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"IN PURSUIT OF EXCELLENCE TOGETHER"

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Table of Contents

Extended Abstracts

01. Accountancy and Management

02. Computing and Technology

03. Language and Literature

04. Agricultural Technology

Message from the Chief Guest

I am delighted to pen this note of felicitation to the 2nd Annual Academic Session of Advanced Technological Institute (ATI) Kegalle; ATIKAS 2022.

Research is undoubtedly the path to excellence. ATIKAS 2022, organised by ATI-Kegalle provides an ideal platform for the Sri Lanka Institute of Advanced Technological Education (SLIATE) community to share research-based knowledge and best practices at the institutional level. It is praiseworthy that the young academics of the institute are committed to fostering research culture and have initiated this virtual forum open for academics, professionals, and students affiliated to the institute. This very well falls within the SLIATE's vision to promote research among its members and facilitate a positive environment of learning and growth.

Furthermore, it is commendable that ATIKAS 2022 has extended its scope to include research contributions from other ATIs under SLIATE. This would be a positive step towards nurturing collaboration at the national level.

In conclusion, I wish to congratulate the organising committee of ATIKAS 2022. I am confident that the deliberations in this forum would not only contribute to the body of knowledge but would also present innovative ideas that could be put into practice and enhance the quality of the Teaching and Learning process.

I wish the forum great success.

Prof. C. Mahesh Edirisinghe

Director General

Sri Lanka Institute of Advanced Technological Education (SLIATE)

Message from the Chairperson

The members of the organizing committee and myself are very proud to present the "2nd Academic session 2022 Advanced Technological Institute- Kegalle (ATIKAS 2022)" under the theme of "In pursuit of excellence together". ATIKAS 2022 is a multidisciplinary forum which aims to promote a research culture among academics, professionals, and students affiliated to Sri Lanka Institute of Advanced Technological Education (SLIATE).

This multi-disciplinary research forum will provide valuable opportunities for top-notch research and an important platform much-needed for young researchers to present their latest research and share their best practices among their peers locally and internationally. I hope that this annual research forum will become more significant and more substantial every year.

Most of all, I thank the presenters, for brightening up ATIKAS 2022 by their presence. As it is the tradition with research forums, I hope you will enjoy the content and have a great discussion.

I would like to congratulate and appreciate the organizing committee of ATIKAS 2022 for their collective effort to make this event a reality amidst the challenges.

Finally, I wish ATIKAS 2022 a great success.

Ms. E. M. D. J. K. Ekanayake

Chairperson- ATIKAS 2022

Advanced Technological Institute-Kegalle -Academic Session 2022

Message from the Keynote Speaker

As the keynote speaker of the Second Academic Session of Advanced Technological Institute Kegalle (ATIKAS 2022), I am delighted to share my thoughts on identifying and developing the skills pursuit with excellence. It is a timely requirement for inculcating positive mindsets within individuals of their carriers in the development which would reflect in their performance in the business industry. The reflection in the industry highlighted a gap of recruiting capable individuals in assigning for job opportunities. A common contradictory statement could be highlighted from the business environment is "there are job opportunities within the industry without suitable individuals" and "there are individuals outside without job opportunities". Hence, it is important to look for remedies to bridge the gap within the educational system focusing on pedagogy and praxis studying the proper casualty.

Studies have demonstrated that nudge techniques can alter people's behaviour provided it is properly developed and administrated at the appropriate time and location. Indeed, it is important in addressing nudge method for a higher quality life and greater well-being as the immediate requirement of bridging the gap. Further, it is important to focus in developing research mindsets within the individuals in enabling the agile methodologies and developing skills, interest, values and talent as core competencies of individuals towards desired behaviours that the most visionary people practice in their exponential growths.

Dr. (Eng.) Sanath Divakara

Founder/ CEO

Educons Lanka (Pvt) Ltd

Visiting Lecturer – University of Kelaniya / SLIATE

Message from the Director (Planning & Research) – SLIATE

It is with much pleasure that I write this message for the Academic Session 2022 of Advanced Technological Institute- Kegalle (ATIKAS) which is a multidisciplinary forum that aims to promote the research culture among academics, professionals, and students affiliated with Sri Lanka Institute of Advanced Technological Education (SLIATE).

The theme of the second academic session is 'In pursuit of excellence together', which is a timely required theme for the sustainable development of the country especially during this economic crisis. As an academic institute, the development of research culture, sharing knowledge, best practices, experience, and innovations among researchers are much important. Thus, ATI Kegalle has given its attention to this academic requirement for the second time.

I am very much pleased to note that academic staff members of ATI Kegalle are highly motivated and involved in high-quality research with the objective of achieving the goals of the institute and the national development goals of Sri Lanka.

I wish to congratulate Director, ATI Kegalle, and the organizing committee for their untiring effort in organizing the ATIKAS research session. I hope this session will provide a stage for the presenters, scientists, professionals and academics to present their research under the theme of "In pursuit of excellence together" and also provide opportunities to exchange knowledge and ideas to develop research collaborations.

I wish this research session all the success.

Dr. W. B. K. Bandara

Director (Planning & Research)

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A Study on Career Preferences of Generation Z
(Special reference to HNDA undergraduates of Advanced Technological Institute-Kegalle)

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Abstract

Currently, Generation Z is beginning to enter the workforce. This study presents the preliminary findings of a study that intends to investigate the job interests of Generation Z, focusing on students pursuing the Higher National Diploma in Accountancy (HNDA) at the Advanced Technological Institute, Kegalle. The main objective of this study is to add to the existing theoretical and empirical work by looking at the factors related to work-related expectations and behaviors known to affect Generation Z in other countries also affect Generation Z in Sri Lanka. The researchers have adopted a quantitative methodology. Based on the sample of 205 HNDA students, the results indicate a few highlighting facts which will be considered by generation z in their decision-making related to their careers. The findings of this study decrease the existing knowledge gap to an extent and as a preliminary study in the Sri Lankan context, this study set the foundation for future researchers.

Keywords: Generation Z, Career Expectations, Generational Studies

INTRODUCTION

Sociologists have long noted the value of generational studies, and for many years, researchers have looked for the unique characteristics of different generations. Some scholars like Giancola (2006) suggest that "the generational approach may be more popular culture than social science". It is an "identifiable group that shares birth years, age, location, and significant life events at critical developmental stages" (Kupperschmidt, 2000). The generations' backgrounds impact their sentiments toward power and associations, what they want from work, and how they plan to fulfill those wishes (Kupperschmidt, 2000).

According to MacKenzie & McGuire (2016) and Wiedmer (2015) dominant characteristics of different generations have been presented in below table.

Table 01: Characteristics of different generations

Generation	Born Year	Dominant Behavioral Characteristics
Traditional	1900-1945	Loyal and discipline
Baby boomers	1946-1964	Responsible, strong work ethics
Generation X	1965-1980	Independent thinkers, efficient
Generation Y	1981-1994	More social, confident, less independent
Generation Z	1995-2012	Poor communication skills, extensively engaged to technology

Many studies have been conducted on the various generational groups in the workforces in different countries, which are claimed to differ in ways that managers should be aware. (Macky et al.2008). Based on the literature, five discussions on generations can be identified in the workforces, namely, Silent Generation, Baby boomers, Generation X, Generation Y & Generation Z. Generation Y was the primary focus of researchers from all over the world (Ex: Alch, 2000; Bennett et al., 2008; Eisner, 2005; Wesner & Miller, 2008; Berry et al., 2010; King et al., 2011; Chung, 2012, Arora et al.,2019) throughout the past two decades, since it represented the youngest talent pool entering the workforce. Today, the newest generation- "Generation Z" has already started their higher studies and working in their first employment. Therefore, it's researchable to study the values, motives, attitudes to work, and career expectations of generation z. From all around the world, researchers have started to explore facts related to generation z. But in Sri Lankan context, no study has been conducted. So, it is essential to conduct a preliminary

study to identify the crucial factors related to generation in Sri Lanka. Researchers from all over the world have already set the foundations for those studies.

The main objective of this study is to add to the existing theoretical and empirical work by looking at the factors related to work-related expectations and behaviors known to affect Generation Z in other countries also affect Generation Z in Sri Lanka. Students following the HNDA course at the Sri Lanka Institute of Advanced Technological Education is a segment representing generation z. Therefore, it is rational to investigate their characteristics to set a basic foundation for further studies related to generation z in the Sri Lankan context.

The findings of this study decrease the existing knowledge gap to an extent and as a preliminary study in the Sri Lankan context, this study set the foundation for future researchers. "Decent Work and Economic Growth" is a United Nations Sustainable Development goal. To achieve that goal as a country, it is vital to have a clear picture of the country's potential and emerging workforce. The findings of this study will be helpful in that case too. And as a country which is taking a new beginning against the economic Crisis, to use the workforce efficiently, having an idea about the career expectations of potential workforces will be helpful to policymakers.

METHODOLOGY

The researchers adopted a quantitative methodology. To achieve the objectives of the study, researchers have adopted a survey-type study, following prior researchers who have conducted the same type of study (Ex: Kirchmayer, 2017)

This study is on Generation z. Researchers have selected students following the Higher National Diploma in Accountancy at advanced Technological Institute, Kegalle, as the referring segment of generation z for this study. Therefore, this population comprises students currently following Higher National Diploma in Accountancy (HNDA) at the Advanced Technological Institute, Kegalle (Sri Lanka). According to the institutional records there are 298 registered students under HNDA program (Full time and Part time) at ATI Kegalle. According to the suggested sample sizes for given population in the book of Sekaran & Bougie 2010 (as cited from Krejcie & Morgan, 1990), a sample of 165 responses is a reasonably representative sample of a population of 298. The sample for this study consisted of 205 students currently studying toward their HNDA. Researchers have used a random sampling technique to select the sample. Based on the previous literature review, the target respondents for the sample were defined as HNDA students born in 1995 or later, with no limitations regarding the mode of study (full-time versus part-time).

In exploring the career expectations of HNDA students, the respondents were asked to assess the importance of a set of factors in four phases of the employee-employer relationship: 1) decision-making in the process of searching for potential employers, 2) career expectations, 3) retention, and 4) work satisfaction. The same set of factors was considered by Kirchmayer (2017) in a study which explored the career expectations of university students (generation z). Following Kirchmayer (2017), Researchers assessed all the factors on a 5-point scale. In the questionnaire, respondents were asked to assess to the importance of each factor on a scale ranging from 1, meaning "this factor is not important at all," to 5 meaning "this factor is of crucial importance". Collected data have been transferred to MS Excel spreadsheet to obtain descriptive statistics. The importance of individual factors in the four phases of the employer-employee relationship was based on calculating mean values for all answers within each factor. Since this is a preliminary study, researchers have not performed any further statistical analyses.

RESULTS AND DISCUSSION

Researchers issued 250 questionnaires and received 220 responses. 15 responses were rejected as those are incomplete. There are full-time and part-time students following HNDA at the advanced Technological Institute, Kegalle (Sri Lanka). 95% of the respondents are full-time students and 5% of the respondents are part-time students. And 80% of respondents do not have any working experience. 15% of respondents have working experience of less than one year and the balance 5% have working experience between 2-5 years. Here, in calculating working experience, not only full-time assignments but also part-time assignments were also considered.

Table 2 displays the results for each factor within each of the four phases. It includes the calculated mean values, standard deviations and ranks of each factor according to calculated mean values.

Table 02: Summary of data analysis

Search for a Future Potential Employer							
Factors	**Mean**	**Std. Div**	**Rank**	**Factors**	**Mean**	**Std. Div**	**Rank**
Opportunity for fast career growth	4.0	0.65	4	Benefits	4.0	0.61	4
Training & development opportunities	4.8	0.54	2	Work flexibility	4.9	0.56	**1**
Job security	4.8	0.58	2	Possibility to travel abroad	4.9	0.81	**1**
Work-life balance	4.7	0.56	3	Organizational values and CSR	3.4	0.78	6
Nature of job	3.2	0.56	7	Image of the organization	3.5	0.80	5
Career Expectations							
Factors	**Mean**	**Std. Div**	**Rank**	**Factors**	**Mean**	**Std. Div**	**Rank**
A job that yields internal satisfaction	4.7	0.78	**1**	Autonomy in what I do	4.6	0.80	2
A secure job	4.7	0.76	**1**	Good social life related to work	4.6	0.76	2
Good reward and wealth	4.6	0.76	2	Good relationship with boss	1.6	0.80	3
Development of skills and proficiency	4.7	0.74	**1**	Work-life balance	4.7	0.79	**1**
Job Retention							
Factors	**Mean**	**Std. Div**	**Rank**	**Factors**	**Mean**	**Std. Div**	**Rank**
Image of the organization	4.2	0.76	4	Autonomy	4.1	0.81	5
Job security	4.2	0.65	4	Organizational culture and values	4.1	0.76	5
Work-life balance	4.8	0.65	**1**	Flexible working time	4.5	0.60	3
Reward	4.8	0.79	**1**	Good relationship with the boss	1.5	0.78	6
Possibility to work on interesting assignments	4.7	0.80	2	Friendly work environment	4.5	0.61	3
				Social life related to work	4.1	0.67	5
Job Satisfaction							
Factors	**Mean**	**Std. Div**	**Rank**	**Factors**	**Mean**	**Std. Div**	**Rank**
The feeling that I have impact	4.7	0.86	3	Financial reward	4.7	0.66	3
Possibility to help others	4.7	0.70	2	Training and development	4.9	0.57	**1**
Interesting and diverse job	4.7	0.63	2	Problem-solving	4.7	0.76	3
Success	4.9	0.56	**1**	Being a member of a motivated team	4.7	0.69	3
Recognition	4.7	0.64	3	The feeling of contributing to something meaningful	4.7	0.79	3

Respondents imagine that the possibility to travel abroad (4.9) along with work flexibility (4.9) is going to be the most substantial factor when they select their future employers, followed by job security (4.8), training and development (4.8) and work-life balance (4.7). And it seems that organizational culture-related factors like the nature of the job (3.2), Organizational values and CSR (3.4), and the image of the organization (3.5) play a leading role in terms of Generation Z's search for future employers.

And in the case of career expectations, it's look like all the identified factors other than "good relationship with the boss" (1.6) will be considered highly by respondents in making their decisions. In such cases, A job that yields internal satisfaction, A secure job, development of skills and proficiency and Work-life balance are the most considering factors.

With very little experience / without any experience majority of respondents have imagined work life balance (4.8), Reward (4.8) and the Possibility of working on interesting assignments followed by flexible work time (4.5) and friendly work environment (4.5) are most important factors in taking decisions related to the job retention. Surprisingly, most respondents believe that having a good relationship with the boss (1.6) is not important when making job retention decisions.

