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An Empirical Study of Selected Challenges in Online Education; A Special Focus on G.C.E. (Advanced Level) Students in the Colombo District of Sri Lanka

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ABSTRACT

The 21st century can be known as an era in which the universe has become one village with the rapid advancement in internet-based information and communication technology. Consequently, online methods were used to develop education opportunities widely in the distance learning process. Though many researchers have paid attention to the challenges and opportunities of online education in schools and universities, researchers have paid less attention to online education in the Sri Lankan school system. However, Sri Lankan schools were trending towards online education due to the challenges of the Covid-19 pandemic in 2020. As a result, this study aims to identify the factors affecting online education usage and the challenges of online education by advanced-level students in the Colombo district. The advanced-level students in the Colombo district were the target population of this study. The sample was selected from Padukka, Hanwella, and Homagama Secretarial divisions under multistage cluster sampling, and the data was collected from 312 students using a questionnaire. Further, the independent sample t-test, Analysis of Variance and Structural Equation Model, was used to identify the self-determining factors. Consequently, social, communication, technical, demographic, and economic factors identified online education usage variables. Finally, this study suggested implementing Learning Management Systems and providing teachers and students with sufficient knowledge about online education. Overall, this study provided an opportunity to identify the challenges teachers and students face in online education and reduce time consumption and cost of the teaching and learning process.

1. Introduction

Since the 1940s, Sri Lanka has mandated that all children between the ages of five and sixteen receive free primary, secondary, and university education. Also, Private sector participation is improving in school, vocational, and university educational systems. The country's long-term goal is to become the region's education and knowledge hub.

Online education provides excellent exposure for the e-learning process to distribute necessary learning and teaching equipment and to have a good interaction between teachers and students. In 1858, London University became the first-ever university that provided degrees for remote learners (Ferrer, 2017).

Information and communication technology were rapidly developed during the 21st century, and most people in the present context have trended towards information technology, networking, and the internet in their professional scenarios. With the help of online education advancement, most students could be exposed to online education without barriers. Though online education could not replace the traditional education system, it influences how the teaching and learning process is done.

In past years, the teaching and learning process was done with both teacher and student in the same place. In that sense, people believe that distance learning is challenging with numerous barriers. From the majority's perspective, the real meaning of education is the process of teaching and learning while having teacher-student and peer interactions.

However, due to networking and website development, most people's attention has been paid to distance learning with high interactions among teachers, students, and peers (Lee & Rha, 2009).

Concerning the education department reports in the United States, expanding access to educational resources, privatizing education, flexibility, and low cost can be shown as the advantages of online education. However, online education creates some challenges for the whole education system as well. In that case, students' retention rate in online learning courses is 15% lower than in traditional face-to-face methods in higher education. Further, students joining online courses for the first time feel lonely and socially isolated because they are new to the online learning environment and unfamiliar with online learning communities. Also, online educators should take on more responsibilities and need additional skills or competencies (Yu & Richardson, 2015). Previous studies have shown that the online education experience is better than traditional classroom instructions (Ni, 2013).

Students' attraction to information technology tools is considerably higher when looking towards the past few years than elders in Sri Lanka. Although many universities and higher education institutions have adopted online education, the number of students turning to it did not increase until 2019. However, most schools moved towards online education in 2020 due to the epidemic of Covid-19.

More than 188 countries were locked down due to the pandemic; therefore, numerous schools and universities worldwide were closed from 2019 to April 2020 (Pan, 2020). Over the past two decades, face-to-face classroom education has shifted to online education, and the current epidemic has forced the rapid adoption of online education (Bisht et al., 2020).

It is clear from the present situation that advanced-level students in Sri Lanka often turn to computers and mobile phones aided online education. Since a considerable percentage of students who sit for advanced level examinations is not selected for universities, the students who sit for the

advanced level examination can be said as the most affected group of students in this process than university students (*G.C.E (A.L) Examination-Performance of Candidates*, 2019).

