selod & Shilpi, 2021). Prolonged migration leads to lifestyle changes, long work hours, and time away from family, increasing the likelihood of cohabitation among migrants (Mu & Yeung, 2023).

The migrant community in the Biyagama and Katunayake Free Trade Zones (FTZs) was selected for this study because the migrant community is more inclined towards these cohabitation attitudes due to economic benefits, rural social isolation, and the need to escape the oppressive conditions in the workplace.

The migrant community may resort to cohabitation mainly to share living expenses (Smock, 2000). Accordingly, it is very important to have an accurate and clear understanding of cohabitation attitudes in order to make the right decisions and solutions in such problematic situations. Research on cohabitation in Sri Lanka is at a very minimal level. Likewise, the majority of research on cohabitation that was available looked at the connections between cohabitation and variables like divorce risk, mental health, sexuality, marital intentions, and marital satisfaction (Kasearu, 2010; Stanley et al., 2010).

Cohabitation, as a form of union outside of formal marriage, has gained prominence in many societies, particularly in the context of increasing urbanization and globalization. In Sri Lanka, while traditional marital norms have remained dominant, rural to urban migration has created new socio-

economic dynamics that may influence attitudes toward cohabitation. The FTZs of Katunayake and Biyagama attract a significant rural to urban migrant workforce, many of whom are young adults seeking employment in garment and manufacturing industries (Gunatilaka, 2008). These migrants often experience exposure to urban lifestyles, economic independence, and shifts in social norms, which may affect their perspectives on cohabitation. Cohabitation is often influenced by factors such as income level, education, family background, and work environment (Bumpass & Lu, 2000). However, in Sri Lanka, limited research has been conducted to examine how these socioeconomic and demographic factors shape migrant attitudes toward cohabitation. Understanding the willingness of migrants to cohabit is crucial for comprehending broader social transformations occurring within Sri Lanka. Given the potential conflicts between traditional values and modern lifestyle changes, this research aims to explore how attitudes towards cohabitation vary among rural to urban migrants in Katunayake and Biyagama FTZs. By analyzing how factors such as income, occupation, migration duration, education level, family type, and work hours influence these attitudes, this study will contribute to the discourse on demographic transitions in developing economies.

The study focuses on the coexistence attitudes of rural-to-urban migrants, and examines how demographic factors, socio-economic factors, and coexistence attitudes affect migrants' willingness to coexist.

2. Literature Review

The definition, importance, and thorough justifications of cohabitation in real world situations vary widely throughout the world. In various nations, cohabitation can mean different things (Perelli-Harris & Bernardi, 2015). Accordingly, this cohabitation, which is widespread throughout the world, is also argued to be a trial period before marriage (Harris & Gassen, 2012). This cohabitation has become an alternative to traditional marriage, especially in student societies and societies undergoing economic transformation (Bumpass & Hen Lu, 2000). Postmodern or capitalist society has seen a drastic change in the way concepts of relationships between men and women, especially cohabitation or life relationships, are thought about, and from a sociological

perspective, the nature of such a shifting structure of cohabitation marriage is an opportunity to understand (Uprety, 2023).

The reasons for cohabitation in today's society include the desire of many couples to spend more time together, convenience-based reasons, and testing relationships. Some research has also pointed to the lack of faith in marriage as a major reason for cohabitation (Rhoades et al., 2009; Cherlin, 2010; Kennedy & Ruggles, 2014). Cohabitation began in the 1960s and grew rapidly in the 1970s, and the reasons for this growth can be attributed to the increasing number of young people delaying marriage to complete their education or pursue a career, the increasing prevalence and acceptability of cohabitation and having children out of wedlock, the rising divorce rate, and the increasing number of single earner families (Cherlin, 2004). In today's world, people choose to live together for a variety of reasons, including racial, sexual, cultural, religious, political, social, economic, and endless and meandering marital complication (Uprety, 2023).

In classifying cohabitation, they first classified it as a prelude to marriage and an alternative to the marriage dichotomy, conceptualizing cohabitation as an alternative to being single (Rindfuss & Heuvel, 1990). Later, four types of cohabitation have been proposed again, namely: (i) an alternative to marriage, (ii) a precursor to marriage, (iii) a trial marriage, and (iv) a cohabiting relationship (Casper & Bianchi, 2001). Thus, cohabitation has now been further classified and explained into six main categories namely:(i) Marginal and random fact (ii) Alternative to marriage (iii) Prelude to marriage (iv) Stage in the marriage process (v) Alternative to single (vi) Indistinguishable from marriage (Rontos et al., 2019).

The main reason for long-term migration and rural to urban migration is employment. Since the main objective of migrants is to improve economic and development prospects, migrants tend to work long hours to maximize earnings and accelerate wealth accumulation (Kulu & Milewski, 2007). Lifestyle changes caused by migration, mainly spending more time away from one's parents and family, working longer hours with irregular work schedules, and uncertain life plans create enormous instability in people's lives (Liang, 2004). Accordingly, during migration critical milestones in life paths such as romantic relationships, marriage, the transition to marriage, various sexual relationships, and the dissolution of marriage begin to take shape (Mu &

Yeung, 2018). With these changes, migrants who eventually migrate from rural to urban areas begin to adapt to the urban lifestyle (Fan & Li, 2002). Migration provides an opportunity to confront traditional cultural norms with less pressure when children are away from their parents and childhood communities (Mu & Yeung, 2018). Accordingly, rural to urban migrants embody cultural and social norms such as low fertility, gender equality, and cohabitation (Liang et al., 2014).

Migrants with origins with a long migration period are more likely to cohabit than those who have not migrated (Mu & Yeung, 2023). Migrant communities, who spend more time away from their parents and family and engage in various informal activities, are more likely to be cohabiting (Mu & Yeung, 2018). As the migrant community tends to be modern and cosmopolitan, they are naturally exposed to different mentalities and social norms, including openness to cohabitation (Mu & Yeung, 2023; Gunarathna 2023a). Similarly, the high cost of living for migrants has made cohabitation essential for financial preparation for household institutions and weddings, housing, and other marriage-related expenses (Mu & Yeung, 2018). Cohabitation is a good option for people who already have obligations and deal with uncertainty regarding their lives and employment as a result of their hectic migrant existence (Mu & Yeung, 2023).

The relationship between attitudes and behavior is largely defined by intentions. The stronger the intention to engage in behavior, the more likely it is that attitudes will predict that behavior (Gyasi-Gyamerah et al., 2024; Gunarathna, 2023a). Psychological family research has consistently shown that attitudes tend to precede behavior (Willoughby & Carroll, 2012). Accordingly, the planned theory points out that an individual's attitudes towards marriage and cohabitation directly or indirectly influence their decision-making (Gyasi-Gyamerah et al., 2024)

Many people migrate from rural areas to cities based on economic needs (Mu & Yeung, 2018; Kodithuwakku, 2018). Often, they migrate as individuals, so they have to bear their living expenses alone. In such a case, cohabitation is a good opportunity to share their expenses with someone else. Accordingly, factors such as housing rent, food expenses, transportation expenses, savings and investments, and cost effectiveness can be considered as economic benefits that influence cohabitation attitudes.

Individuals with lower incomes are more likely to adopt cohabitation attitudes, which in turn provide them with economic benefits such as shared living expenses, financial stability, improved quality of life, and job flexibility (Britt-Lutter et al., 2018). Like marriage, cohabiting unions allow adults to live in a committed relationship, pool resources, establish economies of scale, and work toward a shared financial future. Accordingly, due to these economic benefits, migrants are more likely to be more inclined towards cohabitation attitudes (Sassler, 2004).

Another economic need that may influence the tendency towards cohabitation is the cost-effectiveness of this arrangement, which allows cohabiting couples to share housing costs, grocery expenses, etc. thereby reducing their financial stress (Sassler & Miller, 2010). Cohabiting couples can pool their resources, which allows them to better plan for financial matters, save, and invest, especially during a transition with uncertain incomes (Kuperberg, 2014). This way, they can save money on food, transportation, and household needs, making them cost-efficient (Smock et al., 2005).

The main purpose of migration is to improve economic and development prospects, and for this, they tend to work long hours (Hill & Milewski, 2007). Migrant lifestyles are often fraught with problems such as relocation, uncertain life plans, long working hours, irregular work schedules, and unstable living arrangements (Hannemann & Kulu, 2015). Cohabitation can be a social and psychological relief from such a stressful life.

Both sexes are often motivated to cohabitate on the basis that they can share living expenses (Huang et al., 2011). Although the family economy was dependent on the man, women are now largely employed (Gunarathna, 2007), which is why women are also gaining more economic independence and delaying marriage (Oppenheimer, 2003). In ancient societies, gender equality was very low, and cohabitation shows more gender equality than marriage (Xu et al., 2000).

Often, peers have a special influence in shaping adolescents' attitudes and behaviors towards the opposite sex (Cavanagh, 2007). Accordingly, since the informal life arrangement of cohabitation does not receive strong social support peers have a special influence on leaning towards cohabitation attitudes (Manning et al., 2011).

The idea that cohabitation is a prelude to marriage as a major type of cohabitation in the definition of cohabitation may lead individuals to be more inclined towards cohabitation attitudes (Heuveline & Timberlake, 2004). Cohabitation, which is currently a trend that has become more popular around the world, is argued to be a period of experimentation before marriage and a substitute for marriage (Perelli-Harris & Gassen, 2012).

Another factor that affects cohabitation attitudes is cultural influence. The opportunity to adopt cohabitation attitudes is controlled through this culture. Cohabitation has different meanings in different countries (Perelli-Harris et al., 2014). The meaning and use of cohabitation varies depending on the cultural context in which it occurs (Kiernan, 2002). The main reason why the spread of cohabitation attitudes is low, especially in South Asian countries, is the cultural background of those countries (Mu & Yeung, 2023). Accordingly, when focusing on cohabitation attitudes, things such as traditional and religious values, family background, and social pressure can be taken under this cultural influence.

Religion can influence cohabitation attitudes and behaviors in young adults (Rogerset al., 2015). Family background and social pressure are two factors that can influence the tendency towards cohabitation attitudes and the tendency away from cohabitation attitudes. There is a negative situation for cohabitation in a traditional family background and a traditional social background (Ounjit, 2018). Similarly, family background especially influences some young people to cohabit. Accordingly, people from divorced families and families with low socio-economic status show a greater tendency towards cohabitation attitudes (Dominguez-Folgueras & Castro-Martin, 2013).

Various factors can be used to measure cohabitation attitudes, and the main factors that affect the coexistence attitudes of the rural to urban migrant community include gender, age, education level, monthly income, number of working hours, and period of migration (Shields-Dutton, 2016; Mu & Yeung, 2017).

Gender is very important when it comes to attitudes towards cohabitation. Economic arguments explain that increasing employment opportunities for women give them greater economic independence, while reducing the benefits

of marriage (Oppenheimer, 2003; Gunarathna, 2023b). When it comes to the concept of cohabitation, attitudes towards cohabitation may vary by age (Marino, 2022). The concept of cohabitation, along with the freedom and less responsibility it brings, has led to an increase in couples forming families outside (Cherlin, 2010). Nowadays, the trend of divorce has increased in the world, and there is also a trend of living together after divorce (Kennedy & Ruggles, 2014). The practice of cohabitation varies with different cultures, and this cohabitation attitude is more likely to develop among single people or among people who are divorced, separated, or have passed away (Kiernan, 2002). Cohabitation is more common among those with less education (Bumpass & Sweet, 1989). However, the current study does not show that cohabitation is more common among those with less education (Lesthaeghe, 2020). Thus, educated people are just as likely to start their partnerships as those with less education (Lesthaeghe et al., 2016). Another intriguing discovery is that the likelihood of cohabitation increases with a person's father's educational attainment (Bumpass & Sweet, 1989). Employment can be pointed out as a major factor determining income stability and economic independence, and increasing economic uncertainty and changes in the labor market can lead to unstable lives, which can lead couples to choose cohabitation over marriage (Perelli-Harris et al., 2010). Similarly, due to the irregular work schedules and long hours in the workplace, they may choose cohabitation to escape from these oppressive conditions (Liang, 2004). The cohabitation rate is higher among lower-income groups than among higher-income groups (Wilhelm, 1998). Sometimes, cohabiting couples may not reject marriage and may postpone it for their convenience (Perelli-Harris et al., 2014). Migrants' working hours are relevant to their attitudes towards cohabitation and influence their decision to cohabit or not (Bennett et al., 1995). Nonstandard work schedules can also cause high stress for parents (Joshi & Bogen, 2007). Because of these factors, many people are more likely to be cohabiting. The period of migration can be pointed out as another factor affecting cohabitation attitudes (Mu & Yeung, 2017). The lifestyle changes occasioned by migration have created tremendous instability in the lives of individuals who find themselves spending longer periods away from their parents and family and working longer hours with more irregular work schedules (Mu & Yeung, 2023). People from non-traditional or disrupted family structures, such as single parents or divorced families, are more likely

to be cohabiting (Kasearu, 2010). Similarly, low-income families, especially single parent families or blended families, are more likely to experience economic hardship, and individuals in such families are attracted to cohabitation for the purpose of sharing financial circumstances (Smock, 2000).

3. Methodology

This study is based on quantitative data, and quantitative research allows for the accurate measurement of variables while collecting numerical data (Creswell & Creswell, 2018). The objective of this study is to investigate the cohabitation attitudes of migrants migrating from rural to urban areas. Data is collected for research mainly based on the willingness or unwillingness of migrants to cohabit. Accordingly, data will be collected for research on demographic information, economic characteristics, economic necessity, social necessity and cultural effects affecting cohabitation attitudes among the migrant community working in the Katunayake and Biyagama FTZs.

The highest percentage of residential establishments in Sri Lanka, 25.7%, is in the Western Province, of which 13% belongs to the Gampaha District (Department of Census and Statistics, 2024). The reason for selecting this population for the study is that the two major FTZs, Katunayake and Biyagama, are in the Gampaha District, which has a large migrant population, and the Katunayake and Biyagama FTZs have the highest employed population among all the FTZs (Weerasinghe & Piyasiri, 2022).

Formulas have been used in selecting the sample for this study. In order to estimate the required sample sizes under different circumstances, it may be necessary to calculate the required sample size for different combinations of precision levels, confidence levels, and variance (Sarmah & Hazarika, 2012). In such cases, formulas are used to select the sample. Cochrane's formula is used to select the sample in this study and is used in cases where the population is very large and heterogeneous (Sarmah & Hazarika, 2012).

Since the exact values of the degrees of variation are unknown, the maximum values of variation equal to 0.5 are used for the values of p and q (Sarmah & Hazarika, 2012). The sample population was selected using the margin of error or the expected precision level of 0.05.

$$n_0 = \frac{z^2 pq}{e^2}$$

$$n_0 = \frac{1.96^2 \times (0.5) \times (0.5)}{0.05^2}$$

$$n_0 = 384$$

The migrant population living in free trade zones is a large population with unknown variation. When choosing a sample size for a large population with unknown variation, it is appropriate to use a value of 0.05 for the error term (Sarmah & Hazarika, 2012). Cochran's formula noted that the sample size can be somewhat reduced if the population is finite. This is because information from a very big population is proportionately more abundant than that from a smaller one (Sarmah & Hazarika, 2012).

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

$$n = \frac{384}{1 + \frac{(384 - 1)}{12020}}$$

$$n = 372$$

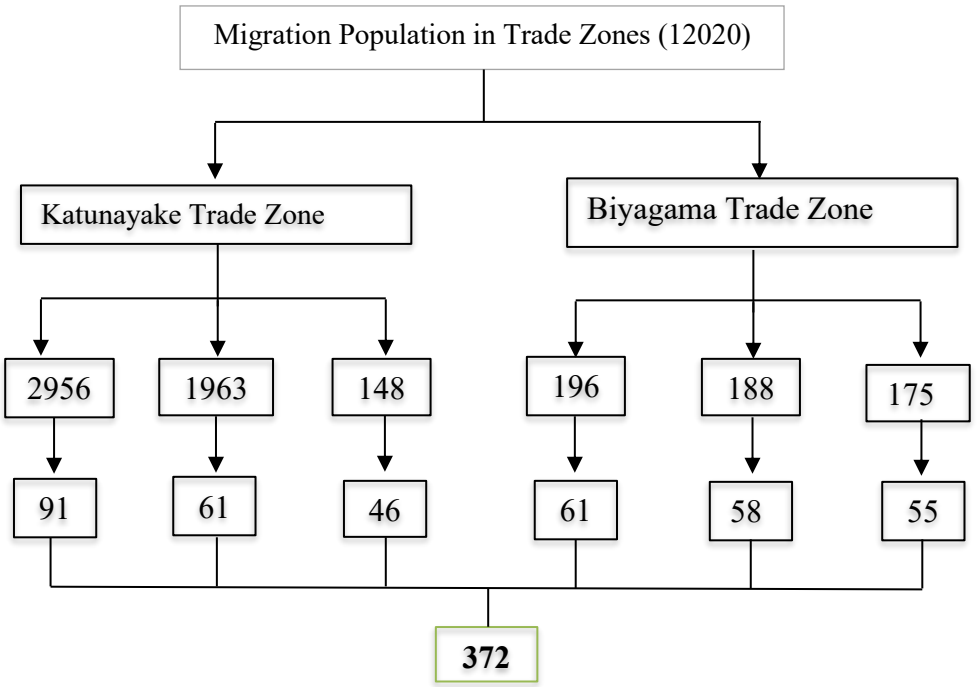
In this study, the primary data collection method was used to collect data to study the attitudes towards cohabitation of the rural to urban migrant community and the questionnaire method was used as the most suitable research instrument to effectively study the willingness of migrant populations towards cohabitation attitudes in the two FTZs of Katunayake and Biyagama in Sri Lanka, this study uses a stratified random sampling method to select a sample. For this purpose, units have been selected for the sample from Grama Niladhari Divisions (GND) with a large migrant population, corresponding to the two FTZs of Katunayake and Biyagama.

Accordingly, the stratified random sampling method is more suitable for this study, and the migrant population consists of various characteristics, and this sampling method is more suitable for the study due to the factors of reducing

the overall variation, ensuring the diversity of the sample, ensuring equal variances (Thomas, 2020).

The migrant population living in the GND close to the two commercial zones of Katunayake and Biyagama is obtained according to the GND and is selected for the sample. Accordingly, the sample for this study was selected from the migrant community in the GND of Kovinna, Amandoluwa and Avariwatta in the Katana Divisional Secretariat Division (DSD) belonging to the Katunayake FTZs. Similarly, the sample was selected from the migrant community in the Yatihena, Walgama West and Biyagama North GND, which have the largest migrant community in the Biyagama DSD, which includes the Biyagama FTZs. The diagram below shows how the units were selected for the sample. The diagram below shows how the units were selected for the sample.

Figure: 1 Migration Population in Trade Zones



In this study, the primary data collection method was used to collect data to the study the attitudes towards cohabitation of the rural to urban migrant community and the questionnaire method was used as the most suitable research instrument for this purpose and the main reason for this was that it was the most suitable method for collecting quantitative data (Kuphanga, 2024). The questionnaire designed based on the main objectives and specific objectives of the study consists of demographic information, willingness to cohabit, economic characteristics and attitudes towards cohabitation. It has been used five likert scales to obtain data on attitudes towards cohabitation.

Accordingly, the objective of the study was to identify the attitudes towards cohabitation among rural to urban migrants, using binary logistic regression analysis. This binary logistic regression analysis was used based on the willingness or unwillingness to cohabit.

4. Results and Discussion

This study focuses mainly on demographic and sociocultural factors and attitudes that may have a major impact on cohabitation to consider the willingness to cohabit among rural to urban migrants and uses the linear regression analysis method to measure the willingness to cohabit. Here, the attitudes of those who prefer cohabitation compared to those who do not prefer cohabitation are measured. The results of the regression analysis, where those who do not prefer cohabitation are coded as 0 and those who prefer cohabitation as 1. The significance of the Hosmer and Lemeshow test statistic concludes that the fitted model is significant at the 5% level (Kodithuwakku & Peris, 2021).

The results of marital status, age, length of stay in the trade zone, family type, gender bias, traditional religious values, family expectations, and social pressure factors, all taken together, are significantly associated with the willingness to cohabit (Table 1).

Table 1: Variables in the Equation

Variables	B	S.E.	Wald	d.f	Sig.	Exp(B)
Marital Status			21.598	4	.000	
[Marital Status=1]	-14.979	16408.756	.000	1	.999	.000
[Marital Status=2]	-20.390	16408.756	.000	1	.999	.000
[Marital Status=3]	-0.523	28420.748	.000	1	1.000	.593
[Marital Status=4]	-0.832	18652.681	.000	1	1.000	.435
Age			11.861	2	.003	
[Age=1]	-2.213	1.666	1.764	1	.184	.109
[Age =2]	-4.173	1.466	8.107	1	.004	.015
Duration (Years)			44.348	3	.000	
[Duration=1]	-19.122	40192.970	.000	1	1.000	.000
[Duration=2]	-6.919	1.237	31.271	1	.000	.001
[Duration=3]	1.723	0.991	3.024	1	.082	5.601
Family Type			11.299	2	.004	
[Family Type =1]	0.518	1.069	0.235	1	.628	1.679
[Family Type=2]	2.445	1.163	4.421	1	.035	11.532
Gender Perspective			10.432	2	.005	
[Positive=1]	-5.447	1.7	10.271	1	.001	.004
[Moderate=2]	-5.198	1.812	8.228	1	.004	.006
(Tra. & Rel.)			16.613	2	.000	
[Positive=1]	4.285	1.051	16.613	1	.000	72.575
[Moderate=2]	-12.609	10108.223	.000	1	.999	.000
(Fam. & So. Pre.)			20.052	2	.000	
[Positive=1]	4.565	1.057	19.404	1	.000	105.181
[Moderate=2]	7.621	2.074	13.502	1	.000	2040.306
Constant	17.715	16408.755	.000	1	.999	49352600.79

Hosmer and Lemeshow Test Statistics $\chi^2 = 19.782 \quad d.f = 8 \quad P = 0.011$

Table 2: Classification based on the Method

Observes		Predicted		
		Type of Willingness to cohabit		Percentage correct
		No	Yes	
Willingness to cohabitate	No	127	11	92.0%
	Yes	22	212	90.6%
Overall Percentage	91.1%			

The overall power of the model is 91.1% (Table 2). The probability of correctly classifying the willingness to cohabit is 0.906, while the probability of correctly classifying the unwillingness to coexist is 0.92.

Table 3: Model Summary

Step	-2 Log likelihood	Cox & Snell R^2	Nagelkerke R^2
7	172.718[a]	0.575	0.784

The results of Cox & Snell R^2 and Nagelkerke R^2 in Table 3 show that the variance explained by the dependent variable varies from 5.7% to 7.84% depending on the task. Both figures show the percentage of variance explained by the dependent variable by the model.

Thus, the fitted model for the log odds ratio of willingness to cohabite can be written as:

$$\begin{aligned} Log\frac{P}{1-P} = 17.715 &- 4.173^{Age\ 20-29} - 6.919^{Duration\ 1-3\ years} \\ &+ 2.445^{Extended\ Family} - 5.447^{Gender\ Perspective\ (Possitive)} \\ &- 5.198^{Gender\ Perspective\ (Moderate)} \\ &+ 4.285^{Traditional\ and\ Religious\ Value\ (positive)} \\ &+ 4.650^{Family\ Expectation\ and\ Social\ Pressure\ (Positive)} \\ &+ 7.621^{Family\ Expectation\ and\ Social\ Pressure(Moderate)} \end{aligned}$$

Extended Family, Traditional and Religious Value (Positive), Family Expectation and Social Pressure (Positive) and Family Expectation and Social

Pressure (Moderate) have a significant positive effect on the odds ratio to willingness Cohabitation. Similarly, Age 20-29, 1-3 years Duration, Gender Perspective (Positive) and Gender Perspective (Moderate) have a significant negative effect on the odds ratio to willingness Cohabitation.

A study by Rontos et al. (2019) found that women are more likely to cohabit. However, this study found that men are more likely to cohabit. This may be because Sri Lanka is still a cultural society based on religion and culture. In terms of types of cohabitation, it is stated that most people accept cohabitation as a precursor to marriage (Rontos et al., 2019). However, in this study, many migrant communities have been inclined to accept cohabitation as a stage in the marriage process. The study shows that single immigrants are more likely to choose cohabitation as an alternative to marriage, and that immigrants with a higher level of education are also more likely to choose cohabitation as an alternative to marriage. However, according to Manning et al. (2014) educated women are more likely to accept marriage. It was proven that the migration period of migrants affects their tendency to cohabit, with migrants who have migrated for a period of 1-3 years being more likely to cohabit, and there is a slight decrease in this tendency for migrants with a migration period of more than six years. However, according to Roster, migrants are more likely to cohabit if their migration period exceeds six years (Ansari-Thomas, 2022).

In the study of the attitudes of those who want to cohabitate compared to those who do not want to cohabitate, it was proven that the influence of friends did not cause them to turn to living together attitudes. According to Ounjit (2018) it has also been proven that the influence of friends did not cause them to turn to living together attitudes. He has also shown that the influence of families is the main reason for not living together. In this study, the influence of families was also considered, and it was accepted that the support of families should be there for living together. According to Mu and Yeung (2023) although it has been accepted that people with long migration periods are more likely to engage in cohabitation, this study has raised opposing views.

5. Conclusion and Policy Suggestions

This study explored attitudes towards cohabitation among rural-urban migrants working in the Katunayake and Biyagama FTZs in Sri Lanka. The findings reveal a complex interplay between economic, social, cultural and demographic factors that influence attitudes towards cohabitation. Although cohabitation is not yet widely accepted in traditional Sri Lankan society, a significant shift is emerging, particularly among younger, more educated, and economically independent migrant workers.

This study suggests that there must be a strong cultural difference between those who are willing to cohabitate and those who are not willing to cohabitate. Although individuals often engage in cohabitation for economic benefits, social and cultural needs are also central to this. Among those willing to cohabit, the most preferred type was "Stage in the Marriage Process," highlighting that cohabitation is commonly viewed not as a replacement for marriage, but as a transitional phase before formal commitment.

The rising prevalence of cohabitation among migrant populations in FTZs calls for urgent policy adaptations to reflect changing social dynamics. Key areas requiring attention include housing, workplace welfare, and public health. Housing policies should prohibit discrimination based on marital status and promote affordable shared accommodation for cohabiting couples. In the workplace, mental health support, peer counseling, and relationship workshops are essential to address the emotional challenges faced by migrant workers. Public health initiatives must also evolve to provide inclusive sexual and reproductive health services that cater to all individuals, regardless of marital status. These policy reforms are vital to ensuring the rights and well-being of cohabiting migrant workers in a rapidly transforming social landscape.

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Factors Influencing Fast Food Consumption Patterns among University Students (Special Reference to Western Province in Sri Lanka)

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Abstract

The increasing prevalence of fast-food consumption among university students has raised significant public health concerns due to its association with obesity, cardiovascular disease, and other non-communicable diseases. Although its popularity is driven by convenience, affordability, and taste, there is limited research on the factors influencing these consumption patterns, especially in Sri Lanka. This study aims to identify the factors influencing fast food consumption among university students in the Western Province of Sri Lanka, focusing on social, psychological, educational, and economic influences. A quantitative research approach was used, with 100 undergraduate students selected as the sample using Yamane's method across four government universities, and data collected through a structured questionnaire. Ordinal regression was used to analyze the data. Peer influence emerged as the strongest predictor, and stress showed an unexpected negative association with consumption. The study concludes that targeted interventions, including university nutrition programs and policy regulations, are essential to promote healthy eating habits among students. These findings are consistent with global trends and highlight the need for culturally tailored strategies to address fast food consumption in university settings.

Keywords: Fast Food Consumption, University Students, Peer Influence, Urbanization, Convenience

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1. Introduction

Fast food consumption has become a pervasive aspect of modern dietary habits, particularly among university students (Rathnayake et al., 2012). The Western Province of Sri Lanka, being highly urbanized, offers increased access to various fast-food outlets. Students balancing academic workloads and personal responsibilities often opt for quick, affordable, and palatable food options. However, excessive reliance on fast food poses significant health risks. Despite awareness of these consequences, many students persist in these eating habits due to social influence, stress, and limited time (Piumali & Rathnayake, 2017). This study aims to identify and analyze the key factors influencing fast food consumption among university students to inform better health interventions and dietary education.

The demands of modern work environments and changes in lifestyle have caused notable changes in food consumption patterns (Bhatoolaul et al., 2024). Globalization, economic expansion, and urbanization have all influenced food patterns (Popkin, 2020). The demand for quick, easily accessible, and frequently unhealthy meal options has increased due to the growing number of people working long hours (Popkin, 2020). Modern lifestyles and work demands have significantly altered food consumption patterns, leading to a rise in fast food consumption, meal irregularities, and reliance on convenience foods (Dobernig & Stagl, 2015).

For many people, fast food restaurants, packaged goods, and ready-to-eat meals have become essential parts of their everyday lives (Lopez et al., 2018). As a result of increased work-related stress, people are consuming more fast food, which is frequently characterized by excessive fat, sugar, and preservative content (Van et al., 2011). The growth of the fast-food sector has further strengthened these habits by offering people with hectic work schedules an inexpensive and time-efficient substitute (Francks, 2013).

The increasing trend of fast-food consumption among young people worldwide has coincided with this cultural integration of fast food (Gassin, 2001). This phenomenon is caused by several factors, the most important of which are time constraints and convenience (Brown et al., 2021).

2. Literature Review

Previous research across various contexts has consistently emphasized the multifaceted nature of fast-food consumption among youth. Study from Australia report that over 81% of individuals aged 16 and above had consumed fast food within six months, with price, taste, and convenience cited as primary motivators (Brindal, 2014). In the United States, fast food consumption accounts for over 36.6% of daily intake among adults, with younger adults and minority populations consuming the highest proportions (Centers for Disease Control and Prevention – CDCP, 2018). Similar trends are observed in the United Kingdom, where the expansion of fast-food outlets has been linked to increased obesity in lower-income communities (Public Health England – PHE, 2018).

In South Asian countries, including Sri Lanka, fast food consumption has surged in recent decades due to economic liberalization and urbanization (Herath et al., 2013). A study found that 54% of Sri Lankan university students consumed fast food more than once daily, driven primarily by taste and price (Jayasinghe & De Silva, 2014).

The importance of fitness and socially mindful junk food consumption is being emphasized by peers (Harari & Eyal, 2019). Due to their vulnerability, adolescents frequently compare themselves to their friends and may alter their choices to conform to the behavior of their peers (Fortin & Yazbeck, 2011). Bruening et al. (2012) found that friends' behavior is associated with a variety of beverages and fast-food restaurants, especially when it comes to university students' trips to these locations (Gunarathna, 2023). In Sri Lanka, peers on social media impact the conforming behavior of adolescents and young consumers (Piumali & Rathnayaka, 2017).

University students' eating patterns of fast food have been greatly impacted by urbanization (Weaver et al., 2020). Fast food is a convenient choice for students with hectic schedules since it is more readily available and accessible in urban locations (Smith et al., 2019). Given that students frequently put convenience over health, fast food outlets located close to urban areas and universities have been associated with higher consumption rates (Bissinger, 2019; Gunarathna, 2023).

Students live in a world where social media is pervasive and where advertisements and shows are utilized to persuade (Gregorio et al., 2017). The more students engage with the media, the more they learn about consumer behavior, and they socialize with other consumers (Neeley, 2005). The use of media platforms, such as television and social media, promotes fast food as desirable and fun, influencing consumption patterns, especially among younger demographics (Harris et al., 2009).

Despite the abundance of literature, there remains a gap in understanding the interplay between social, psychological, and economic factors in localized university contexts, especially in developing nations like Sri Lanka. Most existing studies either focus on Western populations or treat fast food consumption in isolation from broader socio-economic dynamics (Saha et al., 2022). This study addresses this gap by contextualizing the factors within the socio-cultural framework of Sri Lankan university students.

Also, many previous studies have relied heavily on descriptive statistics or single-variable analyses without employing multivariate techniques such as regression modeling to understand the combined effect of socio-psychological, economic, and demographic factors.