Finally, most respondents believe that all these considered factors (Financial reward, Training and development, Problem-solving, Being a member of a motivated team, The feeling of contributing to something meaningful) will be the deciding factors of their job satisfaction because the mean value of each factor is greater than 4.7.

CONCLUSION

When a new generation joins the workforce, supervisors frequently have trouble comprehending the new group (Gelbart and Komninos 2012) Nowadays, a new generation is entering the world of work and thus attracts its attention. Therefore, researchers are trying to fulfil that existing research gap through this study.

The results of this study indicate some critical aspects of generation Z. It Looks like respondents are not considering more about organizational cultural factors like Organizational values and CSR, image of the organization, etc in their decision makings related to career life. This finding is consistent with Kirchmayer,(2017). Kirchmayer,(2017) conducted that study using a sample of university students from generation z. And in this study, most respondents have marked the "Possibility to travel abroad" as a high considering factor. But in the study of Kirchmayer,(2017) that has not been indicated. The Crisis of the country may be the reason for this significant indication. And that also becomes another researchable area as going for a foreign job may create many economic and social impacts within households and society. Further, according to these respondents, Generation Z mainly considered personal skills development opportunities, social life and work-life balance in making decisions related to their careers. On the other hand, according to the results, in job retention and career expectations the respondents are not considering the fact "having a good relationship with the boss". That will be a red notice to the supervisors of Generation Z and the supervisors have to be adopted with these facts to manage this workforce well.

The preliminary findings in this research provide an early glimpse of how Generation Z will perceive many aspects of the workplace in the future. Anyway, the research sample was not diverse to have a broad picture of generation z because all of the respondents included in this part of our study are currently enrolled at the same institute. Therefore, additional research using various samples must strengthen and confirm the findings. These findings will provide the foundation for future studies related to generation Z.

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Factors Influencing on Capital Structure of Listed Manufacturing Companies in Sri Lanka

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Abstract

This study investigates the capital structure of manufacturing companies listed in the Colombo stock exchange, Sri Lanka, in order to find out factors influencing on capital structure. Choosing the optimal capital structure is one of the major influencing factors for the development of each company. Researcher choose the manufacturing sector listed companies as a sample, because the sector has grown faster and a number of companies is also more than any other sector in Sri Lankan economy. Further, the contribution of the manufacturing sector to total Gross Domestic Product (GDP) also higher and compare with other companies manufacturing industry is the important one in the country's economic development. Researcher selected 33 listed manufacturing companies in the Colombo stock exchange (CSE) as a sample for ten years from 2010 to 2019 to this research purpose. Base on listed life time, companies were divided as three groups, such as group A, B and C for the comparison purpose. It was tested on the basis of the tradeoff theory and pecking order theory. Findings of this study are, group A companies shows that profitability and growth rate significantly influenced on debt to equity and long-term leverage but firm size is insignificant with these two dependent variables. But, in case of group B and C companies, profitability, growth rate and firms size not significantly influence on debt to equity and long-term leverage. It explains that well experienced companies with longer listed life in the CSE prefer the equity capital than the debt capital. It is largely consistent with the past empirical finding also. Findings should help corporate managers and decision makers to make optimal capital structure decisions.

Key Words: Profitability, Growth Rate, Firm Size, Leverage

INTRODUCTION

An ideal composition of capital structure which consists of debt and equity will minimize the cost of capital and maximize the firm's value. Therefore, it is important for the firm's manager to understand the theory of capital structure. To understand how firms in developing countries finance their operations, it is necessary to examine the determinants of their financing or capital structure decisions. Capital structure is one of the effective tools of management to manage the cost of capital. An optimal capital structure is reached at a point where the cost of the capital is minimum.

Firm's capital structure decision can be viewed from the capital structure theories. The theory of business finance in a modern sense starts with the Modigliani and Miller (1958) capital structure irrelevance proposition. Before them, there was no generally established theory of capital structure. The debate about how and why firms choose their capital structure began in 1958 (Myers, 2001), when Modigliani and Miller (1958) published their famous arbitrage argument showing that the market value of any firm is independent of its capital structure.

Research Problem
In order to identify which of the determinants of capital structure that have significant effect on capital structure based on trade off and pecking order theories in the context of Sri Lankan firms, this research concentrates on a group of variables identified in the previous literature.

Researcher choose listed firms in the manufacturing sector as a sample because the sector has grown faster, contribution of the Gross Domestic Product and number of companies also more than other sector in Sri Lankan economy. The companies listed life time (experience) also influencing their capital structure decision. (Evans, 1987 and Siti Rahmi Utaami, 2012). In Sri Lanka, the above research work carried out by some authors in different periods. Even though, no one researches carried out as inter comparison among the listed manufacturing companies based on their listed life time in the Colombo stock Exchange. This is identified as research method gap. Therefore, in the light of trade off and pecking order capital structure theories the research problem could be stated and analyzed as follows.

"How far the factors influencing on capital structure based on listed life time of manufacturing Companies in Sri Lanka?"

Research Question

Researcher found the research problem through various literatures and based on the research problem the following research questions were formulated.
- Is there any significant influence between the influencing factors and capital structure of the listed manufacturing companies in Sri Lanka?
- Whether the listed life time of the manufacturing companies determine the capital structure decision?

Research Objective

The fundamental objective of this study is **"To find out the significant factor's influence on capital structure based on listed life time of manufacturing Companies in Sri Lanka"**

Literature Review

The variables used in this study and their measurement are largely adopted from existing literature. Debt-Equity ratio (D/E R), and long –term debt ratio (LTDR), are dependent variables and profitability (PROF), growth rate (GWRA), and firm size (FSIZE) are independent variables in this study. Pecking order theory of the corporate capital structure has long root in the literature given by Myers in 1984. Pecking order theory predicts the hierarchy of preference in which firms prefer internal financing e.g. retained earnings to external financing and prefers debt to equity. Trade-off theory states that there are benefits of financing with debt i.e. tax shield benefit, agency benefit and there are also costs of funding with debt e.g. costs of financial distress, agency costs.

Previous Studies on factors influencing on capital structure in Sri Lanka

It is worth reviewing the previous studies on Sri Lankan companies that are related to leverage and capital structure. Samarakoon (1997) investigated the ability of market beta, book - to –market equity, leverage and earning price ratio to explain the cross-sectional variation in expected returns in Sri Lanka. Senerathne (1998) tested the applicability of pecking order theory of financing in Sri Lanka. The results suggested that Sri Lankan companies follow the pecking order partially. Colombage (2005) empirically investigates the capital structure of Sri Lankan companies and finds that the financing trend of Sri Lankan firms confirms the pecking order hypothesis to a greater extent than predictions of information asymmetry and static tradeoff consideration. Vijayakumaran and Sunitha (2011), Buvanendra (2013) Ajanthan (2013), Kasthury and Ananthasayanan (2019) Mayuri and Lingesiya (2019) and Amjath and Sufeera (2021) also found this result.

METHODOLOGY

Independent Variable   Dependent Variable

Factors	**Capital Structure**
Profitability	Debt to Equity
Growth Rate	Long-Term Leverage
Firm Size	
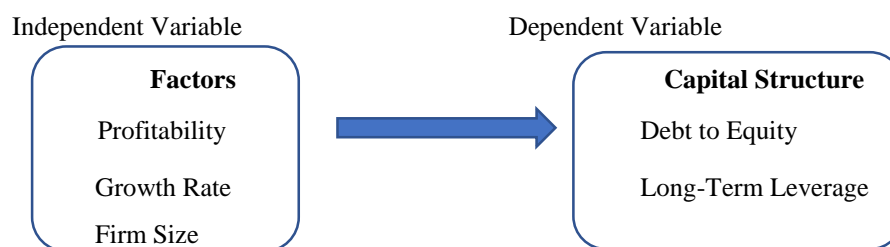
Figure 1. Conceptual Framework

Hypothesis

The following hypotheses were formulated based on the research problem and objective.
H1: Firm's profitability significantly influenced on Debt to Equity
H2: Firm's growth rate significantly influenced on Debt to Equity
H3: Firms Size significantly influenced on Debt to Equity
H4: Firm's profitability significantly influenced on long term debt
H5: Firm's growth rate significantly influenced on long term debt
H6: Firms Size significantly influenced on long term debt

Operationalization

Key concepts and variables used in the conceptual frame work are operationalized as follows:

Table 1: Operationalization

Concept	Variable	Indicator	Measurement (Ratios)
Capital Structure	Debt-Equity	Debt to Equity ratio	Long term Debt / Total Equity
	Long – term Leverage	Long term debt ratio	Long term Debt / Total Assets
Influencing factors on Capital Structure	Profitability	ROTA ratio	Earnings Before Interest and Tax / Total Assets
	Growth Rate	M/B ratio	Market Value of Assets / Book value of Assets
	Firm Size	Sales Value	Log of Sales value

Research Sample

Manufacturing companies which were listed under Colombo Stock Exchange (CSE) were selected as a sample of this study and 33 companies were selected randomly with 10 years financial data representing the periods of 2010-2019 based on the dada availability and time period taken for the study.

Table 2: Number of companies based on the Life Time

Group	Number of companies	Percentage
A	16	49%
B	15	45%
C	2	6%
Total	33	100%

(Source: Colombo Stock Exchange Reports)

RESULT AND DISCUSSION

The secondary data was collected and used from the annual financial reports of listed companies published by the Colombo Stock Exchange for the study.

For the data presentation and comparisons purpose selected companies were categorized into three groups based on their life time. (Evans, 1987 and Siti Rahmi Utaami, 2012).

Table 3: Life time of the companies

Group	Life time (years)
A	10-26
B	27-43
C	44-61

(Source: Colombo Stock Exchange Reports)

For the data analysis purpose, the researcher used Multiple Regression analysis (OLS model) and statistical software "EViews 8" was used to analyze the panel data.

In order to test the hypotheses, and motivated by the literature on capital structure, researcher estimate the following models. Fitness of these models were tested for each group of companies separately based on their life time.

Model – I
$$D/E\ R_{i,t} = \beta0 + \beta1\ PROF_{i,t} + \beta2 GWRA_{i,t} + \beta3\ FSIZE_{i,t} + \varepsilon$$

Model – II
$$LTDR_{i,t} = \beta0 + \beta1\ PROF_{i,t} + \beta2 GWRA_{i,t} + \beta3\ FSIZE_{i,t} + \varepsilon$$

Where, $\beta0$ = constant variable
$\beta1, \beta2, \beta3$- Model coefficients of variables
ε = Error term and i,t = for firm i in period t

Testing of Model Fitness and Hypothesis for Each group of companies

Coefficient of determination for models 1, 2, would be the value between Debt to equity, long-term leverage, as dependent variable profitability, growth, and firm size as predictors.

Factors influencing on Debt to Equity and Long-term Leverage

Table 4: Group A Companies with Debt to Equity

Included observations: 160

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.108987	0.773341	-0.140930	0.8881
PROFITABILITY	-1.073801	0.306541	-3.502959	0.0006
GROWTH	0.062188	0.024150	2.575061	0.0110
FIRM_SIZE	0.047277	0.086640	0.545675	0.5861
R-squared	0.093501	Mean dependent var		0.318687

Table 5: Group A Companies with Long term Leverage

Included observations: 160

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.118933	0.204463	-0.581688	0.5616
PROFITABILITY	-0.298558	0.081046	-3.683810	0.0003
GROWTH	0.028458	0.006385	4.457032	0.0000
FIRM_SIZE	0.025863	0.022907	1.129067	0.2606
R-squared	0.135679	Mean dependent var		0.135436

Based on the analyzed result of Group A companies, growth has a positive highly significant regression coefficient on debt to equity and long term leverage with 0.0110 and 0.0000 at 0.05 significant level and 2.575 and 4.457 t-values respectively, profitability has a negative highly significant regression coefficient on debt to equity and long term leverage with 0.0006 and 0.0003 at 0.05 significant level and -3.502 and -3.683 t-values respectively, Firm Size has a positive insignificant regression coefficient on debt to equity and long term leverage with 0.5861 and 0.2606 at 0.05 significant level and 0.545 and 1.129 t-values respectively, so according to this result, hypotheses 4, 5 are accepted and 6 is rejected.

Coefficient of determination result of A group companies 9.3% of debt to equity, 13.5 % of long-term leverage could be explained by the existence of those independent variables.

Table 6: Group B Companies with Debt to Equity

Included observations: 150

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.707671	9.555563	0.597314	0.5512
PROFITABILITY	0.446028	7.164401	0.062256	0.9504
GROWTH	-0.005966	0.325206	-0.018346	0.9854
FIRM_SIZE	-0.555283	1.062597	-0.522572	0.6021
R-squared	0.002506	Mean dependent var		0.713422

Table 7: Group B companies with Long term Leverage

Included observations: 150

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.800210	0.397719	2.012000	0.0461
PROFITABILITY	-0.391806	0.298194	-1.313928	0.1909
GROWTH	0.015725	0.013536	1.161714	0.2472
FIRM_SIZE	-0.069260	0.044227	-1.566012	0.1195
R-squared	0.081009	Mean dependent var		0.178061

In case of Group B companies, profitability has positive and growth and firm size has a negative insignificant regression coefficient on debt to equity with 0.9504, 0.9854, and 0.6021 respectively at 0.05 significant level and 0.062, -0.018, -0.522 t-values respectively. Hypotheses 1, 2 and 3 are rejected. Growth ha positive and profitability and firm size has negative insignificant regression coefficient on long term leverage with 0.2472, 0.1909, and 0.1195 respectively at 0.05 significant level and 1.161, -1.313, -1.566 t-values respectively and hypotheses 4, 5 and 6 are rejected.

Coefficient of determination result of B group companies 0.25% of debt to equity, 8.1 % of long-term leverage could be explained by the existence of those independent variables.

Table 8: Group C companies with Debt to Equity

Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.799182	2.762872	0.289258	0.7761
PROFITABILITY	0.582463	0.593588	0.981258	0.3411
GROWTH	-0.053343	0.071913	-0.741768	0.4690
FIRM_SIZE	-0.051586	0.317517	-0.162466	0.8730
R-squared	0.110247	Mean dependent var		0.321272

Table 9: Group C companies with Long term Leverage

Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.003854	0.451574	-0.008535	0.9933
PROFITABILITY	0.055375	0.097018	0.570773	0.5761
GROWTH	-0.014721	0.011754	-1.252460	0.2284
FIRM_SIZE	0.011863	0.051896	0.228585	0.8221
R-squared	0.130936	Mean dependent var		0.088189

Analysis result of Group C companies, growth has a negative insignificant regression coefficient on debt to equity and long-term leverage with 0.4690, 0.2284 respectively at 0.05 significant level and -0.741, -1.252 t-values respectively. Hypotheses 1, 2 and 3 are rejected. Profitability has positive insignificant regression coefficient on debt to equity and long-term leverage with 0.3411, 0.5761 respectively at 0.05 significant level and 0.981, 0.570 t-values respectively and hypotheses 4, 5 and 6 are rejected.

