

ATIKA S  
2021

"IN PURSUIT OF EXCELLENCE TOGETHER"



JOURNAL OF ACADEMIC SESSION  
ADVANCED TECHNOLOGICAL INSTITUTE - KEGALLE

14<sup>th</sup> DECEMBER 2021

ADVANCED TECHNOLOGICAL INSTITUTE - KEGALLE  
SRI LANKA INSTITUTE OF ADVANCED TECHNOLOGICAL EDUCATION

ISSN 2820-2171

**Journal of Academic Sessions**  
**Advanced Technological**  
**Institute - Kegalle**

*“In Pursuit of Excellence Together”*

14<sup>th</sup> December, 2021

Advanced Technological Institute

Bandaranayaka Mawatha

Kegalle

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**Journal of Academic Sessions - Advanced Technological  
Institute, Kegalle  
(ATIKAS 2021)**

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ISSN 2820-2171

**Published by:**

Advanced Technological Institute

Bandaranayaka Mawatha

Kegalle

Sri Lanka.

**Cover design by:**

T.A.R. Dilum

Advanced Technological Institute

Kegalle.

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## Message from the Chief Guest



It is my great pleasure to share a few words at the Inaugural Academic Session of Advanced Technological Institute Kegalle, ATIKAS 2021.

In line with the view that research opens up new opportunities for learning and growth, in the past few years SLIATE has been actively promoting a research culture among its members. Taking one step further, it is indeed commendable that the young academics of ATI Kegalle have taken this initiative to provide a platform to share research- based knowledge and best practices at the institutional level. Moreover, adapting to the new normal in this COVID-19 pandemic, ATIKAS 2021 stands as the first-ever virtual research forum initiated by SLIATE. It is noteworthy that the forum lays a strong emphasis on multidisciplinary approach. This year's session consists of papers from diverse fields such as Accountancy and Management, Computing and Technology, Language and Literature and Pedagogical Approaches and collaboration among young researchers from different disciplines is praiseworthy. True to its theme "In pursuit of excellence together", I sincerely hope this endeavour will continue to flourish in the coming years fostering a positive research culture among the academics, professionals and students affiliated to ATI Kegalle.

I would like to congratulate and appreciate the organizing committee of ATIKAS 2021 for their collective effort to make this event a reality amidst the challenges posed by the COVID-19 crisis.

I wish the forum great success.

**Prof. Lakshman Jayaratne**

Director General - Sri Lanka Institute of Advanced Technological Education

Professor - University of Colombo School of Computing

## Message from the Chairperson



The Academic Session of Advanced Technological Institute- Kegalle (ATIKAS 2021) marks a significant milestone in the history of ATI Kegalle. I am extremely happy that all steps have been taken to hold the inaugural academic session ATIKAS 2021 successfully despite the COVID-19 pandemic and its

consequences.

After the 1990's, the World started to change fast especially due to internet-based technological improvements. These improvements have changed not only social systems including educational institutions but also social development and educational perspectives. The conference theme "In pursuit of excellence together" is highly appropriate in the current environment and also is aligned with the ethos of the Advanced Technological Institute - Kegalle which has four different study programs. Therefore, I believe, the conference will provide the much-needed platform for young researchers for greater integration of multi-disciplinary, cross-disciplinary, and interdisciplinary approaches to knowledge generation and sharing.

I extend my sincere thanks to the editorial board and the organizing committee for their hard work in making this forum a reality.

I wish ATIKAS 2021 all the very best.