One important psychological aspect impacting university students' consumption of fast food is emotional eating, which is the tendency to eat in response to both good and negative emotions, as a coping strategy for emotional pain, this practice frequently entails eating tasty, high-energy foods (Gligoric et al., 2023). University students frequently experience emotional eating, which is brought on by stressors like social pressure, academic pressure, and the adjustment to independent living (Bennett et al., 2012).

Two important psychological elements influencing university students' use of fast food are convenience and habit building (Sze et al., 2021). Due to the rigorous schedules and academic demands of college life, students frequently look for convenient and quick lunch options, which makes fast food a desirable option (Taylor et al., 2018). The main causes of students' frequent consumption of fast food are its accessibility and time-saving qualities (Saha et al., 2022).

The patterns of fast-food intake among college students are significantly influenced by cravings and food addiction (Yun et al., 2018). Fast food is designed to be extremely appetizing, mixing large amounts of fat, sugar, and salt to boost flavor and activate the reward system in the brain (Epel et al., 2001). Even when there is no hunger, this hyperpalatability may result in increased desires and consumption (Epel et al., 2001).

University students' eating habits of fast food are significantly influenced by impulsiveness, which is defined as a propensity to act without planning (Guerrieri et al., 2012). In contrast to long-term health considerations, immediate satisfaction frequently influences decision-making processes connected to food choices (Tanaka & Brugliera, 2013).

One of the main causes of university students' fast-food intake is their heavy workloads, Convenience frequently takes precedence over nutrition for students with rigorous schedules, such as those in Science, Technology, Engineering, and Mathematics (STEM) professions or professional degrees like law or medicine (Reuter et al., 2020). People who don't have time to prepare their meals turn to fast food because it's convenient and quick (Saha et al., 2022). A study conducted by Saha et al. (2022), found that South Asian college students' fast food eating habits are influenced by their educational backgrounds, and Humanities students are more likely to eat fast food due to time management, lifestyle, and academic workload.

The economic factors influencing fast food consumption among university students include Income level, Budget allocation, price sensitivity, promotions, and discounts (Powell et al., 2007). Income level is one of the major determinants of fast-food consumption among university students, and students with low incomes tend to consume more fast food because it is cheap, available, and doesn't require preparation time (Parkinson et al., 2009). Due to their low incomes, many college students must rely on part-time work, financial aid from their parents, or scholarships, when compared to healthy options, fast food is sometimes thought of as being more economical (Satia et al., 2005).

Educational equipment may take up a large amount of a student's budget, leaving less money for meals, therefore fast food is a convenient option

because it is reasonably priced (Satia et al., 2005). Fast food is often less expensive than eating out or purchasing fresh produce, which appeals to students on a tight budget, Fast food is a desirable choice for students on a tight budget because of its low cost (Powell et al., 2007).

3. Methodology

This study is based on identifying factors that influence fast food consumption patterns among undergraduate students in government universities in the Western Province of Sri Lanka. The research method is just the way in which a research study is conducted, ensuring that the research objectives are fulfilled. Accordingly, this study adopts a quantitative research approach. Quantitative research allows for the collection of quantitative data and provides the ability to accurately measure variables (Creswell, 2014).

All the undergraduates of these four higher education institutions belong to the target population of this study. Accordingly, there were a total of 17188 undergraduate students at the University of Colombo, 14750 undergraduate students at the University of Jayewardenepura, 14548 undergraduate students at the University of Kelaniya, and 13159 undergraduate students at the University of Moratuwa.

Table 1: Western Province Government University Students in Sri Lanka

University	Students
Colombo	17188
Jayewardenepura	14750
Kelaniya	14548
Moratuwa	13159

Source: University Grants Commission (2021)

To calculate the appropriate sample size, the Yamane/Slovin method was used. According to Taherdoost (2022), Yamane's method has been used for this study because it can be adapted to determine the optimal sample size for continuous and categorical variables at all confidence levels. For this, the sample population was selected using a margin of error or expected level of precision of 0.10 (e=0.10). The population under study is homogeneous, and

the expected level of precision of 0.10 was used based on the assumption that a homogeneous population is the minimum (Louangrath, 2017).

By using this sampling approach, the study aimed to obtain a sample that adequately represents the target population of university students in Sri Lanka, particularly in the Western Province.

$$n = \frac{\mathrm{N}}{1 + Ne^2}$$

The Variables in this formula are:

n = Sample Size

N = Total Population

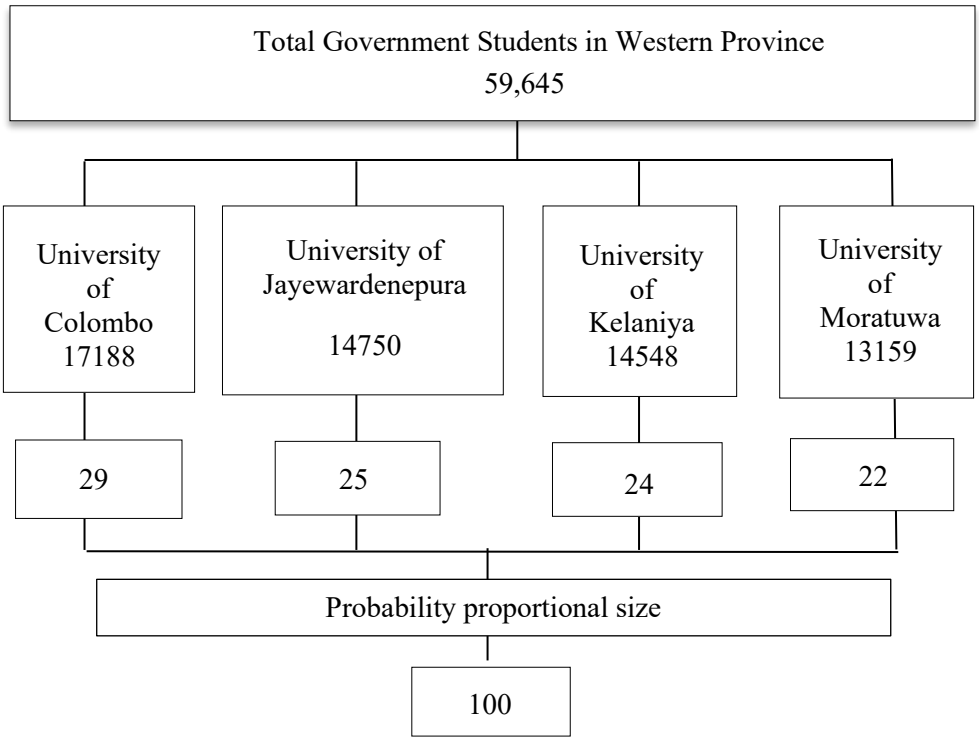
e = Error (0.1)

$$n = \frac{59645}{1 + 59645 \ * \ (0.1^2)}$$

$$n \simeq 99.83 \qquad\qquad n \simeq 100$$

This study uses a stratified random sampling technique to ensure a proportional representation of students from diverse social, psychological, economic, and educational backgrounds across selected government universities in Sri Lanka. Using a stratified random sampling technique was considered appropriate to ensure a representative and comprehensive sample for the study. Therefore, the sample was obtained by dividing it into four strata according to universities. A random sampling technique was used within each stratum to ensure fair representation. Figure 1 indicates the composition of the sample.

Figure 1: Sample Composition



Source: University Grants Commission (2021)

Primary data is used to study the fast-food consumption patterns of university students. A questionnaire is well-suited to collect structured data on the fast-food consumption patterns of university students. Therefore, a questionnaire (Google Form) was used as the data collection method. Because it uses stratified samples, a questionnaire allows for efficient data collection from a large and geographically dispersed population.

This questionnaire uses Likert scale questions based on several factors to measure factors affecting fast food consumption. Here, social factors, psychological factors, educational factors, and economic factors are cited as factors affecting fast food consumption patterns. The questions are structured as follows, peer influence, urbanization, marketing and advertising under social factors, taste and cravings, convenience and time pressure, stress and emotional eating, impulsive and decision making under psychological factors, University, academic year, faculty under educational sectors, and income

level, budget allocation, price sensitivity, promotions and discounts under economic factors.

To examine the key research objective, ordinal logistic regression is used. Ordinal logistic regression is used to predict an ordinal dependent variable given one or more independent variables (Ananth, 1997). In this study, ordinal regression analysis was used to examine the relationship between the fast-food consumption pattern of university students and several factors, such as social factors, psychological factors, educational factors, and economic factors. The dependent variable here is the consumption pattern (level), which is normal in nature and is grouped into daily, weekly, and monthly.

4. Results and Discussion

The objective of the study is to identify the factors affecting fast food consumption patterns among university students, which is done through ordinal regression analysis. The analysis section has obtained conclusions about model fitting information, goodness of fit, R-squared, and parameter estimates.

Table 2: Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	203.027			
Final	147.678	55.349	32	.006

For the intercept-only and final models, the corresponding -2 Log likelihood values are 203.027 and 147.678. This decrease (55.349) shows that the final model's fit to the null model is greatly enhanced by the addition of predictor variables. The chi-square test is used to further evaluate this improvement. According to the statistically significant p-value ($p<0.05$), the final model outperforms the intercept-only model in explaining the variables influencing university students' fast food consumption patterns. Overall, the results validate that the factors found have a significant impact on students' fast food consumption patterns, which supports the study's goal.

Table 3: Goodness of Fit

	Chi-Square	df	Sig.
Pearson	191.074	166	.089
Deviance	147.678	166	.843

The goodness of fit statistics indicates a poor fit if the significance value is less than 0.05 (Fagerland, 2017; Kodithuwakku & Peiris 2021). However, according to Table 3, .089 has been recorded as a significant value, so it can be recognized that there is a good match here. It shows that there is a fair adjustment.

Table 4: Pseudo R-Square

Cox and Snell	.425
Nagelkerke	.489
McFadden	.273

Overall, the pseudo-R-squared values indicate that the logistic regression model provides a moderate explanation of the factors influencing fast food consumption patterns among university students. The Nagelkerke value, being the highest, suggests that nearly half of the variability in students' fast-food consumption can be explained by the factors included in the model. This implies that the model is reasonably effective in identifying key determinants of fast-food consumption behaviors in this population.

Table 5: Parameter Estimates for Testing Consumption Patterns

		Estimate	SE	Wald	df	Sig.
Threshold	[Food consumption= Daily]	9.013	4.054	4.944	1	.026
	[Food consumption = Weekly]	-3.233	4.018	.647	1	.421
Location	[Gender=Male]	2.663	.456	34.021	1	.000
	[Gender=Female]	0[a]	.	.	0	.
	[Ethnicity=Sinhala]	-2.205	.610	13.075	1	.000
	[Ethnicity=Muslim]	0[a]	.	.	0	.
	[Region=Urban]	1.121	.504	4.956	1	.026
	[Region=Rural]	-2.260	.418	29.240	1	.000
	[Region=Semi Urban]	0[a]	.	.	0	.
	[Accommodation=Boarding]	3.860	.721	28.659	1	.000
	[Accommodation=Home]	0[a]	.	.	0	.
	[Year=1]	-4.553	.598	57.933	1	.000
	[Year=2]	-3.437	.540	40.470	1	.000

[Year=4]	0[a]	.	.	0	.
[Faculty=Science]	1.550	.771	4.045	1	.044
[Faculty=Technology]	1.785	.831	4.619	1	.032
[Faculty=Medicine]	1.748	.816	4.591	1	.032
[Faculty=Management]	8.305	1.211	47.057	1	.000
[Faculty=Other]	0[a]	.	.	0	.
[Employment=Unemployed]	2.108	.683	9.534	1	.002
[Employment=Part-time employed]	3.360	1.121	8.982	1	.003
[Employment=Full-time employed]	0[a]	.	.	0	.
[Income=Less than LKR 15000]	-4.530	1.633	7.693	1	.006
[Income=LKR 35000-55000]	-5.371	1.702	9.959	1	.002
[Income=More than LKR 55000]	0[a]	.	.	0	.
[Budget=LKR 500-1000]	2.386	.816	8.544	1	.003
[Budget=More than 2000]	0[a]	.	.	0	.
[Peer_Level=High]	3.228	.746	18.740	1	.000
[Peer_Level=Moderate]	2.147	.602	12.744	1	.000
[Peer_Level=Low]	0[a]	.	.	0	.
[Urbanization_level=High]	2.431	.783	3.346	1	.047
[Urbanization_level=Low]	0[a]	.	.	0	.
[Marketing_Level=High]	-2.499	1.116	5.011	1	.025
[Marketing_Level=Moderate]	2.760	.682	16.380	1	.000
[Marketing_Level=Low]	0[a]	.	.	0	.
[Taste_Level=High]	2.316	.752	9.495	1	.002
[Taste_Level=Low]	0[a]	.	.	0	.
[Convenience_Level=High]	1.670	.686	5.927	1	.015
[Convenience_Level=Low]	0[a]	.	.	0	.
[Stress_Level=High]	-2.121	.776	7.479	1	.006
[Stress_Level=Moderate]	-3.844	.652	34.708	1	.000
[Stress_Level=Low]	0[a]	.	.	0	.
[Habitual_Level=Low]	0[a]	.	.	0	.
[Price_Level=High]	-3.177	1.113	8.151	1	.004
[Price_Level=Moderate]	-3.721	.851	19.128	1	.000
[Price_Level=Low]	0[a]	.	.	0	.
[Promotions_Level=High]	2.284	.748	9.313	1	.002
[Promotions_Level=Moderate]	2.082	.589	12.487	1	.000
[Promotions_Level=Low]	0[a]	.	.	0	.

Source: Field survey Data (2025)

The faculty revealed significant variations in consumption patterns across academic disciplines. Science faculty students showed higher odds of frequent consumption ($\beta = 1.550$, Wald = 4.045, $p = 0.044$), while Technology faculty students demonstrated even stronger positive associations ($\beta = 1.785$, Wald =

4.619, p = 0.032). Medicine faculty students also exhibited increased consumption likelihood (β = 1.748, Wald = 4.591, p = 0.032). Most notably, Management faculty students showed exceptionally high odds of frequent fast-food consumption (β = 8.305, Wald = 47.057, p < 0.001).

Employment significantly affects consumption patterns. Both unemployed students (β = 2.108, Wald = 9.534, p = 0.002) and part-time employed students (β = 3.360, Wald = 8.982, p = 0.003) demonstrate higher consumption compared to full-time employed students (reference group). Part-time employed students show the highest consumption levels among employment categories.

Income level shows a complex relationship with consumption. Students with incomes less than LKR 15,000 (β = -4.530, Wald = 7.693, p = 0.006) and those earning LKR 35,000-55,000 (β = -5.371, Wald = 9.959, p = 0.002) show significantly lower consumption compared to those earning more than LKR 55,000 (reference group).

Budget allocation for food shows mixed effects. Students with budgets of LKR 500-1,000 exhibit higher consumption compared to those with budgets exceeding LKR 2,000 (reference group) (β = 2.386, Wald = 8.544, p = 0.003). Other budget categories show no significant effects.

Peer influence is the strongest predictor of fast-food consumption patterns. Students reporting high peer influence showed substantially higher odds of frequent consumption (β = 3.228, Wald = 18.740, p < 0.001), while those experiencing moderate peer influence also demonstrated significant positive associations (β = 2.147, Wald = 12.744, p < 0.001).

High urbanization exposure significantly increases consumption compared to low urbanization (reference group) (β = 2.431, Wald = 3.346, p = 0.047), supporting the geographic findings regarding urban-rural differences.

Exposure to marketing and advertising showed differing effects at varying intensities. Significantly lower odds of frequent consumption were linked to high marketing exposure (β = -2.499, Wald = 5.011, p = 0.025), indicating that excessive advertising may make some students aware of the health risks or cause reactance. On the other hand, moderate marketing exposure

demonstrated strong positive associations with consumption (β = 2.760, Wald = 16.380, p < 0.001).

High taste preference significantly increases consumption compared to low taste preference (reference group) (β = 2.316, Wald = 9.495, p = 0.002). Convenience-seeking behavior demonstrated significant positive associations with consumption frequency. Students with high convenience orientation showed increased odds of frequent consumption (β = 1.670, Wald = 5.927, p = 0.015). Both high stress (β = -2.121, Wald = 7.479, p = 0.006) and moderate stress (β = -3.844, Wald = 34.708, p < 0.001) significantly reduce consumption compared to low stress (reference group).

Price sensitivity demonstrated strong positive associations with consumption frequency. Students with high price sensitivity showed significantly increased consumption odds (β = 3.177, Wald = 8.151, p = 0.004), while those with moderate price sensitivity exhibited even stronger associations (β = 3.721, Wald = 19.128, p < 0.001). These findings indicate that prices make them more frequent consumers when affordable choices are available.

Promotions and discounts similarly showed significant positive effects, with high promotional sensitivity (β = 2.284, Wald = 9.313, p = 0.002) and moderate promotional sensitivity (β = 2.082, Wald = 12.487, p < 0.001) both increasing consumption probability.

There was no statistically significant difference in the consumption patterns of third-year students compared to fourth-year students. The students in the Faculty of Engineering, students' income level in the LKR 15000-35000 range, and budget allocations less than 500, also did not show significant differences. Similarly, the impulsivity and decision-making factor considered under psychological factors also did not show significant differences.

Peer influence was identified as the strongest predictor of consumption patterns in this study, which is particularly important for applications of social cognitive theory to eating behavior. Lally et al. (2011), found that social eating contexts increased fast food consumption by 250% among British university students, demonstrating similar peer influence effects.

Comparing this study to previous research, the intricate relationship between income and consumption patterns offers subtle insights. Students in moderate income ranges showed higher consumption odds, but those in the lowest income bracket showed significantly lower consumption odds. This pattern is somewhat consistent with the findings of French et al. (2001), who found a U-shaped relationship between American students' fast-food consumption and income. In contrast to certain Western studies, the results showed that students with part-time jobs had higher consumption odds. According to Nelson et al. (2008), students who were employed ate less fast food.

The finding is that urban students show the highest trend for daily fast-food consumption, while rural students show the lowest. Quick et al. (2013) observed similar urban-rural disparities among American college students.

5. Conclusion and Policy Suggestions

This comprehensive study examining fast food consumption patterns among university students in government universities in the Western Province of Sri Lanka has provided significant insights across multiple analytical dimensions.

Peer influence was shown to be the greatest predictor of fast-food consumption patterns ($\beta = 3.228$, $p < 0.001$ for high peer influence), followed by accommodation status, with boarding students exhibiting significantly higher consumption chances ($\beta = 3.860$, $p < 0.001$). Academic advancement showed growing consumption habits from the first year to the fourth year, whereas faculty collaboration displayed substantial differences, with Management faculty students demonstrating extremely great consumption odds ($\beta = 8.305$, $p < 0.001$).

Employment status showed unexpected patterns, with part-time employed students having higher consumption than full-time employed ones, indicating that irregular income patterns may propel quick food consumption. Income relationships proved complex, with both very low and moderate-income students showing different patterns compared to high-income students.

The text outlines suggestions to improve healthy eating habits among university students. The Ministry of Higher Education should mandate health and nutrition courses for all undergraduates and encourage involvement in

physical fitness programs. University staff must identify nutrition-related health issues, while health services should offer telemedicine for nutrition counseling.

Collaboration between the Ministry of Health and the Ministry of Higher Education is necessary to create guidelines for affordable, healthy food options at universities and to implement progressive taxation on fast food. There should also be restrictions on fast food ads near campuses. Mental health and nutrition support must be integrated, with peer influence utilized for promoting healthy lifestyles.

University administrators should redesign food courts to be healthy dining areas and social spaces and establish mobile food units for healthy meals during peak times. Peer mentorship should target males and boarding students with poor eating habits. Health centers should offer screenings and quick interventions for at-risk students.

Student organizations need to advocate for healthy eating, and the Department of Census and Statistics should track fast food consumption in national health surveys. The Ministry of Higher Education should launch a National University Food Environment Standards program, backed by a National Student Health Monitoring System, to gather data on food intake. Finally, a National Student Food Security Program by the Ministry of Finance and National Planning should provide subsidies for nutritious food to help low-income students improve their diets through electronic vouchers for approved sources.

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User Acceptance of AI Tools in Academic Research: An Application of the UTAUT-2 Model

(Special Reference to Final Year Students of HEIs in Western Province)

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Abstract

The rapid integration of artificial intelligence (AI) tools for academic research has transformed educational methodologies. However, user acceptance among university students is still underexplored, especially in Sri Lanka. This study examines the factors influencing students' acceptance of AI tools for academic research using the Unified Theory of Acceptance and Use of Technology 2 (UTAUT-2) model. Yamane's method employed a quantitative approach using stratified random sampling to survey 99 final year students from four universities in Sri Lanka. Data were analyzed using structural equation modeling (SEM) for the UTAUT2 constructs. Findings revealed that Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Facilitating Conditions (FC), and Hedonic Motivation (HM) significantly positively influenced acceptance, while Habit (HT) had a negative effect. Price Value (PV) was not found to be an effect, which may be due to the prevalence of free tools. The study concludes that institutional support, targeted training, and equitable access are crucial to improving the use of AI tools. These insights provide practical recommendations for policymakers and educators to foster the integration of AI in academic research.

Keywords: Artificial Intelligence, UTAUT-2 Model, Structural Equation Model, User Acceptance, Academic Research, University Students

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1. Introduction

Information and Communication Technology (ICT) has significantly impacted on the modern world in various ways, changing how we work, communicate, access information, and engage with one another (Munshi et al., 2024). The term Artificial Intelligence (AI) has recently emerged, attracting attention as a tool that mimics human behavior, creating significant social change by changing the way people live and interact with the world around them (Fitria, 2021; Liu, 2024). AI has increased progress since the early 21st century and is now entering a period of AI renaissance (Russell & Norvig, 2021). Also, AI has revolutionized various fields, including Education and Research, and Natural Language Processing (NLP) techniques and Large Language Models (LLMs) such as GPT-4 and BARD have significantly advanced our understanding and application of AI in these fields (Alqahtani et al., 2023).

In today's learning environment, AI has a pervasive impact that can be found in various fields including Instruction, Research, and Administration and also, applications of AI for data analysis, predictive modeling, and pattern recognition are beneficial to the research process because they accelerate the discovery of scientific knowledge across a range of fields (Kawatra, 2024). Hence, AI is transforming industries around the globe, and academic research is no exception. By accelerating data analysis, enhancing writing quality, and identifying plagiarism, AI tools are changing the research landscape for both students and professionals (Bouchrika, 2025). AI tools have become a significant factor in enhancing the quality of education by improving all aspects of the education system (Weerasinghe, 2024). AI tools have revolutionized the research process by enabling the rapid analysis of large data sets and the retrieval of relevant information and sources (Dwivedi et al., 2023). Furthermore, AI enhances research by automating data analysis, identifying gaps, and generating insights from scholarly publications to propel academic inquiry (Saaida, 2023).

The advancement of AI in Higher Education represents a significant shift, transforming educational methods and learning strategies (Lytras et al., 2024). As scholarly research shows, integrating AI within universities has the potential to optimize administrative processes, and deliver efficiency and cost-effectiveness (Saaida, 2023). Moreover, the rise of AI has invaded the higher

education sector, significantly impacted academic research, and encouraged students to use innovative tools to conduct high-quality research (Weerasinghe & Abeysinghe, 2024; Joseph et al., 2024). Also, AI rapidly transforms Academic Research, accelerating discovery, improving efficiency, and opening new avenues across various disciplines (Kondaveeti et al., 2024). AI has become a fundamental element in transforming the field of academic research (Kondaveeti et al., 2024). Furthermore, technological innovations have continually transformed the landscape of academic research throughout history, driving progress and revolutionizing methodologies (Hanafi et al., 2025). The internet's rise has transformed academic research by removing geographical barriers and promoting global collaboration (Sarwar et al., 2018).

AI tools in academic research and education surround various technologies, including machine learning, NLP, and neural networks (Jaiganesh & Babu, 2025). In fields like biomedical research, Computer Science, and Social Sciences, AI tools can simulate experimental scenarios, predict outcomes, and optimize study protocols (Hanafi et al., 2025). For instance, AI can generate synthetic datasets to evaluate proposed experimental designs, calculate required sample sizes, and identify potential control variables that may not be immediately apparent to researchers (Hanafi et al., 2025). Furthermore, utilizing AI in Academic Research effectively aids students in reviewing literature, overcoming language barriers, particularly for those from non-English speaking backgrounds, summarizing papers, identifying gaps for reviews, and generating drafts of research papers (Joseph et al., 2024).

Writing a research article is largely a creative endeavor that mixes theoretical, methodological, compositional, phenomenological, and framing aspects, and AI has the potential to integrate all these different aspects in various ways and plays a crucial role in innovative academic research (Pigola et al., 2023). Tools like Google Scholar, which AI widely powers, allow students to efficiently find academic papers, articles, and books related to their specific Academic Research topics, while AI-based writing assistants like ChatGPT, Quilbot, and Jasper provide significant support for academic research at various stages of the writing process, then semantic scholar and elicit for literature reviews and DALL-E 2 for creating figures (Khalifa & Albadawy, 2024; Weerasinghe & Abeysinghe, 2024). These AI tools also help undergraduates generate

Academic Research ideas, create outlines, and compose entire pieces of research text during Academic Research (Dwivedi et al., 2019).

Higher education in Sri Lanka can effectively harness the potential of these technologies by fostering the ethical use of AI tools for academic purposes and providing appropriate support and guidance (Fairooz et al., 2024). The use of AI in higher education in Sri Lanka, a field that has been heavily influenced by the evolution of information, communication technologies and Academic Research, has generated significant enthusiasm (Fairooz et al., 2024). According to Gunarathna & Samarakoon (2024), AI tools such as ChatGPT and Grammarly were widely used by students in Sri Lankan higher education institutions (HEI) to improve writing skills and conduct Academic Research.

According to Joseph et al. (2024) given the relevance of AI for research, undergraduates are expected to maximize their use of this technology in their Academic Research work and, similarly, their perception is positive. Thus, understanding the role of trust within the established determinants of technology acceptance offers a valuable theoretical framework for both research and practical applications in trustworthy AI. Several theoretical models, primarily developed from theories in Psychology and Social Sciences, have been used to explain the acceptance and use of technology (Venkatesh et al., 2003).

AI tools have the potential to revolutionize teaching methods, improve learning outcomes, and streamline research processes. University Students' acceptance and attitudes toward using AI tools vary widely and are influenced by factors such as technological literacy and academic motivation. Although many studies have focused on the various uses and challenges of AI in different educational fields, it is problematic to understand university students' acceptance, trust, and attitudes toward using AI tools in research and their true utility in these educational settings. By improving teaching strategies, boosting research productivity, and raising academic results, AI tools have the potential to revolutionize higher education. This disparity is especially noticeable in places like Sri Lanka, where the adoption of AI may be further influenced by the digital divide and unequal access to technology. Thus, it is essential to investigate the major factors guided by the UTAUT-2. Therefore, this study

aims to examine the Factors of User Acceptance of AI tools in academic research.

1.1 Theoretical Perspective

This study examines the factors that encourage or hinder its acceptance and use, employing the UTAUT-2 model by Venkatesh et al. (2012) as our Theoretical framework. The model is well known for its strong predictive abilities and high level of explanatory power (Bahadur et al., 2024). The model includes constructs such as Performance Expectancy (PE), Social Influence (SI), Effort Expectancy (EE), and Facilitating Conditions (FC) which significantly affect the Behavioral Intention (BI) to use technology (Strzelecki, 2023). The UTAUT model was modified to create UTAUT-2, which includes three new constructs of Hedonic Motivation (HM), Price Value (PV), and Habit (HT) (Venkatesh et al., 2012). UTAUT-2 is a prominent theoretical model that aims to understand the factors that influence individuals' adoption and use of new technologies in organizational and personal contexts (Tamilmani et al., 2021). Through extensive empirical research, UTAUT-2 has been developed to offer a comprehensive framework for researchers and practitioners to identify the key factors influencing the acceptance and use of technology (Strzelecki, 2023). As a recent model, UTAUT-2 adapts to current technological trends such as AI usage intention. Hence, in this study, the model examines how various factors, such as PE, EE, HM, FC, SI, PV, and HT influence the user acceptance to use AI tools in academic research.

2. Literature Review

In addition to improving technological advancements and innovation, user satisfaction and technology acceptance are also important (Liu, 2024). The acceptance and use of technology have become a topic of interest in recent years, as individuals increasingly rely on technology for daily tasks (Strzelecki, 2023). To understand why future users might want to use cutting-edge technology like AI, various theories and models are applied from the fields of Information Systems, Sociology, and Psychology, and also since similar elements have been found when synthesizing user acceptance behavior across different theories and models, researchers often choose the theory or

model that best suits their specific study and ignore the contributions of other theories and models (Sharma & Singh, 2024).

The Technology Acceptance Model (TAM) was first created by Davis (1989), it's based on The Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1977) in psychology research and TAM describes the elements influencing users' adoption of information technologies and the level of that acceptance (Marangunić & Granić, 2014). Nie et al. (2019) examined data using the Theory of Planned Behavior (TPB) to gain a deeper understanding of people's technology use and human-computer interaction behavior. Social Cognitive Theory (SCT) also outlines several crucial factors that influence behavior.

TAM, TRA, TPB, the Motivational Model (MM), a model combining TAM and TPB, the Model of PC Utilization (MPCU), Innovation Diffusion Theory (IDT), and SCT theories were derived from the UTAUT theory (Yu et al., 2021). Compared to other models and theories that explained only 17% to 53% of the variance in Behavioral Intention (BI) when applied to the same data, Venkatesh et al. (2003) found that UTAUT model accounted for nearly 70% of the variance, that's why the UTAUT model is very effective in assessing consumers' intention to adopt advanced technologies such as AI (Sharma & Singh, 2024). The UTAUT model synthesizes concepts and user experiences that provide the basis for theories about the user acceptance process of an information system (Yu et al., 2021).

To develop UTAUT, eight previous models of technology acceptance were merged, and the resulting model contains four constructs, PE, SI, EE and FC, that have a major effect on a person's decision to use technology (Strzelecki, 2023). Also, individual difference variables such as age, gender, and experience have been theorized to moderate various UTAUT relationships (Venkatesh et al., 2012). Furthermore, modifications to some UTAUT relationships are expected to be influenced by age, gender and experience (Venkatesh et al., 2012). Venkatesh et al. (2012) produced UTAUT-2 by adding the constructs of HM, PV and HT to UTAUT (Strzelecki, 2023). Three significant factors that direct consumers' intention or use of technology are PV, HM and HT (Venkatesh et al., 2012).

UTAUT-2 attempts to find out what influences people to use and accept new technologies at both work and home (Tamilmani et al., 2018). To understand what inclines students or teachers to use technology tools such as e-learning systems, researchers in higher education use the UTAUT-2 model (Yu et al., 2021). The UTAUT-2 model, developed through extensive empirical research, provides a comprehensive framework for researchers and practitioners to identify key factors that influence technology acceptance and use (Strzelecki, 2023). Thanks to in-depth research, the UTAUT-2 model makes it easier for both researchers and practitioners to spot major factors impacting the acceptance and use of technology. To explore how university students interact with AI, this study adapts the model and highlights differences between proven and unproven causes of their acceptance of AI tools in HEIs. Understanding what affects user acceptance of AI tools among university students helps us know how they use and accept these tools in academic research. For our research, the UTAUT-2 model sets up a structured way to understand these factors.

Performance Expectancy (PE) helps individuals in BI decide to try new technology (Strzelecki, 2023). The study looks at how students believe AI tools will help them improve their learning and performance in school (Venkatesh et al., 2016). Those who think AI tools raise student and teacher productivity are more likely to start using them (Al-Kfairy, 2024). Students who want to perform well tend to use and adapt to AI tools more successfully, according to Raffaghelli et al. (2022). Strzelecki (2023) confirms that PE is positively related to BI in using ChatGPT. In addition, Xu et al. (2024) discovered that university students' positive BI towards AI tools is influenced by PE.