Based on these reasons, it would be more effective if the education system in Sri Lanka could be developed successfully using online education techniques. However, discussions with teachers and students revealed that there are still some issues with the online education systems in Sri Lankan schools. It is important to discuss whether online education can further enhance students' educational skills and factors. Therefore, this study aimed to identify the challenges of online education usage in Sri Lanka through acquiring knowledge based on experience or observations without using scientific methods.

1.1 Research Problem

In 2020, most schools and universities in the world continued their teaching and learning process through online education due to the Covid-19 pandemic, which even now, continues. However, Sri Lanka took considerable time to adopt the online education system, especially for teachers and students. This may have happened because this situation has not arisen in Sri Lanka before, and Sri Lankans did not fully understand the importance of online education. Though both students and teachers gradually adopted online education, they revealed that they encountered some daily online education difficulties. The advanced level examination is the most competitive in the education system of Sri Lanka because limited entry opportunities exist in the university system. As such, this exerts pressure on advanced-level students, and some factors make it challenging to adopt new technologies as Sri Lanka is an upper-middle-income country, and its community is still getting used to the internet (*Annual Report 2019; 2020*).

Therefore, "Can online education be used for the education of advanced-level students in the Colombo district?" can be highlighted as the research problem of this study.

1.2 Research Questions

- Are the demographic, economic, social, technical, and communication factors influencing the usage of online education by advanced-level students in the Colombo district?
- Which solutions can be identified for the problems in using online education for advanced-level students' academic activities in the Colombo district?

1.3 Main Objective

The study aims to study the ability to continue online education in Sri Lanka during the current Covid-19 epidemic and any other circumstance in the future. Therefore, the main objective of this study is as follows.

- To identify the selected challenges of using online education by advanced-level students in the Colombo district.

1.3.1 Sub Objectives

- To identify the demographic, economic, social, technical, and communication factors influencing online education usage of advanced-level students in the Colombo district.
- To suggest solutions for difficulties using online education for advanced-level students' academic activities in the Colombo district.

1.4 Significance of the Study

The online education process, which is very common in many developed countries, is essential for teachers, students, and other parties to progress as the teaching and learning techniques often differ from traditional learning methods. However, it is identified that there is no variation in the

productivity of education due to the usage of online education techniques in most countries.

Therefore, the different parties can acquire the following opportunities by identifying the challenges of using online education by advanced-level students in Sri Lanka.

- It identifies the challenges students and teachers face when using online education.
- The time consumption and cost of teaching and learning can be reduced and done attractively and adequately.
- We are identifying the factors affecting the productivity of online education in the future.
- The ability of education administrators to improve advanced-level results of students.
- Make strategies to minimize government expenditure on education.

1.5 Literature Review

"Online Education is a flexible instructional delivery system that encompasses any kind of learning that occurs via the Internet" (*Online Education*, 2020).

"Online Education denotes the entailed in distance education where network technologies such as the Internet are used to make connections among students, teachers and educational materials" (Muirhead, 2000). Internet-based education was begun with the development of internet facilities in the 1990s. Its goal was to test communication and I.T. skills and abilities (Chandra, 2020). However, for the time being, technology has influenced peoples' professional scenarios and private lifestyles. There are two types of online learning (Varkonyi, 2017).

1. Asynchronous Learning

Here, students can access the content or lesson according to their timetable without real-time interaction with their instructors or teachers. Courses via websites and emails are

famous examples of asynchronous learning; after that, those contents will be published on online forums most of the time.

2. Synchronous Learning

Here, the learning process is done with real-time access. The learning process is done through real-time chats and video conferencing (Varkonyi, 2017).

By 2015, several learning systems used for online education were introduced due to advancements in web-based learning systems and learning environments. Some of them are,

- Learning Management System (L.M.S.)
- Learning Content Management System (LCMS)
- Virtual Learning Environment (V.L.E.)
- Course Management System (C.M.S.)
- Adaptive and Intelligent Web-Based Educational System (A.I.W.B.E.S.)