**Ms. Deepani Ekanayaka**

Director  
Advanced Technological Institute  
Kegalle

## Keynote Speech



Prof Ajith Jayaweera

Faculty of Livestock Fisheries and Nutrition

Wayamba University of Sri Lanka

### Pursuit of Excellence in Teaching and Learning

The term excellence is generally understood as a mark of distinction, describing something that is exceptional, meritocratic, outstanding and exceeding normal expectations. It is a form of commendation commonly linked to the reputation of institutions and to the achievements of students. The enhancement of the quality of institutions and programmes and the accountability of the results of teaching and learning (T&L) are essential for the pursuit of excellence in any academic entity. Excellence in an academic programme can be evaluated in many ways such as excellence in management, excellence in research, excellence in teaching and excellence in student performance. The demand for the programme, completion rate of candidates, stakeholder satisfaction, employability of those who graduate are some indicators of achieving goals of the programme. Overall performance of the student at completion of an academic programme should be measured not only from what they know but from who they are and what they can do. I like to call “What they know” as “*cognitive authenticity*”, “who they are” as “*behavioral authenticity*” and “what they can do” as “*physical authenticity*” in andragogic terminology. The cognitive authenticity refers to knowledge and understanding of the learners. The physical authenticity encompasses psychomotor skills, while behavioral authenticity is a blend of attitudes and mindset of the grandaunts or diplomates. Achieving excellence in this triad should be the ultimate objective of any academic programme we offer.



In the 1990's higher education institutes in the European union had identified that employability of graduates and diplomates is getting lower over the decades and further concluded that less employability or long time taken to get the first employment are due to lack of "employability traits" in the candidates. With this analysis, in the Bologna process adopted for quality assurance in higher education of Europe, tertiary education institutes had identified those "employability traits" and named them as Generic Graduates' Attributes (GGAs). The term "graduate" herein refers to a person who graduates with a degree or diploma from a tertiary education institute. It was proposed that all the GGAs should be developed in the course of study irrespective of the discipline to assure "industry ready" graduates. In 1999, over 47 universities and technical institutes across the world have taken steps for quality assurance (QA) of the academic programmes and to focus on GGA development. Around 2010's higher education sector in Sri Lanka has also started to adopt policies for QA and it came into fully functioning in 2014.

However, the industry continues to query about the "relevance of the programme" that we offer. The term "relevance" refers to the expectation of the industry in the academic programme and it is a legitimate question whether the graduate is "fit for the purpose". One of such expectations is "enterprise skill". I am fascinated about the term "enterprise skill" and keen to identify what is missing in our programmes. In order to address these issues, all the academics and administrators should be well-informed about GGAs and should know how to plan and conduct programme and assess students to achieve GGAs at the best. Are the GGAs and Soft skills same? Should we conduct separate modules and teach GGAs in addition to subject specific knowledge and skills in our T&L? Are all students equally capable in developing GGAs? Should students be entrusted with the responsibility of developing their enterprise skills? These are a few questions that we should find answers to in the discussion today.

## **What are GGAs?**

Graduate attributes are qualities and capabilities demanded by the employers of the graduates. That demonstrates what the graduate can do and who they are, which is more important than what they know. The graduate attributes are defined as “*the qualities, skills and understandings an academic community agrees its students would desirably develop during their time at the institution and consequently shape the contribution they are able to make to their profession and as a citizen*”. Thus, graduate attributes are specific to the graduate profile. However, in comparison, GGAs are open and holistic in nature and they are often referred to as generic attributes rather than generic skills in recognition that as outcomes, they include more than skills and attitudes. As well as being a more global term for such outcomes, it is one that can encompass new or alternative conceptions of wisdom and knowledge.

Educationists have interchangeably referred to GGAs as generic skills, transferable skills, core skills, soft skills, graduate capabilities, work-ready skills and key skills etc. However, GGAs are more specific behavioural objectives than depicted by transferable skills, core skills, or soft skills.

The definition of GGAs includes many generic attributes such as *information literacy, metacognitive skills, intellectual and imaginative powers, understanding and judgement, problem solving and critical thinking skills, ability to see relationships, personal and interpersonal skills needed for communication, cooperative and collaborative teamwork, leadership, skills required for successful work practices i.e. time management, task management leadership and self-evaluation etc.* I have understood that there is a very comprehensive list of skills that encompasses over 40 key generic skills that can be classified into 12 main groups (see Table 01) according to the objectives served by each of the skill and for the convenience of study. The table can be further extended with some more generic skills falling within the given key GGA.