Social Influence (SI) is defined as the extent to which a person perceives those others, they consider important and believe that they should use the new system (Venkatesh et al., 2012). SI has shown that the influence of social circles, including family members, teachers, co-workers, elders, friends, and peers, positively affects users' intention to use technology (Strzelecki, 2023). Xu et al. (2024) found that SI has a positive impact on university students' BI for using AI tools. Therefore, in this research, SI indicates the extent to which university students perceive that peers, mentors, or other key figures in their

social circle approve or encourage them to engage with the use of AI tools in conducting their academic research.

Effort Expectancy (EE) is defined as the degree of ease associated with the use of technology (Venkatesh et al., 2003). EE consists of establishing such as perceived ease of use, complexity, and ease of use (Strzelecki, 2023). According to Xu et al. (2024), EE is a critical predictor of technology acceptance, and it has a direct impact on individuals' BI to use technology. Also, Strzelecki (2023) found that EE has a positive and significant effect on BI. In the context of this study, EE can be characterized as the degree to which higher education university students believe that using AI tools does not cause significant physical or mental strain.

Facilitating Conditions (FC) is based on whether a person believes the organizational and technical framework exists to help with technology use (Venkatesh et al., 2003; Gunarathna, 2024). This approach supplies students with required resources so they can make good use of AI (Dahri et al., 2024). Strzelecki (2023) believes that for HEI settings, FC shows the significance of technical and reliable infrastructure, knowledge, training and support, as these can affect university students' interest in using educational systems. For this study, enabling conditions mean how much university students at HEIs consider there to be helpful technological and organizational bases for using AI when doing academic research.

According to Venkatesh et al. (2012), people find Hedonic Motivation (HM) in technology, and it helps to decide whether they will use it or not. Directly, HM relates to the acceptance and use of technology in information system research. According to Romero et al. (2023), this element is very important in applications such as ChatGPT. In this paper, HM describes the pleasure and satisfaction of using AI in Academic Research by students attending HEIs.

Price Value (PV) is the significant impact of costs and pricing structures associated with the Use of Technology (Venkatesh et al., 2012). Moreover, PV is the cost students incur when purchasing access to online services used for learning (Strzelecki, 2023). According to Venkatesh et al. (2012), PV is positive when the benefits of using technology are perceived to outweigh the

financial costs, and such PV has a positive effect on intention. Thus, we add PV as a predictor of BI to use AI tools.

Habit (HT) refers to the extent to which users automatically engage in routine behaviors without making conscious decisions (Venkatesh et al., 2012). Also, Moorthy et al. (2019) defines habit as the degree to which an individual involuntarily engages with a system. Yuan et al. (2024) found that university students' use of AI tools for academic purposes directly influences SI and FC, HT formation, and that HT has a significant, albeit small, effect on BI. In this study, the degree to which university students in HEIs automate the use of AI tools in Academic Research is described as HT.

In Sri Lanka, there is a clear research gap regarding how user acceptance of using ai tools for the research process is measured. While there are articles on User Acceptance of using AI tools among university students, there is a dearth of studies that focus on User Acceptance of using AI for their research process by university students in the Sri Lankan context. Therefore, there is a need to survey university students' acceptance of AI and the factors that influence their Academic Research process through a user acceptance model. Addressing this gap will shed light on the acceptance of AI tools among Sri Lankan university students through a UTAUT2 model as a user acceptance theory and how these tools can transform their research processes. This includes various aspects of research, such as literature reviews, writing, and proofreading. Ultimately, this enhances the efficiency, accuracy, and quality of research conducted by Sri Lankan university students. This paper aims to examine the rapidly evolving landscape of user acceptance of using ai tools by university students to revolutionize different stages of the research process.

3. Methodology

This study is based on the quantitative approach to explore what influences students' acceptance of ai tools in academic research. To analyze students' user acceptance, the UTAUT-2 model. Rapid conclusions can be made using quantitative analysis and the statistics provide an unbiased presentation of the results (Williams, 2021). Accordingly, the method provides students with a means to assess the effect of PE, EE, SI, FC, HM, PV and HT on the acceptance of AI tools in academic research (Venkatesh et al., 2012).

The target population of this study includes the total number of final year students belonging to Kelaniya, Sri Jayewardenepura, Sri Lanka Institute of Information Technology (SLIIT), and National School of Business Management (NSBM) HEIs. Since a research component is mostly done as a requirement of a special bachelor's degree, final year students have been used as the population for this study. The target population of this study was selected as students in their final year of studies in the faculties of Humanities & Social Sciences, Science, Engineering, Computer and Technology, and Commerce and Management in these four HEIs. Accordingly, 3647 final year students from the University of Kelaniya, 3701 final year students from the University of Sri Jayewardenepura, 1517 final year students from SLIIT University and 935 final year students from NSBM Green University were admitted to these faculties (Statistical Bulletin, 2023; University Grants Commission, 2021).

According to Adam (2020), Yamane's method has been used for this study because it can be adapted to determine the optimal sample size for continuous and categorical variables at all confidence levels. The sample population was selected using a margin of error or the expected level of accuracy as 0.10. Because the population under this study is homogeneous, the expected precision level of 0.10 was used based on the assumption that variance is minimal in a homogeneous population (Louangrath, 2017).

N = Population size

n = Sample size

e = Error (0.1)

$$n = \frac{N}{1 + Ne^2}$$

$$n = \frac{9800}{1 + 9800 \times (0.1^2)}$$

$$n \simeq 99$$

The non-response rate was added to calculate the final sample size. In social sciences research, a non-response rate of 10% is often considered acceptable (Lu & Hu, 2024; Haggard & Chacron, 2024). Therefore, a non-response rate of 10% was used for this study as well.

This study uses a stratified random sampling technique to ensure a proportional representation of students from diverse demographic, socio-economic, and educational backgrounds across selected HEIs in Sri Lanka. It was considered appropriate to use a stratified random sampling technique to ensure a representative and comprehensive sample for the study. Therefore, the sample was obtained by dividing it into four strata based on faculty type.

Aldulaimi et al. (2024) mention that a questionnaire produces structured data on key features in UTAUT-2, so the team built a questionnaire (Google form) for the study. Because stratified sampling is applied, a questionnaire helps gather data from a large population of individuals who are spread out over a wide area (Aldulaimi et al., 2024). Through google forms, people can be invited to participate by email, through social networks or via their university accounts. Collecting data from many individuals with a google form questionnaire is both cheaper and faster than interviews or focus groups. With online banking, you don't need to collect cash from banks, as everything can be done via the Internet. Because the questionnaire uses a Likert scale and multiple-choice options, analyzing relationships between various variables becomes simple by using statistical methods.

Likert scale questions from final year students to identify how user acceptance of AI tools varies across UTAUT-2 factors. Venkatesh et al. (2012) is the original paper that introduced UTAUT-2 and since 5-point Likert scales are used to measure constructs, the 5-point scale was also used for this study. Many studies have used the UTAUT-2 model with Likert scale questions to assess students' User Acceptance of AI tools (Rodríguez & Trujillo, 2014; Raman & Don, 2013; Richter et al., 2019). Therefore, the questions used in one study were also used as the basis for this study.

The objective in this study is supported by multi-directional statistical analyses for improved and true analyses. To study the research objective, the research team applies the statistical technique Structural Equation Modeling (SEM). SEM was used to examine how the UTAUT-2 characteristics play a role in students using AI tools for research. SEM is a statistical method that helps verify theories such as UTAUT-2, since it studies at the same time how different variables are related to each other (Venkatesh et al., 2012). In this study, PE, EE, SI, enabling conditions, HM, PV and HT acted as independent

factors influencing User Acceptance. The Goodness of Fit (GOF) test also checks how close the theoretical model matches the empirical model and, according to Ghozali and Fuad (2014), this includes absolute fit index, incremental fit index and parsimony fit index. As soon as all the assessment standards are satisfied, the GOF value is acceptable.

4. Results and Discussion

To achieve this objective, SEM was used, which consists of two parts: structural model and path analysis. The variable structure coding used for this was coded as follows.

Table 1: Variables of the Structural Model

UA	User Acceptance
PE	Performance Expectancy
EE	Effort Expectancy
SI	Social Influence
FC	Facilitating Conditions
HM	Hedonic Motivation
PV	Price Value
HT	Habit

Table 1 describes the variables of the structural model employed in this analysis, categorizing them into dependent and independent variables, along with UTAUT2 Model Factors that are critical to the Study. The dependent variable in this model is UA. The independent variables are denoted as PE, EE, SI, FC, HM, PV, HT. This structure facilitates a clarified understanding of the interaction between user acceptance of using AI tools and UTAUT-2 factors in academic research.

Figure 2: Structural Model

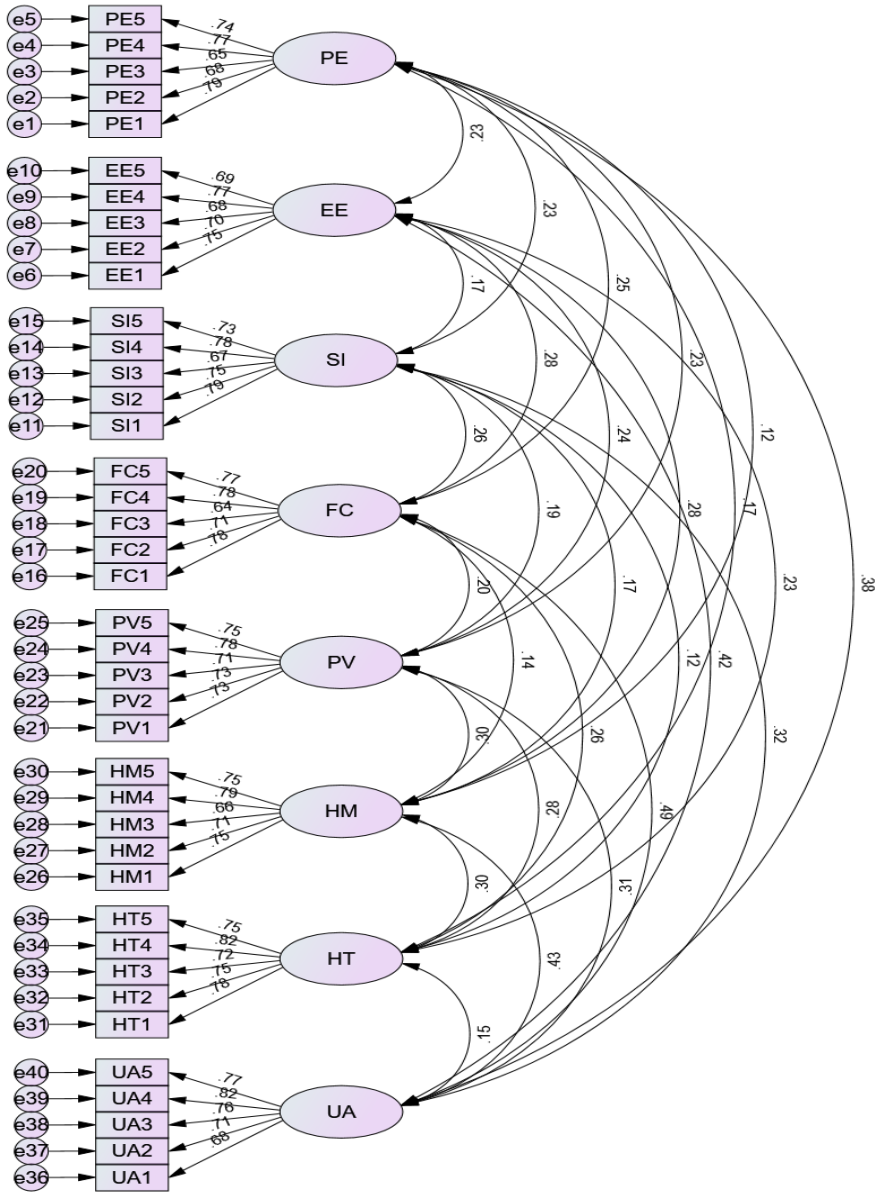


Figure 2 is the structural model for the SEM analysis, where the goal is to determine how well the observed variables reflect the underlying theoretical constructs. There are eight dependent and independent variables, and all loading values are displayed as greater than 0.6.

Table 2: Results of Convergent Validity Test

Construct	No. of Items	Standardized Factor Loadings		AVE	CR
		Min	Max		
PE	5/5	.650	.787	0.528	0.848
EE	5/5	.680	.774	0.519	0.844
SI	5/5	.667	.785	0.552	0.860
FC	5/5	.645	.785	0.548	0.858
PV	5/5	.707	.782	0.549	0.859
HM	5/5	.659	.793	0.538	0.853
HT	5/5	.722	.816	0.583	0.875
UA	5/5	.678	.818	0.561	0.864

Table 2 shows the results of the convergent validity test for the various constructs related to a study on UA, PE, EE, SI, FC, HM, PV and HT. The table systematically lists the number of items, minimum and maximum standardized factor loadings, average variance extracted (AVE) and composite reliability (CR) for each construct. Notably, all constructs show high minimum factor loadings (lowest 0.645), which rise to an even stronger maximum (highest 0.818), indicating that the items have strong loadings on the respective constructs. The AVE values are comfortably above the acceptable threshold of 0.5 (Gunarathna, 2024), with a minimum value of 0.519, indicating a significant proportion of variance. The CR measures reinforce this interpretation, with all values well above the 0.7 benchmark, indicating high internal consistency within each construct (Kodithuwakku & De Silva, 2025).

Table 3 outlines the results of the goodness of fit of the measurement model by reporting various indices that measure how well the model fits the observed data. The results of the goodness of fit indices show that the measurement model shows an excellent fit to the data.

Table 3: Results of the Goodness of Fit of the Measurement Model

The Goodness of Fit Index		Observed Value	Threshold
Absolute fit indices	CMIN/DF	1.004	<3
	GFI	0.945	Close to 1
	AGFI	0.936	Close to 1
	RMR	0.056	<0.1
	RMSEA	0.003	<0.1
Incremental fit indices	CFI	1.0	Close to 1
	TLI	1.0	Close to 1
	RFI	0.929	Close to 1
	NFI	0.935	Close to 1
Parsimony fit indices	PRATIO	0.913	Close to 1
	PNFI	0.854	Close to 1
	PCFI	0.913	Close to 1
	PGFI	0.820	Close to 1

The chi-square to degrees of freedom ratio (CMIN/DF) is much below 3, we can see that the fit is acceptable. The fact that the Goodness of Fit Index (GFI) and Adjusted Goodness of Fit Index (AGFI) are almost 1 proves that the model has improved. In addition, the findings demonstrate that the Root Mean square Residual (RMR) and the Root Mean Square Error of Approximation (RMSEA) are acceptable, supporting the model's close fit to the observed data. It is clear that the model works well, as the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), the Relative Fit Index (RFI) and the Normed Fit Index (NFI) come very close to 1. In addition, the Parsimony Fit Indices (PRATIO), Parsimony Normed Fit Index (PNFI), the Parsimony Comparative Fit Index (PCFI) and the Parsimony Goodness of Fit Index (PGFI) consistently reach figures very close to 1, indicating a proper model fit with a balanced structure. Overall, all observed indices meet the recommended standards, suggesting that the measurement model is considered statistically good and proper (Kodithuwakku & De Silva, 2025).

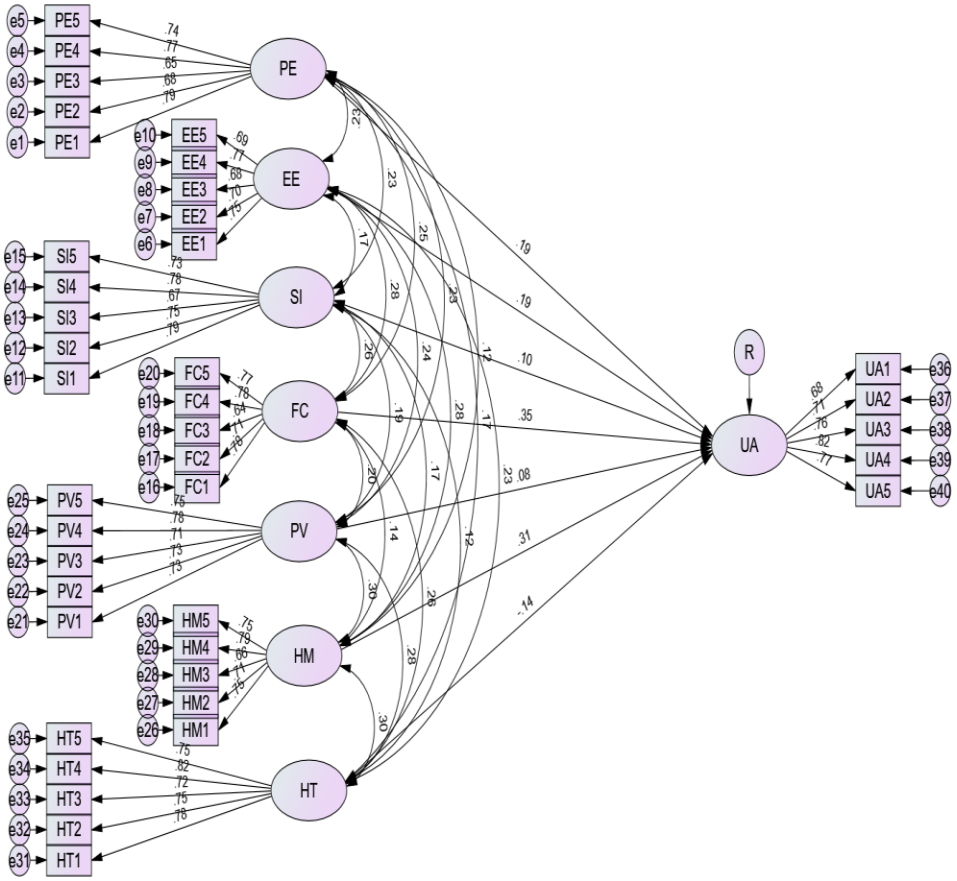
Table 4: Comparison of Squared Inter-Construct with AVE

	HT	PE	EE	SI	FC	PV	HM	UA
HT	0.764							
PE	0.167	0.727						
EE	0.228	0.227	0.721					
SI	0.123	0.228	0.174	0.743				
FC	0.263	0.249	0.278	0.258	0.740			
PV	0.276	0.228	0.236	0.189	0.200	0.741		
HM	0.303	0.123	0.280	0.171	0.137	0.296	0.734	
UA	0.154	0.375	0.419	0.320	0.494	0.308	0.428	0.749

Table 4 illustrates how the discriminant validity of a measurement model is validated by comparing the squared inter-construct correlations with the AVE for the constructs UA, PE, EE, SI, FC, HM, PV and HT. Discriminant validity is supported when the AVE for each construct is greater than the squared correlation with any other construct, indicating that the construct shares more variance with its own measure than with other constructs. For example, HT has an AVE of 0.764, which is higher than its squared correlations with all other constructs (ranging from 0.123 to 0.303). This pattern is also observed with other constructs, where the diagonal elements representing AVE (PE = 0.727, EE = 0.721, SI = 0.743, FC = 0.740, PV = 0.741, HM = 0.734, UA = 0.749) are consistently higher than the non-diagonal elements. Also, the squared correlation between HT and PE is 0.167, which is lower than the AVE for both HT (0.764) and PE (0.727), and this trend is consistent throughout the table.

Path analysis is an extension of the regression model, used to test the fit of the correlation matrix against two or further unproductive models which are being compared by the experimenter. The regression weights prognosticated by the model are compared with the observed correlation matrix for the variables, and a GOF statistic is calculated (Peterlin et al., 2023; Kodithuwakku & De Silva, 2025). Figure 3 delineates the path analysis, alongside its standard estimates, offering a preliminary insight into the direct relationships between variables.

Figure 3: Path Analysis



The path analysis conducted to examine the relationships among the variables identified in this study is shown in Figure 3. It shows how the different variables are connected, with arrows indicating relationships.

Table 5 shows how the factors in UTAUT2 affect User Acceptance of using AI tools in Academic Research. In particular, the analysis shows that UA has no significant effect on PV, as indicated by the non-significant path coefficients. This suggests that variables such as confidence in using AI tools for Academic Research (UA1), regular use of AI tools (UA2), exploring new AI tools for research purposes (UA3), AI tools improving academic performance (UA4), and recommending AI tools to peers for Academic Research use (UA5) do not significantly affect customer concerns regarding

price value. On the other hand, the data reveals significant and positive relationships between UA and HM, FC, SI, EE, PE, and HT.

Table 5: Results of the Path Analysis

Standardized Parth			
Parts	**Coefficient**	**P value**	**Decision**
UA→HM	0.305 (0.044)	0.001*	Support
UA→PV	0.079 (0.045	0.065	Not Support
UA→FC	0.346 (0.042)	0.001*	Support
UA→SI	0.105 (0.042)	0.019*	Support
UA→EE	0.189 (0.043)	0.001*	Support
UA→PE	0.190 (0.042)	0.001*	Support
UA→HT	-0.139 (0.046)	0.002*	Support

Standard errors of Coefficients in Parenthesis
*Denotes the significance of the hypothesis at 5%

SEM analysis based on the UTAUT-2 framework has revealed crucial insights into the factors influencing students' acceptance of AI tools in academic research. The measurement model demonstrated strong validity and reliability, with all constructs ranging from 0.645 to 0.818, AVE values above 0.5, and CR scores exceeding 0.7, confirming the robustness of the constructs. The excellent fit of the model, as evidenced by indices such as CMIN/DF (1.004), GFI (0.945), and RMSEA (0.003), further confirms its suitability for the data. Discriminant validity was also confirmed, as the AVE of each construct surpassed its squared correlations with other constructs, ensuring uniqueness. These results emphasize the reliability of the model and its ability to accurately represent the relationships between the studied variables.

Path analysis revealed significant predictors of UA and FC emerged as the strongest driver, highlighting the importance of infrastructure. HM and PE also played important roles, indicating that enjoyment and perceived utility significantly enhanced acceptance. SI had a moderate effect, and HT showed a negative effect. This suggests that entrenched behaviors may hinder the use of AI tools. PV was not significant, likely due to the widespread availability of free or subsidized tools. These findings highlight the multifaceted nature of AI tool acceptance and have practical implications for students aiming to improve adoption through targeted support and user-centered design.

PE and EE were significant predictors of user acceptance, consistent with Venkatesh et al. (2012) who identified these constructs as central to technology use. Students start using AI tools for learning when they believe they will do better at school, according to Dwivedi et al. Students who have higher expectations for their academic performance are likely to work better with AI tools, according to Raffaghelli et al. The same goes for EE, according to Alsharida et al (2021), because students give greater weight to usability to reduce the mental demands of their devices. Strzelecki (2023) discovered that having effective EE strongly benefits business integration. FC was found to differ a lot in terms of the number and called attention to the support and resources institutions provide. Wong et al. (2020) add that having training and access to good materials is necessary to use technology in academics. Dwivedi et al. (2017) concluded that having access to the proper equipment and supporting programs encourages academic researchers to try AI.

HM also showed a relationship with user acceptance, consistent with Jiang et al. (2024), who highlighted that fun leads to engagement with AI tools, especially among students who perceive these tools as innovative and fun. SI had a moderating effect, and Or and Chapman (2021) study also found that peer and instructor recommendations shape the adoption of technology in educational settings. And Xu et al. (2024) found that SI has a positive impact on university undergraduates' Behavioral Intention for using AI tools. HT showed a negative effect, which contrasts with Gardner (2015), who found that this positively influences habitual use, but consistent with Gupta et al. (2021), who observed resistance when new technologies disrupt established routines.

5. Conclusion and Policy Suggestions

In this study, user acceptance of AI tools for academic research by students from four HEIs in the Western Province of Sri Lanka was examined. The purpose of the study, guided by the UTAUT-2 model, was to see how PE, EE, SI, FC, HM, PV and HT might influence using AI for learning. The results of SEM analysis indicated that PE, EE, SI, FC and HM play substantial roles in increasing user acceptance. HT showed that resistance may be encountered when changing from traditional research to methods involving AI. Since there

are so many free AI tools today, PV did not show to be significant through the analyses.

The results demonstrate that good internet access and digital understanding are key to achieving strong User Acceptance, so universities should offer reliable internet services, AI training courses and provide affordable innovative tools. According to AI, the Ministry of Education should join efforts with telecommunications firms to provide low-priced data plans for students and build AI centers in universities mainly in the Western province. Also, schools can use AI writing assistants and grammar tools to help students get better at technology while still giving them a good foundation in AI. Campaigns should also make clear how AI can boost research work and universities could recommend faculty involved initiatives that benefit students in every department. Faculty members should be trained in AI tools by the University Grants Commission, making them more, but not extremely, willing to adopt them. A national policy approach to AI in education is needed to ensure SDG 4, quality education, is achieved in Sri Lanka.

Moreover, information programs can be organized to show researchers the advantages AI offers to scientific research. Supporting these endeavors with internship opportunities and special tools and encouraging equal use, help the university create the conditions for innovation in academic research. For AI tools to be used more effectively in Sri Lankan higher education, making AI literacy part of the formal program at all levels would be very valuable. Presently, the same program is used at the University of Moratuwa and should be implemented in other universities as well. Among other things, it would mean developing modules that teach students how AI can help them with research, writing and analyzing data and the important point of not misusing AI in ways that harm their ability to learn. Universities can join forces with AI developers to make content that fits the needs of education in Sri Lanka. Furthermore, it's important to give teachers access to programs that help them guide students in using AI in a responsible and inventive way. These projects could be strengthened by giving students and teachers the opportunity to work with modern resources and specialists from international groups and technology businesses. Sri Lanka can become a top researcher in AI by bringing together people who can learn from each other and experiment with new ideas.

Academic research should put a priority on spotting and avoiding algorithmic bias when using AI. If training data and models do not match local culture and language, the results may become biased because of the algorithm. For this reason, it is important to fit AI to local needs by boosting AI knowledge among researchers, selecting data that reflects the culture and population of a place, ensuring meaning ethical guidelines are in place for using AI in research and offering scientifically democratic AI instruments.

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The Impact of Mathematical Anxiety on Subject Choices among Undergraduates in Art Faculties (Special Reference to Higher Education Institutes Sri Lanka)

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Abstract

This study examines the impact of mathematics anxiety on subject choices among undergraduate students in Arts Faculties, focusing on higher education institutions in Sri Lanka. Mathematics anxiety, characterized by fear and stress associated with mathematical tasks, significantly impacts the academic and career trajectories of students, especially in non-STEM fields. This research addresses the gap in understanding how this anxiety affects Arts students, who often avoid mathematically intensive subjects due to cognitive difficulties. A quantitative approach was used, collecting data from 99 undergraduate students from three Sri Lankan universities using a simple random sampling method using a structured questionnaire. Here, a statistical analysis technique, ordinary regression, was used to explore the relationship between mathematics anxiety and subject choice. Among the types of mathematical anxiety, statistical, test, subject-specific, spatial, cognitive, and symbolic anxiety types were also identified as major factors influencing anxiety selection. The study concludes that targeted interventions such as anxiety management workshops and curriculum reforms are essential to mitigate these effects and expand students' academic and career opportunities.

Keywords: Mathematical Anxiety, Subject Choices, Arts Undergraduates, Academic Performance

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1. Introduction

Mathematics is a fundamental skill that fosters logical thinking and problem-solving abilities (Zanabazar et al., 2023). However, many students experience mathematical anxiety, a psychological condition marked by fear and apprehension toward mathematical tasks (Betz, 1978). This anxiety manifests as stress or nervousness during math-related activities, hindering academic performance and influencing subject preferences (Acevedo et al., 2020). In Sri Lanka, the education system classifies academic streams into Science, Commerce and Arts, with subject selection heavily dependent on performance in mathematics at the Ordinary Level (O/L) examination. Students with lower grades often gravitate toward the Arts stream, perpetuating a cycle of avoidance of quantitative subjects (Yogendra, 2017). The primary objective of this study is to examine the impact of mathematical anxiety on subject choices among Arts Faculty undergraduates.

Mathematical anxiety, particularly in the Arts stream, significantly impacts students' academic choices and career aspirations (Dower et al., 2016). It leads to stress, fear, and apprehension, negatively impacting participation and performance in math-related subjects (Kaushal et al., 2022). In Sri Lanka, subject selection is based on students' performance, particularly in mathematics. This systemic placement can create a self-reinforcing cycle, limiting students' academic horizons and career aspirations (Hui & Zhang, 2015). Mathematical proficiency is essential in daily life and competitive exams, but many Arts students experience significant anxiety. Factors contributing to this anxiety include negative experiences, ineffective teaching methods, and societal perceptions that associate mathematical ability with innate talent (Rabkin & Redmond, 2010).

2. Literature Review

Existing research indicates that mathematical anxiety is prevalent among Arts students due to negative perceptions and limited exposure to advanced mathematical concepts (Abdullah et al., 2018). Studies have identified various types of mathematical anxiety, including statistical, test, and cognitive anxiety, each affecting subject choices differently (Paechter et al., 2017). In this context the primary cause of mathematical anxiety is mathematics itself, which

is essential for understanding other Sciences and the Arts. Anxiety has no age barrier and research findings suggest that it can emerge in students as early as six years old (Amran & Bakar, 2022). However, due to challenges in accurately assessing anxiety that may be heightened by exam conditions or challenging subject's research on primary school students remains limited (Zhang et al., 2024). Further analysis reveals that anxiety negatively affects an individual's mathematical performance (Caviola et al., 2021). As a result, high levels of mathematical anxiety often led to avoidance behaviors. Accordingly, individuals who experience high levels of anxiety tend to feel greater fear when engaging in math related tasks (Palmwood, 2024). Thus, from a definitional standpoint mathematical anxiety can be identified as a feeling of stress, fear or apprehension that disrupts mathematical performance. Extensive research has been conducted on its impact on students' academic choices (Chapell et al., 2015). Higher education studies show that students with high mathematical anxiety are more likely to avoid subjects and degree programs that require substantial mathematical involvement instead opting for Arts and Humanities (Timonera et al., 2023).

A recent meta-analysis by Barroso et al. (2021) found a weak to moderate negative correlation between mathematical anxiety and mathematical achievement. However other studie indicate that mathematical anxiety does not necessarily predict mathematical performance (Dietrich et al., 2015). Instead, Wang et al. (2015) found that exam related mathematical anxiety exists across all levels of motivation (high, medium and low). Nevertheless, anxiety related to advanced mathematical learning tends to be associated with lower levels of mathematical motivation. As a result, students with high mathematical anxiety are not necessarily devoid of motivation for mathematics (Wang et al., 2014). However, the evidence suggests that students experiencing severe mathematical anxiety are more inclined to avoid mathematics as much as possible (Kargar et al., 2010). In addition, undergraduates with high levels of mathematical anxiety are more likely to withdraw from degree programs that involve moderate to high levels of mathematical demands there by leading them to distance themselves from STEM fields in college (Daker et al., 2021).

This study addresses the gap in understanding how mathematical anxiety affects Arts students, who are often perceived as having weaker math skills.

Gaps in the literature include a lack of focus on Arts students in Sri Lanka and the interplay between socio-economic factors and mathematical anxiety. This study aims to fill these gaps by examining the specific challenges faced by Arts undergraduates.

3. Methodology

Considering the structured design or framework used to investigate the relationship between mathematics anxiety and subject choice among university students, the research was conducted through a quantitative approach. Quantitative research allows for the collection of numerical data and provides the ability to accurately measure variables (Creswell & Creswell, 2018). This allows researchers to use statistical techniques to identify relationships between variables (Bryman, 2016). In quantitative research, large sample sizes enhance external validity, allowing the results to be generalized to a broader population (Williams, 2021).

The target population of this study includes all undergraduate students of the Faculty of Arts of the Universities of Kelaniya (UOK), Jayewardenepura (USIP) and Peradeniya (UOP). As recognized by the University Grants Commission (UGC), these universities were selected based on the highest student enrollment among the state universities offering Arts degrees. Accordingly, these three institutions were selected as the population for this study. Accordingly, 6021 Bachelor of Arts candidates of the University of Kelaniya, 3840 Bachelor of Arts candidates of the University of Jayewardenepura and 4859 Bachelor of Arts candidates of the University of Peradeniya were selected as the population for the study (University Grants Commission, 2021).