C.M.S. is widely used in the United States, while V.L.E. is popular in Europe. C.M.S. and V.L.E. have been designed to plan, distribute and manage learning activities. The primary role of LCMS is to provide a suitable environment for creating and maintaining learning content. These systems are only accessible to registered students and have relevant passwords (Jonsdottir et al., 2015).'

Taeho Yu, and Jennifer C. Richardson, have developed a model to identify the factors influencing students' readiness for online learning through their exploratory factor analysis and credible analysis of Students' Online Learning Readiness (S.O.L.R.).

That model was known as the S.O.L.R. model, revealing that students' results influenced social, communication, and technical competencies with instructors through the online learning process by 66.69% (Yu & Richardson, 2015).'

1.5.1 The Distribution of Online Education in Sri Lanka

The Sri Lankan government highly invested in distance learning technologies between 2003 – 2009 to increase higher education approaches. Though no studies investigate this, the government has provided quality education to many students at a lower cost than the traditional education system through distance learning under specific terms and conditions (Liyanagunawardena, 2012).

The TEL concept was introduced to Sri Lankan universities to have an effective and efficient technological environment beyond L.M.S., and it includes e-learning facilities with high technologies, virtual laboratories, and digital-based activities (Gunawardana, 2005).'

1.5.2 Usage of Online Education due to the Covid-19 epidemic

The Covid-19 pandemic negatively affected whole economies throughout the world in 2020, and in India, it is around 8.8 billion Indian Rupees. This pathetic situation has substantially impacted the economy and the global education system (Joshi et al., 2020).

Online learning and distance learning are not new concepts to the world, but due to this pandemic, these concepts were the only methods to be implemented due to social distance and locking down countries (Chandra, 2020).'

According to UNESCO, 63 million teachers in 165 countries have suffered from this epidemic. Parallely, around 1.3 billion students worldwide cannot attend schools and universities and in India are around 320,713,810 (Joshi et al., 2020). Students' understanding of online learning through L.M.S. is highly related to students' successful use of these applications (Almekhlafy, 2020).

The covid-19 epidemic has significantly affected two main fields, and they are,

- Changing the mode of education to an online basis from face-to-face methods
- Facing financial challenges

Though most teachers, lecturers, and students had to face some teaching and learning modes from the usual traditional methods, a survey conducted in India revealed that 74% of respondents liked to learn online. However, online education's main disadvantages are the absence of practical activities and not meeting friends (Izumi et al., 2020). During this COVID 19 epidemic, all sectors of the economy, including education, are leveraging the internet for commerce. The majority of undergraduate students in Sri Lanka are extremely acclimated to the conventional classroom teaching method. This shift in mindset has had both positive and negative effects on their educational aspirations. A study on undergraduates' knowledge of online learning is essential in order to evaluate undergraduates' present performance, spot prospective issues, and create online learning regulations and suggestions for a positive learning environment (Nafrees et al., 2020). Sri Lankan higher education institutions and universities started to use Moodle-based learning management systems from web servers to minimize intermittent learning activities and continue them. Due to the pandemic, all the internet service providers in Sri Lanka provided free access for university web clients until 17th August 2020 (Hayashi et al., 2020).