Coefficient of determination result of C group companies 11% of debt to equity, 13 % of long-term leverage could be explained by the existence of those independent variables.

FINDING AND CONCLUSIONS

This study results also shows that Sri Lankan companies follow the pecking order partially. It was largely consisting with the past empirical findings of the previous researchers. Among these group of companies, group C companies' debt to equity is explained more by independent variables than group A and B. Group A companies has less experience in the industry and profitability and growth rate of the company significantly influence on debt to equity and long-term leverage other than the firm size. This suggests that high profit firms are less likely to use debt for financing their investments than low profit firms by negative relationship of profitability. And high growth firms are more likely to use debt for financing purpose because of positive relationship. It indicates, less experienced companies (group A) in the manufacturing industry in Sri Lanka prefer to finance their assets by equity fund and debt based on their profit level. It indicates, more experienced companies (group B, in compare with group A) in the manufacturing industry in Sri Lanka prefer to finance their assets by equity than debt. It indicates, well experienced companies (group C) in the manufacturing industry in Sri Lanka prefer to finance their assets by equity fund than the debt. Well experienced companies (group B and C), all the factors have not significant regression co-efficient on debt to equity and long-term leverage. It indicates experienced companies prefer the equity capital than debt capital. Thus, well experience manufacturing companies follow the pecking order theory in Sri Lanka.

More profitable companies would tend to have fewer debts, since they use the retained earnings rather than debts. This evidence is support to the pecking order theory based on the relevant determinant of profitability variable. Therefore, it could be concluded that implication of pecking order theory is more relevant than trade off in Sri Lankan context. Therefore, it is better to follow the pecking order theory by the listed manufacturing firms in Sri Lanka.

It was largely consist with the past empirical findings of Senerathne (1998), Colombage (2005), Champika and Gunaratne (2007), Gamini (2008), Pirakalathan(2010), Yogendrarajah and Sangeetha (2011), Silva and Ranjani (2010), Vijayakumaran and Sunitha (2011), Lingesiya (2012), Buvanendra (2013), Buvanendra (2013) Ajanthan (2013), Sangeetha and Sivathaasan (2013), Vijeyaratnam and Anandasayanan (2015). Sithy Safeena Hassan (2015), Kasthury and Ananthasayanan (2019), Mayuri and Lingesiya (2019) and Amjath and Sufeera (2021).

Chief executive officers and finance managers of the companies can consider the findings of this research to make appropriate capital structure decisions that best fit their respective firms' financing needs. Lenders also should consider the capital structure determinant variables studied above to evaluate and predict the profit level and risk associated with lending capital to their respective borrowers. Finally, this study helps to policy makers at different levels for designing the policies which guide organizations to develop their market capitalization.

This study covers only selected factors for 10 years data from 2010 to 2019 and listed manufacturing sector companies only. Future researches may consider the entire sectors listed under the Colombo stock exchange and comparative analysis can be done among various sectors. They may consider more than ten years data and can do this study in current economic conditions of Sri Lanka also. Further, researches can be done by including companies in various countries and the Sri Lankan companies can be compared with those foreign companies.

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Impact of Term Deposits Determinants on Term Deposits Demand in Financial Institutions

Empirical Evidence from Financial Sector in Sri Lanka

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Abstract

This study builds a macro-micro economic model to test the relationship between demand for term deposits of a financial intermediary with bank specific determinants, industry specific determinants and macroeconomic indicators, and tested it using panel data of term deposits of fifteen financial institutions in Sri Lanka. The model predicts the demand for term deposits as a function of liquidity, interest rate, income level of people and total asset of the firm. The most prominent findings from estimating this combined function is total asset and cash are the most determining factors of term deposit demand where interest rate and income level which tested through GDP1 give fairly insignificant results. The reason for this insignificance has been identified as the implications in applying macro information and micro information in one single function in practical aspects.

Keywords: Term Deposits, Financial Institutions, Bank Specific Determinants, Industry Specific Determinants and Macroeconomic Indicators

INTRODUCTION

The global financial crisis results created an uncertainty in the financial market where investors are in the question of where to invest their excess money. Even though earlier investors initial intention was to maximize return and there by investors mostly liked stock market and other related investment option which are highly risk but which had a term deposits which are a safer place to park investor's excess money as stock market and most of other investment alternatives continuously deal with the Global Financial Crisis aftermath. Banks also making good portion from these term deposits as bank do not have to buy more expensive money from the whole sale money market. Therefore it's a win - win situation.

Term deposit is one of the most famous ways of investment by most of the ordinary financiers. Normally investors plan their place of investment, amount of investment, time of investment by considering lot of factors. Accordingly, investment planning focuses on identifying effective investment strategies according to an investor's risk appetite and financial goals. This begins after investors have taken into account their current and expected income level and have put down their financial goals.

Most of the studies in the financial markets are based on the assumption that the markets are efficient and the investors are rational (Dann et.al. 1977), nevertheless in the actual market, people not merely are rational. Investors hardly take high risk, uncertain, unpredictable hazards in decision making and they would not just stop at high return investments. For this most obvious solution is the Term deposit. Because in one way this gives not sky-scraping rates but better rates and on the other way especially they give fixed return so people comfortable with invest in the Term deposits.

As a result of above mentioned sequence most of the investors will then tend to move into other investment options available in the market rather than keeping their money in Term deposits. Nevertheless, some of the customers are deemed to maintain Term deposits even though there are fluctuations in deposit rates, inflation rates and other micro economical fluctuations as well as internal or bank specific issues. This contradicting behaviour of investors can be studied by examining the impact of fluctuations in the amount of Term deposits held in different time periods in different financial institutions. Therefore, this research aims to study the various determinants of term deposits, identifying their significance and relationship with term deposit based on the behaviour of term deposit amounts of bank and financial institutions of Sri Lanka in different time periods.

METHODOLOGY

This study has been prepared grounded on collected secondary data from annual reports in Commercial banks as well as finance sector in Sri Lanka. For the sample of study, out of entire bank and financial system of Sri Lanka Researcher has selected 9 Commercial banks and 6 Finance companies for five financial years from 2014 to 2018 which maintain Term deposits, in deciding the term deposit, other macroeconomic indicators, and industry specific data and in deciding bank specific determinants.

The research findings were generated through the quantitative data analysis. Reviews were used to tabulate and analyze the data for quantitative data analysis. The data and sample were designated using percentages, means, and frequency distribution tables. The regression analysis test, which is utilized to test for any variances towards banks and financial businesses, was used to build associations among the independent and dependent variables.

Researcher developed a multiple regression model for the analysis. The variables are Bank Specific Determinants, Industry specific determinants, Macroeconomic indicators and term deposits amounts. Out of these, the independent variables will be Bank Specific Determinants, Industry specific determinants, Macroeconomic indicators, for the reason that the demand for term deposits not determine by merely interest rate but various other factors.

When forming the regression function combining to variables the function will be:

$$Y = ß_1 + ß_2 CASH\_V + ß_3 \, AVG\_IR + ß_4 \, GDP + ß_5 \, TA + U$$

Where;

Y = Term deposits amounts (Selected bank and finance industry)

$ß_1$ = Intercept (When the all available independent variables fluctuations are nil amounts of fixed deposits)

$ß_2 \, CASH\_V$ = Slope (responsiveness of term deposit amount when Bank Specific Determinant for liquidity position change by a unit)

$ß_3 AVG\_IR$ = Slope (responsiveness of term deposit amount when Industry Specific determinant change by a unit)

$ß_4 \, GDP$ = Slope (responsiveness of term deposit amount when Macroeconomic indicator change by a unit)

$ß_5 TA$ = Slope (responsiveness of term deposit amount when Bank Specific Determinant for size of the financial institution change by a unit)

U = Error term

RESULTS AND DISCUSSION

Correlation Analysis

Table 1: Correlation Analysis

Variable	Term Deposits	Cash	TA	TB
Cash	0.624			
	0.000			
TA	**0.789**	**0.910**		
	0.000	0.000		
TB	-0.102	-0.106	-0.152	
	0.392	0.366	0.198	
GDP	0.142	0.179	0.164	-0.723
	0.230	0.124	0.167	0.000

Source: - Calculations based on the annual report from selected financial institutions.

In analyzing the correlation relating to this model (Pearson correlation) have tested the condition of how independent variables are related to each other. According to the table 1, between cash and average interest rate as well as total asset and average interest rate the relationship is negative but it is representing a less value (weak negative). Furthermore, GDP with cash and GDP with total assets represent a positive relationship but with very less amount (weak positive). Those relationships demonstrate an imperfect relationship. But total assets with cash can be seen a multi co linearity of 91% which is likely to be high (strong positive). Therefore, there is a correlation between only cash and total assets out of all other independent variable combinations.

Coefficient Analysis

The data from the sample of 15 Financial Institutions are pooled for all five years (2014-2018). Different specifications of equations were estimated. In arriving at optimal situation, using different combination of variables has run the estimations. The estimated coefficients and summary statistics for regression is presented in below table.

Term Deposits = -28358597 (5.29 Cash) + 0.4150 TA + 4194346 TB + 0.00148 GDP

Table 2: Coefficient Analysis

Variable	Coefficient	SE. of Coefficient	P-value
Constant	-28358597	100213393	0.778
Cash	-5.29	1.55	0.001
TA	0.4150	0.0527	0.000
TB	4194346	5735751	0.467
GDP	0.00148	0.00647	0.820

Source: -Calculations based on the annual report from selected financial institutions.

Table 3: Regression Analysis: Term Deposits versus Cash, TA, TB, GDP

Source	Degrees of freedom	Adjusted SS	Adjusted mean sum of Square	F value	P value
Regression	4	6.0876E+17	1.52196E+17	35.46	0.000
Cash	1	5.00583E+16	5.00583E+16	11.66	0.001
TA	1	2.65881E+17	2.65881E+17	61.94	0.000
TB	1	2.29537E+15	2.29537E+15	0.53	0.467
GDP	1	2.83301E+17	2.24916E+14	0.05	0.820
Error	66	8.92087E+17	4.29244E+15	-	-

Source: - Calculations based on the annual report from selected financial institutions.

Table 4: Hypothesis Testing

Hypothesis	Test	F	P	Decision
CASH	Analysis of variance	11.66	0.001	Accepted
TA	Analysis of variance	61.94	0.000	Accepted
TB	Analysis of variance	0.53	0.467	Rejected
GDP	Analysis of variance	0.05	0.820	Rejected

Source: - Calculations based on the annual report from selected financial institutions.

The outcome of the designed model describes the significance of each of the independent variable in concerned with dependent variable (adj.R^2 is 65.8%) and how model can be used to understand the nature of relationship between bank specific determinants, industry specific determinants , macroeconomic indicators and demand for Term Deposit as well as to understand whether the bank specific determinants, industry specific determinants and macroeconomic indicators of a country perform as key factors in making investment decisions which are forced by the demand for Term Deposits. Total assets of a financial institution reflect 62% of significance level in determining Term Deposit amount and whereas income level of a country as well as liquidity position of the financial institution reflects 68% of significant. But average interest rate in that particular period is an insignificant amount. As well as incorporating TB with other independent variable there is no significantly impact to the adj. R.

CONCLUSION

This research has developed and tested a model of the demand for time deposits of fifteen Financial Institutions in Sri Lanka. It is the first time that a combination of all institution specific, industry specific and macro-economic indicator inclusive function has been developed and tested. The model, which was estimated for the period of 2014 to 2018, explained 66% of the variability in the annual changes of Term Deposits. The discussions of the outcome basically focus on the way how it meets the objectives of the research. The main objective of identifying the relationship between the behavior of liquidity of the firm, interest rate of the economy, income level of the people and total assets in the firm over Term Deposits demand and the impact on making key investment decisions. Then it confers about the reasons why the previous research results and this research results are contradicting. Finally, researcher has analyzed whether the outcome is compatible with some stated hypotheses or not.

Total asset and cash value (liquidity) are the most significant variables effect on Term Deposit demand where it represented a positive direction, income of the people (gross domestic product) variable is insignificant at approximately 38% (R^2) and have weak positive directions but average interest rate behavior of a country not have significant impact on Term Deposit demand where it was recorded a negative relationship.

Term Deposits = -28358597 - 5.29 Cash + 0.4150 TA + 4194346 TB + 0.00148 GDP

This provides evidence of existence of a linear relationship between the response Time deposits and the four explanatory variables (cash, average interest rate, GDP and total assets).

The most significant factor of this function is the total asset value. Hence the justification on why the total assets have a huge impact on Term Deposits is, a smaller sized financial institution has to generate fewer deposits in absolute terms to achieve the same deposit growth than a large bank, thus possibly favoring smaller banks in achieving higher deposit growth. But a larger bank with economies of scale as well as larger branch network might be able to better attract deposits. At the same time people more overly prefers a place where they can make their investment in safe. A company with large amount of assets means their business going concern at optimum and they can mitigate their risk factor by diversification.

These results suggest that Term Deposit demand is largely explained by both cash value and total asset of a firm which represent just the micro or internal information of a firm but macro factors of GDP and average interest rate (TB) is not good representations of Term Deposits.

As comparison with other research studies, certain limitation should be considered when interpreting the result. In order to prevent this limitation, some potential directions are suggested for future researchers. The first suggestion is that the future research should have larger size of sample. There are currently 71 listed financial institutes (licensed finance companies 46 and licensed commercial bank 25) in the Colombo Stock Exchange under above sector. But, this study covered only the 15 institutes in CSE. Therefore, additional investigation is required to examine all listed finance companies. The study covered only the listed finance Companies. Therefore, additional investigation is required to examine firms in the different sectors. The other suggestion for future research is that it should be conducted on different types of variables (sensitivity to economic and financial conditions, the size of long-Term Deposits, advertising, staff incentives etc.) This study focused only five-year period further study must include changes over long time period.

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Cloud Database Security issues: A Review

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Abstract

The newest advancement in the IT sector is cloud computing, commonly referred to as on-demand computing. Because of features like accessibility, scalability, and others, this technology is attracting a variety of organizations. In addition, there are significant security issues in cloud databases. In this work, we describe how to overcome several security issues in cloud databases, such as trust, authenticity, confidentiality, encryption, key management, multitenancy, and data splitting. Furthermore, cloud database as a way of improving the services of the cloud service providers when deployed.