It is applicable to use formulas to opt for the applicable sample for this study. In studies similar as calculation anxiety, it is applicable to opt the sample using formulas because it helps in changing the confidence situations and non-response situations as asked for the study. For this purpose, Yamane's formula is used. Consequently, when the population size is known, an applicable significance position is followed, and the demanded sample size is unknown, it's important to consider the use of Yamane's formula (Al-hasnawi & Hotson, 2023, Gunarathna, 2023). Also, Yamane's system can be applied to determine

the applicable sample size for all confidence situations, ensuring consistency across continuous and categorical variables (Osahon & Kingsley, 2016; Gunarathna, 2023). Yamane's system is used to calculate sample size for a 90% confidence level. A 90% confidence level is used also as a practical approach to balance responsibility and feasibility (Louangrath, 2017). The quantum of time was chosen as follows. N = Population size, n = Sample size, e = Error (0.1)

$$n = \frac{N}{1 + N\,(e^2)}$$

$$n = \frac{14720}{1 + 14720\,(0.1^2)}$$

$$n = 99.32 \sim 99$$

According to that, from the population of 14720 students, under a 90% confidence level, the number of units obtained as 99.32 was selected as 99 units for the convenience of studying. The non-responsive rate should be included in the final sample size calculation. A 10% nonresponse rate is frequently seen as acceptable in a variety of study domains, such as the social sciences and economics (Lindner et al., 2001).

Table 1: Population and Sample Size Composition

University	Actual sample size
University of Kelaniya	$\frac{6021}{14720} \times 99 = 40$
University of Peradeniya	$\frac{4859}{14720} \times 99 = 33$
University of Jayewardenepura	$\frac{3840}{14720} \times 99 = 26$

Source: University Grants Commission (2021)

It is appropriate to use a simple random sampling technique to ensure an equal chance of selecting an undergraduate student for the study and to prevent selection bias. Also, the results can be generalized since they are randomly selected. In this case, the sample was first obtained. There, students are selected without bias using a random number generator. Here, the accuracy and validity of the study are improved since a probability based statistical technique is used (Saunders et al., 2023).

In this study, the primary data collection method was used, and the questionnaire method was chosen as the most suitable research tool for this purpose, the main reason being that it is the most suitable method for collecting quantitative data (Kufanga, 2024). Therefore, a Google Forms questionnaire was used (Olajide, 2019). Since a simple random sampling method was used, the questionnaire enables efficient data collection from a large and geographically dispersed population.

Google Forms allow for easy distribution via email, social media or university networks, ensuring wide participation. Compared to face-to-face interviews or focus groups, a Google Forms questionnaire is a cost effective and time efficient method for collecting data from a large sample. It eliminates the need for physical distribution and enables automated data entry and analysis (Raju and Harinarayana, 2016). The questionnaire is structured using a Likert scale and multiple-choice questions.

Here, Questions related to different types of math anxiety are presented using ten different anxiety categories (statistical, test, subject-specific, spatial, cognitive education, numerical, learning, symbolic, and application anxiety). Although there are various classifications of math anxiety, these ten categories were chosen because they are commonly used in relevant studies. In addition, the overall impact of math anxiety is also considered. All these aspects are addressed through questions structured using Likert scales.

4. Results and Discussion

To test the main research objective, ordinary logistic regression is used. Ordinary regression (also known as ordinary logistic regression) is a regression analysis used when the dependent variable is ordinary (Winship and Marae, 1984). In this study, ordinary regression analysis was used to examine the effect of mathematics anxiety on subject choice (the dependent variable) (Atoyebi et al., 2023). It examines the effects of independent variables, mainly statistical, test, subject-specific, spatial, cognitive, educational, numerical, learning, symbolic, and application anxiety, along with factors such as gender, age, ethnicity, and the candidate's general text results. Here, the research is conducted using categorical dependent variables based on high mathematics, medium mathematics, and low mathematics, therefore, the most appropriate

method to study the effect of mathematics anxiety on the subject choice of Faculty of Arts candidates is ordinary logistic regression.

Here, conclusions about model fit information, goodness of fitness, R-squares, and parameter estimates have been obtained through general regression analysis.

To ensure model fit, several diagnostic tests and measures were applied (Maydeu-Olivares et al., 2022; Kodithuwakku & Peiris, 2021). Here, the -2-log likelihood (-2LL) statistic was examined. A decrease in -2LL from the null model to the final model suggests improved model fitness. Further validation was performed using classification accuracy measures, pseudo-R-squared values, to ensure that the model predictions were in good agreement with the observed results (Ryu, 2014). The null model (containing no predictors) provides a significantly better fit compared to the final model (including all specified predictors), so the significant p-value ($p < 0.05$) in this test indicates that the final model provides a statistically better fit than the null model, and that the predictors collectively improve (Kodithuwakku & Peiris, 2021).

Table 2: Model Fitting Information

Model	-2 Log Likelihood	Chi-square	df	Sig.
Intercept only	211.760			
Final	132.216	79.544	27	.000

Here the information about the difference is statistically significant. That is, the p value should be equal to or less than 0.05. Accordingly, the p value is 0.000. Therefore, it can be concluded that the model is suitable. Here, the decrease in -2LL confirms that the predictors collectively improve the fit of the model. Also, the chi-square test (79.544, $p < 0.001$) shows that the final model is significantly better than the null model. Accordingly, it can be assumed that math anxiety and other included variables significantly affect students' subject choices.

To assess how well the logistic regression model fits the observed data, i.e., to test the goodness of fit, the Pearson chi-square and deviance statistics are evaluated using chi-square tests (Fagerland & Hosmer, 2016). A non-significant result for these tests ($p > 0.05$) would indicate that the model's

predicted probabilities agree well with the actual observed outcomes, supporting a good fit (Tezel et al., 2021). On the other hand, a significant result ($p < 0.05$) would suggest that the model is not well-fitting, i.e., the predictions deviate systematically from the observed data.

Table 3: Goodness of Fit

	Chi-square	df	Sig.
Pearson	224.658	155	.000
Deviance	129.444	155	.933

This table provides two key goodness of fit statistics, Pearson's chi-square and Deviance chi-square, to assess how well the logistic regression model fits the observed data. If the significance value is less than 0.05, the goodness-of-fit statistics indicate a poor fit (Kwak, 2023). Here, the Deviance chi-square test indicates a good fit with a non-significant p-value ($p > 0.05$). Thus, $p = 0.933$ suggests that the model fits the data adequately.

In assessing the fit of a model, it is used to assess how well the model explains the variation in the dependent variable (Heinzl & Mittlböck, 2003). It tests three pseudo-R-squared statistics. The Cox and Snell R^2 provides an estimate of the model fit, but has an upper limit of less than 1, making it difficult to obtain high values. The Nagelkerke R^2 adjusts the Cox & Snell R^2 to a range of 0 to 1, providing a more interpretable measure (Hemmert et al., 2016). It allows for better comparison across models. The McFadden R^2 measures improvement over a null model, and values closer to 1 indicate a stronger fit. However, it tends to give lower value than Nagelkerke. Although these pseudo-R-squared values are not directly comparable to R^2 in linear regression, higher values indicate a better-fitting model. Nagelkerke's R^2 was given priority for interpretation because of its generalized scale and clear practical meaning.

Table 4: Pseudo R

Cox and Snell	**.552**
Nagelkerke	.624
McFadden	.371

Overall, the pseudo-R-squared values indicate that the logistic regression model provides a moderate explanation of the types of math anxiety affecting subject choice among university students. A high value of Nagelkerke indicates that more than half of the types of math anxiety affecting subject choice are explained by the types included in the model. Also, according to the above data, 0.371 (McFadden value) indicates that this model explains 37.1% of the predicted results compared to the null model, which is based on the predictions.

This analysis examines math anxiety and how it affects subject choice (classified as low, moderate, and high). Threshold parameters: ($p < .001$), statistically significant. The estimated threshold (-2.576) indicates a clear difference between subject choices. That is, high math anxiety levels reduce the likelihood of choosing subjects related to this category. When considering statistical anxiety, it is ($p = 0.004$, Wald = 8.330). The negative coefficient (-2.127) suggests that having high math anxiety problems reduces the likelihood of choosing the subject compared to those with low math anxiety. When considering moderate anxiety, it is ($p = 0.000$, Wald = 26.158) and the negative coefficient (-3.509). This suggests that having high math anxiety problems reduces the likelihood of choosing the subject compared to those with low math anxiety. When considering test anxiety ($p = 0.038$, Wald =4.312), the coefficient of variation is (1.015). When considering neutrality ($p = 0.005$, Wald =7.897), the coefficient of variation (1.340) also shows significant positive effects. That is, it suggests that test anxiety can encourage subject choice. When considering high problems of subject-specific anxiety ($p = 0.007$, Wald =7.150), the negative coefficient is (-0.990). When considering neutrality ($p = 0.069$, Wald =3.314), the negative coefficient is (-0.614). Thus, it is shown that high subject-specific anxiety reduces subject selection.

Table 5: Parameter Estimates

		Estimate	Std.Error	Wald	df	Sig
Subject choices	High	-2.576	0.629	16.790	1	0.000
	Moderate	0.422	0.632	0.446	1	0.504
Statistical anxiety	High	-2.127	0.737	8.330	1	0.004
	Moderate	-3.509	0.686	26.158	1	0.000
	Low	0[a]	.	.	0	.
Test anxiety	High	1.015	0.489	4.317	1	0.038
	Moderate	1.340	0.477	7.897	1	0.005
	Low	0[a]	.	.	0	.
Subject-specific anxiety	High	-0.990	0.370	7.150	1	0.007
	Moderate	-0.614	0.338	3.314	1	0.069
	Low	0[a]	.	.	0	.
Spatial anxiety	High	-0.855	0.360	5.638	1	0.018
	Moderate	-1.223	0.340	12.920	1	0.000
	Low	0[a]	.	.	0	.
Cognitive anxiety	High	-1.338	0.487	7.535	1	0.006
	Moderate	-1.609	0.444	13.116	1	0.000
	Low	0[a]	.	.	0	.
Symbolic anxiety	High	1.385	0.540	6.577	1	0.010
	Moderate	-0.144	0.345	0.175	1	0.676
Age	22-25	0.583	0.325	3.226	1	0.072
	Above 25	0[a]	.	.	0	.
Ethnicity	High	1.527	0.460	11.018	1	0.001
	Moderate	2.967	0.662	20.098	1	0.000
	Low	0[a]	.	.	0	.
Result (O/L math)	High	2.370	0.417	32.295	1	0.000
	Moderate	0.976	0.333	8.583	1	0.003
	Low	0[a]	.	.	0	.

Furthermore, high spatial anxiety is shown (p = 0.018, Wald =5.638) and the negative coefficient is (-0.855). In terms of moderation (p = 0.000, Wald =12.920), the negative coefficient is (-1.223), indicating that high spatial anxiety reduces subject selection. In terms of high problem anxiety, the negative coefficient is (p = 0.006, Wald =7.535) and the negative coefficient is (-1.338) and in terms of moderation (p = 0.000, Wald =13.116), the negative

coefficient is (-1.609). Thus, it is shown that high cognitive anxiety reduces subject selection. Furthermore, symbolic anxiety is considered in high problem situations ($p = 0.010$, Wald =6.577) and the coefficient of variation (1.385) also shows significant positive effects. That is, symbolic anxiety can encourage subject choice. Also, according to demographic and educational information, age groups show a positive but marginally significant effect. Also, ethnic groups show significant positive estimates, indicating that these groups are more likely to choose subjects with low math anxiety compared to those with high math anxiety.

The findings of this study highlight the significant impact of different types of mathematics anxiety (statistical, test, subject-specific, spatial, cognitive and symbolic anxiety) on subject choice among Faculty of Arts candidates. Logistic regression analysis confirms that these anxiety factors collectively influence students' decisions, with statistical and cognitive anxiety showing particularly strong negative effects, while test and symbolic anxiety show some positive effects. Model fit statistics (-2LL reduction, chi-square tests and pseudo-R^2 values) support the robustness of the analysis, with Nagelkerke's R^2 indicating that more than half of the variance in subject choice is explained by the predictors.

These results are consistent with existing research, which suggests that statistical anxiety interferes with cognitive processing (Cheese et al., 2011), and that test anxiety although often harmful can sometimes be a motivating factor for engagement (Embsey et al., 2016). Subject-specific and spatial anxieties further inhibit students from mathematically rigorous areas (Gogol et al., 2017; Lyons et al., 2018), reinforcing avoidance behaviors. Symbolic anxiety related to abstract representations (Daker et al., 2021), despite some positive associations, may paradoxically lead art students to shy away from quantitative subjects.

Demographic factors also played a role, with ethnicity and previous mathematics performance (O/L results) significantly influencing choices. This is consistent with studies that highlight sociocultural and educational background as key determinants of math anxiety (Malik, 2015; Ferguson et al., 2015).

5. Conclusion and Policy Suggestions

The study provides significant insights into the impact of mathematics anxiety on the subject choice of undergraduates in arts faculties across multiple analytic dimensions. These results highlight the need for targeted interventions to address mathematics anxiety. Particularly in students pursuing arts subjects, where quantitative skills may still be relevant, future research should explore the long-term effects of mathematics anxiety on academic performance and career trajectories, as well as the effectiveness of anxiety reduction strategies in educational settings. In addition, expanding the study to include other subjects and cross-cultural comparisons could provide a deeper understanding of the broader implications of mathematics anxiety on subject choice.

To address these challenges, policy interventions should focus on gender-sensitive mathematics education, pre-university teaching, and anxiety reduction workshops. Institutional reforms, such as integrating math literacy across disciplines, establishing peer mentoring programs, and providing mentoring services, can foster a supportive learning environment. Future research should expand to other faculties, use mixed-method approaches, and explore additional types of anxiety to develop more targeted strategies. By implementing these steps, universities can reduce math anxiety, promote equitable access to quantitative fields, and cultivate a workforce equipped with the analytical skills essential for national development.

Finally, fostering a culture of mathematical confidence requires collaboration among educators, policymakers, and students to ensure that math anxiety does not hinder academic and career potential in an increasingly quantitative world.

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The Influence of Sustainable Fashion Marketing on Purchase Intention Among Gen Z (With Special Reference to Colombo District, Sri Lanka)

K.V.C. Rashmika[1]

Abstract

This research examines how sustainable fashion marketing affects the purchasing intentions of Generation Z consumers in the Colombo District of Sri Lanka. A quantitative research design was employed, and primary data were gathered through structured questionnaires distributed to a representative sample of Gen Z participants. The collected data were analyzed using Structural Equation Modeling (SEM) with AMOS to investigate the intricate relationships among sustainable marketing elements such as sustainable product features, sustainable pricing, sustainable place, sustainable promotion, brand credibility, and social influence on consumers' buying intentions. The results demonstrate that sustainable fashion marketing has a significant effect on Gen Z's buying intention. Consumer attitudes were found to be a vital mediator, emphasizing the significance of positive perceptions in converting marketing activities into actual purchase intentions. This research highlights the need for transparency, trustworthy certifications, and compelling storytelling in sustainable fashion marketing to foster consumer trust and align with the environmental beliefs of younger consumers. The insights gained provide crucial guidance for fashion marketers aiming to create effective campaigns and for policymakers focused on encouraging responsible consumption and sustainability within the apparel industry in Sri Lanka. And, this study adds to the expanding knowledge on sustainable consumer behavior in emerging markets and presents practical implications for promoting sustainable fashion consumption among the influential Gen Z demographic.

Keywords: Sustainable Fashion Marketing, Purchase Intention, Gen Z, Consumer Attitudes, Colombo District

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1. Introduction

The global fashion industry faces a significant challenge: reconciling the rising consumer demand for trendy and affordable clothing with the pressing need to address its considerable environmental and social consequences. Valued at over USD 2.5 trillion, the fashion sector is a powerful economic entity but also a major factor in environmental harm. It is responsible for roughly 10% of global carbon emissions and 20% of wastewater production, while also depleting substantial quantities of non-renewable resources (Okafor et al., 2021; Dehghani & Goyal, 2022). The advent of fast fashion has intensified these problems, with consumers acquiring 60% more garments than they did in 2000, yet keeping items for only half as long, leading to approximately 85% of textiles ending up in landfills each year (Ronan, 2022; Gupta et al., 2022). This linear "take-make-dispose" model is not sustainable and calls for immediate change.

Sustainable fashion has arisen as an essential response to these dilemmas, focusing on environmentally sound production, ethical labor practices, and efficient resource use throughout the product lifecycle (Ellen MacArthur Foundation, 2017). This involves utilizing eco-friendly materials, minimizing waste and adopting circular economic strategies such as recycling and reuse (Allen et al., 2022). Companies across the globe are increasingly implementing sustainable fashion marketing techniques to align with evolving consumer values, especially among younger generations who exhibit greater environmental consciousness (Soyer & Dittrich, 2021).

Generation Z (Gen Z), born between 1997 and 2012, constitutes a significant global demographic with unique consumption patterns influenced by digital interconnectivity and social awareness (Connell, 2010). As digital natives, Gen Z has exceptional access to information regarding environmental and social challenges, enhancing their awareness of the effects of their purchasing decisions. Nevertheless, despite their professed commitment to sustainability, an attitude-behavior gap exists, as many Gen Z consumers still opt for fast fashion due to issues of affordability and availability (Connell, 2010). This gap illustrates the intricacy of converting environmental awareness into sustainable buying practices.

Sri Lanka's apparel industry is a pillar of the national economy, significantly contributing to export income and employment opportunities. The country has made remarkable progress in sustainable manufacturing, including hosting Asia's inaugural carbon-neutral factory and several facilities with net-zero carbon emissions (Allen et al., 2022). The Colombo District, as a dynamic commercial center, is vital to the growth and sustainability endeavors of the sector (Export Development Board Sri Lanka, 2022). Despite these advancements, challenges persist, including economic disruptions from the COVID-19 pandemic and a lack of consumer knowledge about sustainable fashion options within the domestic market. The fast fashion model continues to prevail due to its ease of access and low prices, highlighting the necessity for effective marketing strategies that educate consumers and promote sustainable alternatives (Connell, 2010; Soyer & Dittrich, 2021).

The success of sustainable fashion marketing is crucial for engaging Gen Z consumers, who are swayed by social media, brand credibility, and peer influence (Kurukula, 2022). Comprehending how these marketing initiatives affect purchase intentions can assist in bridging the attitude-behavior gap and foster the growth of sustainable consumption in Sri Lanka's apparel industry. Consequently, research focusing on the influence of sustainable fashion marketing on Gen Z's buying decisions in the Colombo District is timely and necessary.

While the apparel industry in Sri Lanka has made notable advancements in sustainable manufacturing practices, there is a scarcity of empirical research regarding the impact of sustainable fashion marketing on the buying intentions of Generation Z consumers in the country. Young consumers in Sri Lanka demonstrate environmental concerns but encounter obstacles such as a lack of awareness, social pressures, and uncertainties about the quality and affordability of sustainable products (Thilinika & Gunawardana, 2021; Gunarathne & Ranathunga, 2023). This gap between expressed environmental values and actual purchasing behavior commonly known as the attitude-behavior gap represents a significant challenge for both marketers and policymakers (Connell, 2010; Soyer & Dittrich, 2021).

Furthermore, the influence of marketing strategies such as pricing, product positioning, distribution, promotion, brand reliability, rental and resale options, and social influences in shaping Gen Z's intentions to purchase

sustainably remains insufficiently investigated in the Sri Lankan scenario. In the absence of a comprehensive understanding of these factors, apparel brands may find it difficult to create effective marketing campaigns that resonate with the values of young consumers and address economic and social challenges. Policymakers also lack specific insights necessary to encourage responsible consumption behaviors within this demographic.

Considering the economic significance of the apparel sector and the increasing demand for sustainability, it is essential to bridge this knowledge gap. Doing so will allow stakeholders to better align their marketing strategies with the preferences of Gen Z and promote environmentally responsible consumption practices, thereby contributing to sustainable development goals.

The key objective of this research is to explore how sustainable fashion marketing affects the purchasing intentions of Gen Z consumers in the Colombo District of Sri Lanka. This analysis is crucial considering Colombo's position as a commercial hub and the diversity of its Gen Z population, which represents a significant market segment for brands emphasizing sustainable fashion. By analyzing this connection, the research seeks to offer practical insights for marketers aiming to connect with Gen Z consumers effectively, as well as for policymakers who wish to promote sustainable consumption habits.

To fulfill this objective, research has developed several hypotheses based on the marketing mix framework and theories related to consumer behavior. These hypotheses investigate the possible direct impacts of components of sustainable marketing, including sustainable products, sustainable price, sustainable place and sustainable promotion on purchasing intentions. Moreover, this study considers external factors such as brand credibility and social influence, which are significant influences of consumer behavior in the realm of sustainability (Soyer & Dittrich, 2021; Allen et al., 2022). It also examines the significance of rental and resale services, highlighting the increasing interest in circular economy practices among younger consumers (Gunarathne & Ranathunga, 2023). And, the research posits the mediating role of Consumer Attitude, aligning with the Theory of Planned Behavior, which stresses that attitudes are crucial predictors of behavioral intentions (Ajzen, 1991).

2. Literature Review

The idea of sustainable fashion marketing has gained notable attention recently as the fashion sector faces increasing scrutiny regarding its social and environmental consequences (Niinimäki & Hassi, 2011; Shen, 2014). Worldwide, this industry is acknowledged as a significant source of pollution, resource exhaustion, and waste, spurring both researchers and industry professionals to investigate more sustainable methods of production, distribution, and consumption (Joy et al., 2012). In response, many brands have begun to utilize eco-friendly materials, adopt ethical labor standards, and ensure transparent supply chains to meet both regulatory demands and the rising expectations of consumers, particularly among younger demographics (Henninger et al., 2016).

Current studies consistently point out that Gen Z, born from 1997 to 2012, is becoming a particularly powerful segment within the sustainable fashion marketplace. This generation is marked by increased environmental consciousness, digital savviness, and a strong inclination toward brands that exhibit a genuine commitment to social and ecological principles (Francis & Hoefel, 2018; McKinsey & Company, 2020). Research indicates that Gen Z consumers are more inclined to critically evaluate brand claims and demand transparency regarding environmental and ethical practices (Nguyen et al., 2020). Consequently, sustainable fashion marketing tactics that highlight credible certifications, open communication, and genuine storytelling are notably effective in enhancing purchase intent among this demographic (Kim & Kim, 2021; Johnstone & Tan, 2015).

The literature outlines several important components of sustainable fashion marketing that impact consumer behavior. These components encompass the incorporation of organic, recycled, or biodegradable materials during product creation (Niinimäki et al., 2020), the adoption of fair and clear pricing models (Henninger et al., 2016), and the establishment of ethical and efficient distribution methods (Shen, 2014). Promotional strategies focusing on authenticity and transparency, such as narrating the brand's sustainability journey or offering third-party verification, are particularly effective in fostering consumer trust (Kozlowski et al., 2019). Brand credibility, which refers to the perceived authenticity of a company's sustainability assertions, is another crucial element influencing purchase intention (Joy et al., 2012).

Social influence, especially through peer networks, social media, and digital influences, also significantly affects Gen Z's beliefs and behaviors toward sustainable fashion (McKinsey & Company, 2020).

There remain several gaps in the expanding field of research on sustainable fashion marketing, especially concerning developing countries. Much of the current literature concentrates on Western markets where consumer behaviors, regulatory frameworks, and cultural perspectives toward sustainability may markedly differ from those found in South Asia (Shen, 2014). In Sri Lanka, where the apparel industry serves as a vital economic engine, there is a scarcity of empirical research regarding the impact of sustainable marketing strategies on the purchasing intentions of Gen Z consumers (Kim & Kim, 2021). Numerous studies have not fully examined the relationship between marketing components, consumer attitudes, and demographic or socio-economic variables within this group. Additionally, although the beneficial connection between sustainable marketing and purchase intention is well established (Nguyen et al., 2020; Kim & Kim, 2021), the underlying processes that drive this connection, such as the mediating effect of consumer attitudes and the moderating influence of social factors, warrant further exploration (Johnstone & Tan, 2015).

A significant gap in existing research is the ongoing attitude-behavior gap, in which favorable views toward sustainability do not consistently lead to corresponding purchasing actions (Johnstone & Tan, 2015). Elements such as sensitivity to price, inadequate product availability, and doubts regarding greenwashing can obstruct the shift from intention to actual behavior (Henninger et al., 2016; Kozlowski et al., 2019). Furthermore, the effect of demographic and socio-economic factors like age, gender, income, and education on the intention to purchase sustainable fashion has not been sufficiently examined in the Sri Lankan context. It is crucial to tackle these gaps to create effective marketing strategies and policy measures that encourage responsible consumption and foster the growth of sustainable fashion in emerging markets.

While marketing sustainable fashion is acknowledged as a significant motivator of purchase intention among Gen Z worldwide (Nguyen et al., 2020; Francis & Hoefel, 2018), there is a clear demand for research tailored to the context of Sri Lanka. Gaining insights into how elements of sustainable

marketing affect Gen Z's buying choices, and how these influences are shaped by attitudes and demographic characteristics, is vital for both academic research and practical implementation. This study aims to bridge these gaps by offering empirical data from Colombo District, thereby enriching the overall discussion on sustainable consumer behavior in developing economies.

3. Methodology

This study utilizes a cross-sectional quantitative framework to investigate the connection between sustainable fashion marketing strategies and the purchase intentions of Generation Z consumers in Colombo District, Sri Lanka. Based on a deductive methodology, the research aims to validate hypotheses derived from recognized theories related to sustainable consumption and marketing, employing Structural Equation Modeling (SEM) to explore intricate relationships between observable variables (such as marketing elements) and underlying constructs (like purchase intention). This choice of methodology facilitates the accurate assessment of sustainability's effect on consumer behavior while capturing subtle changes in attitudes, resulting in actionable insights for formulating targeted marketing tactics (Saunders et al., 2019).

The focus of this research is on Gen Z individuals (ages 13–27, born between 1997 and 2012) in Colombo District, a demographic chosen due to its increasing impact on sustainability-oriented market trends, digital proficiency, and shifting consumption behaviors (Williams, 2015). Projections for 2025 indicate this population will be around 593,000, divided into two segments: early Gen Z (37%; born 1997–2002) and late Gen Z (63%; born 2003–2012). To guarantee proportional representation, a stratified random sampling method was utilized. Using Cochran's formula (95% confidence level, 10% margin of error, $p = 0.5$), a sample size of 100 was determined. This sample was allocated in proportion: 37 participants from the early cohort and 63 from the late cohort. The stratified sampling method boosts representativeness and reduces age-related biases, ensuring the results accurately reflect the diverse sustainable fashion preferences of Gen Z (Kumar et al., 2022).

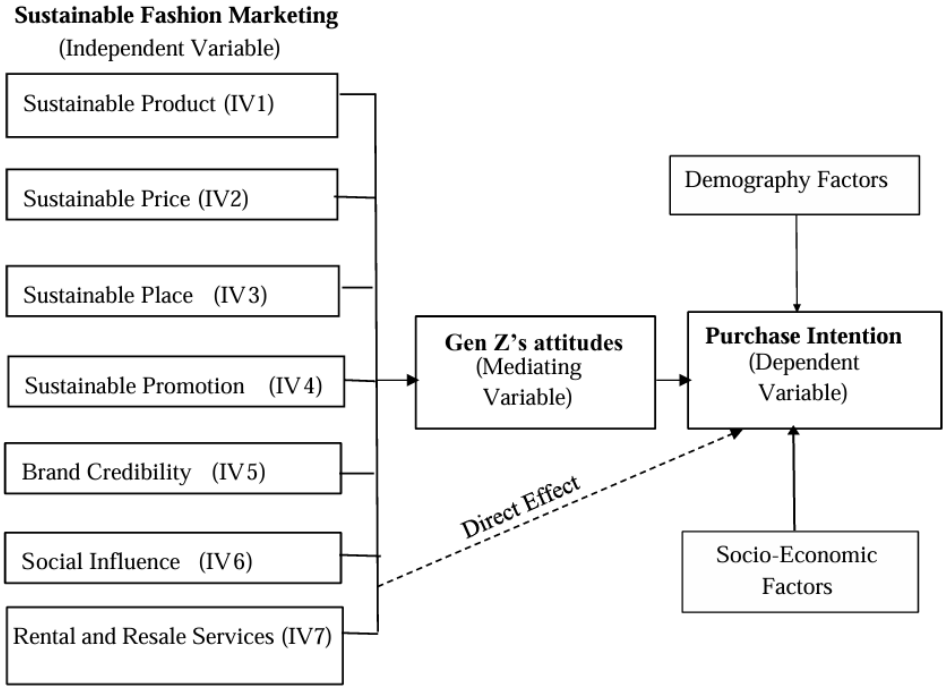
By combining robust quantitative approaches with demographically appropriate sampling, this study achieves a balance between statistical reliability and practical significance, providing a framework to understand Gen Z's influence in developing ethical consumer markets.

The primary data for this research was gathered using a structured questionnaire that was distributed through stratified random sampling. This approach guarantees that the sample includes a representative number of early and late Gen Z consumers. The online survey was crafted to gather information on participants' awareness, attitudes, and purchasing patterns concerning sustainable fashion. Additionally, it explored the role of attitudes in influencing their intentions to engage in sustainable buying decisions. The design of the questionnaire comprised both multiple-choice and Likert-scale questions to ensure clarity, uniformity, and ease of statistical evaluation (Bryman, 2016). The subsequent section of the study provides details on the specific variables that were measured and the rationale behind the question types utilized.

The questionnaire was organized into three primary sections. The first section concentrated on demographic factors such as gender, marital status, age, ethnicity, and religion. These variables were crucial for depicting the sample profile and understanding how demographic characteristics impact sustainable purchasing intentions. The second section addressed socio-economic factors, including occupation, education and monthly income. These variables were included to investigate how socio-economic status may influence consumers' attitudes and behaviors toward sustainable fashion.

The third and most extensive section was dedicated to identifying the key elements that affect consumer purchase intention in the realm of sustainable fashion marketing. This section comprised multiple constructs, with each being evaluated through four items on a five-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The constructs assessed in this section included: sustainable product, sustainable price, sustainable place, sustainable promotion, brand credibility, social influence, and rental and resale services. Furthermore, consumer attitudes were accounted for as a mediating variable, while purchase intention was identified as the dependent variable, with both measured through four items each. This structured format ensured that all pertinent dimensions of the research framework were comprehensively evaluated, facilitating meaningful statistical analysis and interpretation of the factors influencing Generation Z's purchasing behavior regarding sustainable fashion.

Figure 1: Research Framework



This research framework depicts the connection between sustainable fashion marketing and the purchase intentions of Generation Z consumers. The primary independent variable, sustainable fashion marketing, is represented through seven dimensions: sustainable product, sustainable price, sustainable place, sustainable promotion, brand credibility, social influence, and rental and resale services. These dimensions reflect the essential marketing strategies aligned with sustainability practices.

The dependent variable is Purchase Intention, which captures Gen Z's readiness to buy sustainable fashion items. Each marketing dimension is predicted to affect this intention either on its own or collectively.

Gen Z's Attitudes serve as a mediating variable, potentially influencing the strength or direction of the relationship between sustainable fashion marketing and purchase intention. Given Gen Z's strong values and concern for environmental issues, their attitudes may affect how they respond to marketing initiatives focused on sustainability.

The scales used for measurement in the questionnaire were adapted from established validated instruments in previous studies, ensuring that key constructs like purchase intention, sustainability attitude, and perceptions of sustainable marketing are both reliable and valid. Internal consistency was verified through Cronbach's alpha reliability analysis, and content validity was established through expert reviews to guarantee the clarity and relevance of the items.

The research began with the careful creation and refinement of the questionnaire items, followed by a pilot test with a small group of Gen Z consumers to confirm reliability and enhance the instrument's clarity. A stratified random sampling method was then employed to proportionally select participants from both early and late Gen Z groups. The finalized questionnaire was distributed online, with responses being collected, coded, and checked for completeness. Before analysis, the data was meticulously cleaned and prepared to ensure accuracy and compatibility with statistical methods.