**Table 01:** Examples of GGAs

| <b>GGAs</b>            | <b>Example core competencies</b>  |
|------------------------|---|
| Communication          | Writing reports, giving presentations, using media  |
| Group work             | Teamwork, leadership, cooperation   |
| Personal               | Independence, autonomy, self-assessment, integrity, vision for life, emotional intelligence |
| Interpersonal          | Counselling, listening, negotiation, assertiveness,   |
| Organizational         | Time management, project management, objective setting                                      |
| Teaching & training    | Peer tutoring, conducting training, identifying learning needs                              |
| Learning               | Literature review, note taking, reading for purpose,  |
| Information gathering  | Locating information sources, extracting data   |
| Problem solving        | Problem analysis, creative problem solving,   |
| Language               | Oral skills, language fluency,  |
| Information technology | Using software, database, spreadsheet, graphics   |
| Entrepreneurship       | Taking initiatives, seizing opportunities,  |

All the academic programmes specify a list of learning outcomes which are often targeted at the attributes listed in the graduate profile. The subject specific knowledge and skills are included in the graduate attributes and all the generic skills or alternatively called soft skills/transferable skills come under GGAs. In planning the curriculum of any academic programme, GGAs are an important consideration. GGAs should be integrated in the course specifications and teaching learning process should be planned to achieve the GGAs. Proper delivery should ensure that students develop skills that would better equip them with enterprise skills for the work environment and self-employment. It is evident in the

classification given in literature that graduates should acquire GGAs irrespective of their area of study. By tackling courses, students are expected to acquire ‘generic processes’ rather than just ‘specific content’. However, the popular assumption that content in these generic processes will transfer into skills for students’ subsequent work and lives is still uncertain in conventional academic curricular in the orthodox delivery. Thus, I believe that any golden academic programme would produce silver graduates/diplomates if we fail to facilitate GGA development and in contrast any silver academic programme would produce golden graduates/diplomates if we are geniuses to identify and facilitate GGA development through our T&L process.

In a programme, GGAs are no longer seen as being independent of subject specific knowledge because they interact with discipline knowledge. Also, we should not forget that “every student is a good student” if he or she finds a good teacher and good T&L process and thus, every student is well capable of developing GGAs to an appreciable level if the T & L environment is created in such a way.

As we all know, syllabus, subject area and topics are specified and agreed upon by the board of academic body for a programme. Tutors are not expected to do much change in these contents, in their session planning. However, we have the academic freedom and if agreed across by the similar programmes, to select the best method of delivery to match the outcomes, manipulate the order, reset time allocation for each session and to emphasise sections to develop the GGAs. We may not be able to change the content much but we can add variety to methods of delivery from teacher-centred to student-centred, entrusted with the responsibility of task to students following the “five precepts” of T&L in andragogy. That is:

- i. Relevance of activity to youthfulness and expectation of adult learners,
- ii. Active involvement of the learner from all aspects and remove passivity or free riding,

- iii. Formidable challenge in activities to learners to use more of their skill and abilities and team spirit,
- iv. Support, guidance and good relationship of teacher, and facilitation from institute, and
- v. Reward to the learners at the successful completion of tasks as grades, marks or appreciation worthy for the effort.

I use these five precepts with very successful results in all the student-centred activities not only in T&L but also in all extracurricular work with students.

The understanding of GGA is a must for all the academics because, as long as we are fancy about content delivery and ground cover but ignorant about the outcomes achieved by the graduates, our graduates will not be equipped with enterprise skills. In the end, we are wasting resources and students' valuable time to achieve Lower Order Thinking skills (LOTs) because our students should develop not only LOTs but also Higher Order Thinking skills (HOTs) which are needed most in the world of work. On the other hand, if we are impressed about what GGAs are and how to achieve them by learners through all that we do, we are doing a great service to the programme and the student. Here, the academics and administrators should be humble enough to accept that we academics being “expert in the subject” and having a well written curricular, do not guarantee that our graduates are equipped with enough “enterprise skills”, unless we conduct the teaching learning process and foster teaching learning environment to facilitate development of GGAs. I also believe that generic skills are not independent of the field of study and if the academics are strategic and reflective on feedback of students and stakeholders, we can develop many GGAs along the subject specific skills. Nevertheless, there are many other generic skills developed well within disciplines because of the methods of teaching and assessment in practice which is inevitably attached to the subject.