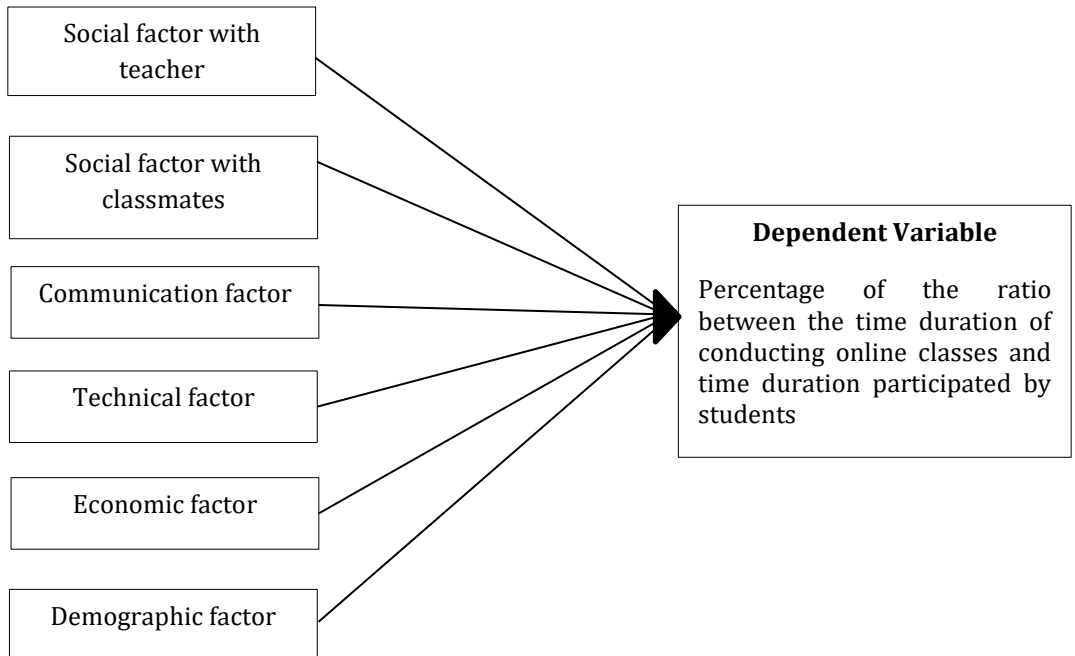
1.5.3 Online Education in Schools around the World

Online education in schools, relatively new globally, is currently gaining considerable attention in many Western Empires. For instance, Farrel's survey in 1999 about the extent to which online education is used in Commonwealth countries revealed that the

interest in web-based online programs has increased due to difficulties faced by remote, in-house students attending schools. However, there are no deep investigations done regarding how this online education system affects both teachers' and students'

During the epidemic, all Sri Lankan students have used online education methods. Studies have been conducted only on university students, although school students have faced the same situation. This research study attempts to fill that gap.

Independent Variables



lives (Muirhead, 2000).

Figure 1. Conceptual Framework

Source: An Exploratory Factor Analysis and Reliability Analysis of the Student Online Learning Readiness (S.O.L.R.) Instrument (Yu & Richardson, 2015)

2. Materials and Methods

Here, a questionnaire was used as the research instrument, and the study was conducted using a conclusive logic approach due to quantitative data, the use of a theory identified from previous research, and the researcher's independence from the research (Putra, 2021). The cross-sectional method was used for the time horizon as the time was minimal, and the study was based on an environmental phenomenon (Sahay, 2016). In addition, this can be described as a

composite structure as the study concludes by studying a sample, identifying the methodology from previous studies, and using a quantitative structure as a qualitative structure for this research (Saunders, 2012).

The students in the Colombo district sitting for advanced level examinations in arts and commerce streams in 2020 and 2021 and engaging in online education were taken as the population of this study. The 1232 students living in Padukka, Hanwellla, and Homagama secretarial divisions were taken

for a sampled population. Of that, 312 students were selected for the sample concerning Yamane's equation (Yamane, 1967). Finally, the data were analyzed using an independent sample t-test, analysis of variance, and structural equation model with software applications such as SPSS-25, AMOS-21, and Excel.

2.1 Conceptual Framework

In 2015, Yu & Richardson identified some factors that affected Online Learning Readiness. Conceptual framework of the study was developed using those factors.

3. Results and Discussion

3.1 Demographic and Economic factors

Independent sample t test, variance analysis and structural equation modelling were used to identify the demographic, economic, social, technical, and communication factors influencing online education usage of advanced-level students in the Colombo district.

Here, the dependent variable was the percentage of the ratio between the duration of conducting online classes and students' duration, which was normally distributed. Therefore, this analysis used an independent sample t-test and variance analysis. In this analysis, gender, subject stream, year of appearing for the examination, and the number of siblings were used as demographic factors.