Keywords: Cloud Computing, Privacy, Security, Cloud Database

INTRODUCTION

The concept of cloud computing implements with the advancement of the communication, digital data processing and changes in storage requirements. Simply described, using a network of remote servers connected to the internet, cloud computing is a method for processing, storing, and managing data on demand while only paying for what you really use. It provides access to a pool of shared resources instead of local servers (Ahmed and Hussan, 2018). Basically, the cloud service providers provide different cloud services to its users.

When using cloud computing, data is dispersed across several places as resources that may be accessed remotely by various users throughout the cloud. In cloud infrastructure, robustness and secure computing are extremely important. Any organization that tries to store data either on host files or on a public cloud loses the ability to have physical access to the servers housing its own data. This makes potentially sensitive data susceptible to insider assaults. Insider attacks are ranked as the sixth highest threat to cloud database, according to a recent report from the Cloud Security Alliance. Persons with physical access to data center servers must undergo extensive background checks in order to prevent dangers of this nature. Data centers must be regularly checked for any suspicious activity.

Architecture of the Clouds

Software as a Service (SaaS): This model gives browser-based software applications over the Internet. The client is not allowed to change the Infrastructure (operating systems, servers, storage and network). (Eugene, 2013)
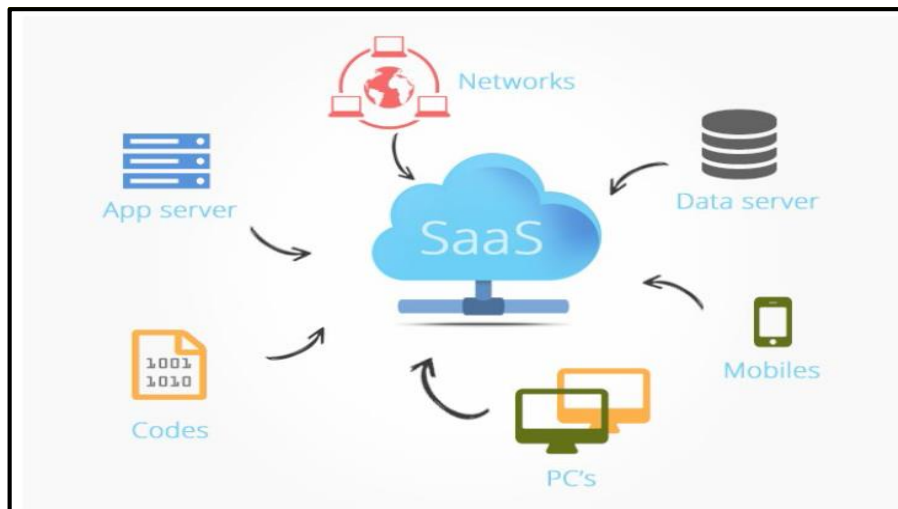
Figure 1. SaaS

Infrastructure as a Service (Iaas): It gives an online administration access to assets, for example, handling disk space, limit, and many others. The client is given the permission to install software in that infrastructure (Eugene, 2013).
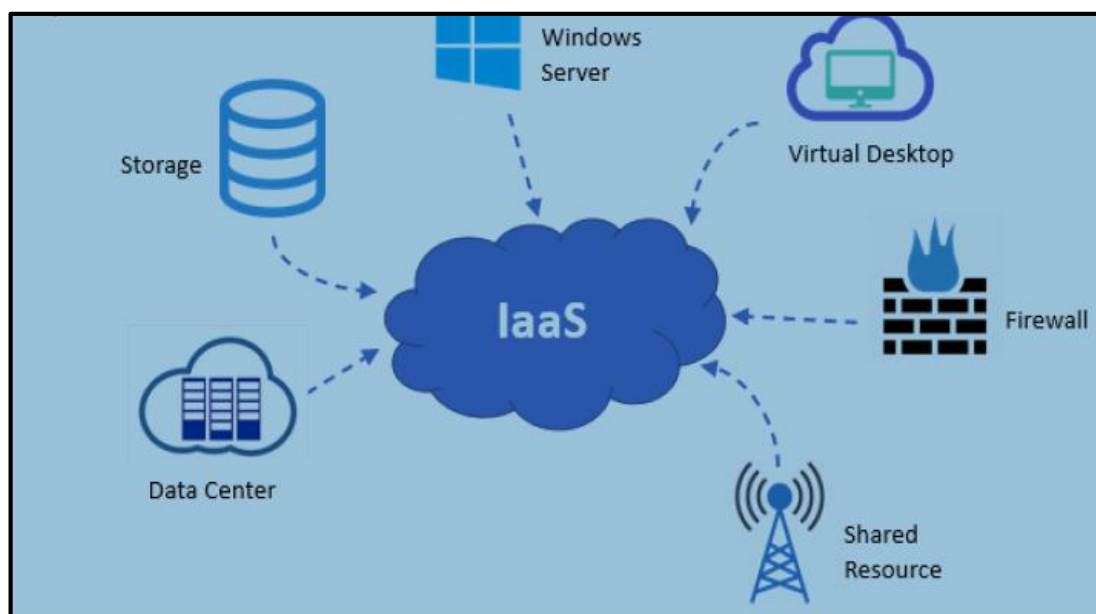

Figure 2: IaaS

Platform as a Service (Pass): In this model, developers are given an environment and platform empowering them to make services and applications accessible via Internet (Eugene, 2013).
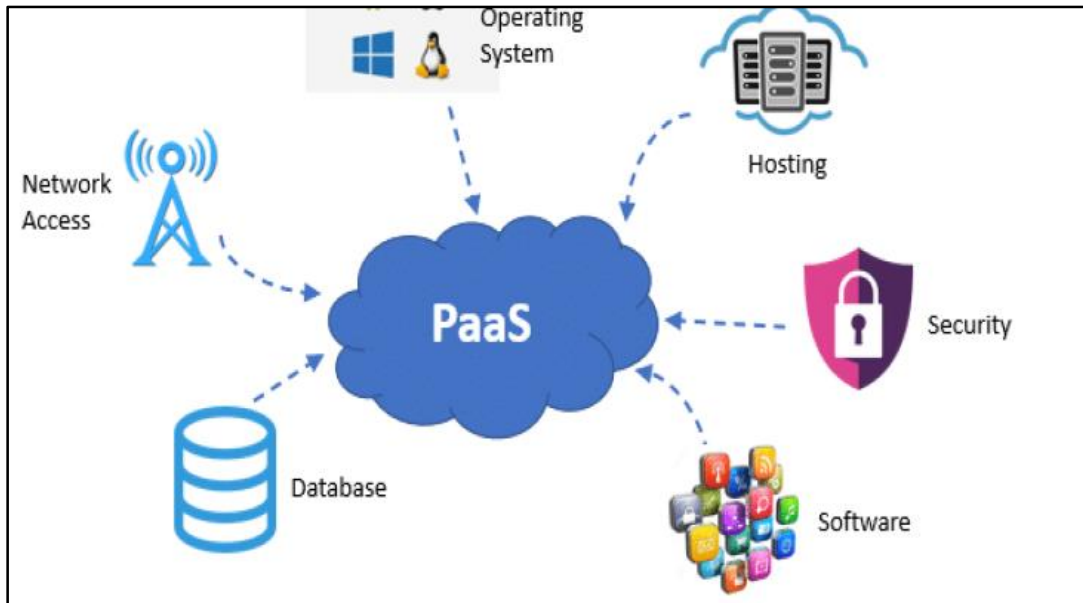
Figure 3. PasS

Database as a service (DBaaS): As a Service (DBaaS) is an operational and architectural paradigm that enables IT suppliers to provide database functionality as a service to a larger number of customers.
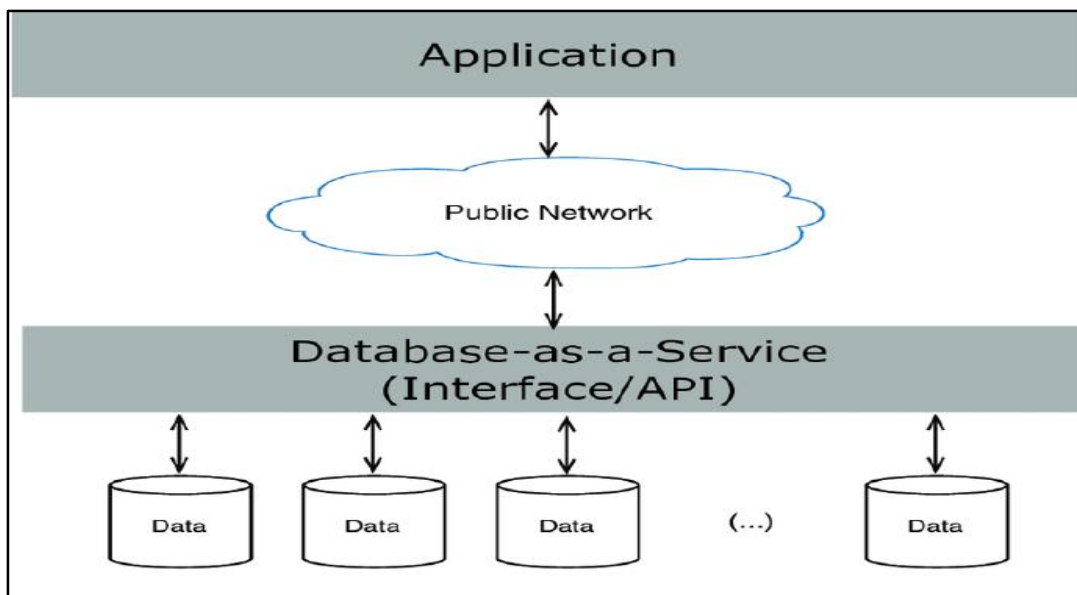

Figure 4. DBaas

Nowadays most of the industry-oriented people are focusing on the cloud database service. The term "cloud database" refers to a database service that is created and accessible using a cloud platform, performs the functions of a traditional database, and incorporates the most recent cloud computing technology. To implement the database, users may need to install software on a cloud infrastructure that they may access on demand.

Popular databases in cloud computing (Bhatti and Rad, 2017)
- StromDB
- PostgreSQL
- MongoLab

Google Cloud
- Google Cloud SQL
- GC Bigtable

- Google Cloud Datastore
- GC Spanner

Microsoft Azure
- MA Table Storage
- Microsoft Document DB
- Microsoft SQL Database
- Oracle Database
- IBM

Amazon
- DynamoDB
- Amazon Aurora
- Simple DB
- Amazon RDS

The reasons to move for the cloud database system are
- Virtual access, using a vendor's API or web interface
- Runtime capacity expansion of the database
- Flexibility to accommodate the changes
- Disaster recovery mechanisms

Since all those are positive measures it should be highly considered the security issues on the cloud databases. It is not possible to implement the security mechanisms as on traditional databases. Privacy, security, and ethical concerns are individually highlighted as three major difficulties in the cloud database paradigm, and there is yet no clear answer to address those concerns.

Database as a Service (DBaaS) has the following advantages:
- Flexibility to accommodate the changes.
- Cost savings
- Runtime capacity expansion of the database.
- Simpler, less costly management
- Software quality.
- Virtual access, using a vendor's API or web interface.
- Disaster recovery mechanism.

Although it is not possible to establish proper security methods as on traditional databases, it is possible that users should be worried about security issues on clod databases given that all of those are good actions. Security, privacy, and ethical concerns are examined separately as three common difficulties in the Cloud Database Paradigm, but no concrete solutions are identified to address them.

Literature Review

We are now talking about the security problems with cloud databases and the solutions that have been offered to fix them. The majority of researchers have researched the security concerns around cloud databases. They gave the means to address the problems to some extent by leveraging those facts. Let's look at a few research publications to gain a general sense of the security problems with cloud databases and how to solve them.

A. Cloud database security issues

Sharma and Sharma (2015): In this paper some obstruction and threat on the cloud database has been clearly analyzed and this paper gives privacy and security of cloud databases, possible attacks and the approach to make data secure on cloud databases. More probable attacks on the cloud database were described. SQL injection, cross-site scripting (XSS), man-in-the-middle attacks, denial-of-service attacks, and cookie poisoning are examples of such attacks. An adversary can completely take over the database for your web application by inserting arbitrary SQL code into a database query. An unauthorized person become able to get unauthorized access over the database stored in the cloud. Cross site scripting another malicious script in inserted into the actual web context which helped the enemy to gain the confidential information of the victim. Man, in the middle is tried to intrude between client and server to gain access of the data.

Izang, Adebayo, Okoro and Taiwo (2017): In this study reviewed the Ethical Issues in Cloud Computing and Cloud Databases and Legal and Regulatory Issue and Third-Party Involvement. Because in the contexts of cloud computing and cloud database the service providers should highly engage with the ethical and legal concerns about their users' secure data.

Arora and Gupta (2012): In this paper possible issues with cloud database development by highlighting database security and privacy. The risks of storing transactional data on unreliable host systems have been widely identified, and sensitive data should be encrypted before being transmitted to the cloud to avoid unwanted access.

In the review of researches on cloud database security issues, there were few researches were found related to Cloud database and most of them encounter the problem unauthorized access and modification of customers data. The solving techniques also found in their research. There were many security issues identified in cloud computing environment. Some important issues are listed below.

- Safety of Data Storage
- Data Theft by Authorized Users
- The Production Data and the Backup Data are both stored in the same physical location.
- Your Data Can Be accessed by a DBaaS Provider
- Attacks on the database's DDoS and performance
- Users from outside the company can access the database.
- Hidden Sensitive Data
- SQL Injection Attacks
- Neighbor Tenants Can Access Data
- DBaaS Regulatory Compliance

Nayak and Mishra (2015) suggested in their study of "Cloud database security" that cloud database security is an important concern when accessing the database by clients. The unauthorized access of cloud database is the main issue for the customers and their confidential. In addition, the study noted that various user identification and credential management practices are used in the cloud computing environment to prevent unwanted access. An Adaptive Encryption Technique in cloud database services was designed to address this issue. It could increase the trust of cloud customers on data storage. Also reduces the computation cost and also increased CPU utilization.

The same was found in other studies as well (Leena, 2012). "Centralized database security in cloud" also suggested that the accessing of cloud database is associated with various security issues such as password vulnerabilities, data hijacking, compromising of accountant attack, man in the middle attack, password guessing against multiple user, user password attack. In this study the simple solution of Cryptosystem algorithm suggested for database security. The algorithms TORDES and RSA strategy was suggested for the efficient, scalable for simple data access/sharing application.

Shcherbinina et al. (2020) revealed a few other potential attacks against cloud databases include SQL injection, weak authentication, data breaches, account takeover, cross-site scripting (XSS), man-in-the-middle attacks, denial-of-service attacks, and cookie poisoning.