I have identified that a number of factors may impede successful embedding activities for GGA development into academic programs and disciplines. Poorly developed rationale for content,

no sense of urgency, unstable leadership, weak course design, poor understanding of how to teach and assess GGAs, poor staff commitment, lack of identification and appreciation of even short-term gains of students and lack of a critical mass of people who have the vision, passion and drive to be champion for GGA development of learners are the most important barriers we have in our programme delivery. Also, we should self-assess to check whether we have generic skills to match our profession. If we are masters of generic skills, we will create an environment for our learners to develop theirs. We should not wait till the big changes are brought up in curricular or syllabus or system of education in the country to empower our learners with enterprise skills. Active participation of learners in the T&L process by adopting student centred learning specially using blended learning strategies, planning academic activities deliberately looking beyond mere content delivery but keeping opportunities for GGAs to develop, using continuous assessment with prompt feedback and guidance to learners for improvement of anticipated skills, taking away punitive approach and bring up edutainment in the T&L process, using appropriate and innovative teaching methods and creativity with commitment of teacher for excellence, and good governance of the institute will be some suggestions to bring about all GGAs and ultimately enterprise skill of our students.

In the pursuit of excellence together we must identify our immediate role to achieve objectives towards 21<sup>st</sup> century paradigm of education, update our knowledge, skills, perceptions with growth mind-set in T&L, and above all commit ourselves at best irrespective to any barriers to fulfil our profession for the betterment of the future generation.

# **Panel of Reviewers**

## **Accountancy and Management**

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# Factors Influencing the Perception to Become a Professional Accountant

(Special reference to students who are following Higher National Diploma in Accountancy at Advanced Technological Institute Kegalle)

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## Abstract

*The scope of the career in accountancy has been expanding in the business world, along with emerging complexities as well as the rise of the number of organizations with the global acceptance and expectations of accountants being professionally qualified with qualifications like ACCA, CIMA, CA, etc. Many Sri Lankan organizations have expectations of containing professionally qualified accountants. This study empirically verifies the factors which have a significant influence on the perception to become professional accountants. The study has used primary data and data collected through a structured questionnaire from 220 students following HNDA at Advanced Technological Institute Kegalle. The study has tested the influence of six factors: salary, job security, prestige, advancement for opportunities, advisory received, and grit personality on the perception to become a professional accountant. Descriptive statistics, Correlation analysis and Regression analysis, have been used to analyse the data. According to the results, other than Grit Personality, all other independent variables significantly influenced the perception to become a professional accountant. Findings of this study are showing consistency with the findings of earlier studies too.*

**Keywords:** Professional Accountant, Salary, Job Security, Prestige, advancement for opportunities, advisory received, grit personality

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## INTRODUCTION

This study analyzes undergraduate accounting students' perspectives of choosing a career of becoming a professional accountant. According to Azni, et al. (2016), A professional accountant, is a person trained professionally in accounting and normally have a Professional Accountancy Qualification (PAQ) awarded by professional accounting bodies. Some examples for such professional accounting bodies are Institute of Chartered Accountants of Sri Lanka (ICASL), Association of Chartered Certified Accountants (ACCA), the Chartered Institute

of Management Accountants (CIMA). Considering the Sri Lankan context, in December 1959, the Institute of Chartered Accountants of Sri Lanka (ICASL) was established under Act of Parliament No. 23 of 1959 replacing the Accountancy Board. ICASL has been the main local professional body for accounting education and training since then. (The CA Sri Lanka Annual Report 2019).