Family income, educational level of elders, elders' occupation, and monthly expense for data were used as economic factors. According to the independent sample t-test, it can be concluded with 95% confidence that the use of online education by advanced-level students differs according to the gender and year of appearing for the examination and not according to the subject stream and several siblings under the demographic factor.

It can be concluded with 95% confidence that the use of online education by advanced-level students differed according to the sibling's education level and not according to family income, parents' educational level, occupation of elders, and monthly expenses for data under the economic factor.

3.2 Social, Technical, and Communication factors

3.2.1 Measurement Model

The measurement model specifies each construct's indicators and enables an assessment of construct validity (Hair et al., 2010) (Sanayei & Saneian, 2013). The graphical representation of the initial measurement model is shown in figure 1. Here, number one (1) is assigned for selected arrows using A.M.O.S. 21 program to identify the model, and there are 21 and 4 observed variables and latent variables, respectively.

Concerning the results in table 1, the CMIN/DF value is less than 5(2.734), and the R.M.E.S.A. value is less than 1. In addition, all other goodness of fit indices is close to 1. Therefore, the overall goodness of fit in the measurement model can be verified.

3.2.2 Validation of the Measurement Model

The measurement model's validity was checked using convergent and discriminant validity tests. In that case, the convergent validity was checked under three criteria: individual standardized factor loadings, Average Variance Extracted (AVE), and composite reliabilities.

According to Hair et al. (2010), it is ideal when standardized factor loadings for reflective indicators are equal to 0.5 or exceed 0.7.