4. Results and Discussion

Responses from the questionnaire were entered using SPSS Version 23 and analyzed with AMOS. AMOS is especially beneficial for Structural Equation Modeling (SEM), which enables researchers to evaluate intricate relationships between observed and latent variables. This functionality is crucial for validating theoretical models and comprehending the foundational constructs that influence Gen Z consumers' intentions to purchase sustainable fashion. AMOS provides strong analytical capabilities, an intuitive interface, and support for advanced statistical methods, making it an ideal option for testing model fit and hypotheses in this research. By utilizing AMOS, the study effectively validates the proposed model and offers valuable insights into the elements influencing sustainable fashion consumption among Generation Z in the Colombo District.

To achieve this key objective, SEM was used, which consists of two parts: structural model and path analysis (Gunarathna, 2024). The variable structure coding used for this was coded as follows.

Table 1: Variables of the Structural Model

SP	Sustainable Price
SPR	Sustainable Product
SPL	Sustainable Place
SPM	Sustainable Promotion
BC	Brand Credibility
SI	Social Influence
RR	Rental and Resale Services
CA	Consumer Attitudes (Gen Z)
PI	Purchase Intention

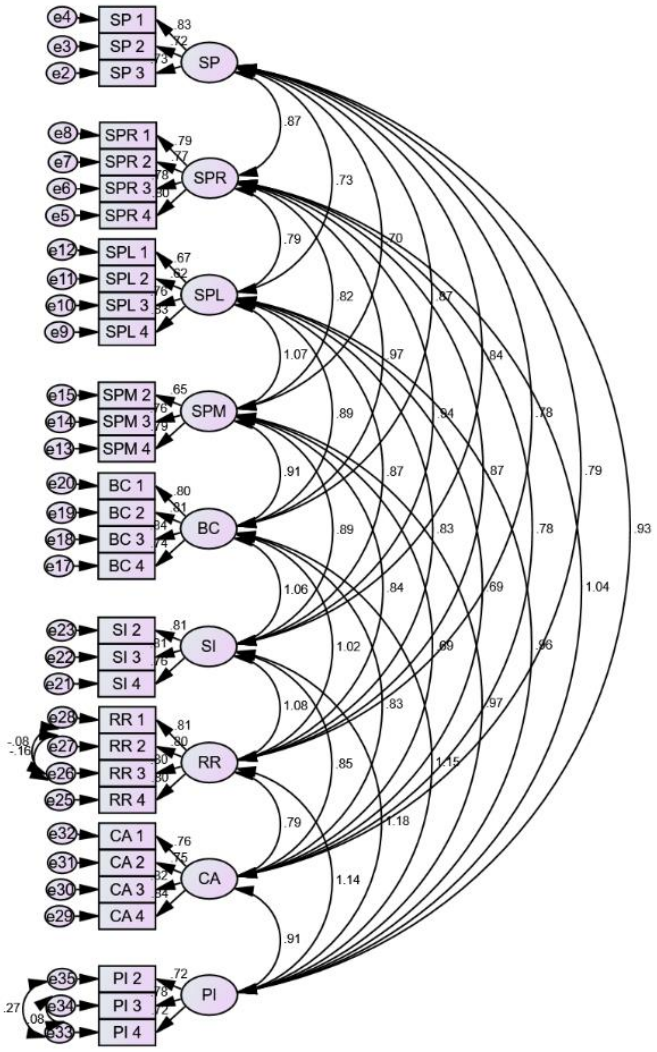
The measurement model exhibited significant reliability and validity, with Composite Reliability (CR) values surpassing the suggested minimum of 0.7 for all constructs and Average Variance Extracted (AVE) values exceeding 0.5, which confirms convergent validity (Sujati, 2021; Ramayah et al., 2018; Kodithuwakku & De Silva, 2025; Gunarathna, 2024). The standardized factor loadings ranged from 0.624 to 0.829, demonstrating strong measurement quality for all constructs.

Discriminant validity was validated by utilizing the Fornell-Larcker criterion, in which the square root of the AVE for every construct was greater than its correlations with other constructs, affirming that the constructs are separate and assess distinct concepts. Table 3 displays the matrix for discriminant validity.

Table 2: Comparison of squared inter

	CA	SP	SPR	SPL	SPM	BC	SI	RR	PI
CA	0.767								
SP	0.684	0.743							
SPR	0.624	0.695	0.757						
SPL	0.592	0.661	0.673	0.733					
SPM	0.577	0.649	0.656	0.691	0.727				
BC	0.568	0.622	0.631	0.655	0.61	0.775			
SI	0.574	0.603	0.615	0.633	0.588	0.641	0.782		
RR	0.552	0.597	0.61	0.628	0.603	0.629	0.644	0.774	
PI	0.538	0.582	0.59	0.615	0.576	0.601	0.614	0.63	0.751

Figure 2: Measurement Model



The goodness-of-fit indices for the model demonstrated that it adequately fit the data. The Root Mean Square Error of Approximation (RMSEA) was calculated to be 0.065, and the Root Mean Square Residual (RMR) was found to be 0.049, both of which are below the recommended thresholds of 0.08 and 0.1, respectively. Incremental fit indices, including the Comparative Fit Index (CFI) at 0.930 and the Tucker-Lewis Index (TLI) at 0.912, were close to the

ideal value of 1, which further supports the model's adequacy (Field Survey Data, 2025). These fit indices can be found in Table 4.

Table 3: Goodness of Fitness

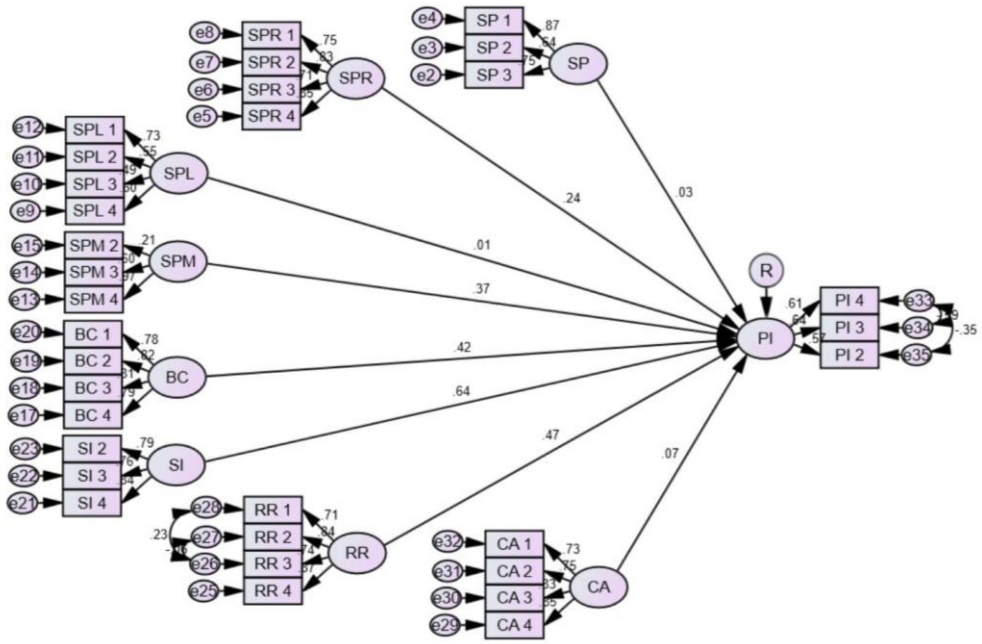
The Goodness of Fit Index		Observed Value	Threshold
Absolute fit indices	CMIN/DF	1.415	< 3
	GFI	.751	Close to 1
	AGFI	.690	Close to 1
	RMR	.049	< 0.1
	RMSEA	.065	<0.1
Incremental fit indices	TLI	.912	Close to 1
	CFI	.930	Close to 1
	RFI	.767	Close to 1
	NFI	.801	Close to 1
Parsimony fit indices	PGFI	.603	Close to 1
	PRATIO	.855	Close to 1
	PNFI	.685	Close to 1
	PCFI	.795	Close to 1

The path analysis demonstrated notable direct associations between various sustainable marketing factors and the intention to purchase. The Sustainable Product (SPR) variable exhibited a strong positive influence on purchase intention ($\beta = 0.470$, $p = 0.006$). Similarly, Sustainable Price (SP) ($\beta = 0.239$, $p = 0.040$) and Sustainable Promotion (SPM) ($\beta = 0.366$, $p = 0.034$) also had a positive impact on purchase intentions. Brand Credibility (BC) ($\beta = 0.419$, $p = 0.044$) and Social Influence (SI) ($\beta = 0.637$, $p = 0.012$) were also found to be significant indicators. On the other hand, Sustainable Place (SPL) ($\beta = 0.015$, $p = 0.789$), Rental and Resale services (RR) ($\beta = 0.026$, $p = 0.836$), and Consumer Attitudes (CA) ($\beta = 0.067$, $p = 0.461$) did not reveal any significant direct impacts.

Table 4: Results of the Path Analysis Direct Effect

Standardized Path			
Parts	**Coefficient**	**P value**	**Decision**
PI→SP	0.470 (0.206)	0.006*	Support
PI→SPR	0.239 (0.108)	0.040*	Support
PI→SPM	0.366 (0.122)	0.034*	Support
PI→SPL	0.015 (0.106)	0.789*	Not Support
PI→BC	0.419 (0.164)	0.044*	Support
PI→SI	0.637 (0.185)	0.012*	Support
PI→RR	0.026 (0.106)	0.836*	Not Support
PI→CA	0. 067 (0.095)	0.461*	Not Support

Figure 3: Path Analysis Direct Effect

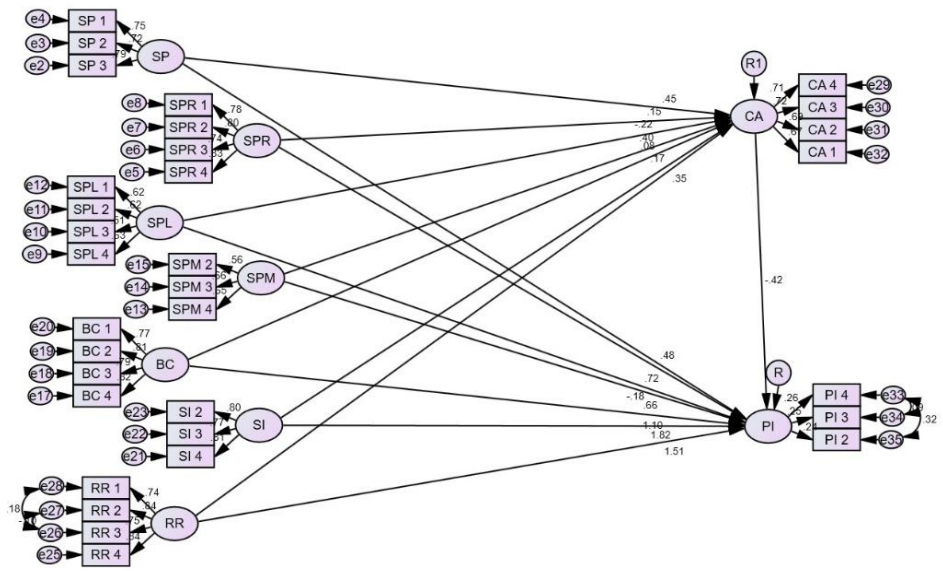


Mediation analysis indicated that Consumer Attitudes partially mediate the relationship between purchase intention and Sustainable Product, Sustainable Promotion, Brand Credibility, and Social Influence. The significant indirect effects varied from $\beta = 0.060$ to 0.132 ($p < 0.05$). Nevertheless, mediation was not confirmed for sustainable price, sustainable places, or rental and resale services.

Table 5: Results of the Path Analysis Indirect Effect

	Standardized Path		
Parts	**Coefficient**	**P value**	**Decision**
PI→CA→SP	0.068 (0.028)	0.020*	Support
PI→CA→SPR	0.023(0.015)	0.080*	Not Support
PI→CA→SPM	0.060(0.027)	0.030*	Support
PI→CA→SPL	-0.033(0.021)	0.090*	Not Support
PI→CA→BC	0.132(0.048)	0.005*	Support
PI→CA→SI	0.072(0.031)	0.025*	Support
PI→CA→RR	-0.027(0.019)	0.140*	Not Support

Figure 4: Path Analysis Indirect Effect



The results of this study indicate that factors such as Sustainable Product, Price, Promotion, Brand Credibility, and Social Influence have a significant effect on the purchasing intentions of Generation Z regarding sustainable fashion in the Colombo District. Notably, Social Influence was identified as the strongest predictor, exhibiting the highest path coefficient ($\beta = 0.637$). This highlights the crucial impact of social networks, peer endorsements, and online communities on the sustainable consumption habits of young consumers. This trend aligns with the digital-oriented characteristics of Gen Z, who respond exceptionally well to social media and influencer marketing (Soyer & Dittrich, 2021; Kurukula, 2022).

Brand Credibility also exhibited a considerable influence ($\beta = 0.419$), underscoring the importance of reliability and perceived genuineness within sustainable fashion brands. This finding is consistent with prior studies that assert that credible brands can effectively encourage sustainable purchases by alleviating consumer skepticism (Allen et al., 2022; Thilinika & Gunawardana, 2021). Likewise, the considerable impact of Sustainable Product quality ($\beta = 0.470$) affirms that product characteristics such as eco-friendly materials and ethical manufacturing significantly affect purchasing choices.

Sustainable Price and Promotion also have meaningful impacts, indicating that both affordability and clearly communicated sustainability benefits are essential for engaging Gen Z consumers. These observations support the marketing mix theory, which suggests that product, price, promotion, and place collectively influence consumer behavior.

And, sustainable place, rental and resale services, and consumer attitudes exhibited no significant direct effects on purchasing intention. The absence of influence from Sustainable Place may imply that distribution channels and retail locations matter less to this demographic, possibly due to the rise of online shopping and digital access. The insignificant effect of Rental and Resale services indicates that circular economy models are still evolving and may not yet be widely embraced by Sri Lankan Gen Z consumers (Gunarathne & Ranathunga, 2023). The lack of a direct effect from Consumer Attitudes might illustrate an attitude-behavior gap, where favorable sustainability attitudes do not necessarily convert into purchase intentions, a phenomenon noted in earlier research (Connell, 2010).

The mediation analysis reveals that Consumer Attitudes partially mediate the links between purchasing intention and key marketing factors such as Sustainable Product, Promotion, Brand Credibility, and Social Influence. This supports the Theory of Planned Behavior (Ajzen, 1991) and aligns with Hair et al.'s (2010) argument that attitudes are pivotal to behavioral intentions. The partial mediation indicates that while attitudes significantly amplify the effects of marketing and social elements, other psychological or contextual factors may also influence purchasing intentions (Hair et al., 2010).

These results are consistent with both international and local research on sustainable consumption. The significant role of social influence resonates with global research identifying peer pressure and social media as essential elements in shaping young consumers' eco-friendly choices (Soyer & Dittrich, 2021; Kurukula, 2022). The relevance of brand credibility and product quality corresponds with findings from Allen et al. (2022) and Thilinika and Gunawardana (2021), who identified these factors as crucial motivators in Sri Lanka's apparel industry.

The non-significant impacts from Sustainable Place and Rental and Resale services contrast with certain Western studies that emphasize accessibility and circular economy as significant drivers (Dehghani & Goyal, 2022). This difference likely reflects the nascent stage of these concepts within Sri Lanka's market and cultural context (Gunarathne & Ranathunga, 2023).

The attitude-behavior gap identified here supports Connell's (2010) observations that positive environmental attitudes do not always translate into sustainable purchasing behaviors, stressing the necessity for effective marketing and social strategies to bridge this divide.

Theoretically, this research advances the Theory of Planned Behavior by empirically illustrating the mediating impact of consumer attitudes on the connection between sustainable marketing and purchase intention, particularly in the context of an emerging market. It also incorporates social influence as a significant factor, emphasizing the importance of recognizing social and digital dynamics in sustainable consumption models.

Practically, the findings indicate that sustainable fashion brands aiming at Gen Z should prioritize enhancing product sustainability, maintaining transparent

pricing, creating credible promotional content, and utilizing social influence via social media and influencers. Marketing strategies should highlight authenticity and emotionally engage consumers to promote favorable attitudes. Policymakers and industry stakeholders should advocate for initiatives that raise awareness and enhance the availability of sustainable fashion, including circular economy alternatives, to build consumer trust and involvement.

Future studies should consider longitudinal designs to evaluate changes in attitudes and behaviors over time, examine additional mediators such as perceived behavioral control, and broaden samples to diverse regions and demographics to enhance generalizability. Additionally, exploring obstacles to the adoption of rental and resale services in Sri Lanka could yield valuable insights.

5. Conclusion and Policy Suggestions

The results indicate that Sustainable Product, Sustainable Price, Sustainable Promotion, Brand Credibility, and Social Influence all have a significant positive effect on Gen Z's purchasing decisions regarding sustainable fashion. Social influence was identified as the most significant factor, highlighting the role of peer relationships and online interactions in shaping sustainable purchasing habits among young consumers. The study also found that Consumer Attitudes partially mediate the link between sustainable marketing elements and purchase intentions, emphasizing the important role of internal psychological factors in converting marketing efforts into actual buying behavior. However, sustainable place, rental and resale services, and consumer attitudes did not show significant direct impacts on purchase intention, indicating areas where increased consumer education and market enhancement may be beneficial.

These findings add important empirical data to the currently limited research on sustainable fashion marketing in developing markets, specifically within the Sri Lankan context. The research highlights the need for brands to create authentic, transparent, and socially engaging marketing campaigns that resonate with the values of Gen Z and utilize social media effectively. Policymakers should also take note of the importance of promoting awareness

campaigns and facilitating access to sustainable fashion alternatives to address the existing disconnect between consumer perceptions and actions.

The study suggests that clothing brands should focus on enhancing the sustainability features of their products, adopt clear and competitive pricing strategies, and cultivate appealing promotional activities that build brand credibility while leveraging social influence. Additionally, increasing the visibility and availability of sustainable distribution channels and fostering circular economy initiatives, such as rental and resale options, is crucial. Consumer education initiatives aimed at cultivating favorable attitudes and narrowing the attitude-behavior gap are also vital.

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Reproductive Issues and their Impact on Career Goals and Economic Stability of Working Women

(Special reference to Trade Zone Sri Lanka)

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Abstract

This study examines the impact of reproductive health issues on the career goals and economic stability of women working in Sri Lanka's Free Trade Zones (FTZs). Despite their significant contribution to the economy, these women face numerous reproductive health challenges, including menstrual disorders, pregnancy complications, infertility, sexually transmitted infections (STIs), and psychological distress, which hinder their career advancement and financial security. The research addresses a critical gap in literature by exploring how these health issues affect women's livelihoods. A quantitative approach was used using a structured questionnaire administered to 105 women selected through a stratified random sampling from Katunayake, Koggala, and Biyagama FTZs. The data were analyzed using structural equation modeling (SEM) and general regression to assess the relationships between reproductive health issues, career goals, and economic stability. Reproductive health issues significantly affect women's income consistency, job stability, and career progress. The findings revealed that married women and those aged 26-36 reported the highest prevalence of complications, with lower levels of education and factory work compounding the risk. The study highlights an urgent need for workplace policies that support reproductive health, including better access to healthcare, maternity benefits and mental health resources, to foster gender equality and economic empowerment.

Keywords: Reproductive Health, Career Goals, Economic Stability, Free Trade, Zones, Working Women

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1. Introduction

Women workers in Sri Lanka's Free Trade Zones (FTZs), predominantly from impoverished rural backgrounds, face severe reproductive health challenges that undermine their economic empowerment and career advancement (Ranaraja & Hassendeen, 2016; Hewamanne, 2021). Despite constituting the majority workforce in garment manufacturing - an industry generating over $502 billion annually these women endure harsh conditions including excessive work hours, exposure to toxic chemicals, poor ventilation, and inadequate sanitation (Hancock et al., 2012).

Between 32-60% of FTZ workers experience reproductive health issues like menstrual disorders, hormonal imbalances, and pregnancy complications - significantly higher than other sectors (Hancock et al., 2012). Contributing factors include physically demanding workloads, stress, limited restroom access, and lack of hygienic facilities. These conditions lead to chronic absenteeism and reduced productivity, reinforcing gender stereotypes that hinder promotion opportunities (Ranaraja & Hassendeen, 2016).

Systemic barriers exacerbate these challenges: inadequate maternity benefits, limited healthcare access, and cultural stigma surrounding reproductive health (Hewamanne, 2021). Many women delay medical treatment due to job insecurity and financial constraints, risking severe complications (Ranaraja & Hassendeen, 2016). Workplace harassment and weak labor law enforcement further compromise their safety and career prospects (Haque et al., 2015).

The financial consequences are devastating. Low wages force reliance on informal credit systems (Seettu) for medical emergencies, while health-related job losses plunge many into poverty (Hancock, 2006; Wijesiri, 2022). Limited personal time and resources prevent skills development, trapping women in cyclical poverty (Hancock et al., 2012).

Reproductive health remains a critical yet neglected issue for women working in Sri Lanka's FTZs, where demanding conditions, workplace discrimination, and financial constraints hinder access to essential healthcare services. According to the ILO (2016) and Weerakkody (2023), migrant female workers face menstrual irregularities, infertility, pregnancy complications, and limited maternal care, forcing many to choose between health and job security due to

inadequate workplace policies like paid maternity leave and flexible schedules. Despite increasing awareness of gender equality, little research exists on how reproductive health impacts career aspirations and economic stability for FTZ workers. This study seeks to address this gap by examining key reproductive health challenges, their effects on women's professional growth, and potential policy solutions to foster a more supportive work environment.

The objective is How reproductive issues impact on working women career goals and economic stability.

2. Literature Review

Sexual reproduction, regulated by hormones like estragon, is fundamental to women's reproductive health, encompassing physical, mental, and social well-being (Marck et al., 2014). Reproductive health services, including family planning, prenatal care, and postnatal support, are critical for women, particularly in developing countries where industrialization exacerbates health disparities (National Institute of Health - NIH, 2016). Working women face heightened risks, with 1 in 6 experiencing fertility issues and 1 in 4 suffering from heavy menstrual bleeding, while conditions like endometriosis and fibroids lead to reduced productivity and job attrition (World Health Organization - WHO, 2023; Royal Collage of Nursing - RCN, 2024). These challenges, compounded by physical and emotional symptoms, often force women to reduce hours or leave employment entirely, underscoring the need for workplace accommodations and healthcare access to safeguard their economic and health stability. In identifying reproductive problems among employed women.

Menstrual irregularities include various conditions such as dysmenorrhea (severe cramps), menorrhagia (heavy bleeding), amenorrhea (absent periods), oligomenorrhea (infrequent cycles), and premenstrual syndrome (PMS). Abnormal patterns cycle shorter than 21 days, longer than 3 months, or bleeding exceeding 10 days may signal underlying health issues. Amenorrhea can be primary (no periods by age 16) or secondary (stopped periods for ≥3 months). PMS involves physical, emotional, and behavioural symptoms before menstruation, often persisting until menopause. These disorders can

indicate ovarian or hormonal problems, requiring medical attention (Parker, 2019; Moore, 2020).

Subfertility refers to difficulty conceiving despite regular unprotected intercourse, with couples having an 84% chance of pregnancy within a year under optimal conditions. Infertility, defined as failure to achieve pregnancy after one year, affects 15-20% of couples in developed nations and over 25% in developing countries (WHO, 2023; Messinis et al., 2016). Both conditions, including recurrent pregnancy loss, impact 26% of heterosexual women (Mehta, 2022), often causing psychological distress and significant challenges for working women balancing career and reproductive health needs.

Pregnancy-related health complications include iron-deficiency anaemia due to increased iron demands, anxiety disorders often co-occurring with depression (National Institute of Mental Health - NIMH, 2022), and diabetes which raises risks of birth defects, preeclampsia, and preterm delivery (American College of Obstetrician and Gynaecologists - ACOG, 2013). Heart disease may cause severe complications despite asymptomatic cases, while chronic or gestational hypertension can lead to preeclampsia, eclampsia, and low birth weight (ACOG, 2020). Hyperemesis gravidarum (severe vomiting) surpasses typical morning sickness, risking dehydration and weight loss, necessitating medical intervention (NIMH, 2022). These conditions collectively threaten maternal and fatal health, requiring vigilant monitoring and care.

Each day, over 1 million curable sexually transmitted infections (STIs) occur among adults aged 15-49, with most cases being asymptomatic. In 2020, there were 374 million new infections of chlamydia, gonorrhoea, syphilis, and trichomoniasis. Additionally, more than 500 million people live with herpes simplex virus (HSV), while HPV causes over 311,000 cervical cancer deaths annually. Syphilis remains a critical concern, infecting 8 million adults in 2022 and 1.1 million pregnant women, leading to 390,000 adverse birth outcomes. STIs contribute to infertility, pregnancy complications, and increased HIV risk, with emerging drug resistance posing a significant challenge to global control efforts.

Reproductive health issues including hormonal imbalances, infertility, pregnancy-related stress, and postpartum depression significantly impact

women's mental well-being, particularly for those in demanding work environments (Chauhan & Potdar, 2022). Social stigma often prevents women from seeking help, exacerbating conditions like anxiety and depression, which affect 30-40% of women with infertility and 10-15% postpartum (WHO, 2022). Workplace challenges, such as lack of menstrual leave policies and unsupportive environments, worsen stress for women managing conditions like PCOS or severe dysmenorrhea, leading to absenteeism and emotional exhaustion (Fitch, 2024). Addressing these issues requires destigmatization and workplace accommodations to support women's dual burdens of reproductive health and professional responsibilities.

Women working in FTZs comprising 85% of the workforce, predominantly rural migrants face severe reproductive health challenges that jeopardize both their well-being and economic stability (Feminist Participatory Action Research - FPAR, 2021). They report fatigue, mental health struggles, malnutrition, sexual harassment, and infections like STIs, compounded by cultural stigma that limits contraceptive access and fosters reliance on unsafe abortions (Hettiarachchi & Schensul, 2002). Financial pressures, including remittance obligations, restrict their ability to afford nutritious food or private healthcare, exacerbating health risks and perpetuating cycles of poverty and instability (Hettiarachchi & Schensul, 2002).

Working women aspire to achieve key career milestones, including leadership opportunities, financial independence, work-life balance, equal pay, and professional networking (Cook, 2022). However, gender stereotypes and systemic barriers often hinder their progress. Women in male-dominated industries, such as Sri Lanka's FTZs, face disproportionate challenges in attaining promotions or equitable wages (Hancock, 2006). Financial stability is further compromised by limited access to benefits like maternity leave and health insurance, while workplace discrimination perpetuates pay gaps and restricts decision-making roles (National Women's Center, 2017). Achieving these goals is critical not only for individual empowerment but also for organizational and societal growth.

Reproductive health issues such as menstrual disorders, pregnancy complications, and infertility treatments severely disrupt women's career trajectories (Wyatta, 2024). Frequent absences due to health needs foster perceptions of unreliability, reducing promotion prospects (Carnes et al.,

2008). High medical costs and unpaid leave exacerbate financial instability, limiting investments in education or career development (Finlay & Lee, 2018). Workplace discrimination, including pregnancy-related dismissals and biased policies, undermines job security and work-life balance (Bravo, 2021). Additionally, time constraints and stigma around reproductive health hinder networking and mentorship opportunities, further marginalizing women in professional spaces (Johhanson & Wictorin, 2023). Addressing these challenges requires policy reforms, employer accommodation, and cultural shifts to support women's health and career aspirations.

Economic stability refers to a nation's financial resilience with minimal growth fluctuations and low inflation, enabling individuals to meet basic needs, manage debts, and handle unexpected expenses without hardship (United Nation - UN, 2024; World Bank, 2023). For women, economic empowerment equal access to financial resources, opportunities, and decision-making remains elusive, with 10.3% living in extreme poverty and 342 million projected to survive on less than $2.15 daily by 2030 (Golla, 2011). Persistent gender gaps persist in financial inclusion (a 4% global disparity in bank account ownership) and digital access (259 million fewer women online), exacerbating social and economic vulnerability. Addressing these barriers is critical to fostering women's stability and broader societal resilience.

Reproductive health issues significantly undermine women's income consistency and employment stability. Frequent absences due to menstrual disorders, pregnancy complications, or infertility treatments often lead to reduced earnings and job insecurity (Doepke et al., 2022). Many women face unpaid leave or resignation due to inadequate workplace policies, with the ILO (2020) highlighting how such gaps exacerbate financial vulnerability. Fertility treatments, requiring multiple medical appointments, further disrupt work performance (Convery, 2025). Additionally, pregnancy discrimination and lack of maternity support perpetuate systemic biases, making employers reluctant to hire or promote women, thereby worsening job instability (Gatta, 2020; Anderson & Ozcan, 2021).

The financial burden of reproductive health care also strains women's economic resilience. High out-of-pocket costs for prenatal care, infertility treatments, and postpartum recovery inflate debt-to-income ratios, forcing many to rely on credit or deplete savings (Siril, 2023; World Bank, 2021).

Limited health insurance coverage and unpaid medical leave further erode savings and emergency funds, particularly for low-wage workers (Ashraf, 2013). The ILO (2021) notes that without robust maternity benefits or employer support, women in informal sectors face heightened economic precarity, hindering long-term financial planning and career investments. These challenges create a cyclical barrier to economic stability, disproportionately affecting women's financial independence.

3. Methodology

This study is based on quantitative data. Quantitative research produces objective data that can be clearly communicated through statistics and numbers (Williams, 2021). Quantitative data analysis enables rapid conclusions to be drawn while providing the ability to confidently present results with unbiased statistics (Williams, 2021). For these reasons, this research will produce objective data on the relationship between reproductive issues and their impact on the career goals and economic stability of working women.

The population for this study comprises employed women working in Sri Lanka's FTZs. The female employment rate in Sri Lanka stands at 32% (World Bank, 2023), with approximately 60% of these women working in trade zones (World Bank, 2023). Sri Lanka has three main trade zones. They are Katunayake, Koggala, and Biyagama. Table 2 Present the current working female population between the ages of 15-45 in Sri Lanka's FTZs.

Table 2: Working Women Population in Sri Lankan FTZs

Trade zones	Population
Katunayaka	17,844
Biyagama	10839
Koggala	9576

Source: Bord of investment (BOI) of Trade Zones Sri Lanka (2025)

Women employed in trade zones frequently encounter reproductive health challenges at a higher rate than other working women. They are more susceptible to pregnancy related complications, abortions, and high-risk sexual behaviours (Hettiarachchi, 2002). Given these prevailing concerns, this

study focuses on this population to analyse the impact of reproductive issues on their career goals and economic stability.

In the study of sensitive aspects such as reproductive problems, it is advisable to select the sample using formulas, so that the use of formulas helps to change the confidence levels (Iddon, 2023). In a way that suits the study. This study uses the Yamane method (Gunarathna, 2023).

$$n = \frac{N}{1 + Ne^2}$$

$$n = \frac{38259}{1 + 38259 \times (0.1^2)}$$

$$n \simeq 99$$

The variables in this formula are:

n = the sample size

N = the population of the study

e = the margin error in the calculation

Assuming a non-response rate of 5%, because the suggested non-response rates in social sciences surveys also aim for low levels to ensure the quality and validity of the data (Lindn et al., 2001) The total sample size is 105. The sample population was selected using the margin of error or the expected precision level of 0.10. Since the population under this study is an expected population, a precision level of 0.10 was used based on the assumption that the variance is minimal. (Luangrath & Louanglath, 2017). This method accounts for the population size and desired level of precision in estimating population parameters, allowing for a scientifically valid sample size to be determined (Fleetwood, 2022). Stratified sampling has been used to study reproductive issues that affect women's career goals and economic stability in the Sri Lankan trade zone. Stratified sampling is a widely used method of stratifying populations (Fleetwood, 2022). Stratified sampling was also used in this study. Here, the three free trade zones were used as the basis for the study. The sizes of each of these sub-units were determined by randomly selecting from the subset using a simple random method. An equal sample fraction is used for each stratum sample. This makes the sample size of each

stratum directly proportional to the total population of the stratum (Fleetwood, 2022). Due to its statistical accuracy, stratified sampling can always yield very useful results with small sample sizes. Stratified sampling is useful because it allows us to distinguish and understand the sub-segments separately (Fleetwood, 2022).