Before being a professional qualified accountant it's imperative to develop market research. A detailed study can help in determining the projections of becoming professionally qualified accountants from the perception of undergraduate students. Market research study includes assessment of the current and future job demand market conditions, size, and trends apart from evaluating student needs & job demand and competition. In this study, the research problems raised such as course fee, time, financial strength and job market attractiveness. In the Sri Lankan context, there is a lack of studies to understand the factors that would prove the undergraduate accounting students' perceptions of becoming a professional accountant. So this is an attempt to create a platform to identify the factor significance of the selection of their profession as professional accountants. Moreover, the findings of prior studies in Sri Lanka's context do not show consistency, so, it is vital to reinvestigate the things to get a clear idea.

## **LITERATURE REVIEW & HYPOTHESES DEVELOPMENT**

The study by Amarathunga and Ajward (2018) proposes that factors such as greater potential to earn a high salary, challenging working environment available, a higher opportunity for advancement, possessing higher qualifications and greater opportunity to work as a team in the field of accounting are identified to influence positively on the management undergraduate's perception and their intention to choose a professional accounting career. Furthermore, they concluded that together with greater potential to earn a high salary in the field of accounting, a challenging work environment, greater opportunities for advancement in the field of accounting and gaining higher qualifications in the field of accounting, and working as a team were listed as the top five variables that influence the perceptions of management undergraduates' career choice decision making. The findings of Aziz et al. (2017) state that although other studies have shown that intrinsic and extrinsic factors may motivate students to be professional accountants, various studies, especially ones involving Asian students, found that they are consistently intrinsically motivated.

The study by Amarathunga and Ajward (2018) proposes that factors such as greater potential to earn a high salary, challenging working environment available, a higher opportunity for advancement, possessing higher qualifications and greater opportunity to work as a team in the field of accounting are identified to influence positively on the management undergraduate's perception and their intention to choose a professional accounting career. The researchers from previous studies show that salary is an 11 important factor for accounting students to choose accounting as a carrier (Said, et al., 2004). In

contrast, Jackling, et al. (2006) concluded that salary has no significant influence on management undergraduates becoming professional accountants. Myburgh (2005) reports that students choose the availability of employment as the most important benefit for pursuing a career as chartered accountants. Moreover, Mustapha and Abu Hassan (2012) study among final year accounting students at a public university in Malaysia found job security and stability positively and significantly related to the respondents choosing to be professional accountants. Abdullah and Zakaria (2006) also support job security as an important attribute for accounting students to join public accounting firms. In another study by van Zyl and de Villiers (2011), it is found that accounting major students rank availability of employment as one of the motivating factors to become chartered accountants. Jackling, et al (2012) conducted a study on Australian and international students mainly from China, Malaysia and Hong Kong and found that for both groups, prestige is a significant factor for students to continue into the accounting profession. This finding is consistent with Mustapha and Abu Hassan (2012) and Germanou and Hasall (2009). Abdullah and Zakaria (2006) found evidence that advancement is the most important attribute for accounting students to join a public accounting firm, especially among male students. Mustapha and Abu Hassan (2012) reinforced this finding, who also found that opportunities for advancement to be positively correlated to students' career choices as professional accountants. Other elements that have been investigated are 'parental influence' (Law, 2010) and parent and teachers' influence (Myburgh 2005) on motivating factors for students to be professional accountants. Law (2010) found that 'parental influence' significantly contributes to predicting accounting students' career choice in Hong Kong. While Myburgh (2005) study on first-year accounting students at the University of Pretoria, South Africa shows that advice given by significant family members and the influence of school teachers were ranked amongst the top three sources of influence in the respondents' career decision making. Therefore, this study seeks to also examine the significance of family and educators influence in predicting accounting students' intention to pursue professional accounting profession. Bacanlı (2006) found support that personality characteristics influence career indecisiveness while Gunkel, Schlaegel, Langella and Peluchette (2010) opines personality traits have direct effect on students' career. Duckworth and Peterson (2007) propose one personal quality prominent in successful leaders is grit. Grit is defined as perseverance and passion for long-term goals. Geiciki (2002) explains the word career as an individual does commercial, industrial activities during his or her's educational or other events. Redman and Wilkinson (2001) defined this as the utilization of a man's judgment and capacities, calling, perfect work, size and making and creating the business framework. Adefolaju (2015) as a person's type of profit just as conduct and ideas in regular daily existence. Akomolafe (2003) states that an individual's profession could either make or imperfection a person or the person can get satisfied and joy.