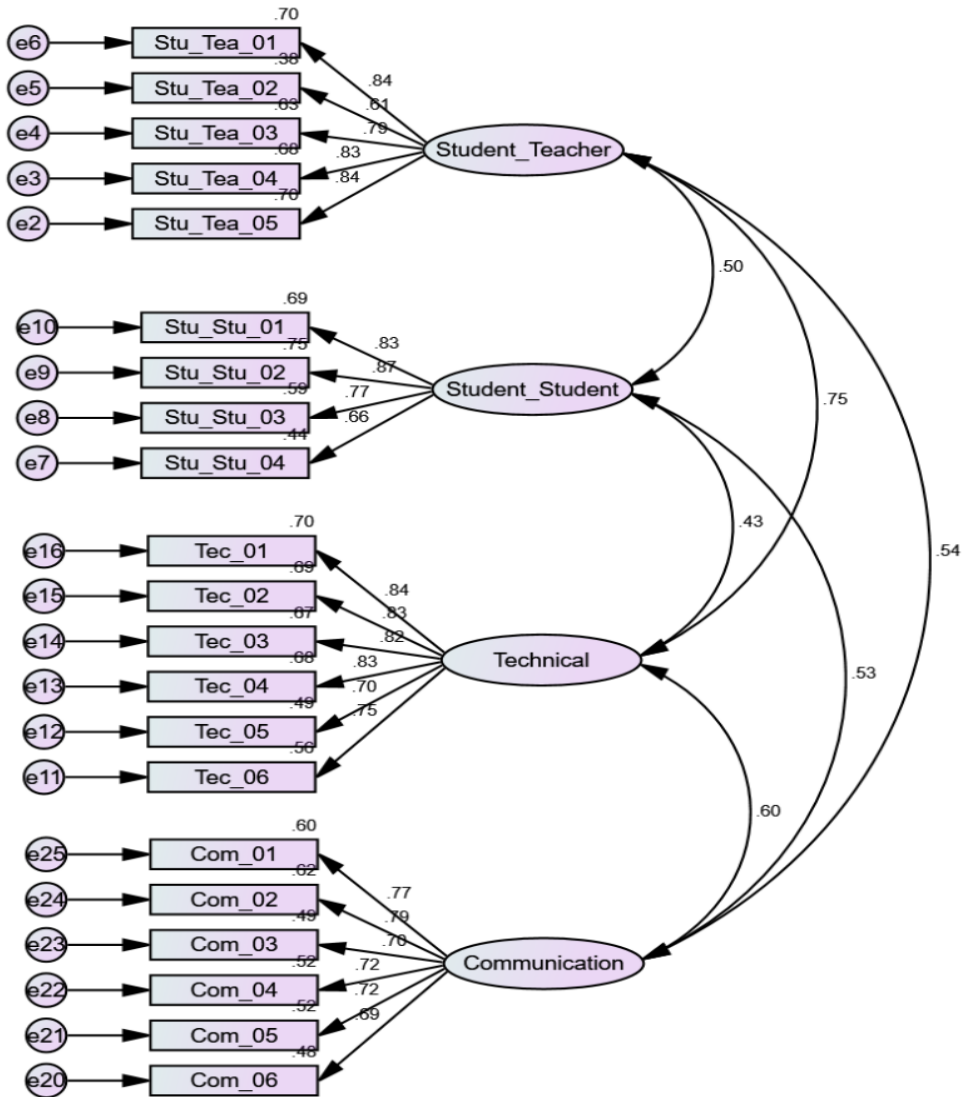


Figure 2. Measurement Model

Table 1. Results of the Goodness of Fit of the Measurement Model

| The goodness of the fit index | | Observed value | Acceptable Value |
|-------------------------------|---------|----------------|------------------|
| Absolute fit indices | CMIN/DF | 2.734 | 1-5 |
| | GFI | 0.862 | 0-1 |
| | AGFI | 0.826 | 0-1 |
| | RMSEA | 0.075 | 0-1 |
| Incremental fit indices | TLI | 0.911 | 0-1 |
| | CFI | 0.922 | 0-1 |
| | RFI | 0.866 | 0-1 |
| | NFI | 0.883 | 0-1 |

| | | | |
|-----------------------|--------|-------|-----|
| Parsimony fit indices | PGFI | 0.683 | 0-1 |
| | PRATIO | 0.871 | 0-1 |
| | PNFI | 0.770 | 0-1 |
| | PCFI | 0.803 | 0-1 |

Table 2. Results of the Convergent Validity Test

| Construct | No. of items | Standardized factor loadings | | Average Variance Exacted | Composite Reliability |
|-------------------------------|--------------|------------------------------|-------|--------------------------|-----------------------|
| | | Min | Max | | |
| Social factor with teacher | 5 | 0.614 | 0.838 | 0.618 | 0.817 |
| Social factor with classmates | 4 | 0.662 | 0.867 | 0.616 | 0.703 |
| Technical factor | 6 | 0.702 | 0.839 | 0.633 | 0.829 |
| Communication factor | 6 | 0.692 | 0.786 | 0.537 | 0.738 |

As mentioned in table 2, all standardized factor loadings are greater than 0.6 and are significant at a 5% significance level.

In addition to that, all-composite reliability measures are more significant than 0.7, and all AVE values are greater than 0.5. In that sense, it can be concluded that the measurement model is validated for further analysis.

Here, the discriminant validity was checked by comparing the squared inter-construct correlations estimated between each construct and the AVE of each construct. However, the AVE of all constructs should be greater than the squared inter-construct

correlations estimated between each construct.

As mentioned in table 3, the diagonal values are AVEs for all constructs, and sub-diagonal values are the squared inter-construct correlations estimated among constructs. Since all AVEs are more significant than the squared correlations estimated, it can be concluded that the measurement model is validated for further analysis.

3.3 Hypothesis Testing

A structural model was developed to identify the significant factors affecting the time ratio used in online education. Figure 2 illustrates the fitted structural model.

Table 3. Comparison between Squared Inter-construct Correlations and AVE

| | Social factors with teacher | Social factors with classmates | Technical factors | Communication factors |
|-----------------------------------|-----------------------------|--------------------------------|-------------------|-----------------------|
| The social factor with teacher | 0.618 | | | |
| The social factor with classmates | 0.249 | 0.616 | | |
| Technical factor | 0.561 | 0.187 | 0.633 | |
| Communication factor | 0.287 | 0.281 | 0.357 | 0.537 |