- The term "weak authentication" refers to an authentication technique that is very weak.
- When there are data breaches, hackers are able to access private information, like credit card numbers and personal data, that is kept in cloud databases.
- Attackers can obtain data from a cloud database in an unauthorized manner through SQL Injection. In most cases, the attacker runs malicious SQL code on top of the actual SQL code. Therefore, the dangerous SQL code assists attackers in getting past cloud protection.
- When cookies are poisoned, it signifies that hackers have been changing them.
- Attackers typically conduct denial of service (DOS) attacks when they send erroneous requests from outside the server to a noisy database server. Database failures occur as a result of the server's inability to meet the actual needs.
- Attacks that place the attacker in the middle of the client-server connection in an effort to steal data are known as "man in the middle" attacks.
- When a third party makes an infiltration attempt utilizing phishing or security holes in a database system to collect credentials, this is referred to as account hijacking.

Few conclusions could be drawn from studying research publications on security concerns with cloud databases. Most studies on security issues in cloud databases focused on unauthorized access by third parties and changes to the privacy information of the cloud database that had an impact on subscribers. Many authors also went into great detail about the problems by offering some sort of solutions in their research papers (Singh and Chatterjee, 2017).

- **Latency and reliability:** The encryption and decryption processes for the data in cloud databases will be most impacted by this.
- **Platform Specificity:** It implies that we are able to operate anywhere using cloud database services without any reliance on a particular language. Thus, any attacker can do so with ease. Cloud doesn't restrict to certain languages
- **Data breach through the fiber optics:** In the beginning, fiber optics were used to transfer data from a cloud database from one service to another. At that moment, an attacker used some tech equipment to successfully penetrate the shared cloud databases' trustworthy records of data without any hindrance.
- **Security and Privacy:** A variety of attacks have taken place as a result of privacy concerns. Some individuals lack the skills necessary to properly configure modern cloud databases, which poses serious security risks for these databases.

B. Solutions for security problems with cloud databases

Least Privilege - Limits access to resources by allowing only the minimal level of access, while still allowing an application to function normally.

In order to develop separate, particular privileges, the administration must first examine the requirement.

Give every user, application, and process who accesses the database the absolute minimum privileges. Unintentional data alterations or data leaks won't occur as a result (Chetan and Singh, 2016).

Separation of Privileges - Separates critical functions that can affect the security of the database into portions that is performed by different people or systems.

Authorization and Authentication - Authorization determines who has access to what resources. The identity of an entity requesting access to a resource is verified through authentication.

Another crucial security component is authorization. Only authorized users will have access to protected information, preventing data leaks (Huang and Tso, 2012)

Defense in Depth - Ensures that security controls are in place across the entire information architecture, including the database, network, server, and operating system. Cloud Pools can be used to accomplish this policy. A shared collection of resources that numerous tenants can use is called a cloud pool.

Logging and Auditing - Keeps track of all activities by keeping a log of any acts that may be security-related.

The most crucial security component is logging. We can track down issues and occasionally retrieve lost data. These logs can be utilized to carry out particular compliance certifications that demand proof of actions that are traceable and auditable that have been taken.

Information Hiding - Cryptography and hashing functions are used to hide sensitive information.

Only authorized users or processes will be able to access the true data in a database thanks to encryption. Encrypting sensitive data will help to stop data leaks and breaches. Even if an unauthorized person gains access to data, encryption will prevent them from accessing actual data. The system's speed will suffer if the entire database is encrypted (Wi, et al., 2014)

Redundancy - The reproduction of important components in a system, or an entire system, with the goal of improving the system's reliability. Additionally, periodic DMBS backups are required in order to restore corrupt or lost data if necessary.

Monitoring - Constant monitoring of a system's status to ensure that specifications are met. This is a crucial step because if a security breach is not noticed, it cannot be addressed.

The majority of databases do not follow all of the aforementioned rules because it is not practicable to do so, due to the fact that increased security can result in a reduction in throughput and robustness. Cloud databases in particular need to reply to queries rapidly in order to be effective. In order to aid developers in implementing security in cloud databases and settings more effectively, many of these regulations are given in pattern format.

Different security approaches and techniques have been proposed to secure databases that live in the internet or the cloud. However, despite progress, hackers continue to uncover new ways to exploit vulnerabilities that go unnoticed throughout development, testing, and deployment. For online databases, access management is a fundamental and crucial security challenge.

These are the primary techniques used in cloud databases to boost security. It is impractical to use every strategy suggested above. The performance and robustness of the entire system will decline as more security mechanisms are added. Quick response times, simple maintenance, and affordability should be features of cloud databases. These factors will be lessened by including all security methods. For cloud databases, requirement engineers can choose the appropriate security level and protocol for implementation. However, hackers will discover a way to take advantage of flaws that go unnoticed during development, testing, and deployment. We have therefore ensured that the system can handle extra security standards.

METHODLOGY

For this research, conference papers, journal articles, and relevant websites were used. published in numerous databases, including Google Scholar, IEEE Explore, and ScienceDirect.

The researcher used the search phrases "security issues in cloud databases" and "solution for security problem in cloud databases" to find the right dataset from this Database. 40 related papers are as a result identified and evaluated for these search phrases.

CONCLUSION AND FINDINGS

The security issues of cloud databases are the main topics covered in this review paper. This study also discusses possible solutions. We may therefore draw the conclusion that in order to improve the service provided by Cloud databases, security issues must be reduced and the encryption process must be improved.

The field of remote data storage and database management on a third party's infrastructure is one in which cloud computing is an advanced and developing technology. It provides many advantages to the users without establishing a private server or data center infrastructure for the business activities.
Today most organization are implementing the cloud database for their huge data storage. Although cloud computing is the new emerging technology that presents a good number of benefits to the users, it faces lot of security challenges. There are ethical issues, security, and privacy that affect the use of cloud services. But to overcome these issues, Data can be stored and retrieved from the cloud using new, advanced encryption techniques and technologies. Also, proper key management techniques can be used to distribute the key to the cloud users such that only authorized persons can access the data.
Database need effective access control security mechanisms to protect the data stored. In particular, cloud databases present a difficult problem because they can be accessed at anything through the Internet, therefore effective security mechanisms are necessary to protect them without affecting normal business operations. Not only is it important that a database as security controls but in addition, a wide variety of security policies are required at varying levels of a systems architecture to sufficiently protect it.

A novel idea that offers users a ton of advantages is the cloud database. The cloud users may be impacted by some of the security issues it also faces. Described in this article are problems with and remedies for cloud databases. The performance of the entire database is traded off in favor of those solutions. The system designer should consider the system's security requirements while maintaining system speed. Cloud database systems cannot be said to be 100 percent safe. However, we can guarantee that it offers many more features than conventional databases.

FUTURE WORK

The main security issue with cloud databases is resource sharing. Any person can access data in a cloud database. We must therefore include some encryption and decryption functionality in cloud databases. In the future, we'll store a unique user's login and password in a cloud database. There is still more that can be done in the field of cloud databases. However, there are still a lot of unresolved issues, so there is always need for more research.

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Analysis of Main Concerns for the Adoption of Community Cloud in Decentralized Education Systems

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Abstract

With the rapid change in technology, higher education institutions are being heavily supported by cloud computing models. The use of cloud computing not only facilitates academic activities but also administration and collaboration. A cloud environment provides access to software, hardware, infrastructure, and platform whenever there is internet access regardless of time and location. When it comes to decentralized education systems where the resource usage is high, it is crucial facilitating the demand, hence identification of appropriate cloud models and adoption factors would lead decision makers towards proper cloud migrations. This paper represents the most concerning factors that influence the adoption of community cloud when it is to be implemented in decentralized education systems.

*Keywords***:** *Cloud Computing, Community Cloud, Higher Education, Decentralized Education*

INTRODUCTION

Cloud computing is a popular computing paradigm in which everything is delivered as-a-service. It is reported that cloud computing will replace traditional data centers within four years, handling 95% of total data center traffic by 2021, compared to 88% in 2016 (Perspectives and Report, 2022). Everything on the cloud provides an efficient way of sharing information, storage, resource management, and disaster recovery.

A number of companies like Google and Amazon use cloud computing to reduce technology acquisition costs; and provide services such as email (Gmail); cloud storage (Dropbox); hosted desktop (AT & T); streaming music (Spotify) etc. According to experts, it makes no sense for smaller enterprises to operate their own data centers. Cloud computing will be both cost-effective and also environmentally safer and cleaner for such organizations (Alharthi et al., 2015). Therefore, a wide range of businesses and academic institutions adopt cloud computing platforms to reduce costs and increase information systems responsiveness.

When educational institutions are given facilities through the cloud, students can extensively use them with no time or location bounds. This in return provides students with a flexible learning environment and increases student engagement in the teaching-learning process. A survey done by Faronicsin (Cornell, 2013) reports that universities drive towards the cloud based on the following factors.

- · Increased efficiency – 55%
- · Mobile access – 49%
- · Innovation – 32%
- · Provide new services – 24%

Thus, number of studies have been carried out by researchers to adopt cloud computing for higher education. The selection of most suitable service delivery model is one of the crucial tasks that involved in it. The decision is usually taken upon various factors that influences the cloud adoption for any organization in general.
At the moment of preliminary study of cloud adoptability, the concept of centralization and decentralization also plays an important role as they have significant effects on the functions of the relevant organization or institute. Decentralized education systems have become extremely appealing due to the numerous benefits of the model compared with centralized systems. With the new and emerging technologies and the tendency of cloud adoption in higher education institutes, decentralized education systems require appropriate cloud adoption models so as to support most of its activities. For any institution, administration and collaboration are as vital as academic

activities. Therefore, when adopting cloud models, it would be essential that the adopted model to be a success for them all. This is where the community cloud draw attention.

A community cloud is a popular concept where infrastructure is shared between several organizations from a specific community. This dispersed infrastructure is manageable by a single organization or by many organizations in the community; thus, making it help solve particular issues by associating services offered by different providers. Application of community cloud is seen in different areas. Many researchers have suggested ways that the model could be adoptable by different sectors such as health, financial, education etc. Valluripally (2019.) states that community clouds allow distribution of data processing workflows across the community and how it is adoptable to health sector. Indian Banking Community Cloud (IBCC) is another aim towards the secure cloud-based services to address the financial sector's growing demand (Sangavarapu et al., 2014).

As the application of community clouds in a commercial setting, there're many related researches in the education sector as well. A study by Paul Heinzlreiter (2012) discusses different application scenarios for a private cloud deployment, to be used as a community cloud. The study explains the use of community cloud by multiple institutions for teaching and research purposes. Another study by Aldahwan and Ramzan, (2022) introduces a research framework that combines Technology-Organization-Environment (TOE), Diffusion of Innovation (DOI) and Institutional Theory (INT) theories that drives an organization toward community cloud adoption. The study determines the important aspects impact the adoption of community cloud in higher education sector.

METHODOLOGY

This study aims to identify most concerning factors for adoptability of community cloud in decentralized education systems through a survey, that has been carried out with the participation of individuals from three higher education institutions. The institutions are in a decentralized education system; where they are located in different geographical areas and governed by the same body.

The survey was done through a semi-structured questionnaire, where the survey questions were adapted from Aldahwan's and Ramzan's (2022) research framework. The questionnaire was sent to more than 500 individuals. The questionnaire was sent to the participants via online and received 313 completed questionnaires. A descriptive analysis has been performed and conclusions were drawn based on the selected variables that are of considerable concern to most respondents as per Aldahwan and Ramzan (2022). Following lists more considerable factors used by Aldahwan for each area of concern.

Organizational Concerns:
 Technology readiness – 46%, Top management support – 33%, Training – 31%, Size – 14%
Technology concerns:
 Compatibility – 37%, University Culture - 40%, Quality of Service – 4%
Human concerns:
 Ease of use - 39%, Usefulness – 15%
Advantages Concerns:
 Performance - 27%, High automation – 22%, adequate resource – 22%
Security Concerns:
 Integrity - 60%, Governance issue – 41%, Privacy - 17%

The questionnaire was prepared to test the level of influence of the following factors that are of higher percentage of the above.
 Technology readiness
 University Culture
 Ease of use
 Performance
 Integrity

The responses were assessed against the above variables to identify the participant's perspective about them being in a decentralized education system. Only the participants who had prior experience in the cloud were selected for data analysis and 4 points Likert scale was used for the assessment.

RESULTS AND DISCUSSION

Table 1 and Figure 1 show the summary of responses received. According to the results, it is observed that the participants have identified a strong influence in performance (75%), technology readiness (65%), and ease of use (62%) variables while university culture (47%) and integrity (44%) with a moderate influence.