This research is a quantitative study examining how reproductive problems impact the professional goals and economic stability of working women in Sri Lanka's trade zone. Given the sensitivity of topics like career aspirations, reproductive health, and financial stability, a structured questionnaire is deemed the most appropriate tool (Kuphanga, 2024). Structured questionnaires are effective for efficiently collecting data while ensuring anonymity, which encourages honest responses (Williams, 2024). They also yield higher response rates due to their anonymous and open-ended nature (Kuphanga, 2024). The questionnaire is designed in two parts: the first gathers general sample data, while the second focuses on reproductive issues, career goals, and economic stability, ensuring reliable and relevant findings.

The questionnaire used a Likert scale to collect data on women's reproductive problems, economic stability, and career goals. The questions were categorized into five categories and asked on a Likert scale to identify reproductive problems.

In this study, reproductive problems can be considered as an independent variable, and since the study is about the impact of reproductive problems on the career goals and economic stability of women in the trade region, they remain as dependent variables. The main objective of this study is to identify reproductive issues and how they impact on working women's career goals and economic stability. Structural equation modeling (SEM) is used to analyze the impact of reproductive issues on the career goals of working women in the trade zone. And Ordinal linear regression model is used to analyze the impact of reproductive issues on economic stability.

Women's careers tend to be highly affected by reproductive health issues and concerns such as menstrual health complications, absenteeism due to pregnancy, need for treatment for infertility, and inadequate reproductive health facilities. These challenges significantly affect work productivity and job security in addition to hinder career growth prospects. SEM serves this

purpose with its unique capabilities of integrating these complex relationships into one model. With the complexity of interactions between independent and dependent variables, SEM provides a multivariate statistical analysis approach that considers multiple factors. Ordinal regression analysis was used to examine the relationship between the reproductive issues and economic stability (Gunarathna, 2024). The dependent variable here is the economic stability (level), which is normal in nature and is grouped into low, moderate and higher.

4. Results and Discussion

4.1 Identifying How Reproductive Issues impact on Career Goals

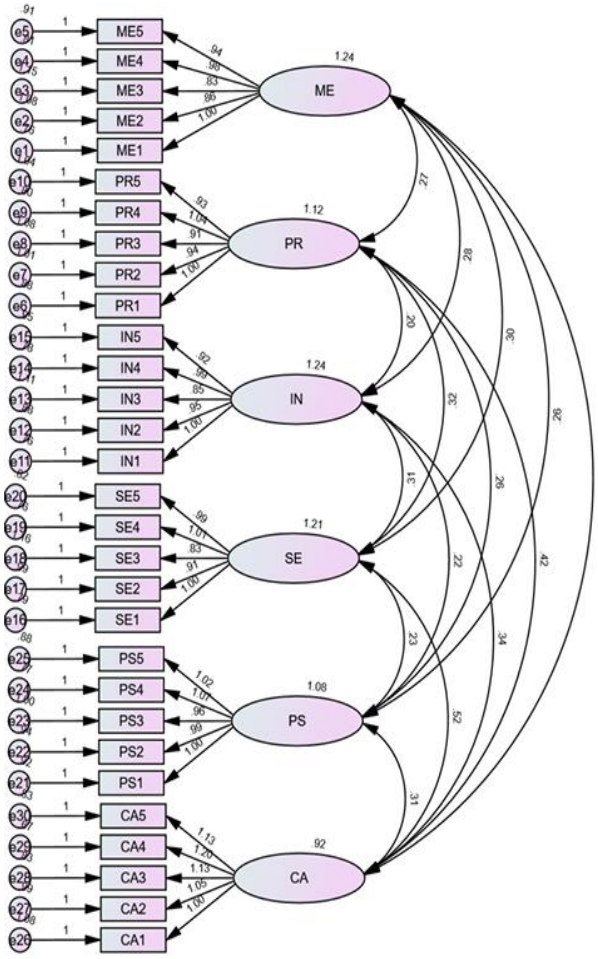
The key objective of the study is how reproductive issues impact on working women career goals and economic stability. SEM is used to examine the relationship between reproductive problems and career goals, with reproductive problems as the independent variable and career goals as the dependent variable. Ordinal regression is used to examine the relationship between reproductive problems and economic stability. Here, reproductive problems are used as the independent variable and the dependent variable is the level of economic stability.

SEM is used for this purpose of analysis and the variables used for it are as follows. Reproductive problems are the independent variable and career goals are the dependent variable

Table 3: Variables of the Structural Model

CA	Career Goals
ME	Menstrual Health Issues
PR	Pregnancy Complication
IN	Infertility and Subfertility
SE	Sexual Transmitted Infections and Reproductive Infection
PS	Psychological and Emotional Reproductive Health Issues

Figure 2: Measurement Model



Using SEM, it is possible to examine the pathways, assess the strength of relationships, and identify reproductive health factors that contribute to significant data. This can be mitigated and addressed through workplace policies, health care support, or mental health interventions to support working women in achieving their career goals.

Table 4: Results of Convergent Validity Test

Construct	No. of Items	Standardized Factor Loadings		AVE	CR
		Min	Max		
ME	5/5	.650	.786	0.528	0.848
PR	5/5	.678	.774	0.519	0.843
IN	5/5	.666	.786	0.552	0.860
SE	5/5	.647	.787	0.547	0.857
PS	5/5	.708	.783	0.548	0.858
CA	5/5	.678	.816	0.560	0.864

The results of the convergent validity test confirm that all constructs (ME, PR, IN, SE, PS, CA) exhibit strong measurement properties, as evidenced by high standardized factor loadings (ranging from 0.647 to 0.816), which exceed the recommended threshold of 0.5 (Gunarathna, 2024), demonstrating that the indicators effectively capture their respective latent variables. The Average Variance Extracted (AVE) values, all above 0.50 (minimum 0.519), indicate that each construct explains a substantial portion of the variance in its items, while Composite Reliability (CR) scores, ranging from 0.843 to 0.864, surpass the 0.70 benchmark, confirming excellent internal consistency (Kodithuwakku & De Silva, 2025). These findings collectively support the robustness of the measurement model, affirming that the constructs are well-defined and reliably measured by their underlying indicators.

According to table 5, the measurement model demonstrates strong statistical alignment with the observed data, as all key fit indices meet or exceed recommended benchmarks. The CMIN/DF ratio confirms model parsimony, while GFI, AGFI, CFI, and TLI (all near 1.0) reflect near-perfect fit. RMSEA and RMR fall within ideal ranges, indicating minimal error, and parsimony indices (PNFI, PCFI, PGFI) show the model achieves excellent fit without unnecessary complexity. Collectively, these results validate the model's robustness and accuracy in representing the data.

Table 5: Results of the Goodness of Fit of the Measurement Model

The Goodness of Fit Index		Observed Value	Threshold
Absolute fit indices	CMIN/DF	0.970	<3
	GFI	0.960	Close to 1
	AGFI	0.952	Close to 1
	RMR	0.052	<0.1
	RMSEA	0.000	<0.1
Incremental fit indices	CFI	1.0	Close to 1
	TLI	1.0	Close to 1
	RFI	0.947	Close to 1
	NFI	0.953	Close to 1
Parsimony fit indices	PRATIO	0.897	Close to 1
	PNFI	0.854	Close to 1
	PCFI	0.897	Close to 1
	PGFI	0.805	Close to 1

Table 6: Comparison of Squared Inter-Construct with AVE

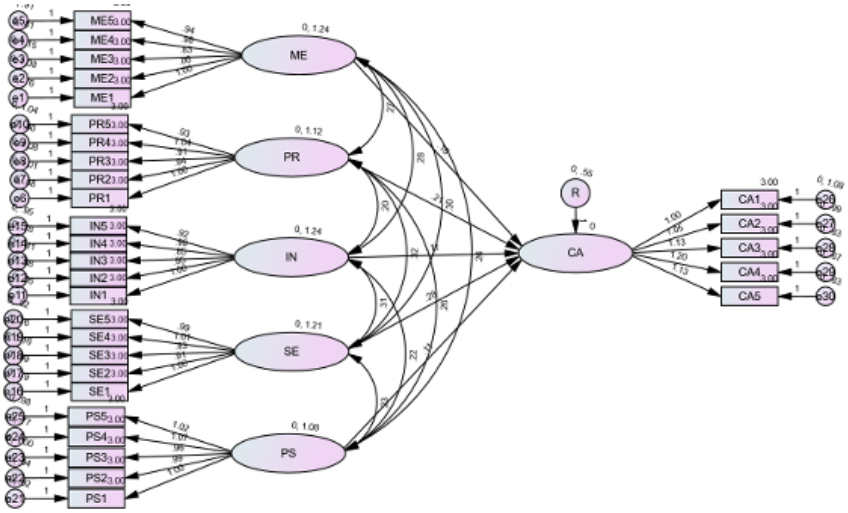
	PS	ME	PR	IN	SE	CA
PS	0.740					
ME	0.228	0.727				
PR	0.237	0.227	0.720			
IN	0.189	0.228	0.174	0.743		
SE	0.200	0.278	0.278	0.258	0.740	
CA	0.308	0.375	0.419	0.320	0.492	0.740

Discriminate validity means each construct is truly unique. If a construct's AVE (how well its items measure it) is greater than its squared correlations with other constructs, it confirms the construct stands apart it doesn't overlap too much with others. The AVE values of the items here are less correlated with each other than they are with other items (Kodithuwakku & De Silva, 2025), and this is spread throughout the entire table.

Path analysis is a key component of SEM that examines direct and indirect relationships among observed variables. Unlike traditional regression, it allows simultaneous testing of multiple dependencies in a single model,

including mediators and moderators. By analysing path coefficients, researchers can assess how variables influence each other, providing a clearer understanding of causal mechanisms.

Figure 3: Path Analysis



According to this path analysis the way all the variables are related is shown, and the arrows that extend here represent the nature of the relationship, and the values on the arrows contribute to it. This indicates the positive or negative nature of the relationship.

Table 7: Results of the Path Analysis

Standardized Parth			
Parts	**Coefficient**	**P value**	**Decision**
CA→SE	0.324(0.041)	0.001	Support
CA→IN	0.131(0.038)	0.002	Support
CA→PR	0.236(0.042)	0.001	Support
CA→ME	0.184(0.038)	0.001	Support
CA→PS	0.121(0.040)	0.006	Support

Standard errors of Coefficients in Parenthesis

*Denotes the significance of the hypothesis at 5%

The results shown in this table show how the independent variables CA, SE, IN, PR, ME, PS, affect and in line with the main objective of the study, the

results confirm that all variables have a negative impact on career goals. This is because the P value of all variables is less than <.05.

4.2 Identifying How Reproductive Issues impact on Economic Stability

An ordinal regression model is conducted based on reproductive problems as the independent variable and the nature of economic stability as the dependent variable.

Table 8: Model Fitting Information

Model	-2 Log Likelihood	Chi-square	df	Sig.
Intercept only	999.818			
Final	847.866	147.952	20	.000

According to table 8, the modification information should be statistically significant meaning that the P value should be equal to .05 or less than .05. Accordingly, the P value is .000. So, it can be concluded that the model is fit.

Table 9: Goodness of fitness

Goodness of Fit			
	Chi-square	df	Sig.
Pearson	0.000	73	1.000
Deviance	0.000	73	1.000

According to table 9, it has been recorded as a significant value, so it can be recognized that there is a good match here. It shows that there is a fair adjustment.

Table 10: Pseudo R square

Pseudo R Square	
Cox and Snell	.223
Nagelkerke	.268
McFadden	.141

According to Table 10, .141 (McFadden value) tells that this model explains a 14.4 percent improvement in the prediction of outcome based on the predictors in comparison to the null model.

Table 11: Parameter Estimates

		Estimate	SE	Wald	df	Sig.
Threshold	Low	-5.382	1.341	16.113	1	.000
	Moderate	-4.290	1.334	10.345	1	.001
Menstrual Health Issues	Low	-.692	.338	4.208	1	.040
	Moderate	-3.331	.292	1.286	1	.257
	High	0[a]			0	
Pregnancy Complication	Low	.045	.273	.028	1	.868
	Moderate	-1.252	.313	16.036	1	.000
	High	0[a]			0	
Infertility and Subfertility	Low	-.768	.307	6.227	1	.012
	Moderate	-1.546	.289	28.571	1	.000
	High	0[a]			0	
Psychological and Emotional Reproductive Health issues	Low	.129	.347	.138	1	.710
	Moderate	-.761	.295	6.666	1	.010
	High	0[a]			0	
Age	15-25	-1.188	.441	7.247	1	.007
	26-36	-1.823	.402	20.540	1	.000
	37-47	-1.177	.455	6.685	1	.010
	48<	0[a]			0	
Marital Status	Single	.889	.638	1.943	1	.163
	Married	.609	.608	1.004	1	.316
	Divorced	-.688	.763	.811	1	.368
	Widowed	0[a]			0	
Education Level	Primary	-2.763	1.116	6.132	1	.013
	Secondary	-2.611	1.120	5.433	1	.020
	Diploma	-3.331	1.266	6.924	1	.009
	Drgree	0[a]			0	
Occupation	Factory Worker	-.683	.686	.990	1	.320
	Supervisor	-3.674	.954	14.840	1	.000
	Managerial	-.306	.854	.129	1	.720
	Administrative	0[a]			0	

The thresholds -5.382 and -4.290 are both statistically significant (P < .001), indicating clear distinctions between the economic stability categories. Low menstrual issues are significant P = .040, Wald = 4.208. The negative coefficient -.693 suggests that having low menstrual health issues decreases the likelihood of being in a higher economic stability category compared to those with high menstrual issues. Moderate pregnancy complications are highly significant P < .001, Wald = 16.036. The negative coefficient -1.252 indicates that moderate pregnancy complications strongly decrease the likelihood of higher economic stability. Both low and moderate levels show a significant (P = .012, Wald = 6.277, coefficient = -.768), (P < .001, Wald = 28.571, coefficient = -1.546) strong negative coefficient for moderate infertility, indicating that increasing infertility problems are associated with decreased stability.

Moderate psychological issues are significant P = .010, Wald = 6.666. The negative coefficient -.761 suggests moderate psychological reproductive health issues decrease the likelihood of higher economic stability. All age groups are statistically significant when considering the influence of demographic factors, the strongest negative effect is seen in 26-35, suggesting this age group has the lowest economic stability compared to the reference category (age group above 48), P < .001, Wald = 20.540, the negative coefficient -1.823. All levels of education are significant. The strongest negative effect is in diploma, suggesting this education level is associated with lower economic stability compared to the reference category (education level of degree or higher) P = .009, Wald = 6.924, the negative coefficient -3.331. Considering employment status, only supervisor shows a significant effect P < .001, Wald = 14.840. The strong negative coefficient -3.674 indicates this occupation category is strongly associated with lower economic stability.

The model suggests that reproductive health issues, particularly infertility/subfertility and pregnancy complications, have significant negative associations with economic stability. Additionally, certain demographic factors (particularly age, education, and occupation) appear to be important modifiers of this relationship.

This study explored how reproductive health issues affect the economic stability and career goals of working women in Sri Lanka's primary FTZs

Katunayake, Biyagama, and Koggala. The findings affirm that reproductive health problems significantly hinder women's ability to maintain consistent employment and progress in their careers. Notably, consistent with Havala (2025), the study revealed that 35% of women suffer from work absenteeism due to reproductive issues such as endometriosis and menstrual irregularities. Beyond these, this study also identified the impact of infertility, subfertility, sexually transmitted infections (STIs), and psychological and emotional health conditions, which cumulatively challenge women's professional lives.

Ordinal regression analysis showed that women experiencing fewer menstrual problems were more likely to be economically stable, whereas those dealing with moderate to severe reproductive and psychological issues reported greater economic instability. These findings underscore the direct link between health and income security. Interestingly, the role of STIs in affecting economic stability, as emphasized by Chesson (2017), was not supported by this study, indicating possible contextual differences in access to care or reporting behaviours in Sri Lanka.

5. Conclusion and Policy Suggestions

The results of the SEM conducted in accordance with the objectives of this study confirm that all reproductive problems negatively affect career goals, with menstrual problems and pregnancy complications having the greatest impact. The analysis conducted under the Ordinal regression model also shows that menstrual problems, pregnancy complications, infertility and subfertility, psychological and emotional reproductive problems have a negative impact on economic stability, while the combined impact here shows that there is an effect of age, education level and occupation as sociodemographic factors.

To mitigate the study's challenges, policymakers should adopt a multi-sectoral approach addressing healthcare access, workplace conditions, education, and legal protections. This includes workplace health programs like mandatory reproductive health screenings and on-site clinics in FTZs, flexible policies such as paid menstrual leave, and integrating reproductive health education into vocational training to combat stigma. Economic safeguards like subsidized healthcare and incentives for promoting women should reduce financial barriers, while stronger legal protections, including anti-discrimination laws and stricter occupational standards, would ensure safer

workplaces. Together, these measures create a more equitable framework, enabling women to manage their health needs while thriving professionally.

To tackle reproductive health challenges in FTZs, coordinated efforts are needed among government agencies, employers, and civil society. The Ministry of Health should partner with NGOs to provide mobile clinics offering STI screenings, maternal care, and mental health services, while the Ministry of Labour must enforce workplace policies through inspections and penalties for violations. Employers should conduct health workshops, supply free sanitary products, and expand insurance coverage for reproductive health services. Civil society and labour unions must advocate for stronger legal protections and offer legal aid to women facing discrimination, while media campaigns can help reduce stigma by sharing empowering stories. Together, these actions create a supportive ecosystem that ensures policy enforcement, corporate accountability, and community engagement to empower women workers in FTZs.

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Female Students' Attitude Toward STEM Education in Sri Lanka

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Abstract

In the Sri Lankan context of education, there is a significant underrepresentation among female students of pursuing Science, Technology, Engineering, and Mathematics (STEM). The aim of this research is to determine the principal determinants that affect female students' attitudes towards STEM education, particularly in the Colombo District. Primary data were collected from 100 female students via a structured questionnaire, with the simple size of 100 determined using the Yamane Method. The data were analyzed using Structural Equation Modeling (SEM). SEM analysis revealed awareness, perceived ability, perceived value, and commitment as consistent predictors of positive attitudes. These findings can assist teachers and policy makers in designing targeted interventions to foster gender-sensitive and inclusive STEM education, consequently addressing participation gaps.

Keywords: STEM Education, Female Students, Attitudes, Gender Equality, Educational Equity,

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1. Introduction

The low representation of women in Science, Technology, Engineering, and Mathematics (STEM) education has been an issue around the world and especially in developing nations such as Sri Lanka, where cultural, social, and structural issues are main determinants of their involvement (UN Women Asia and the Pacific, 2024). As STEM education is broadened to lead the world's future in innovation and economic development, STEM education should be accessible and inclusive in the agenda of sustainable development (UN Women Asia and the Pacific, 2024). Sri Lankan female students have also shown high potential, but society, school systems, and availability of facilities affect their interest in STEM education (Karunarathne, 2022).

STEM education has been globally recognized as fundamental to driving innovation, and yet women are underrepresented in the discipline, particularly at a university level (UNESCO, 2017- United Nations Educational, Scientific and Cultural Organization). Worldwide, only 35% of higher education students study STEM-related subjects, a fact that indicates the persistence of the gender gap in these disciplines (UNESCO, 2017). The same applies in Sri Lanka, where the participation of girls in STEM is behind that of boys, particularly in senior fields of technology and engineering (Induranga, 2022). Bridging this gap is essential to the advancement of gender equity and the capability of women to play a role in developing Sri Lanka (Chamara, 2023). Literature recognizes that gendered attitudes have a significant contribution to the participation of female students in STEM education (Induranga, 2022).

The challenges for female students to pursue STEM education are multifaceted and consist of societal, institutional, and cultural elements (Islam, 2019). Structural barriers such as inadequate school infrastructure and limited access to STEM resources especially affect female students from low socio-economic and rural backgrounds (Islam, 2019). Additionally, cultural values that promote the maintenance of traditional female roles discourage girls from learning and doing STEM, further exacerbating gender gaps (Chamara, 2023). The Sri Lankan National Science Foundation interim report emphasizes the need for targeted education reform to close these gaps and provide gender sensitivity in STEM (National Science Foundation, 2017).

This research tries to fill the gap by examining Sri Lankan female students' attitudes, motivations, and barriers toward STEM education. By determining what drives their attitudes, this research tries to provide evidence for policy interventions and educational reforms that have the ability to make the STEM education system more inclusive and equitable. Elimination of such hindrances would not only be in a position to offer the girls a chance to reach their peak but would also take Sri Lanka as a knowledge-based economy forward. The research problem of this study was identified as what are the key factors influencing female students' attitudes toward STEM education in Sri Lanka? This study basically focused on Identify factors influencing female students' attitudes towards STEM education.

2. Literature Review

Attitudes among female students in STEM education are an important determinant of whether or not they choose to study and continue in STEM disciplines. Positive STEM attitudes tend to be linked with increased levels of interest, self-efficacy, and achievement in STEM subjects (Lent et al., 1994). But a host of internal and external factors can determine these attitudes. It is important that an inclusive and supportive climate for female students in STEM be created in order to enhance their attitudes towards these fields. Gender-equitable educational systems that provide equal opportunities to all students will be more likely to see a rise in the number of girls studying and performing well in STEM education. Efforts to address stereotype threat, increase female numbers in STEM courses, and instill a sense of belonging within STEM classrooms are key steps toward improving female students' attitudes towards STEM education and encouraging them towards being STEM professionals (Smeding & Darnon, 2014).

Awareness, perceived ability, value, and commitment are important factors that each and together affect female students' attitudes on pursuing STEM education. Awareness refers to the degree of a student's interest, awareness, and interest in STEM fields, and when girls get educated about possibility and usability in STEM, their interest significantly increases (Mahoney, 2010). Perceived ability is how students view themselves as competent and self-assured in STEM fields; high levels of self-efficacy have been linked to persistence and success in these areas (Zeldin et al., 2008). A student’s value

for studying STEM how valuable or important they believe it is definitively determines whether they continue to study STEM fields (Eccles et al., 2000). Lastly, commitment is the level of commitment and long-term intention to pursue STEM or work in STEM, and they can be developed through experiences of inspiring role models, hands-on activities, and inclusive environments (Mahoney, 2010). These must be understood and supported in order to promote beneficial attitudes of female students and offer equal access to STEM opportunities.

3. Methodology

The population to be included in the current study is girls aged 11 and above in national and provincial government schools in the Colombo District of Sri Lanka based on the School Census Report (2022). Questionnaire method is used to collect primary data for the study. In this way, a questionnaire is prepared and given to the selected sample. This makes it possible to obtain up-to-date detailed information. Moreover, they are very reliable data. To have a representative overall sample for the study, the stratified random sampling method is used. In this case. Yamane/Slovin formula was employed to determine the suitable sample size. This method is widely adopted in social science research when the population size is known, and a specified margin of error is desired (Gunarathna, 2023). In doing so, the population in the sample was chosen with a margin of error or desired precision level at 0.10 (e=0.10).

Table 1: Basic Statistics of Students of Provincial and National Schools by District

School Type	Population based on Colombo district
Provincial	116,709
National	50,687
Total	167,396

Source: School Census Report (2022)

A Structural Equation Model (SEM) is a sophisticated statistical technique used to test and estimate causal relations among variables by merging multiple regression analysis and factor analysis (Gunarathna, 2024). It enables researchers to model complex interactions between observed and latent (unobservable) variables, giving a general overview of the underlying

structures in a set of data. SEM analysis is employed in this study to examine and estimate the causal relationships between the attitude of female students towards STEM education and the factors influencing it, such as educational environment, societal and cultural factors, and individual factors. Table 2 presents the variables employed for the Structural Equation Modeling (SEM) analysis, illustrating the key constructs and their interrelationships in affecting students' engagement and interest in STEM fields.

Table 2: Variables

Dependent Variables	Independent Variables
Attitudes toward STEM education	Awareness, Perceived Ability, Value, and Commitment

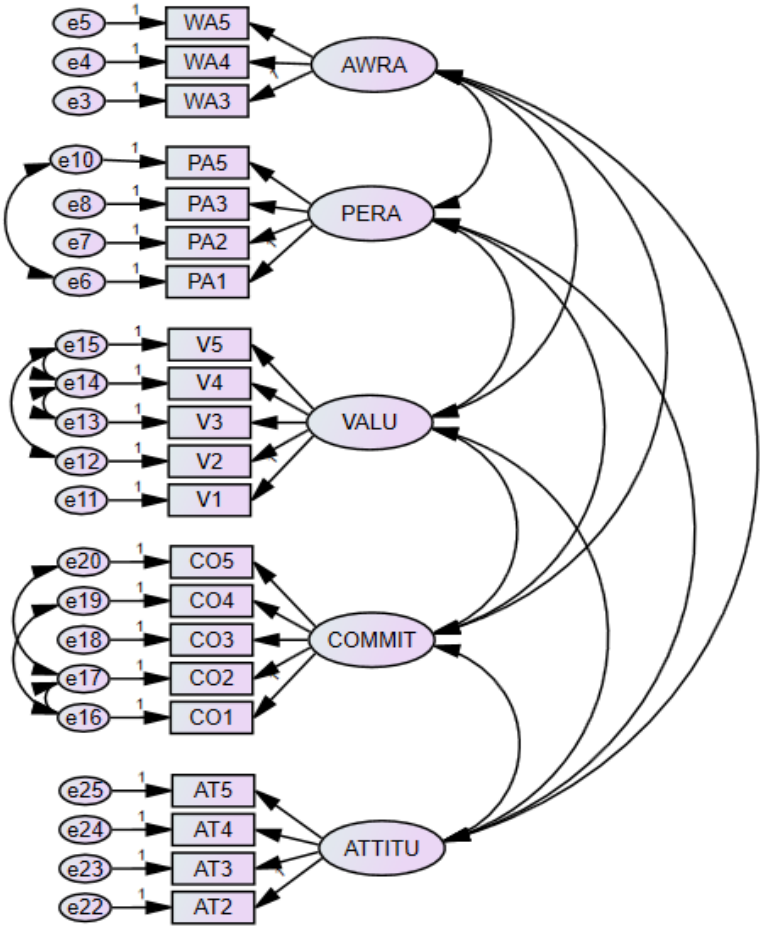
4. Results and Discussion

The measurement model serves as a critical component of the SEM framework, enabling the validation of the relationships between observed variables and their underlying latent constructs. In this study, the measurement model is employed to assess how well the selected indicators represent the key dimensions influencing female students' attitudes toward STEM education. These dimensions include awareness, perceived ability, value, and commitment constructs grounded in established educational and psychological theories. By evaluating the reliability and validity of the measurement items through Confirmatory Factor Analysis (CFA), the model ensures that each construct is accurately measured, thereby enhancing the robustness of the structural model used for further analysis. This section outlines the procedures, criteria, and statistical indicators used to validate the measurement model in the context of STEM education among female students in Sri Lanka.

Table 3: Indicates the Variables Used for SEM Analysis

AWRA	Awareness
PARA	Perceived Ability
VALU	Value
COMMIT	Commitment
ATTITU	Attitude

Figure 1: Measurement Model of Attitudes Toward STEM



The results presented in Table 4 confirm that the measurement model meets the criteria of convergent validity and composite reliability. Each value of Average Variance Extracted (AVE) is higher than 0.50 (Gunarathna, 2024), ranging from 0.680 to 0.744, indicating that a very high percentage of variance in the observed variables is explained by their corresponding latent constructs (Ahmad et al., 2016). This reflects high convergent validity for all construct commitment, awareness, perceived ability, value, and attitude used in the measurement of female students' orientation towards STEM education. In addition, the Composite Reliability (CR) for all constructs is well above the minimum requirement of 0.70, from 0.864 to 0.935, thus confirming high internal consistency and reliability for each of the constructs (Tentama &

Anindita, 2020; Kodithuwakku & De Silva, 2025). These findings endorse the measurement model's fitness and its usage for further structural investigation in the SEM model.

Table 4: Results of the Convergent Validity Test

Construct	No. of Items	Standardized Factor Loadings		AVE	CR
		Min	Max		
Commitment	5/5	0.794	0.913	0.720	0.928
Awareness	3/5	0.772	0.880	0.680	0.864
Perceived Ability	4/5	0.782	0.862	0.680	0.895
Value	5/5	0.794	0.902	0.744	0.935
Attitude	4/5	0.809	0.901	0.715	0.909

The results provided in Table 5 illustrate the assessment of the model fit. It allows us to conclude that, in general, the measurement model fits the data within the given ranges of various goodness-of-fit metrics. The estimated level of the chi-square Minimum Discrepancy divided by Degrees of Freedom (CMIN/DF) is 2.010, which puts it under the recommended cut-off mark of 3.0. This indicates that there is a good fit between the observed data and the fitted data (Iacobucci, 2009). Also, although the Goodness of Fit Index (GFI = 0.766) and the Adjusted Goodness of Fit Index (AGFI = 0.686) are both below the desirable cut-off of 0.90, they offer at least a moderate fit. The Root Mean Square Residual (RMR) = 0.048 in conjunction with Root Mean Square Error of Approximation (RMSEA) = 0.101 are slightly above or within the acceptability range but indicate an acceptable level of proximity error (Bhale & Bedi, 2023; Kodithuwakku & De Silva, 2025).

Tucker Lewis Index (TLI) = 0.895, Comparative Fit Index (CFI) = 0.914, Relative Fit Index (RFI) = 0.810, and Normed Fit Index (NFI) = 0.845 are benchmark fit indices as measures of incremental fit yield results within the satisfactory range (≥ 0.90), showing a reasonable fit of the model the authors set out to explore and validate their hypothesis on. These values highlight CFI and TLI, confirming the proposed model is beyond 0.90. Parsimony Goodness of Fit Index (PGFI) = 0.571, Parsimony Ratio (PRATIO) = 0.819, Parsimony Normed Fit Index (PNFI) = 0.692, and Parsimony Comparative Fit Index

(PCFI) = 0.748, which are also within an acceptable range, as a ratio of explanatory power and simplification of the model provides evidence to the model to further extend proof to aid the model's complexity. To summarize, though, some provide scope for further advancement.

Table 5: Results of the Goodness of Fit of the Measurement Model

Goodness of Fit Index		Observed Value	Threshold
Absolute Fit Indices	CMIN/DF	2.010	<3
	GFI	0.766	Close to 1
	AGFI	0.686	Close to 1
	RMR	0.048	<0.1
	RMSEA	0.101	<0.1
Incremental Fit Indices	TLI	0.895	Close to 1
	CFI	0.914	Close to 1
	RFI	0.810	Close to 1
	NFI	0.845	Close to 1
Parsimony Fit Indices	PGFI	0.571	Close to 1
	PRATIO	0.819	Close to 1
	PNFI	0.692	Close to 1
	PCFI	0.748	Close to 1

Table 6: Comparison of with Inter-construct Correlations Square Root of AVE

	Commitment	Awareness	Perceived Ability	Value	Attitude
Commitment	0.848				
Awareness	0.749	0.725			
Perceived Ability	0.789	0.720	0.825		
Value	0.840	0.655	0.784	0.862	
Attitude	0.787	0.421	0.612	0.022	0.846

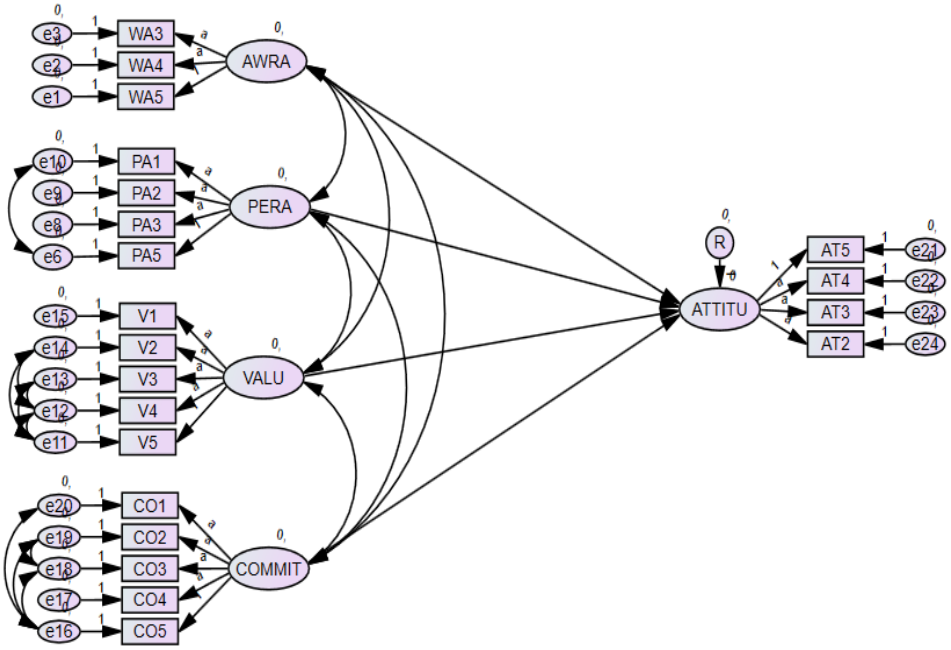
The results in Table 6 confirm that the measurement model meets the requirements of discriminant validity. Discriminant validity ascertains that each construct is statistically and conceptually distinct from others, which is of utmost importance in latent variable modeling (Taherdoost, 2016). According to the Fornell-Larcker criterion, discriminant validity is achieved if the square root of the AVE of every construct is greater than the inter-construct correlations (Engellant et al., 2016). As can be seen in Table 6, all the diagonal values square roots of the AVE for Commitment = 0.848, Awareness = 0.725, Perceived Ability = 0.825, Value = 0.862, and Attitude= 0.846 are higher than the corresponding inter-diagonal construct correlations. This illustrates that every construct accounts for more variance with its indicators than with the other constructs in the model, proving that discriminant validity has been established.