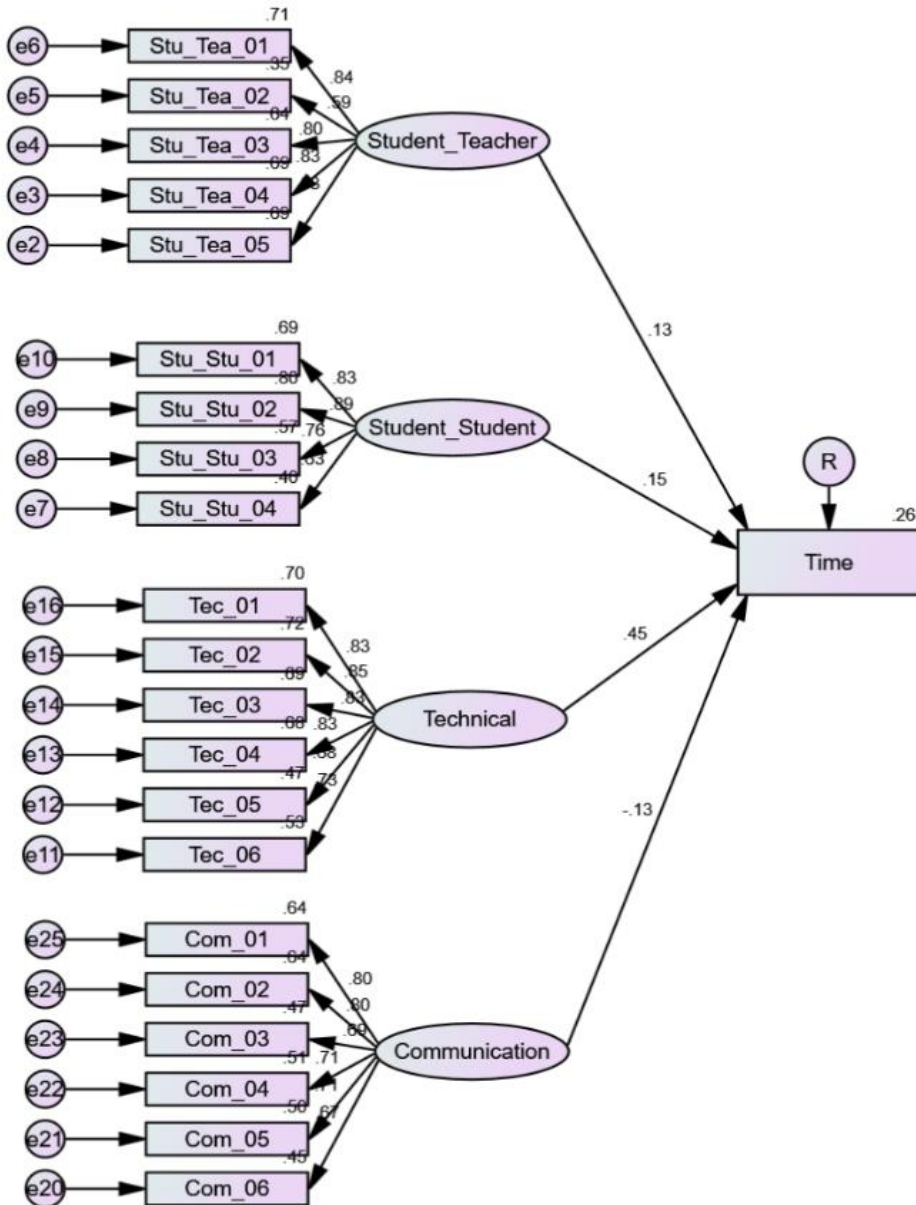


Figure 3. Structural Model

Table 4. Results of the Goodness of Fit of the Structural Model

| The goodness of the fit index | | Acceptable value | Observed Value |
|-------------------------------|---------|------------------|----------------|
| Absolute fit indices | CMIN/DF | 1-5 | 4.688 |
| | GFI | 0-1 | 0.765 |
| | AGFI | 0-1 | 0.711 |

| | | | |
|-------------------------|----------|-----|-------|
| | RMSEA | 0-1 | 0.109 |
| Incremental fit indices | TLI | 0-1 | 0.797 |
| | CFI | 0-1 | 0.819 |
| | RFI | 0-1 | 0.756 |
| | NFI | 0-1 | 0.782 |
| Parsimony fit indices | P.G.F.I. | 0-1 | 0.622 |
| | PRATIO | 0-1 | 0.892 |
| | PNFI | 0-1 | 0.698 |
| | PCFI | 0-1 | 0.731 |