Table 1: Summary of responses

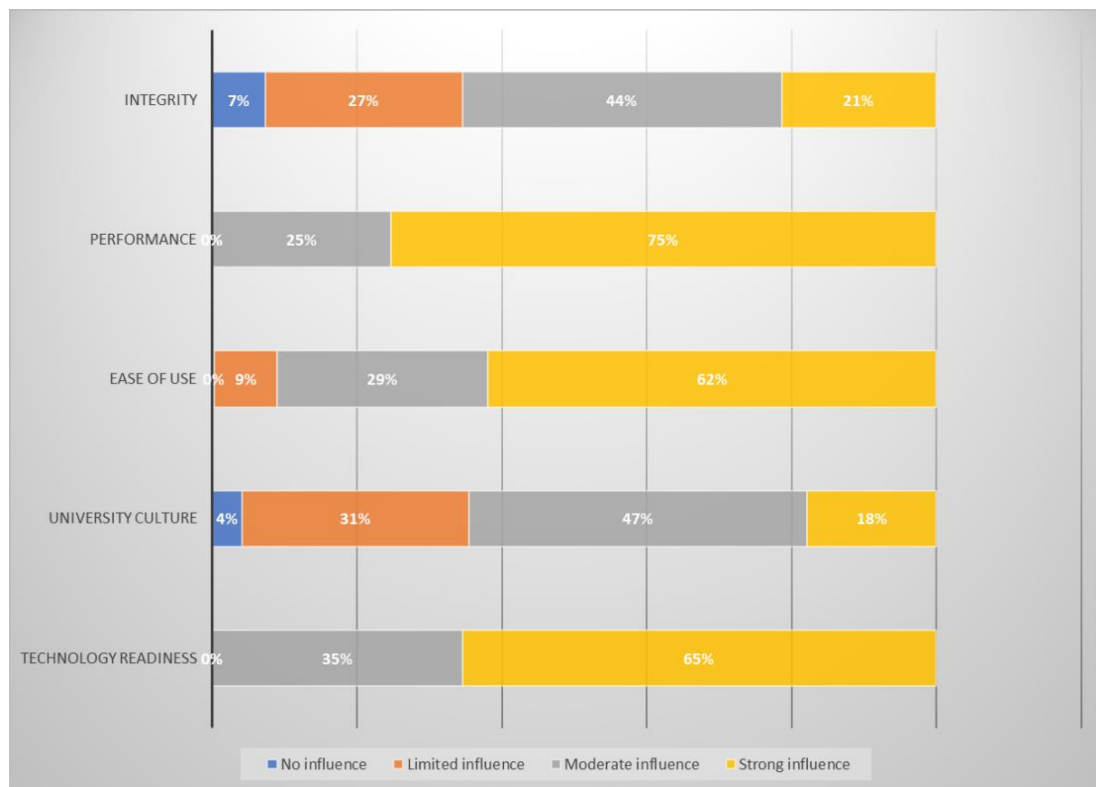|	Technology Readiness	University culture	Ease of Use	Performance	Integrity
No influence	0	13	1	0	23
Limited influence	0	98	27	0	85
Moderate influence	108	146	91	77	138
Strong influence	205	56	194	236	67

Figure 1. Summary of Responses

Figure 2 shows the mean influence of each cloud adoption variable. According to the results, it is shown that every proposed variable has a considerable influence on community cloud adoption. The variable performance shows the highest influence and the university culture is the lowest.
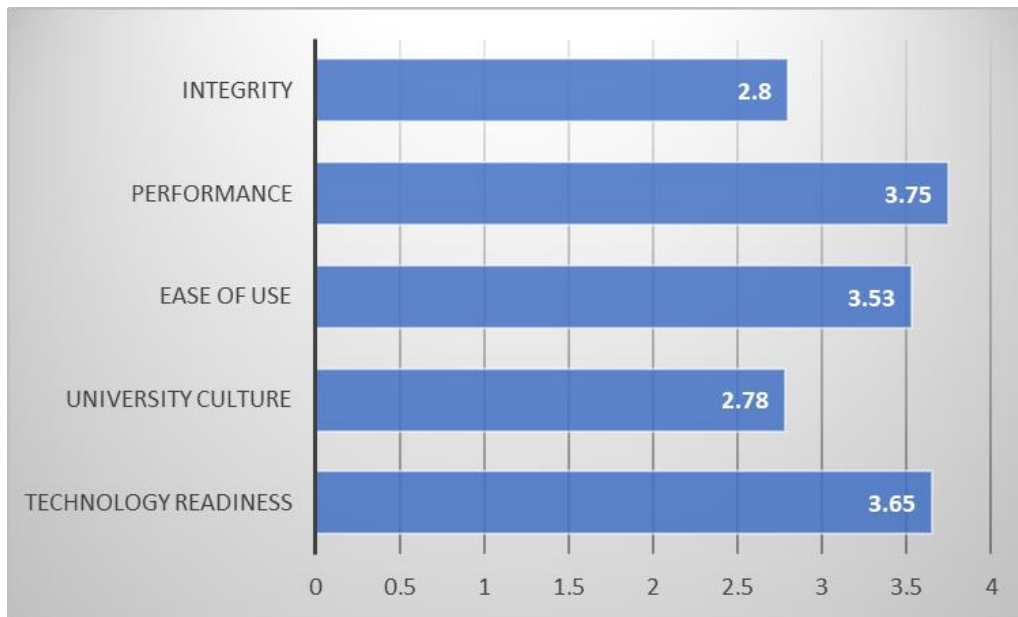
Figure 2. Mean influence of cloud adoption variables

CONCLUSION

A community cloud is an efficient and cost-effective solution that provides a pool of resources that could be shared among multiple member organizations within a community. Any decentralized education system is hence would automatically fit this concept considering its architecture. But before migrating to any cloud model it is necessary to consider the adoptability of the relevant model so as to minimize any conflicts. Therefore, this study proposes and evaluates five main concerns extracted from Aldahwan's and Ramzan's, (2022) research framework for adopting community cloud to a decentralized education system.

This study has been conducted with the participants of a decentralized education system and observed that the proposed five main concerns of community clouds have a strong association with decentralized education systems. Consequently, it is suggested that the concerns, Technology readiness, University Culture, Ease of use, Performance and Integrity would be more productive for testing adoptability of community clouds within decentralized education systems.

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Tackling the Class Imbalance Problem in Multiclass Brain Signal Classification

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Abstract

Brain-Computer Interface has become a heavily researched topic in the healthcare community, law enforcement, and other sectors. Some popular experimental areas in BCI are Sleep stage classifications, emotions detections, epileptic seizures, and alcoholism. Electroencephalogram(EEG) signals that are being recorded by the electrodes placed on the scalp are used widely for those experiments. A series of electroencephalogram (EEG) signal processing techniques have been developed rapidly recently. Among them, Machine Learning(ML) has become the most common development in the last decades. Class distribution of a dataset can make a significant effect on the prediction accuracy and performance of the model in ML. The imbalanced problem has become a critical issue to be solved in Machine learning. Oversampling and under-sampling are the two common mechanisms to be used in learning from the imbalanced dataset. The experiment investigates the behavior of two sampling techniques in a multiclass EEG signal classification problem. The results exposed that sampling can improve the performance of an ML model predictions in terms of both accuracy and F1- score. Accuracy improved from 0.91 to 0.93 where the F1- score increased from 0.49 to 0.72 in the rebalancing dataset.

Keywords: *Electroencephalogram, Oversampling, under-sampling, Rebalancing, multiclass classification*

INTRODUCTION

In recent years, many researchers have shown their interest in Brain-Computer Interface (BCI) systems, which has resulted in many experiments and applications. BCI translate brain signal into control commands in interpreting specific human activity. Electroencephalography (EEG) is a widely used technique to measure brain activities. EEG signals record the spontaneous electrical activity of the human brain using the electrodes placed on the scalp. BCI stay popular due to some significant characteristics in EEG signals such as destructiveness, painlessness, and accurate interpretation of some brain disease. In general, EEG signals are classified according to the frequency, amplitude, shape, and position of the electrodes on the scalp. Frequency is the basic unit used to determine normal or abnormal rhythms. Brain wave frequency differs and corresponds to the behavior and mental states of the brain. These signals have a 0Hz – 100Hz frequency range (Kumar and Bhuvaneswari, 2012).

Chaabene et al. presented a comparative analysis to identify the brain state based on convolutional neural networks(CNN) (Chaabene et al., 2021). A wavelet transform-based approach by using CNN and deep learning has been presented by Budak et al. (Budak et al., 2019). A comparison of the performance of different machine learning algorithms in classifying EEG signals has been researched by (Joshi et al., 2022). (Mousa, El-Khoribi and Shoman, 2016) have experimented with differentiating the sleep stages on EEG signals using different classifiers. Principal Component Analysis has been applied for dimensionality reduction in the approach (Mousa, El-Khoribi and Shoman, 2016).

Datasets can have a significant effect on the performance of a model in machine learning. Therefore a quality dataset is always required for building a high-accuracy model. To record EEG a system consists of electrodes, amplifiers, an AID converter, and a recording device. The electrodes get the human signal through the scalp, in turn, the amplifiers progress the analog signal to expand the amplitude of the EEG signals for the AID converter to make the signal digital in a precise manner(Mousa, El-Khoribi and Shoman, 2016). Recording EEG signals is a time-consuming process that requires additional hardware and expert knowledge. Hence, the majority of the studies in BCI are using publicly available datasets. Class imbalance of a dataset is a challenging issue that needs to resolve in statistical machine learning.

Recently, there is a great interest in "Learning from imbalanced data" and new learning algorithms designed specifically for imbalanced data. One of the common approaches was to use resampling techniques to make the

dataset balanced. Machine learning presents automatic approaches to resolve the class imbalanced problem using different sampling techniques depending on the features extracted using expert knowledge from the raw signal. Resampling techniques can be applied either by under-sampling or oversampling the dataset (Mohammed, Rawashdeh and Abdullah, 2020).

Under-sampling, reduce the instances from the majority class to make it a match with the minority class. It may remove possibly valuable data that can be essential for classifier models, but it is useful when you have a huge number of data. Further, under-sampling is used as a data cleaning process to remove noise (AT et al., 2016). Oversampling is a technique, which duplicates examples from the minority class to match the number of instances in the majority class (Fernández et al., 2018). Combined sampling is a technique to combine oversampling and under-sampling to improve the accuracy of the classification (Safira et al., 2021).

The models built using severely skewed datasets are inefficacious in identifying the minority classes. Further, show overfitting results for the majority classes. When comes to multiclass classification problems where more than two labels exist for a dependent, this can be more trivial. Hence, this study investigates class-rebalancing techniques to improve the performance of models in EEG signal classification in BCI systems.

METHODOLOGY

Dataset

Most researchers have experimented with classifying sleep stages using the dataset available on https://physionet.org/. This data set is a multi-class dataset and imbalanced. EOG and EEG signals were each sampled at 100 Hz in the sleep- cassette. There were 153 PSG recordings and the relevant Hypnogram files which have recorded from 82 healthy Caucasian subjects aged 25-101. The EEG features were recorded from Fpz-Cz and Pz-Oz electrode locations. Hypnogram files contain annotations of the sleep patterns that correspond to the PSGs. These patterns (hypnograms) consist of sleep stages W, R, 1, 2, 3, 4, M (Movement time), and ? (Not scored). The PSG files were in the format of EDF while the hypnograms were in EDF+ (Vilamala, Madsen and Hansen, 2020). This study has used the W, 1, 2, 3and 4 classes in consideration.
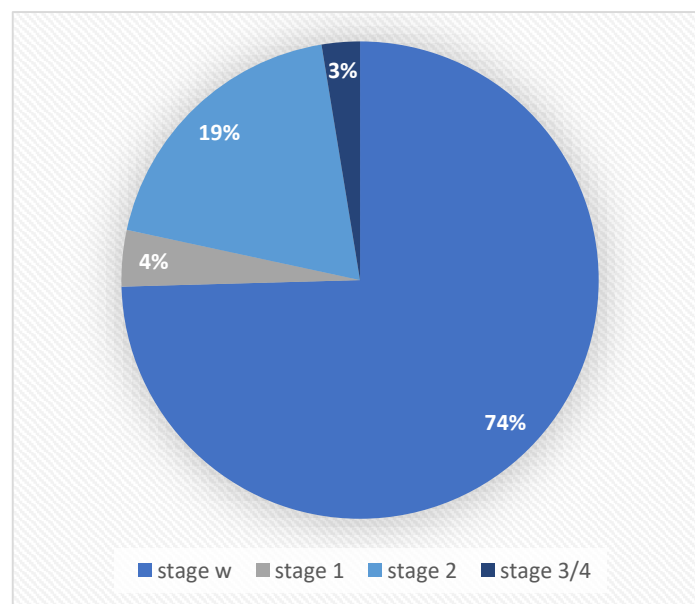

Figure 1. Class distribution of Original dataset
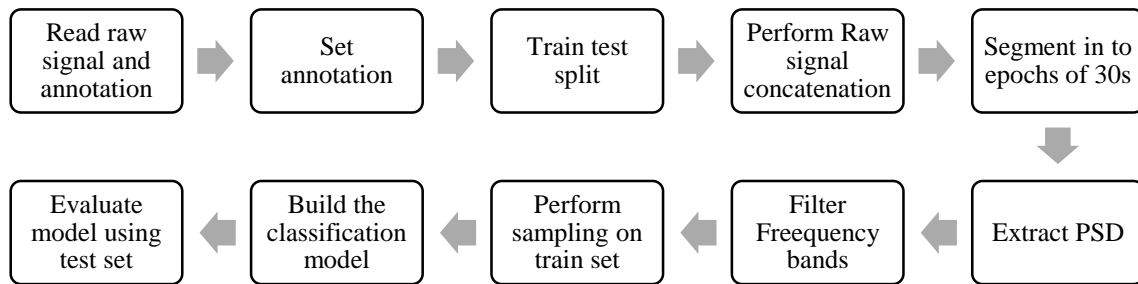
Proposed approach

Figure 2. Proposed approach

Two third of the data set were taken into training and the rest were taken as the test set. As the proposed approach in Figure 1 shows the raw signals of both train and test sets were annotated using the given annotation file in the dataset. The annotated raw signals were concatenated and Fpz-Cz channels were retrieved. Then the raw signal was segmented into epochs of the 30s and extracted the Power Spectral Density (PSD) relevant to the EEG feature. Filter the frequency band from 0.5Hz-30 Hz because the sleep stages are falls in that frequency range. The events; Sleep stage W, Sleep stage 1, Sleep stage 2, Sleep stage 3 and 4 were extracted as the targets. As represents, the class distribution is severely skewed. Hence, the calculated PSD s for the training epochs were then resampled to get equal class distribution. A Classification algorithm was applied to the resampled dataset with the relevant targets for training the model. The trained model was tested using the PSD s of testing epochs.

Rebalancing

The study used the combined sampling of oversampling and under-sampling. Synthetic Minority Oversampling Technique, now widely known as SMOTE is an oversampling technique, which is considered one of the most influential data preprocessing/sampling algorithms in machine learning and data mining. The basis is to carry out an interpolation among neighboring minority class instances (Fernández et al., 2018). The study used SMOTE for oversampling the dataset. SMOTE can generate noisy samples by interpolating new points between marginal outliers and inliers. This issue can be solved by cleaning the space resulting from over-sampling by using Tomek Link.

Tomek Link (T-Link) is a method of under-sampling. It is considered an enhancement of the Nearest-Neighbor Rule (NNR)(AT et al., 2016). The T-Link method can be used as a data cleaning technique, which can be combined with an oversampling such as SMOTE.

Classification

Classification model built using Support Vector Machine (SVM) classifier with the Radial Basis kernel Function. Support Vector Machine (SVM) is a classification method where a training data set representing two different classes is projected into a high dimensional space through a kernel function. Not only it has a better theoretical foundation, but practical comparisons have also shown that it is superior to the ANN(AT et al., 2016).

Evaluation

Evaluation of the model performed in terms of Accuracy as well as F score. Accuracy represents the count or the fraction of the correct prediction over the total number of samples.

$$Accuracy = \frac{TP+TN}{TN+FP+FN+TP} \tag{1}$$

Where True Negatives (TN) represent the amount of correct prediction of negative class. False positive will give the amount of incorrectly predict negative class. False Negatives (FN) and True Positives (TP) represent the number of incorrect predictions and amount of correct predictions of positive class respectively.