Table 7 shows Awareness ($\beta = 1.353$, $p < 0.001$) and Commitment ($\beta = 0.252$, $p = 0.010$) have significant effects on attitudes among female students towards studying STEM. Perceived Ability exerts this significantly negatively ($\beta = -0.602$, $p = 0.013$), showing a complex relationship. Value does not exert a significant effect ($p = 0.773$). They imply that awareness and commitment are robust determinants of positive attitudes towards STEM, but perceived ability and value could have differential influences on attitudes

Table 7: Results of the Regression Weight of the Path Analysis

Path	Path Coefficients	Standardized Path Coefficients	SE	P- value
Awareness	1.368	1.353	0.260	0.000
Perceived Ability	-0.496	-0.602	0.199	0.013
Value	0.034	0.038	0.119	0.773
Commitment	0.279	0.252	0.109	0.010

Figure 2: Path Analysis



The SEM output delivers deep insights into the determinants of the attitude of female students towards STEM education. The results show that awareness has the highest and most significant positive impact on attitude ($\beta = 1.353$, $p < 0.001$), which suggests the role of exposure to activities and themes of STEM in developing motivation and interest (Goldman, 2023). This aligns with previous studies that highlight increased exposure and familiarity with the areas of STEM have a positive effect on the interest of students (Subasinghe, 2023). Girls are likely to develop good attitudes when schools and communities are engaged in raising awareness about STEM (Sosale, 2023).

Commitment was also a strong positive predictor ($\beta = 0.252$, $p = 0.010$), which implies that the committed students working with STEM subjects will develop a positive attitude towards the same. It also holds true with expectancy-value theory, which is argued to predict motivational beliefs and persistence as predictors of long-term academic investment (Eccles & Wigfield, 2002). Conversely, perceived ability was negatively correlated with attitude ($\beta = -0.602$, $p = 0.013$) and might be viewed as a marker of dissonance between

confidence and the STEM standards provided to the students. This might be interpreted as an indication that the more-able pupils are increasingly discerning when standards are unmet, as observed in the literature (Kim et al., 2018). Interestingly, construct value also failed to serve as a determinant of substantial importance on the attitudes of students ($p = 0.773$), i.e., appreciation of the importance of STEM may not be enough to guarantee turnout. This affirms that value should go hand in hand with actual opportunity and incentivizing if it is to translate into positive attitudes (Induranga, 2022). In conclusion, SEM results indicate higher commitment and higher awareness to be critical intervention factors towards improving female participation in STEM. Teachers, policymakers, and school leaders should therefore give utmost priority to the said factors in intervention programs towards eradicating the gender gap in STEM education in Sri Lanka.

5. Conclusion and Policy Suggestions

The model confirmed that Awareness and Commitment both had statistically significant positive impacts on attitudes, their prime role in setting interest and motivation among female students. Surprisingly, Perceived Ability had a strongly negative impact, suggesting that confidence in STEM is good but blaming oneself actually sets back positive attitudes highlighting the harmful psychological forces at play. On the other hand, Value construct was not significant, which may indicate that perceived personal or social value of STEM may not be a foremost attitudinal driver in this system. Generally, SEM results ensured reliability and validity of measurement model and ascertained awareness and commitment, affective, cognitive, and behavioral factors as principal determinants in developing positive attitudes towards STEM. These findings form the foundation of policy and pedagogic measures which increase exposure and activation and constructively enhance confidence and personal salience in STEM subjects among girls.

Based on the findings of this research, various targeted policy interventions can be employed to promote female students' favorable attitudes towards STEM studies. Age-graded STEM enrichment programs also top the list because age was considered a significant variable to manipulate students' attitudes and older students were found more interested. Successively demanding STEM material and career guidance sessions throughout the

grades must be implemented in schools to build and sustain interest. Additionally, socioeconomic disparities are of utmost concern; therefore, educational policy should aim to ensure equal distribution of resources, including access to labs, the internet, and STEM extracurricular activities, for low-income children. Parental education and occupation were also found to have significant impacts on students' attitudes. Therefore, community outreach programs, such as parent-teacher STEM nights and education campaigns, should be instituted in an effort to engage families as active participants of their children's STEM development. Besides this, the medium of instruction and perceived quality of education became important; thus, STEM teacher training programs must be guaranteed to increase pedagogical quality for any instruction language. STEM clubs, mentorship groups, and joint activities with universities and industries can encourage devotion and applicability. Finally, ongoing assessment and surveillance of these policies through student attitude measurement will define and customize strategies to achieve the greatest long-term impact. This action advances Sustainable Development Goal 4 (SDG 4), which entails inclusive, equitable, and quality education providing students with the most important skills of the 21st century.

At the national level, the suggestion is that concerned government ministry, and agencies draft and implement a gender-responsive STEM policy framework. It would involve curriculum adjustment, resource allocation, and monitoring systems to make access for all girls' levels. Policy interventions like STEM scholarship for women, gender quotas, and incentives to schools in terms of getting women to STEM streams would be drivers in orchestrating the change.

Community action is equally crucial. Specific campaigns for awareness among parents and local government must be conducted in an attempt to overcome negative gender stereotypes dissuading girls from pursuing STEM studies. Families are central in influencing what profession children ought to adopt; hence, their involvement through workshops and outreach programs can lead to improved home settings. Opportunities for repeated interaction between teachers, students, and parents must also be made available at school in order to promote consistency between career objectives and educational objectives.

Last but not least, interagency collaboration between institutions of learning, schools, and private organizations can create more vibrant pathways for girls in the fields of STEM. Industry participation can help in providing internships, mentorship, and hands-on training which might not be typically acquired via traditional schooling. By integrating practical application into education, the students are better poised to perceive STEM as pertinent, fun, and achievable, leading to long-term higher interest and career success in these areas.

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JSS (2024) Vol (11) Issue (1)

Factors Affecting E-Waste Management Intention Among Undergraduates in Sri Lanka

M.U. Sandeepani[1]

Abstract

The rapid advancement of technology and electronic usage has raised concerns regarding e-waste disposal. This study investigates the factors that affect e-waste management intention among Sri Lankan undergraduates, utilizing the Theory of Planned Behavior (TPB) as a conceptual framework. Primary data were gathered from 100 undergraduates at the Universities of Peradeniya, Kelaniya, and Colombo using a structured questionnaire and stratified random sampling. An enhanced TPB model that included Attitude (AT), Subjective Norms (SN), Perceived Behavioral Control (PBC), Awareness (AW), Financial Influence (FI), and Data Security (DS) was examined using Structural Equation Modeling. The SEM analysis revealed that Perceived Behavioral Control, Financial Influence, and Data Security had a significant and positive impact on students' intentions to manage their e-waste. Interestingly, Subjective Norms had a negative influence, while Attitude and Awareness were not statistically significant. These findings point out the need for practical solutions, in addition to raising awareness, to address data privacy concerns and provide institutional support that encourages responsible e-waste behavior among students.

Keywords: E-Waste Management, Behavioral Intention, Structural Equation Modeling, Theory of Planned Behavior, Undergraduates

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1. Introduction

Every year, millions of electrical and electronic devices become obsolete, generating vast amounts of electronic waste (e-waste). Globally, e-waste has reached alarming proportions. According to the United Nations Global E-waste Monitor 2020, 53.6 million metric tons of e-waste were generated globally in 2019, a record growth of more than 21% in just five years. Despite this growth, only 17.4% of e-waste was properly recycled (Forti et al., 2020), raising concerns over its environmental and health impacts. By 2030, the global e-waste volume is expected to reach approximately 74 million metric tons (Parajuly et al., 2019).

South Asia is significantly affected by this problem. In India, the situation is particularly severe. The country produced over 1 million tons of e-waste in 2019–2020, a 32% increase from the previous year. However, just 3.6% in 2018 and 10% in 2019 were formally gathered and managed (Garg et al., 2023). India now generates more than 50,000 tons of e-waste each month, with an annual growth rate of 23.7% over the last decade. India, the world's third-largest e-waste generator, has a pressing need for sustainable and scalable e-waste solutions (Garg et al., 2023). Bangladesh, also, confronts growing challenges in South Asia. The country generates around 2.8 million tons of e-waste each year, with the ship-breaking business accounting for 2.5 million tons alone. The entire e-waste statistic is increasing at an alarming annual growth rate of 20% (Prothom-Alo, 2021).

Sri Lanka, although smaller in scale, faces growing challenges, producing around 20,000 metric tons annually with projections indicating a tripling by 2030 (Central Environmental Authority, 2016). This increase stems from greater use of electronic devices, rapid technological advances, and planned obsolescence (Azodo et al., 2017; Chen and Yee, 2011).

E-waste contains hazardous materials like lead, mercury, and cadmium, which pose severe environmental and public health risks when improperly handled (Njoku et al., 2023; Parvez et al., 2021). Unsafe recycling practices such as open burning and acid leaching release toxic chemicals into the air, soil, and water (World Health Organization - WHO, 2024). Informal recycling is widespread in low- and middle-income countries (LMICs) due to poor infrastructure and weak regulations, further exposing communities,

particularly vulnerable groups such as children and pregnant women, to dangerous substances (International Labour Organization - ILO, 2014). Toxic compounds can affect immune systems, cause respiratory problems, and impact cognitive development (Chen et al., 2010; Omondi et al., 2022).

Global initiatives such as the Basel Convention and its 2019 Ban Amendment aim to regulate the transboundary movement and disposal of hazardous e-waste, restricting exports from developed to developing countries (WHO, 2024). The WHO advocates for national and international cooperation to improve e-waste management, including enforcing regulations, educating healthcare professionals, prohibiting child labor in waste processing, and raising community awareness (WHO, 2024).

In Sri Lanka, e-waste management is an emerging environmental concern, particularly in underdeveloped nations where proper disposal procedures are restricted. While various studies have investigated e-waste awareness and behaviors, the majority have not directly addressed the intentions of undergraduate students at government institutions, particularly those known for their green university initiatives. Furthermore, research into the impact of these green university initiatives on undergraduates' e-waste management intents is limited. This study intends to close this gap by focusing on Sri Lanka's top three green-ranked government universities and providing insights into how institutional environmental efforts impact student intentions toward proper e-waste disposal. Specifically, the study aims to identify the factors affecting e-waste management intention among undergraduates in Sri Lanka.

This research supports several United Nations Sustainable Development Goals (SDGs), particularly Goal 3 (Good Health and Well-Being), Goal 6 (Clean Water and Sanitation), Goal 8 (Decent Work and Economic Growth), Goal 11 (Sustainable Cities and Communities), Goal 12 (Responsible Consumption and Production), and Goal 14 (Life Below Water) (Baldé et al., 2017; United Nations Statistics, 2017). Effective e-waste management can reduce environmental pollution, protect public health, and promote economic growth in waste management industries (Tsydenova and Bengtsson, 2011; Anuardo et al., 2023).

By focusing on undergraduates, this study highlights the role of youth in shaping sustainable consumption behaviors and informs policymakers,

educational institutions, and environmental groups aiming to develop tailored awareness campaigns and infrastructure improvements in Sri Lanka.

2. Literature Review

Waste Electrical and Electronic Equipment (WEEE) is defined under the Basel Convention as electrical or electronic equipment that is waste, including all components, sub-assemblies and consumables that are part of the equipment at the time the equipment becomes waste (Basel Convention, 2025). According to the Waste Electrical and Electronic Equipment Directive (WEEED) of the European Union (EU), ten major e-waste categories are used for reporting purposes. These include large household appliances, small household appliances, IT and telecommunication equipment, consumer equipment, lighting equipment, electrical and electronic tools, toys, leisure and sports equipment, medical devices, monitoring and control instruments, and automatic dispensers (Ranasinghe & Athapattu, 2019).

E-waste management strategies can vary significantly across countries, influenced by existing policies, stakeholder involvement, social challenges, and economic conditions (Pouyamanesh et al., 2023). Effective e-waste management typically involves the collection, transportation, processing, disposal, and the recovery of valuable materials (Ahirwar and Tripathi, 2020). Globally, these processes occur through either formal or informal channels. Formal recycling, common in developed nations, is regulated and technologically advanced (Nawaz et al., 2021). Informal recycling, which is more common in developing countries, is typically unregulated and poses significant environmental and health risks, especially to young workers who are often exposed to dangerous practices such as wire burning (Decharat and Kiddee, 2020; Omondi et al., 2022; Harfadlli et al., 2024).

This study applies the Theory of Planned Behavior (TPB) to examine the influencing factors affecting undergraduates' intentions towards e-waste management behavior in Sri Lanka. The Theory of Planned Behavior, developed by Ajzen (1985), extends the Theory of Reasoned Action by Ajzen and Martin Fishbein in 1980 by including perceived behavioral control, making it one of the most widely used models for predicting and explaining social behaviors (Ajzen, 1991). According to Ajzen (2002), TPB is a theoretical framework used to predict and explain human behavior in specific

settings. It explains that actions are determined by intentions, and intentions are influenced by three key factors: attitudes toward behavior, subjective norms, and perceived behavioral control.

The TPB has been widely applied as a theoretical framework in studies examining the determinants of e-waste management intentions and behaviors. It is recognized as an effective and methodical framework for understanding sustainable behaviors, including waste management and recycling practices (Poškus, 2015). Strong evidence suggests that TPB has been successfully used in various recycling behavior studies, making it a preferred theory for analyzing the key determinants affecting consumers engagement in e-waste management (Tonglet et al., 2004; Ramayah et al., 2012).

Recent researchers have expanded the TPB model by incorporating additional variables to enhance its predictive ability in explaining recycling behaviors. These include factors such as past e-waste disposal behavior, infrastructure, economic incentives, personal norms and publicity which have been identified as crucial in shaping recycling intentions and behaviors (Nduneseokwu et al., 2017; Nguyen et al., 2018; Michael et al., 2024). Therefore, based on recent empirical findings, this study incorporates three additional factors: awareness, financial influence, and data security (Ananno et al., 2021; Kwatra et al., 2014; Singh et al., 2020). These variables reflect emerging concerns and motivational drivers in electronic waste management intention, offering a more comprehensive understanding of undergraduates' intentions toward proper e-waste disposal.

3. Methodology

This study applies a quantitative research approach to investigate the factors influencing e-waste management intentions among Sri Lankan undergraduates. To support this approach, primary data were collected using a structured questionnaire designed to gather students' behavioral intentions toward e-waste management.

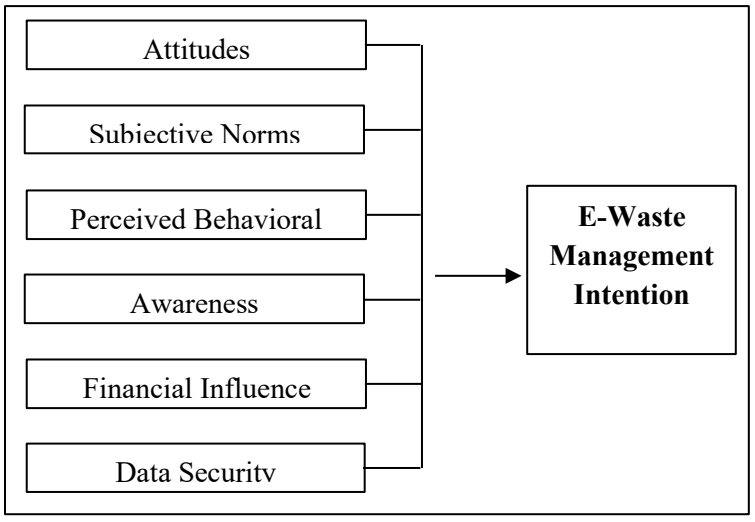
The target population consists of undergraduates enrolled in Sri Lankan government universities. According to the Sri Lanka University Statistics (2022), the country has 17 government universities. This research focuses on three main universities: the University of Peradeniya, the University of Kelaniya, and the University of Colombo. These universities were selected

based on the UI GreenMetric World University Rankings (2024), which ranked them first in Sri Lanka for their green initiatives. The target group was identified based on undergraduate enrollment data from the University Grants Commission (2022). According to this data, the University of Peradeniya had 12,534 undergraduates, the University of Kelaniya had 14,325, and the University of Colombo had 11,982, bringing the total undergraduate population across the selected universities to 38,841.

A stratified random sampling technique was employed to ensure proportional representation from each university. The sample size was determined using Yamane's formula with a 90% confidence level, resulting in a sample of 100 undergraduates, distributed as 32 from the University of Peradeniya, 37 from the University of Kelaniya, and 31 from the University of Colombo.

The conceptual framework of this study, designed to examine the factors influencing e-waste management intention among undergraduates in Sri Lanka, is mainly based on the TPB. At the center of the model is e-waste management intention, which serves as the dependent variable. The key independent variables include attitude, subjective norms, and perceived behavioral control, which are the three main elements of the TPB. Additionally, the framework incorporates three other contextually relevant factors: awareness, financial influence, and data security. Figure 1: presents the conceptual framework based on this structure.

Figure 1: Conceptual Framework



The required statistical analyses were conducted using the Statistical Package for the Social Sciences (SPSS) version 27 and AMOS version 26. These tools support efficient processing of inferential statistics and are suitable for analyzing data that is relevant to the study's objective.

As shown in Table 1, the reliability values measured by Cronbach's alpha coefficients indicate a high level of internal consistency for all variables included in the study. The values range from 0.811 to 0.942, demonstrating that each construction measured in the questionnaire is reliable. According to George and Mallery (2018), reliability coefficients above 0.90 are considered excellent, while those between 0.80 and 0.89 are regarded as good. Based on these guidelines, the reliability scores in this study fall within acceptable to excellent levels, confirming the strong consistency of the items used to assess e-waste management intention and its related factors.

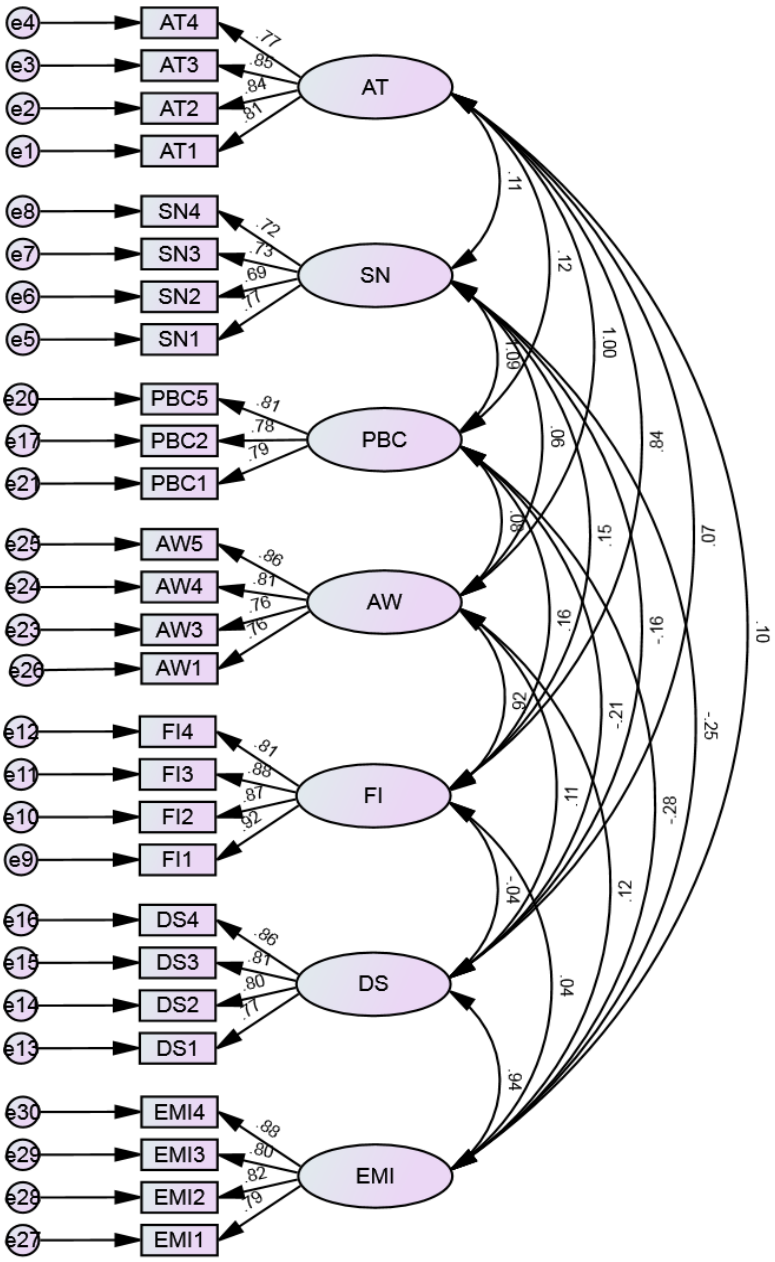
Table 1: Reliability Values of Variables

Dimensions	Cronbach's Alpha	Number of Questions
E-Waste Management Intention	0.917	4
Attitude	0.942	4
Subjective Norms	0.889	4
Perceived Behavioral Control	0.811	5
Awareness	0.905	5
Financial Influence	0.928	4
Data Security	0.882	4

4. Results and Discussion

The measurement model evaluates how well observable variables replicate the underlying theoretical entities (Gunarathna, 2024). It ensures that each variable loads strongly on its assigned construct without any cross-loading. All constructs are regarded as exogenous, with an emphasis on correlation rather than causality. This evaluation confirms the measuring framework's reliability and validity.

Figure 2: The Measurement Model



The structural model includes both dependent and independent variables essential for the analysis. The dependent variable is E-Waste Management Intention (EMI), which reflects the behavioral intention of undergraduates toward managing e-waste. Independent variables consist of Attitudes (AT), Subjective Norms (SN), Perceived Behavioral Control (PBC), Awareness (AW), Financial Influence (FI), and Data Security (DS). These variables are selected to capture the range of factors that may affect the intention to manage e-waste effectively. This model provides a comprehensive framework to examine the relationships between these factors and their influence on EMI.

Figure 2 shows the measurement model, and it explains how the observed variables connect to their hidden constructs and how these constructs relate to each other.

Table 2: Results of Convergent Validity Test

Construct	No. of Items	Standardized Factor Loadings		Average Variance Extracted (AVE)	Composite Reliability (CR)
		Min	Max		
AT	4	.769	.850	0.672	0.891
SN	4	.692	.771	0.533	0.820
PBC	3	.776	.809	0.625	0.833
AW	4	.755	.858	0.638	0.876
FI	4	.807	.923	0.762	0.927
DS	4	.769	.859	0.653	0.883
EMI	4	.789	.883	0.677	0.893

Table 2 presents the results of the convergent validity and reliability analysis for all the constructs used in the study. The standardized factors loading of the items range from 0.692 to 0.923. Most of the values exceed the recommended threshold of 0.7, indicating a strong relationship between each item and its respective construct. Although one item under the construct Subjective Norms shows a slightly lower loading of 0.692, it is still within an acceptable range and does not negatively affect the overall validity. According to these findings, the indicators accurately capture the underlying concepts they were intended to analyze.

In terms of convergent validity, all AVE values are above the required threshold of 0.5 (Gunarathna, 2024). The fact that each construct can explain more than half of the variance in its indicators lends validity to the idea that the items enclosed inside it are evaluating the same fundamental concept. CR values for all constructs are also above 0.7, confirming that the items are internally consistent and reliable. Among the constructs, financial influence shows particularly strong measurement properties, with high factor loadings, an AVE of 0.762, and a CR of 0.927. Although Subjective Norms has the lowest AVE at 0.533, it still meets the acceptable standard and maintains sufficient convergent validity.

Each construct's discriminant validity was assessed by comparing its AVE to the squared correlations with others. Since each construct's AVE is higher than the squared correlations with other constructs, it confirms that the constructs are clearly distinct from one another. This means that each concept measured in the study captures a unique aspect and does not overlap excessively with other constructs. Overall, the results indicate that the measurement model used in this study is both valid and reliable, with strong evidence of convergent and discriminant validity as well as internal consistency.

Table 3: Results of the Goodness of Fit of the Measurement Model

Goodness of Fit Index		Observed Value	Threshold
Absolute Fit Indices	CMIN/DF	1.404	<3
	GFI	0.776	Close to 1
	AGFI	0.721	Close to 1
	RMR	0.060	<0.1
	RMSEA	0.064	<0.1
Incremental Fit Indices	CFI	0.941	Close to 1
	TLI	0.932	Close to 1
	RFI	0.797	Close to 1
	NFI	0.825	Close to 1
Parsimony Fit Indices	PRATIO	0.863	Close to 1
	PNFI	0.712	Close to 1
	PCFI	0.812	Close to 1
	PGFI	0.622	Close to 1

Table 3 presents the results of the goodness-of-fit test for the measurement model, showing how well the model fits the observed data. Looking at the absolute fit indices, the chi-square to degrees of freedom ratio (CMIN/DF) is 1.404, which is well below the recommended maximum of 3. This fact indicates an acceptable and moderate model fit. The Root Mean Square Residual (RMR) and the Root Mean Square Error of Approximation (RMSEA) are 0.060 and 0.064, respectively, both of which fall below the threshold of 0.1. These values suggest that the residual errors in the model are within acceptable levels, supporting a reasonable fit. However, the Goodness of Fit Index (GFI) and the Adjusted Goodness of Fit Index (AGFI) are 0.776 and 0.721, which are slightly below the ideal value close to 1 (Kodithuwakku & De Silva, 2025). This fact shows that there is opportunity for improvement in the model's ability to fit the data in absolute terms.

When examining the incremental fit indices, the model shows stronger performance. The Comparative Fit Index (CFI) and the Tucker-Lewis Index (TLI) are 0.941 and 0.932, both approaching the ideal value of 1. These results suggest that the measurement model fits the observed data much better than a baseline (null) model with no relationships between variables. The Normed Fit Index (NFI) and the Relative Fit Index (RFI), although slightly lower at 0.825 and 0.797, still indicate a reasonable fit. These incremental fit values highlight that the model performs well when compared to a less structured version of the data (Kodithuwakku & De Silva, 2025).

Finally, the parsimony fits indices, which take into account the simplicity of the model, and offer mixed results. The Parsimony Ratio (PRATIO), the Parsimony Normed Fit Index (PNFI), and the Parsimony Comparative Fit Index (PCFI) show values of 0.863, 0.712, and 0.812, respectively. These are fairly close to 1, suggesting that the model balances fitness and simplicity quite well. However, the Parsimony Goodness of Fit Index (PGFI) is 0.622, which is lower than the ideal level, indicating that there is potential for a more efficient model structure. Overall, the measurement model demonstrates an acceptable level of fit across most indices, particularly in terms of incremental fit, with some minor areas that could be improved in future model refinements.

Table 4: Comparison of Square Inter-Construct Correlation with AVE

	EMI	AT	SN	FI	DS	PBC	AW
EMI	**0.823**						
AT	0.098	**0.820**					
SN	-0.251	0.111	**0.730**				
FI	0.036	0.775	0.151	**0.873**			
DS	0.790	0.066	-0.157	-0.040	**0.808**		
PBC	-0.280	0.123	0.701	0.157	-0.206	**0.790**	
AW	0.123	1.002	0.062	0.787	0.105	0.080	**0.799**

Table 4 shows the results of the discriminant validity test. The test checks if each construct is different from the others. The squared correlations between the constructs are compared to the AVE for each component. When the AVE exceeds the squared correlations, the construct is more connected to itself than to other constructs.

As seen in the table, the AVE values for each construct are clearly greater than the squared correlations with any other construct. For instance, the AVE value of EMI is 0.823, which is higher than its squared correlation with DS, which is 0.790. Similarly, AT has an AVE of 0.820, which is greater than its squared correlation with FI, which is 0.775. SN has an AVE of 0.730, which exceeds its squared correlation with PBC, which is 0.701. These comparisons show a consistent pattern across all constructs. Therefore, the results confirm that each construct in the model demonstrates acceptable discriminant validity (Kodithuwakku & De Silva, 2025).

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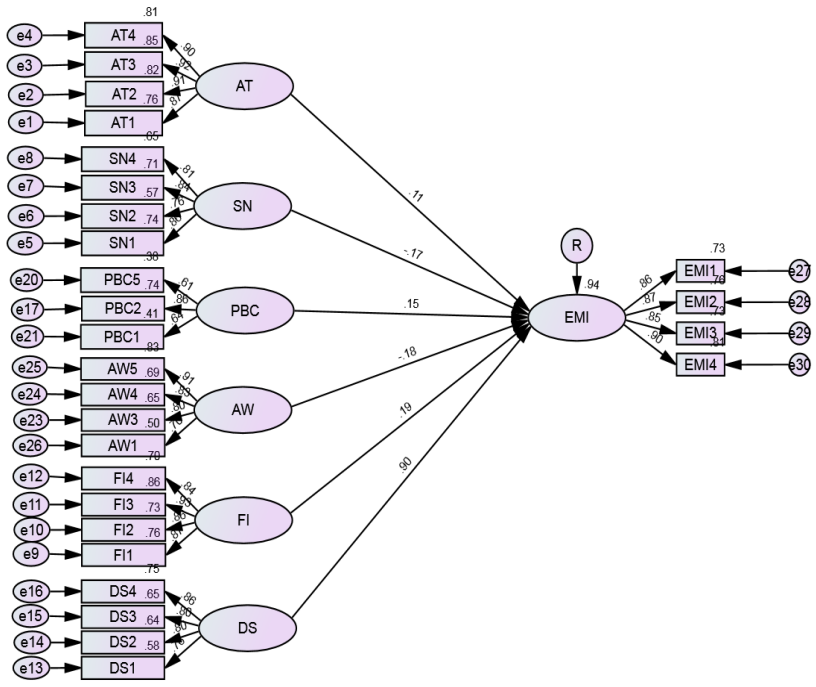
Figure 3: Path Analysis



As shown in Figure 3, path analysis illustrates the direct effects of multiple independent variables on a dependent variable. It provides standardized estimates that help understand the strength and direction of relationships within the model.

Table 5: Results of the Regression Weight of the Structural Model

Path	Standardized Path Coefficients	Critical Ratio	Decision
EMI→AT	0.112 (0.113)	0.366	Not Supportive
EMI→SN	-0.173 (0.055)	0.002	Supportive
EMI→PBC	0.149 (0.057)	0.017	Supportive
EMI→AW	-0.181 (0.119)	0.178	Not Supportive
EMI→FI	0.191 (0.083)	0.048	Supportive
EMI→DS	0.900 (0.049)	0.001	Supportive

Table 5 presents the standardized regression weights that explain the influence of EMI on various dependent variables. The path from EMI to AT shows a weak and statistically insignificant relationship, with a standardized coefficient of 0.112 and a critical ratio of 0.366, indicating that EMI does not have a notable impact on AT. Similarly, the path from EMI to AW is not statistically supported, as the coefficient is -0.181 and the critical ratio is 0.178, suggesting no significant effect of EMI on AW.