According to the literature review salary, job security or stability, prestige or status, opportunity to advance, advisory received, financial assistance and grit personality as the factors which are influenced to be a professional accountant. And it can be noted that there is a lack of studies to understand the factors that would determine the undergraduate accounting students' perceptions towards

becoming a professional accountant in Sri Lankan context. The researchers have developed the following hypotheses to identify the factors that significantly influence the perception of becoming professionally qualified accountants.

H1: There is a significant relationship between Salary scale and perception to become a professional accountant

H2: There is a significant relationship between Job security or stability and perception to become a professional accountant

H3: There is a significant relationship between Opportunities for advancement and perception to become a professional accountant

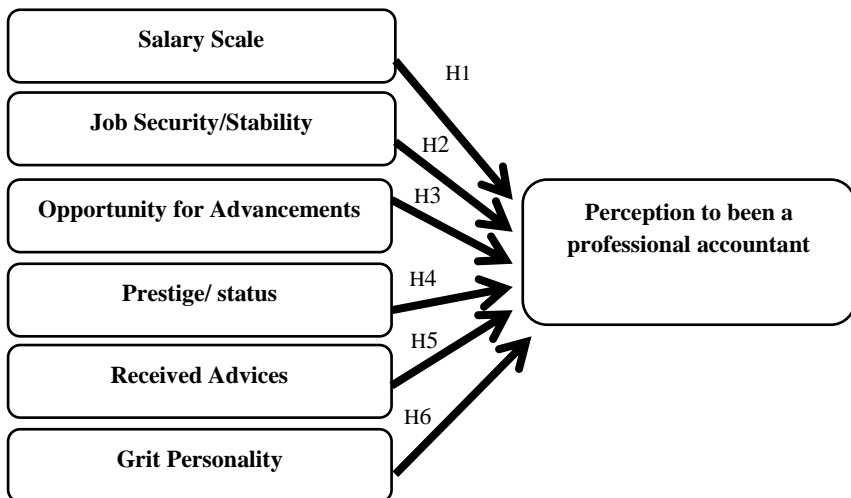
H4: There is a significant relationship between Prestige or status and perception to become a professional accountant

H5: There is a significant relationship between received Advices and perception to become a professional accountant

H6: There is a relationship between Grit personality and perception to become a professional accountant

## METHODOLOGY

In achieving the predefined objectives of this study, the researchers have adopted a positivism approach following quantitative methodology. The researchers have developed the following conceptual framework based on the identified literature.



**Figure 1.** Conceptual Framework

Aziz, et al., 2017 have been developed operationalization in a same type of study. The researchers have been used same indicators to develop operationalization in measuring these variables.

According to the annual report of SLIATE, registered students in department of accountancy is 600. This research has aimed to collect data from 220

respondents whose population is students of department of Accountancy, ATI Kegalle. sample size was determined following Krejcie and Morgan (1970). Similar studies by Aziz, et al. (2017) and Samsuri, et al. (2016) have followed the same approach to detect the relationship between the variables and to identify how variables influence one another. Following those studies, the researchers used parametric tests (Pearson correlation Analysis) to assume normal distribution of the data set. And to assess the accuracy of measuring dependent variable through these identified independent variables, the researchers has adopted multiple regression analysis model testing.