F-Measure represents a balance between Precision and Recall hence this can be taken as the most important matrix in the performance evaluation of a model. Though accuracy represents the number of correct predictions it is not enough to use only the accuracy scores in model evaluation. Some models are skewed to predict one type of class label though it gives higher accuracy. So another set of the matrix is required other than the accuracy. Precision

is the ability of the classifier not to label as positive a sample that is negative. Recall is another important matrix in model evaluation in a classification problem as it exposes the ability of a model to capture the actual positive values as positives.

$$F1 = 2 * \frac{P*R}{P+R} \qquad (2)$$

$$P = \frac{TP}{TP+FP} \qquad (3)$$

$$R = \frac{TP}{TP+FN} \qquad (4)$$

F scores are calculated for each class separately and then calculate as a micro average for comparison. Micro average calculate metrics globally by counting the total true positives, false negatives, and false positives.
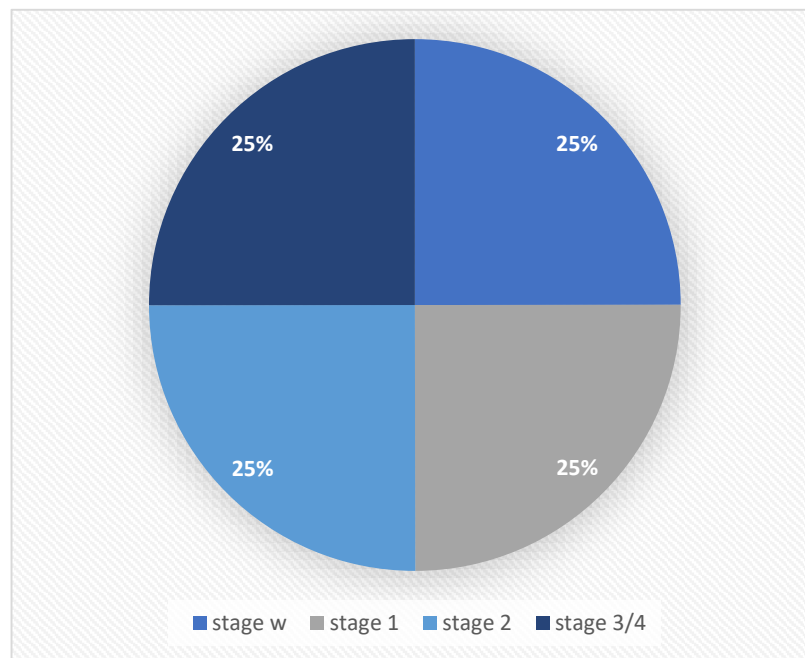
RESULTS AND DISCUSSION

Figure 3. Class distribution after resampling

Originally 2516 amounts epochs were extracted and as Figure 2 depicts 74% are from the "stage 1" class type among them. Only 3%, 4%, and 19% instances are included from the rest of the class respectively. Which is heavily unbalanced and will show overfitting results for the majority class. In contrast, Figure 3 shows that the resampled dataset distributes the proportions of instances equally as 25% among the classes. 1875, 1873, 1872, and 1874 amount of epochs were resampled for "stage w", "stage 1", "stage 2" and "stage 3/4" respectively.

The accuracy of the prediction was figure 0.91 in the original dataset whereas 0.93 in the resampled dataset. Though the given accuracy is high in original dataset it shows poor F1-score. The average F1-score for all the classes was 0.49 and 0.72 in original and resampled data sets respectively as elaborated in the Figure 4. F1 score has increased by 0.23 after rebalancing the dataset.
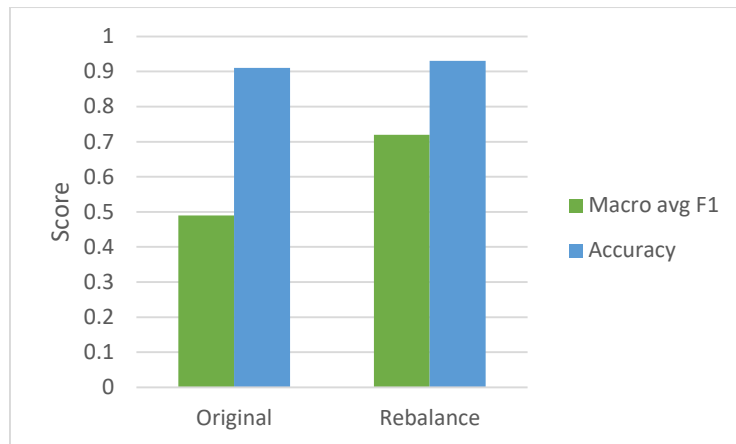
Figure 4. Score comparison

F1 scores presented in Table 1 show that the model trained with the original dataset has given low F1 scores for the classes "stage 1" and "stage3/4" as opposed to the class "stage w" and "stage 2". The lowest F-score has been given for "stage 1" in the original dataset which had the least amount of instances. "stage3/4" classes have also given a low F-score of 0.07 whereas the original dataset contains a low amount of instances as shown in Figure 2. The model built using rebalanced dataset showed improved F1 scores for "stage 1" and "stage 3/4" as 0.23 and 0.82.

Table 1: F1-Score comparison of classes

	stage w	stage 1	stage 2	stage 3/4
Original	0.99	0.06	0.83	0.07
Rebalanced	0.99	0.23	0.86	0.82
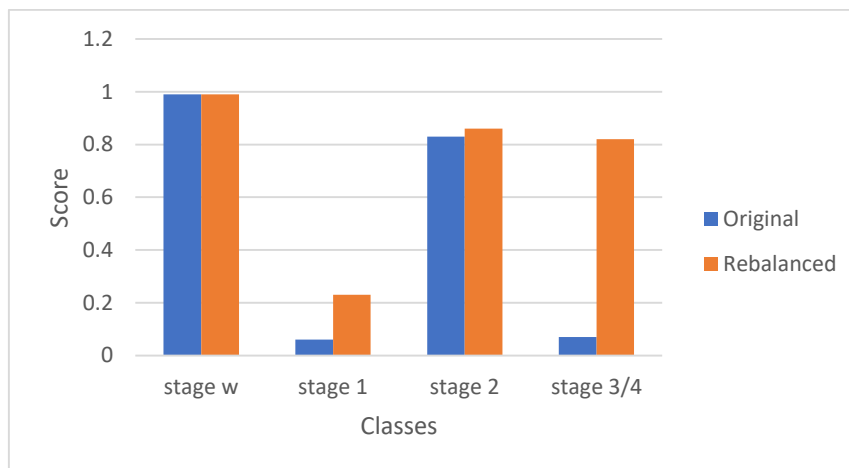
Figure 5. F1-Score comparison of classes

CONCLUSION

Raw EEG signal processing is used in most of the experiments in BCI systems. It is widely used in clinical setups to diagnose brain diseases. Machine learning plays a vital role in classifying EEG signals. Learning from an imbalanced dataset has been wide open for research as the imbalanced dataset is a challenging issue in statistical machine learning. Models built with an imbalanced dataset may be biased to predict the majority class. This paper presented an analysis of the impact of rebalancing an EEG raw signal dataset. SMOTE and Tomek Link are used for Oversampling and under-sampling respectively and SVM is used for classification. Accuracy and F1-score were used for the evaluation of the models. As Figure 5 shows rebalanced dataset has improved the F1 score of

all the classes with low amount of epochs extracted while accuracy remains nearly 0.9. It can be concluded that, rebalancing improves the F-scores of a EEG signal classification model.

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Effectiveness of the Reading of Newspaper with Bottle-Polythene-Circle Reading Strategies on the Performance in the Professional Writing

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Abstract

The adequate application of reading of newspapers based on bottle-polythene-circle reading strategies shows a main part in the performance of the students and the research was led to recognize the connection between the reading of 'Sunday Observer' newspaper with bottle-polythene-circle reading strategies and the performance in the professional writing in Higher National Diploma in English – HNDE course of Advanced Technological Institute – ATI Sammanthurai of Sri Lanka Institute of Advanced Technological Education – (SLIATE) as there is a need to do a research in relation to this section in the academic field in SLIATE. Ninety students from HNDE – class – first year - A were randomly taken for experimental group and ninety students from class - the first year – B were taken for the controlled group. A pre-test was conducted for both the groups and the mean differences were found to be negligible for both the groups from the pre-test. Later, the experimental group was educated to read 'Sunday Observer' based on bottle-polythene-circle reading strategies for three months with thirty hours reading while the controlled group was generally taught without the use of 'Sunday Observer'. After three months a post-test was conducted for both the groups in the same syllabus with different content. When the post-test was conducted, the mean was slightly improved for the group - B from the post-test and the mean was considerably enhanced for the group - A from the post-test. It finds that there is a positive relationship between the reading of 'Sunday Observer' newspaper based on bottle-polythene-circle reading strategies and the performance in the professional writing. Therefore, if the students have to show improved performance in the professional writing they need to read 'Sunday Observer' newspaper too with bottle-polythene-circle reading strategies consecutively.

Keywords: Bottle method, Circle method, Polythene method, Professional writing, Reading strategies.

INTRODUCTION

The students' performance in the professional writing through reading of newspapers with Bottle-Polythene-Circle reading strategies is a topic in contemporary higher education. Lack of reading of newspapers with reading strategies is seen as one of the reasons for failure in the performance in the professional writing in academic courses (Torgesen, 2000). Moreover, the presence of the new study methods based on technological learning requires a further analysis and discussion on the reading of newspapers. During the last decade, a number of studies have investigated the relationship between reading of newspaper and the performance in the professional writing reaching to the conclusion that there exists a positive correlation between these two variables (Oleg, 1999; Azizolah, 2014), but there are lack of researches in relation to the higher education at SLIATE. As per the gap, along with the direct investigation, this study aims at looking into the effect of the reading of ''Sunday Observer'' newspaper with reading strategies on the performance in the professional writing using data collected from Higher National Diploma in English course at ATI - Advanced Technological Institute – Sammanthurai in SLIATE under the Ministry of Education in Sri Lanka..

Literature Review

María (2011) examines the relationship between the newspaper reading of students and their professional language skills with what is taking place in people by means of 19 news items with images beforehand testing and verbal performance beforehand giving the news items and afterward giving the news stuffs by approaching the pictorial illustration of minor settlers in a model of a native newspaper and the study finds that familiarizing pictorial grammar in an English language courses with the usage of newspapers, with multimodal writings in the teaching-learning procedure from writings of newspapers and enquiring students to assess this kind of writings, links the activities completed in the classroom to mature their language skills with what is taking place in people as per the day today vocabularies in the newspapers as per the method.

Diana (2005) assesses the relationship between the authentic news of professional business simulations and the performance of the students of the English language classes with text authenticity, task authenticity, pedagogical authenticity and learner authenticity among the students in the particular classes with the usage of appraisal system with comparison. This study finds that there is a positive relationship between the authentic news of professional business simulations and the performance of the students of the English language classes with text authenticity, task authenticity, pedagogical authenticity and learner authenticity among the students in the particular classes.

Oleg (1999) assesses the relationship between the reading-based integrated skills and the success of the performance of the class conditions with the availability of the framework of reading habit – knowledge acquisition for the second year students in a university in Russia with pre-stage reading, reading stage and post-stage reading testing. This study finds that the suggested method seems not only realistic but undoubtedly one of the best for reaching wanted outcomes in teaching English where class time is restricted and where the aim is in cooperation to improve students skills for reading professional literature and to cultivate the skills of listening speaking and writing in practiced circumstances. This method has certainly recognized its productivity in the real-world involvement of using it at methodical academia.

David (2000) empirically examines the relationship between the newspaper and online version reading habit of the students and knowledge acquisition of the students using the framework of reading habit. This study finds that there is a connection between these two variables as an actual consequence of changes in understanding experience, online news readers were less possible to remember having read national and political news topics that seemed in the *Times* newspaper and more likely to remember business and other news topics.

Safana (2015) examines the relationship between loud reading of newspapers and spoken skill of the students of Higher National Diploma in English – Part Time at Sri Lanka Institute of Advanced Technological Education – Sammanthurai. This study provides direct evidence regarding the pure relationship between loud reading of newspapers and spoken skill. It appears that when students used newspapers for loud reading in the classes over the semester, their spoken skill with effective communication skill significantly increased.

Anderson (1985) finds that learners' attitudes and approaches regarding the purposes for reading also influence their capability to read. If students need to obtain the most of the materials they are allocated, they have to absorb to read critically and methodically, the idea here is that when people read something, the purpose is to try to understand what the author's target is. When dealing with reading, people meet two layers of reality: one that they can see and one that they cannot see. The purpose of reading is to make the invisible layer visible and clear.

METHODOLOGY

The aims of the research were to identify the relationship between the reading of 'Sunday Observer' newspaper with Bottle-Polythene-Circle reading strategies and the performance in the professional writing and to identify the most significant value relevant variable between the reading of 'Sunday Observer' newspaper with Bottle-Polythene-Circle reading strategies and the performance in the professional writing. Two groups of students were randomly taken from HNDE course with the targeted subject of professional writing from Advanced Technological Institute - Sammanthurai under SLIATE. Ninety sample students from Higher National Diploma in English – class – first year - A were taken for experimental group and ninety sample students from Higher National Diploma in English – class – first year - B were taken for controlled group.

A pre-test was conducted for both the groups with same reading comprehension question in professional writing. Later, the experimental group was instructed to read 'Sunday Observer' based on reading strategies such as 'Bottle Method', 'Polythene Method' and 'Circle Method' for three months with thirty hours reading practices and the classes for the controlled group was conducted with usual reading practices such as skimming and scanning without 'Sunday Observer' and its reading strategies. After three months a post-test was conducted for both the groups with the same reading comprehension questions in professional writing. The question paper was of same structure like pre-test paper but the content was different.

Hypothesis

In order to accomplish the aim of this research the following hypotheses were developed.

> H $_1$: There is a positive relationship between the reading of 'Sunday Observer' newspaper based on reading strategies and the performance in the professional writing.

RESULTS AND DISCUSSION

The data analysis and findings bring out the representation of data which were collected through pre-test for experimental group, pre-test for controlled group, post-test for experimental group, and post-test for controlled group. In this analysis, significant p value and mean difference were mainly considered with the support of Statistic Package for Social Science – version 23. At this point, from the pre-test, the table 1 shows that group A took the mean of the marks as 10.3587 with the standard deviation of 2.05720 and group B took the mean of the marks as 11.2132 with the standard deviation of 3.12932. The mean deference between Group A and B is -0.844 in the independent sample test. The t statistics is -1.138 and associated p value was as 0.064. It means that it is more than 0.05 and, therefore the null hypotheses is not rejected and it shows that the mean differences (- 0.75544) were found as to be negligible between both the groups.