On the other hand, the path from EMI to SN is statistically significant and negative, with a standardized coefficient of -0.173 and a critical ratio of 0.002. This implies that higher EMI is associated with a decrease in SN. The association between EMI and PBC is also substantial and positive, with a coefficient of 0.149 and a critical ratio of 0.017, indicating that EMI has an important influence on improving individuals perceived behavioral control.

A positive and significant relationship is shown between EMI and FI, with a standardized coefficient of 0.191 and a critical ratio of 0.048, indicating that EMI moderately contributes to FI. The path from EMI to DS shows the strongest and most significant effect, with a standardized coefficient of 0.900 and a critical ratio of 0.001. This illustrates EMI's great positive influence on DS.

Overall, EMI has significant impacts on SN, PBC, FI, and DS, while its influence on AT and AW is not statistically significant according to the structural model results.

The study revealed that several factors significantly influence students' intention to manage e-waste, aligning with many existing studies. Most notably, data security emerged as a strong influence, supporting the findings of Singh et al. (2020) and Liu et al. (2018), who emphasized that concerns over personal data being accessed or misused often discourage individuals from recycling electronic devices. This factor confirms that trust and safety are critical in shaping e-waste behavior, especially among young users who frequently store personal information on digital devices.

Financial incentives also played an important role, as revealed by Kwatra et al. (2014), who discovered that economic rewards could drive people to

dispose of e-waste properly. It suggests that financial benefits can act as practical motivators in driving environmentally responsible behavior.

Another important dimension observed in the study is the influence of subjective norms, which confirms the idea that social and peer influence are important. This validates Kumar (2018) observation that family and peer expectations can either encourage or discourage environmental initiatives. However, the study's direction of influence indicates that standards alone may not be sufficient unless accompanied by positive messaging or conducive settings.

Perceived Behavioral Control had a substantial impact on e-waste management intention, indicating that students who believe they can overcome barriers and access recycling resources are more willing to take action. This supports the findings of Mancha and Yoder (2015) and Wang et al. (2018), who emphasized that confidence in one's ability is a key driver of behavior. Echegaray and Hansstein (2016) further explain this by focusing on the roles of self-efficacy and perceived controllability, both of which contribute meaningfully to students' recycling intentions.

Overall, these findings demonstrate that, while control, norms, and support networks influence intention, awareness and attitude alone are insufficient to inspire action. This underlines the importance of practical engagement approaches beyond fundamental knowledge and favorable impressions.

5. Conclusion and Policy Suggestions

This study examined the factors that influence e-waste management intentions among Sri Lankan undergraduates. The University of Peradeniya, University of Colombo, and University of Kelaniya are three well-known state universities chosen for the study based on environmental rankings. Using stratified random sampling, data were collected from 100 respondents through a structured questionnaire. The study employed Structural Equation Modeling (SEM) to evaluate how various psychological, social, and contextual aspects influence students' behavioral intentions toward e-waste management.

The SEM analysis revealed that the overall model had a good fit, indicating that the selected independent variables were appropriate for predicting e-waste management intention among undergraduates. However, not all hypothesized relationships were statistically significant. Perceived behavioral control, financial impact, and data security showed significant positive effects on behavioral intention. Interestingly, subjective norms had a statistically significant but negative influence, suggesting that social pressure may actually reduce intention in this context. Meanwhile, attitude and awareness, although important in theory, did not show statistically significant effects in the final path model. This suggests that having a positive attitude or basic awareness about e-waste issues may not be enough to shape behavioral intentions unless reinforced by factors like perceived behavioral control, financial considerations, or concerns about data security.

These findings concluded that undergraduates' e-waste management intentions are influenced by a complex interaction of individual, societal, and structural factors. It emphasizes the necessity for comprehensive solutions that go beyond raising awareness to address actual barriers and motivators that drive sustainable behavioral change.

From a policy standpoint, Sri Lanka currently lacks clear, enforceable laws focused solely on e-waste disposal and recycling, which contributes to ongoing environmental and health risks. It is critical that the government adopt thorough legislation assigning responsibilities to manufacturers, consumers, and recyclers, supported by severe monitoring and penalties for noncompliance. Addressing data security issues through certified data destruction policies would also help to foster trust and promote more ethical disposal practices. Furthermore, developing user-friendly digital platforms, such as government-backed websites or mobile apps, can help undergraduates understand how and where to recycle e-waste, making participation easier and more appealing.

Universities also play an important role in promoting sustainable e-waste management. They can incorporate awareness campaigns, workshops, and student-led activities into campus life, enabling students to better understand the environmental and social consequences of improper disposal. Establishing clearly identified e-waste collection stations in partnership with certified recycling organizations would ensure safe and ecologically friendly

processing while also assuring students about data protection. In addition, universities should use digital tools such as mobile apps or online portals to tell students about collection days, nearby drop-off locations, and educational resources. Encouraging online campaigns through student societies can normalize appropriate e-waste habits and develop a long-term culture of sustainability on campuses.

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JSS (2024) Vol (11) Issue (1)

Factors Affecting Customer Satisfaction on Online Food Delivery Services
(Special Reference to Colombo District – Sri Lanka)

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Abstract

This research focuses on the factors that determine customer satisfaction with online food delivery (OFD) services, focusing on the Colombo district of Sri Lanka. The continuous and widespread advancement in technological systems has greatly impacted consumers, making the study of customer satisfaction in emerging markets valuable. In addressing the digital dimension of OFD services, this study incorporated the additional elements of interface design and digital literacy into the SERVQUAL model, which is based on five dimensions: tangibility, reliability, responsiveness, assurance, and empathy. The research adopted a quantitative method by distributing a pre-structured questionnaire to 180 respondents selected through cluster sampling. Data analysis included structural equation modeling (SEM) and chi-square test. The study evidence suggests that in Colombo, the combination of digital literacy with tangibility, assurance, and empathy increases customer satisfaction, while reliability and responsiveness have no discernible impact. Additionally, user satisfaction is associated with demographic factors such as age, gender, income, and the user interface provided. The results confirmed that local levels of technological sophistication, general population measures including diversity, and service user expectations should be considered when customizing these services. This study suggests actionable strategies.

Keywords: Online Food Delivery, Quality Service, Customer Satisfaction, Delivery Service

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1. Introduction

The study examines the key factors influencing customer satisfaction in online food delivery (OFD) services, with a particular focus on the Colombo district of Sri Lanka. The rapid advancement of digital technology has reshaped the food service sector globally, leading to the rise of efficient, app-based delivery platforms such as Uber Eats and PickMe Food (Vitsentzatou et al., 2022; Shanmugam et al., 2020). Particularly during the COVID-19 pandemic, consumer reliance on digital channels for food access has accelerated, resulting in the growth of OFD services due to their popularity, variety, and speed (Pal et al., 2021; Jiang, 2023).

Customer satisfaction in this industry is influenced by several factors, including service quality, user interface design, reliability, delivery efficiency, and price sensitivity (Kavindi & Dissanayake, 2024; Yeik et al., 2022). Customers expect timely deliveries, accurate orders, responsive support, and user-friendly platforms (Vu, 2021; Smith & Heriyati, 2023). Challenges such as late deliveries, food inconsistencies, and high service charges remain barriers to satisfaction and long-term loyalty (Soon et al., 2024; Kang, 2024).

Demographic factors such as age, income, and occupation significantly influence satisfaction levels and preferences (Perera & Dissanayake, 2021). Insights into these variables can help service providers tailor offerings and marketing strategies accordingly. Moreover, restaurants and delivery staff face issues such as high commission rates and operational inefficiencies (Wahyudin et al., 2023; Mohamed & Fonseka, 2024).

This study is essential for practitioners and policymakers. It helps providers refine their platforms and services while providing regulatory insights into areas such as fair pricing, food hygiene, and labor protection (Wu et al., 2022). Although limited to urban and semi-urban areas of Colombo, this research provides a baseline understanding of customer satisfaction in Sri Lanka's evolving OFD landscape and identifies areas for further improvement and research (Negoro, 2024).

2. Literature Review

OFD industry has become a vital area of research due to the rapid digital transformation of food services and changing consumer preferences. Numerous studies have identified various factors influencing satisfaction, including service quality, technological interface, food quality, pricing, delivery efficiency, and socio-demographic variables.

Service quality remains one of the most widely studied determinants of customer satisfaction in OFD platforms. The SERVQUAL model developed by Parasuraman et al. (1988) is commonly applied to measure service quality across five dimensions: tangibility, reliability, responsiveness, assurance, and empathy. In the context of online food delivery, these dimensions translate into packaging quality, accurate order fulfillment, real-time customer support, secure payment methods, and personalized service interactions. Wu et al. (2024) demonstrated that all five SERVQUAL dimensions significantly impact customer satisfaction and reuse on food delivery platforms.

Among these dimensions, reliability: the ability to deliver accurate and timely orders is often the most crucial (Yeik et al., 2022). Inaccurate orders or late deliveries are leading causes of customer dissatisfaction, especially during peak times. Similarly, responsiveness, particularly regarding real-time tracking and effective communication with delivery personnel, is linked to positive customer experiences (Rane et al., 2023).

Tangibility, such as the aesthetic quality of the app interface and food packaging, plays a psychological role in shaping customer impressions (Alden et al., 2023). Mitri et al. (2020) emphasized that customers associate clean, secure, and visually appealing packaging with food hygiene and brand reliability. Likewise, professional branding and user-friendly mobile applications improve trust and satisfaction (Vu, 2021).

Digital literacy has also emerged as a critical factor in influencing customer satisfaction, especially in emerging markets. According to Ullah et al. (2025), customers with higher levels of digital literacy are more confident in navigating food delivery apps, using digital payment systems, and interpreting app interfaces. Anita et al. (2021) argued that a user's digital capability can

directly influence their experience with OFD platforms, especially among older adults or first-time users.

Food quality is another core determinant of satisfaction. Even though customers interact primarily through a digital interface, their ultimate judgment often hinges on the quality, freshness, and presentation of the delivered food. Smith and Heriyati (2023) found that food quality acts as a mediating factor between perceived service and repeat usage intentions. Poor food quality, regardless of delivery efficiency, can result in service failure in the minds of consumers.

Pricing and perceived value for money are also vital. Low et al. (2013) found that competitive pricing, discount schemes, and transparent fee structures significantly improve satisfaction. In OFD, perceived fairness in delivery fees and food prices plays an essential role in shaping the customer's decision to reorder.

User interface (UI) and app functionality are increasingly relevant in influencing satisfaction, especially as most transactions are mobile based. According to Chein et al. (2024), intuitive navigation, minimal loading times, and a clear display of food items and promotions improve satisfaction levels. Complex or glitchy apps, by contrast, frustrate users and reduce their likelihood of placing repeat orders.

Trust and assurance, particularly in data security and food safety—are fundamental for sustained satisfaction. Bonfanti et al. (2023) noted that trust in the OFD platform, as well as the hygiene standards of partner restaurants, affects whether users will remain loyal to a service. With rising awareness of food safety and hygiene post-Covid-19, this dimension has gained more attention.

Empathy, the ability of the platform to understand and cater to individual preferences, is a softer but still impactful factor. For instance, offering options for dietary preferences, handling complaints gracefully, and being proactive with feedback loops fosters emotional satisfaction (Wu et al., 2024).

Demographic variables such as age, income, occupation, and location can also shape customer expectations and satisfaction levels. Gadiman et al. (2024) and Chein et al. (2024) reported that younger users are more influenced by app

functionality and social media marketing, whereas older users tend to value reliability and customer support. Urban customers prioritize speed and choice, while suburban users focus more on availability and cost.

3. Methodology

A clear and systematic research methodology is crucial for investigating the factors influencing customer satisfaction in OFD services. This section outlines the research design, sampling method, data collection instruments, data analysis techniques, and ethical considerations related to the study conducted in the Colombo District of Sri Lanka.

This study adopted a quantitative research design using a deductive approach to test established theories such as SERVQUAL in the context of the OFD industry. Quantitative methods are particularly effective in measuring service quality dimensions, customer satisfaction levels, and identifying patterns across large populations (Creswell, 2014). This research was descriptive and explanatory in nature, and aimed not only to identify current customer satisfaction, but also to clarify the causal relationship between variables such as service quality, user interface, and digital literacy.

The research focused on three main clusters within the Colombo District: Colombo City, Kaduwela, and Maharagama. These areas were selected using cluster sampling to reflect a mix of urban and semi-urban populations. These zones are densely populated, technologically active, and represent a high concentration of OFD users, making them suitable for understanding various customer satisfaction determinants (Perera and Dissanayake, 2021).

The target population consisted of individuals who had used online food delivery platforms such as Uber Eats and PickMe Food in the past three months. The rationale behind this choice was to ensure that participants had recent and relevant experiences. According to Cochran's (1967) formula with a margin of error of 0.075, the ideal sample size was calculated from 180 respondents.

$$n0 = \frac{Z^2 . P . q}{e^2}$$

$$n0 = \frac{1.96^2 . 0.5 . (1 - 0.5)}{0.073^2} = 180$$

The study used a structured questionnaire to collect primary data. This method is widely used in quantitative research to ensure standardization across respondents (Kumar, 2011). The questionnaire consisted of five sections: (i) Demographic details, (ii) digital literacy, (iii) servqual dimensions, (iv) user interface, (v) customer satisfaction.

Each item used a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), which allowed for a nuanced understanding of customer perceptions.

To ensure reliability, a pilot test was conducted with 20 respondents from unselected areas. Feedback was used to refine unclear questions. The internal consistency of the questionnaire was verified using Cronbach's alpha, and all key constructs scored above 0.70, indicating acceptable reliability (Hair et al., 2010).

Table 1: Reliability Analysis

Variable	Cronbach's Alpha
Digital Literacy	.905
Tangibility	.841
Reliability	.849
Responsiveness	.863
Assurance	.851
Empathy	.870
Customer Satisfaction	.867

The analysis included Structural equation modeling (SEM) to examine the relationship between independent variables (e.g. SERVQUAL dimensions, digital literacy) and customer satisfaction.

SEM was chosen for its ability to model complex relationships and test theoretical models that include multiple latent variables (Byrne, 2016). It also offers model fit indices such as CFI, RMSEA, and TLI, which were used to validate the measurement and structural models.

4. Results and Discussion

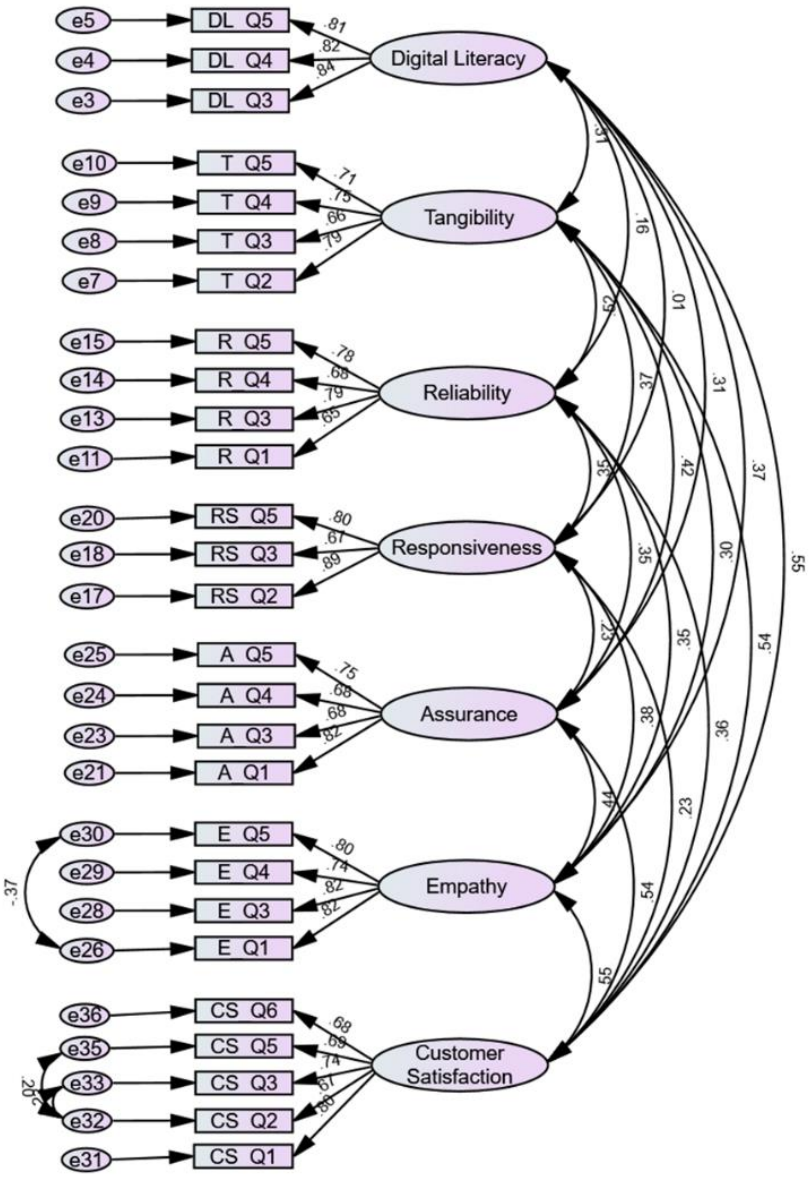
This chapter focuses on identifying the factors that affect customer satisfaction in OFD using primary data. The factors of tangibility, reliability, responsiveness, assurance, empathy and digital literacy were studied to determine how they affect customer satisfaction.

The main objective of the research is to study the factors affecting customer satisfaction in OFD services. Under this, the factors affecting customer satisfaction are identified and the extent to which they affect the change in customer satisfaction is studied. For this, the SEM was mainly used. This mainly has two parts. Namely, Measurement model and path analysis. Under these two parts, the factors affecting customer satisfaction are identified.

The measurement model evaluates measurement adequacy and inter-construct correlation. It examines how systematically measured variables represent the theoretical constructs specified in the model and how different latent constructs relate to each other (Bedi & Bhale, 2023). All constructs are treated as exogenous (independent), and a non-causal bidirectional relationship is studied among them. Observed variables load only on their designated construct with no cross-loadings, and different constructs can be correlated with each other (Kline, 2011). Figur 01 show chart the measurement modelof the analysis.

Reliability and validity both refer to how well a method measures something. Reliability and validity are closely related but distinct concepts. While reliability focuses on consistency, validity deals with whether a measurement actually measures what it intends to measure. High reliability is a prerequisite for high validity, but a reliable measure may not necessarily be valid (Bedi & Bhale, 2023).

Figure 1: Measurement Model



Convergent validity is the correlation of results from different variables used to evaluate the same construct. Since Average Variance Extract (AVE) can explain how much information is shared between concepts, it is appropriate to use AVE as a test of convergent validity (Sujati et al., 2020). To achieve this validity, the value of AVE should be greater than or equal to 0.5 (Ahmad et al., 2016). As shown in Table 2, AVE values greater than 0.5 have been obtained, indicating the validity of the test.

Construct reliability (CR) ranges from 0 to 1, with values closer to 1 indicating greater internal consistency. A construct reliability coefficient greater than 0.70 is acceptable. Construct reliability requires a CR value of 0.7 (Tentama & Anindita, 2020). Table 03 shows that when the CR value is greater than 0.7, the composite reliability of the test is achieved.

Table 2: Results of the Convergent Validity Test

Convergent	No. of Question	Standardize factor loadings		AVE	CR
		Min	Max		
Digital Literacy	3/5	.809	.841	.629	.871
Tangibility	4/5	.674	.769	.677	.863
Reliability	4/5	.652	.790	.533	.820
Responsiveness	3/5	.673	.886	.527	.816
Assurance	4/5	.680	.823	.626	.832
Empathy	4/5	.737	.818	.540	.824
Customer Satisfaction	5/6	.673	.810	.517	.842

The results presented in Table 2 indicate that all constructs in the study have satisfactory levels of convergent validity and internal CR. The AVE values for each construct are above the minimum required level of 0.50, suggesting that a significant amount of variation in the indices is due to latent constructs rather than measurement error. Furthermore, all constructs show strong internal consistency with CR values above the acceptable value of 0.70. Constructs such as tangibility (CR = 0.863, AVE = 0.677), customer satisfaction (CR = 0.842, AVE = 0.517) and digital literacy (CR = 0.871, AVE = 0.629) demonstrate strong measurement properties. These results provide a

very strong basis for structural analysis and demonstrate the validity and reliability of the model.

The three goodness of fit indices, absolute, incremental and parsimony, are calculated for the structural model. As explained in the research methodology, all variables are in an acceptable fit. It is shown in Table 3 below.

Table 3: Results of the Goodness of Fit of the Measurement Model

The goodness of fit index		Goodness of fit
Absolute fit index	CMIN/DF	1.116
	GIF	.884
	AGFI	.854
	RMR	.036
	RMSEA	.025
Incremental fit indices	TLI	.981
	CFI	.984
	RFI	.841
	NFI	.864
Parsimony fit indices	PGFI	.702
	PRATIO	.855
	PNFI	.739
	PCFI	.841

The creation of a latent variable instrument must include a discriminant validity test. Divergent validity, also known as discriminant validity, is the validity that helps to show how one construct differs from another (Taherdoost, 2016). To demonstrate discriminant validity, one method would be to correlate one construction with another (Sujati et al., 2020). Discriminate validity exists if the correlation between the two constructs is smaller than the square root of the AVE scoring (Engellant et al., 2016). The Table 4 compares the inter-constructed correlations with the square root of AVE. As indicated in Table 1 the AVE value of each construct is higher than the squared correlations between the two constructs.

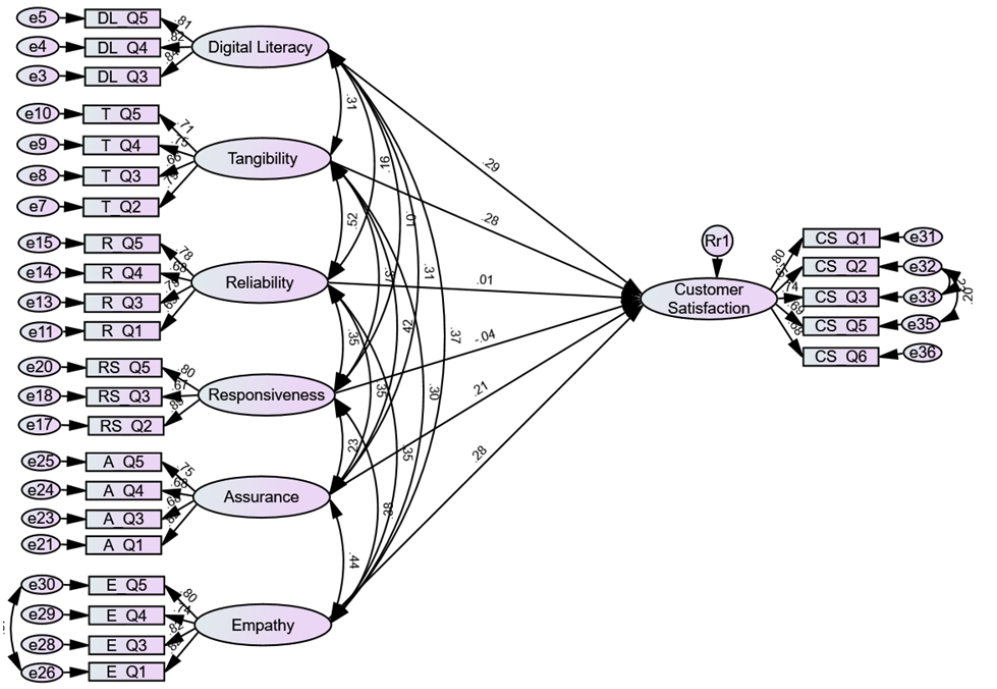
Table 4: Comparison of with Inter-construct Correlations, Square Root of AVE

	Empathy	Digital Literacy	Tangibility	Reliability	Responsiveness	Assurance	Customer Satisfaction
Empathy	0.793						
Digital Literacy	0.374	0.823					
Tangibility	0.298	0.314	0.730				
Reliability	0.351	0.163	0.523	0.726			
Responsiveness	0.379	0.012	0.374	0.355	0.791		
Assurance	0.445	0.312	0.424	0.346	0.231	0.735	
Customer Satisfaction	0.554	0.554	0.535	0.358	0.228	0.540	0.719

Path analysis is a form of multiple regression statistical analysis that is used to evaluate causal models by examining the relationships between a dependent variable and two or more independent variables. By using this method, one can estimate both the magnitude and significance of causal connections between variables (Crossman, 2019).

The path analysis model, shown in Figure 02, examines the impact of various service quality dimensions and digital literacy on customer satisfaction. The model includes six latent variables – digital literacy, tangibility, reliability, responsiveness, assurance, and empathy – that are measured through the corresponding observed indicators. Each of these latent variables is assumed to have a direct impact on customer satisfaction.

Figure 2: Path Analysis



As shown in Table 5, Digital Literacy ($p<0.05$), Tangibility ($p<0.05$), Assurance ($p<0.05$), Empathy ($p<0.05$) have a significant positive relationship with customer satisfaction. Reliability and Responsiveness ($p>0.05$) have no significant relationship with customer satisfaction. It can be concluded that all the factors except Reliability and Responsiveness affect customer satisfaction.

Table 5: Results of the Regression Weight of the Structural Model

Standardized Parth	Coefficient	P value	Decision
Digital Literacy	.213 (.061)	.001	Support
Tangibility	.240 (.108)	.021	Support
Reliability	.006 (.101)	.982	Not Support
Responsiveness	-.024 (.062)	.701	Not Support
Assurance	.180 (.079)	.034	Support
Empathy	.228 (.100)	.005	Support

The standard error of the coefficient is given in parentheses.

As shown in Figure 2, path analysis has been studied to determine how service quality and digital literacy affect customer satisfaction. Table 5 shows how

tangibility, reliability, assurance and empathy under digital literacy and service quality have a significant impact on customer satisfaction. As shown in the table, reliability and responsiveness have not contributed much to customer satisfaction. Five questions have been used to measure digital literacy as shown in Annexure 01, and question DL_Q3 has an impact of 0.84 for measuring literacy. Similarly, questions DL_Q4 and DL _Q5 have similar impacts for measuring digital literacy, with the values being 0.82 and 0.81 respectively.

Although T_Q2, T_Q4 and T_Q5 have a greater impact on Tangibility than 0.71, while question T_Q3 has a relatively smaller impact of 0.66. A_Q5 had the highest impact of 0.75 on assurance, while questions A_Q1, A_Q3 and A_Q4 had a relatively lower impact of about 0.66 compared to the other questions. E_Q1, E_Q3 and E_Q5 have a higher impact of almost 0.8 on empathy, while question E_Q4 has a slower impact of 0.74.

Out of 06 questions that have an impact on the dependent variable, question CS_Q1 has a high impact of 0.80 on customer satisfaction. All others have a relatively slow impact at levels of 0.6 and 0.7.

With the introduction of digital technology and changing consumer orientation, studies on customer satisfaction and online food ordering have become very popular in recent times. This study was conducted in the Colombo district of Sri Lanka and examines a number of key issues based on structural equation modeling and chi-square analysis. Specifically, it examines how tangibility, reliability, responsiveness, assurance, empathy, and digital literacy affect customer satisfaction. The impact of all these variables on customer satisfaction is established in this study, and the role of demographic variables is also examined. The findings of this study are compared with other studies as follows.

One of the most striking discrepancies in the findings of this study is the non-significant impact of two basic service quality dimensions: reliability and responsiveness. The results obtained from the path analysis show that these two variables do not have a statistically significant impact on customer satisfaction in the Colombo district ($p > 0.05$). This is in stark contrast to the global literature, which necessarily identifies these dimensions as predictors of service quality and satisfaction. For example, in their analysis of Chinese

online food ordering services Meituan and Ele.me, (Luo et al., 2020) ranked reliability and responsiveness as the two most salient dimensions with path coefficients above 0.30. Similarly, Ray et al. (2019) in their USA-based investigation found that reliability in terms of on-time delivery and correct orders were the most salient predictors of user satisfaction.

Such a gap could be due to the infrastructural conditions of Colombo city, such as traffic, unpredictability of weather, and regionally unstable delivery staff behavior. This can moderate customers' expectations of responsiveness and reliability. Compared to industrial economies, Colombo customers may be accustomed to partial delivery delays or service disruptions, where on-time delivery is the norm and delivery is regular (Fernando & Fernando, 2016). This assumption is true, as Parasuraman et al.'s (1988) SERVQUAL model suggests that customer satisfaction is influenced not only by service quality but also by expectation levels. If low customer reliability expectations are generated by systemic inefficiencies, then this type of variability would not have much of an impact on satisfaction. A second notable anomaly is the strong positive effect of digital literacy on customer satisfaction in this study. The path coefficient for digital literacy is significant ($\beta = .213$, $p < 0.01$), suggesting that consumers who are more comfortable with technology report significantly higher satisfaction with OFD services. This is a relatively low estimate of the factor in global studies, especially in international studies from high digital penetration economies such as South Korea, Singapore, and Western European countries (Cheong, 2007). In this context, it is assumed that the digital competence of application users is homogeneously high and therefore plays no role in explaining the variance.

5. Conclusion and Policy Suggestions

This research investigated customer satisfaction among users of online food delivery (OFD) services in the Colombo district of Sri Lanka. With the increasing reliance on digital services, especially food delivery, it has become timely and important to identify what drives customer satisfaction in emerging markets. Based on the SERVQUAL framework and incorporating digital-related variables such as digital literacy and user interface, this research presents a broader perspective on how traditional and modern service variables influence customer satisfaction in a local context.

Among the key findings, not all service quality dimensions appear to be equally important for OFD services in Colombo. Of the five core SERVQUAL variables, only tangibility, assurance, and empathy contributed significantly to customer satisfaction. Tangibility is the most prominent, determining the use of food packaging, app design, and overall visual appearance in shaping customer attitudes. This highlights that in virtual service environments where physical contact is minimal, physical items such as packaging and app design act as proxies for quality. Similarly, assurance and empathy were highly predictable, indicating that trust in the service organization and trust in the care provided to customers are essential for a satisfying experience. These results replicate findings from the international literature and also confirm their relevance in the emerging digital market of Sri Lanka. On the other hand, responsiveness and reliability, which are common leading factors in service quality studies, were not statistically significant in this study. Such divergence can be rationalized through infrastructural constraints at the local level, such as traffic and unorganized delivery reliability. Since Colombo users have learned to configure their expectations with such constraints, timeliness of delivery or immediate customer response carry less weight. This confirms the notion that satisfaction is not just a function of performance, but also of how that performance matches local expectations.

Adding digital literacy as a value-added variable in this research. The findings revealed that digitally highly skilled customers expressed significantly higher satisfaction. This is especially important in developing countries such as Sri Lanka, where digital skills are uneven. Navigating, paying and tracking orders through apps equates to a smooth-flowing service experience. Therefore, digital literacy should be seen not only as a contextual variable but also as an extremely important aspect of customer satisfaction, especially in digitally-dominated services.

Methodologically, the study had high reliability and validity across all measurement scales. Cronbach's alpha was significantly above acceptable levels, and SEM analysis showed a satisfactory fit of the model. Applying Cochrane's formula to determine sample size and cluster sampling ensured that the sample of Colombo OFD users was representative, and the results were more valid and reliable.

Another conclusion relates to the suitability of theoretical models such as SERVQUAL in online service settings. While SERVQUAL remains a viable tool, the study found that it would be wise to include new dimensions such as digital literacy and user interface to better understand the overall customer experience in online settings. In addition, the insignificance of reliability and responsiveness in this case demonstrates how theoretical models need to be adapted to suit local realities and technological advances.

Finally, constant feedback channels and quality assurance programs should be put in place to realize customer-oriented service improvements and foster long-term loyalty in the digital food market of Sri Lanka that is presently growing.

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