Table 5. Results of the Regression Weights of the structural model

| Variable | Path Coefficients | Standardized Path Coefficients | Standard Error | Critical Ratio | P-Value |
|-------------------------------|-------------------|--------------------------------|----------------|----------------|---------|
| Social factor with teacher | 2.525 | 0.133 | 0.991 | 2.548 | 0.011 |
| Social factor with classmates | 2.449 | 0.147 | 0.876 | 2.795 | 0.005 |
| Technical factor | 8.432 | 0.454 | 1.007 | 8.374 | 0.000 |
| Communication factor | -2.365 | -0.126 | 0.996 | -2.374 | 0.018 |

According to table 4, the CMIN/DF value is less than 5 (4.688), and the R.M.E.S.A. value is less than 1. Parallely, all other goodness of fit indices is close to 1. Therefore, it can be concluded that the structural model is valid for further analysis.

Concerning the results in table 5, it indicates a significant positive relationship between social factors with the teacher and online education ($\beta = 0.133, P = 0.011$). Therefore, it implies that the teacher's social factor is positively influenced by online education. In addition, there is a significant positive relationship between the time ratio used in online education and social factor with classmates ($\beta = 0.147, P = 0.005$). Therefore, it can be concluded that the social factor with classmates positively influences the time ratio used in online education. Table 5 shows a significant positive relationship between technical factors and the time ratio used in online education ($\beta = 0.454, P = 0.000$). Further, it can be concluded with 95% confidence that the communication factor is

negatively influenced by the time ratio used in online education as it holds a significant negative relationship between two variables ($\beta = -0.126, P = 0.018$).

4. Conclusion and Recommendation

Concerning the analysis of this study, it was concluded that, online enrollment rate for academic activities varied from gender and year of sitting for the advanced level examination, which was demographic factors. Parallely, it was concluded that the time rate for engaging in online academic activities varied according to the level of education of siblings, which was an economic factor. Regarding the structural equation model developed to identify the impact of the social, communication, and technical factors on-time rate of engaging in online academic activities, there is a direct influence on the time rate by the following factors. They were social factors between students, social factors between students and teachers, and all other communication and technical factors. There

is a positive relationship between the time rate and social factors among students. Also, teachers and students have a positive relationship between time rate and social factors. Further, there is a positive relationship between time rate and technical factors. However, there is a negative relationship between the time rate and the communication factor. Though these relationships are moderate, the students have little experience deciding whether or not to agree with online education. However, these social, communication, and technical factors directly influence the usage of online education. Therefore, the structural equation model developed for these factors can be used for future forecasts as all the eligibility values satisfy the required levels.

Predominantly, a standard learning management system for all schools or at least one learning management system should be provided to establish an online education system to improve communication between students and teachers. Furthermore, it is suggested that an appropriate application can be introduced to the student community to ensure increased student engagement.

Online education is a novel experience for students and teachers alike. Therefore, teachers can provide proper training to improve teaching quality in an online mode of education. Moreover, it is suggested that the university and school students' progress can be evaluated by identifying a suitable online education system common to Sri Lanka. This will contribute to the preparation of Advanced Level students as well.

According to the Central Bank reports, the poverty rate is 4.1% in Sri Lanka. Therefore, Sri Lankan students lack the resources to engage in online education. The government can provide data packages for a reasonable price and improve the quality of internet connectivity in rural areas. Online learning can often be isolated as the learning process occurs in a virtual space. Therefore, Interactive learning sessions can be employed in the online teaching process to

maintain a proper relationship between the teacher and students.

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