Table 1: Group Statistics

	Group	N	Mean	Std. Deviation	Std. Error Mean
Pre-test	A	90	10.3587	2.05720	.21503
	B	90	11.2132	3.12932	.32794

Independent Samples Test (Pre-Test)									
	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	13.28	.000	-1.138	178	.064	-.7554	.3649	-1.6238	-.0650
Equal variances not assumed			-1.138	154	.064	-.7554	.3649	-1.6246	-.0642

The table 2 shows paired sample t test of group – B (pre and post). The mean of the marks as 11.3222 with the standard deviation of 3.10961 is in the post-test. The mean of the marks as 11.2233 with the standard deviation of 3.10032 is in the Pre-test. The mean deference between pre and post-test of groups B is - 0.07478 and standard deviation is 3.6132 in the paired sample t test. The t statistics is -0.201 and associated p value was as 0.830. It means that it is more than 0.05 and, therefore the null hypotheses is not rejected and it shows that the mean differences were found as to be negligible between both the test and expound as there is no considerable improvement in the performance.

Table 2: Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
group – B	PreTest	11.2233	90	3.10032	.32996
	PostTest	11.3222	90	3.10961	.33094

Paired Samples Test								
	Paired Differences					T	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
PreTest - PostTest	-.074	3.613	.3835	-.8399	.6843	-.201	89	.830

The table 3 shows paired sample t test of group – A (pre and post). The mean of the marks as 11.2889 with the standard deviation of 2.0492 is in the pre-test. The mean of the marks as 14.1667 with the standard deviation of 1.9085 is in the post-test. The mean deference between pre and post-test of groups A is – 2.787 and standard deviation is 1.7713 in the paired sample t test. The t statistics is -14.489 and associated p value was as 0.000. It means that it is less than critical alpha value 0.05 at 95% confidential level. Therefore, the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is not rejected. It means that there is an impact of reading of 'Sunday Observer' newspaper with reading strategies on the performance in the professional as Thajoon (2017) empirically examined the relationship between the newspaper monthly version reading habit of the students and knowledge acquisition of the students using the framework of reading habit – knowledge acquisition consisting of 36 students for newspapers and 36 students for monthly versions in Sri Lanka with the analytical methods of Exposure Control Check and Final Exposure Patterns including the methodology of Pre-test and post-test for readers and found that there is a connection between these two variables as an actual consequence of changes in understanding experience, monthly news readers were less possible to remember having read national and political news topics that seemed in the *Times* newspaper and more likely to remember professional and other news topics.

Table 3: Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
group – A	PreTest	11.2889	90	2.04920	.21706
	PostTest	14.1667	90	1.90857	.20223

Paired Samples Test								
Paired Differences								
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		T	df	Sig. (2-tailed)
				Lower	Upper			
-PreTest - PostTest	-2.787	1.771	.1972	-3.269	-2.4858	-14.489	89	.000

CONCLUSION

The students who read 'Sunday Observer' newspaper with Bottle-Polythene-Circle reading strategies, described in methodology section for three months with thirty hours of reading practices show an impact on the performance in the professional when the students who read with usual reading practices such as skimming and scanning, described in methodology section do not show an impact on the performance in the professional writing.

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Feasibility Study on Growing Abalone and Oyster (*Pleurotus sp*) Mushrooms on Agricultural Residue

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Abstract

Mushrooms are the fruiting bodies of edible macro fungi belonging to the class Basidiomycetes and genus Pleurotus. It is an excellent source of high quality plant protein, vitamins and minerals. There is an increasing demand for mushroom in the local market and currently the production is far less than the demand. Abalone and oyster mushrooms (Pleurotus sp.) are locally available and famous for their unique flavor. At present saw dust is used as the growth media. Among the bio-conversion processes of agricultural residue, mushroom cultivation is an appropriate technology in managing crop residue. The objective of the study was to evaluate the yield performance of Abalone and Oyster (Pleurotus sp.) mushroom grown on two different agricultural residue; Bagasse and Durian husk. The pilot study was conducted in a well-constructed mushroom-house recommended by the Department of Agriculture in Kegalle, Sri Lanka during 2021-2022. The saw dust rreplacement proportions of 0 (control), 0.25, 0.50, 0.75 and 1.0 were tested using 08 replicates each. Overall time required for spawning/mycelial running, pin-head formation, and maturation of fruiting bodies, and number of fruiting bodies formed were assessed. Biological efficiency was compared for all media compositions tested. A rapid mycelial growth was observed in Oyster (30 days) compared to Abalone (46, 50 days) in all media proportions tested. Biological efficiency of 50-51% was recorded in the control experiments in which both mushroom types were grown on saw dust media. Both Oyster and abalone mushroom grown on replacement proportion of 0.75 bagasse showed improvement in biological efficiency. Out of the two residue studied bagasse perform better compared to Durian husk. Oyster and Abalone mushrooms can be productively grown on sugarcane bagasse. Even though Durian husk can be used to grow Abalone with the same biological efficiency as saw dust, further studies are encouraged on adjusted particle sizes of the growing media.

Keywords: Mushroom, Oyster, Abalone, Bagasse, Durian

INTRODUCTION

Mushrooms are the fruiting bodies of macro-fungi and edible fungi belonging to the class Basidiomycetes and genus Pleurotus. It is an excellent source of high quality plant protein, vitamins and minerals (Thanuejah, *et al.*, 2013). A high nutritional value of dried oyster mushrooms has been reported with protein (25-50%), fat (2-5%), sugars (17-47%), micro-cellulose (7-38%) and minerals (potassium, phosphorus, calcium, sodium) of about 8-12%. Edible mushrooms are rich in vitamins of niacin, riboflavin, vitamin D, C, B1, B5 and B6 (Ahmed *et al.*, 2009). Different species of *Pleurotus* normally grow within a temperature range of 15-25°C and on various agricultural waste materials as substrate (Hasan *et al.*, 2010). Abalone and oyster mushrooms (*Pleurotus sp.*) are usually available in the local market and famous for their unique flavour and has become one of the major protein sources in vegetarian diets.

A major portion of the organic matter produced during the crop production is non-edible and becomes a source of environmental pollution. Among the bio-conversion processes of agricultural residue, mushroom cultivation is an appropriate technology for the management of agricultural and agro-industrial residue. Several studies have been conducted to evaluate the possibility of using plant residues as a substrate for mushroom cultivation (Gayathiri *et al.*, 2008; Basnayake *et al.*, 2008; Tarko & Sirna, 2018).

There is an increasing demand for mushroom in the local market and currently the production is far less than the demand. Because of the high cost of production, the market price is kept around Rs. 800-1600/kg for the past few years. At present saw dust is used as the growth media. Thanuejah, *et al.,* (2013) has done a comprehensive review on 'Potential for Oyster Mushroom Cultivation in Sri Lanka'. Even though attempts have been made to increase the production of mushroom, still there is a gap between production and the market demand. Limited availability and the cost of media preparation lead to increased cost of production. Therefore, it would be beneficial in finding alternate growth media for mushroom cultivation by utilizing freely available agricultural residue; bagasse, durian husk, bare corn cob, cowpea and green gram pod hull. This is an ongoing research and

the results obtained on bagasse and Durian husk are presented in this extended abstract. The objective of the study was to evaluate the yield performance of Abalone and Oyster (Pleurotus sp.) mushroom grown on two different agricultural residue; Bagasse and Durian husk.

METHODOLOGY

The pilot study was conducted in a well-constructed mushroom-house recommended by the Department of Agriculture in Pitihuma Grama Niladhari Division, Kegalle, Sri Lanka in 2021-2022. Bagasse and Durian husk were collected from Monaragala and Gampaha respectively. Pure cultures of Abalone and Oyster (*Pleurotus sp*) were collected from the Department of Agriculture Mushroom-Laboratory, Wagolla.

In the normal process of grow bag preparation (50-55 bags), 20 kg of saw dust, 2 kg of rice bran, 400 g of lime and soybean powder and 40 g of Magnesium Sulphate is used. Replacement proportions of saw dust were made according to the Table 1 and 08 replicates were prepared for each replacement proportion. Saw dust, dried Durian husk and bagasse were machine chopped before use (Figure 1). The machine mixed substrate/media (0.9-1.0 kg) was fed into the polythene (150-200 gauge) grow bags. The tightly packed grow bags were autoclaved at 121°C, 1 atm pressure and allowed to cool. A day after sterilization, the grow bags were inoculated with 10 g of pure culture of Abalone and Oyster under aseptic condition. The grow bags were kept in a dark room at 25-30°C and 90% relative humidity for 20 days. The humidity of grow bags was maintained by spraying water using misters. When the growth media/substrate was fully covered by the mushroom mycelia, bags were opened and kept for fructification.

The experiment was laid out in randomized complete block design and a control with 08 replications for each treatments (replacement proportion). The time taken for the completion of spawn running/mycelium growth, pin-head formation, and maturation of fruiting bodies was recorded. The average number of fruiting bodies, mean weight of fresh mushroom were recorded and the biological efficiency (BE) was calculated using the equation 01 (Peng *et al*., 2000). Four rounds of mushroom harvests (flushes) were made across all growth media/substrates during the course of experiment. The data was analyzed using SPSS (Version 20). Analysis of variance was used to indicate significant mean differences at 95% confidence interval.

$$BE = \frac{Weight\ of\ fresh\ mushroom\ harvested\ per\ bag}{Weight\ of\ dry\ substrate\ per\ bag\ before\ innoculation} \times 100\% \qquad (Equation\ 01)$$

Table 1: Sample preparation plan

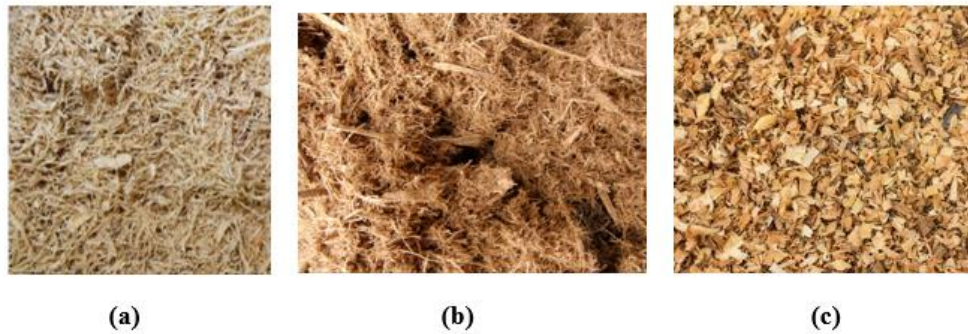| Growth Media	Replacement Proportions of **Band Saw Dust*** in the Growth Media				
		0.25 (1)	**0.50 (2)**	**0.75 (3)**	**1.0 (4)**
Bagasse (B)	Oyster (O)	BO1	BO2	BO3	BO4
Durian husk (D)		DO1	DO2	DO3	DO4
Saw dust (C)		CO			
Bagasse (B)	Abalone (A)	BA1	BA2	BA3	BA4
Durian husk (D)		DA1	DA2	DA3	DA4
Saw dust (C)		CA			

Figure 1. Substrates/growth media (Dried ground Durian husk (a); Dry bagasse (b) and Saw dust (c))

RESULTS AND DISCUSSION

Table 2 presents the summary of the results including average time taken for spawning/mycelial growth, pin-head formation, fruiting body formation and maturation of fruiting body bodies, and number of fruiting bodies. Mycelial running is the extension and colonization of fungal hyphae throughout the substrate and it was comparatively faster in Oyster (30 days) than Abalone (46-50 days) in all the substrates tested including the controls. Pin-head formation took 3-6 days in both Oyster and Abalone mushrooms while fruiting bodies formed within 3-5 days after pin head formation and there was no significant difference in the time spent for pin-head formation and fruiting body formation among different substrates tested. Figure 2 shows the fruiting body formation in different substrate/growth media. Mean weight of fresh mushrooms harvested and biological efficiency of the substrate calculated over 03 consecutive flushes are listed in the Table 3. Biological efficiency of 50-51% was recorded in the control experiments in which both mushroom types were grown on saw dust media. Oyster mushroom grown on replacement -ratio of 0.75 bagasse showed significant biological efficiency compared to the control. Oyster mushroom did not perform well on Durian husk and the biological efficiency was less than the saw dust media. The reason could be higher bulk density of Durian husk. The bulk density of Durian husk of 10 mm particles was calculated to be 214 kg/m^3.

Table 2: Summary of the results- Time taken for the completion of spawning, pin-head formation and fruiting body formation, and average number of fruiting bodies

Growth media (Table 1)	Completion of spawn/mycelial running (Days)	Pin-head formation (Days)	Fruiting body formation (Days)	Average number of fruiting bodies
BO1	30	3	3	22
BO2	30	4	4	26
BO3	30	3	3	23
BO4	30	5	5	23
DO1	30	4	4	23
DO2	30	4	4	24
DO3	30	3	3	23
DO4	30	3	3	23
CO	30	3	3	22
BA1	50	5	4	13
BA2	50	5	4	14
BA3	50	6	5	14
BA4	50	6	5	13
DA1	46	4	4	13
DA2	46	4	4	12
DA3	46	4	4	14
DA4	46	4	4	13
CA	50	5	4	14

Table 3: Mean weight of harvested mushroom and biological efficiency (BE) of substrate in 03 consecutive flushes

Growth media (Table 1)	Mean Weight (g)	Biological Efficiency (%)
BO1	230	46.0
BO2	140	28.0
BO3	343	68.6
BO4	153	30.6
DO1	153	30.6
DO2	130	26.0
DO3	152	30.4
DO4	195	39.0
CO	255	51.0
BA1	355	71.0
BA2	300	60.0
BA3	400	80.0
BA4	340	68.0
DA1	255	51.0
DA2	260	52.0
DA3	257	51.4
DA4	260	52.0
CA	250	50.0

(a)   (b)   (c)   (d)

Figure 2: Formation of fruiting bodies of Oyster and Abalone mushroom in different substrate

Abalone mushroom grown on bagasse showed significant increase in biological efficiency in all the replacement proportions compared to the control. The fibrous nature and low bulk density (100 kg/m^3) of sugarcane bagasse make it more suitable for growing mushroom. Abalone showed no improvement, yet equal biological efficiency compared to the control when grown on Durian husk, yet further evaluation is need on optimization of particle size.

CONCLUSION

Oyster and Abalone mushrooms can be productively grown on sugarcane bagasse. Out of the two residue studied bagasse perform better compared to Durian husk in all replacement proportions tested. Abalone performed best on bagasse, hence it can be recommended as a substitute for saw dust. Even though Durian husk can be used to grow Abalone with the same biological efficiency as saw dust, further studies are encouraged on adjusted particle size of the growing media.

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