## DATA ANALYSIS & RESULTS

Data were collected through a structured questionnaire developed based on prior studies. Responses have been received from 220 respondents and 116 (52.7%) are females and 104 (47.3%) are males. As HNDA is a 4-year course, data have been collected from the students from every year. The most number of respondents were from the first year and second year accounting undergraduates amounting to 68 (30.9%) each, followed by 55 (25%) from 3rd and the least from the 4<sup>th</sup> year amounting to 29 (13.2%).

The researchers conducted a pilot study of 25 respondents. The inter-item consistency reliability was examined with Cronbach's Alpha test. The Cronbach's Alpha was computed for the variables that have over one item and the below table which suggests that the internal reliability of each instrument is satisfactory as the Cronbach alpha values exceed 0.7.

**Table 1:** Pearson Correlation Analysis results

| Independent Variables          | Dependent Variable (Perception to be a professional Accountant) |                     |                               |
|--------------------------------|---|---------------------|-------------------------------|
|                                | P value   | Pearson Correlation | Remarks                       |
| Salary                         | .000  | 0.440               | Significant Moderate Positive |
| Job security or stability      | .003  | 0.272               | Significant Weak Positive     |
| Opportunities for advancements | .001  | 0.309               | Significant Weak Positive     |
| Prestige or status             | .001  | 0.307               | Significant Weak Positive     |

|                   |      |       |               |      |
|-------------------|------|-------|---------------|------|
| Advisory received | .009 | 0.239 | Significant   | Weak |
| Grit personality  | .459 | 0.068 | Insignificant |      |

According to the Pearson correlation analysis results, besides the correlation between the dependent variable and the independent variable ‘grit personality’ is not significant, the remaining correlations between the dependent variable and the independent variables display a weak positive correlation, with the exception of the correlation with the variable ‘salary’ having a moderate positive correlation. Higher salary is observed as the highest influential factor on developing a better perception of becoming professionally qualified accountants. Furthermore, the researchers used the multiple regression analysis model testing in case of measuring the impact from independent variables, towards dependent variable. According to the adjusted  $R^2$  of the model this particular regression model is 0.465, which implies that the independent variables explain 46.5% of the variations in the dependent variable. At the same time, the significance values of the ANOVA result are also less than 0.05. Thus, this model is statistically significant in predicting how the perception of students to become professional accountants.

The hypothesis testing was carried out using Pearson’s Correlation analysis results and the hypotheses testing summary presented below.

**Table 2.** Hypotheses Testing Summary

|                | <b>Hypothesis</b>  | <b>Acceptance/<br/>Rejection (95%<br/>Confidence level)</b> | <b>Rationale</b>          |
|----------------|--|---|---------------------------|
| H <sub>1</sub> | There is a significant relationship between Salary scale and perception to become a professional accountant                  | Accepted  | P value is less than 0.05 |
| H <sub>2</sub> | There is a significant relationship between Job security or stability and perception to become a professional accountant     | Accepted  | P value is less than 0.05 |
| H <sub>3</sub> | There is a significant relationship between Opportunities for advancement and perception to become a professional accountant | Accepted  | P value is less than 0.05 |
| H <sub>4</sub> | There is a significant relationship between Prestige or status and   | Accepted  | P value is less than 0.05 |



perception to become a professional accountant

|                |  |              |                              |
|----------------|--|--------------|------------------------------|
| H <sub>5</sub> | There is a significant relationship between Advisory received and perception to become a professional accountant | Accepted     | P value is less than 0.05    |
| H <sub>6</sub> | There is a relationship between Grit personality and perception to become a professional accountant              | Not Accepted | P value is greater than 0.05 |

According to the hypotheses testing summary, researchers have enough statistical evidence to accept H1, H2, H3, H4 and H5.

## CONCLUSION

The study investigates the factors influencing the perception to become professional accountants, where evidence was collected from undergraduates from the Department of Accountancy, ATI Kegalle. As such, though the representation of undergraduates of the Department of Accountancy, ATI Kegalle towards all university/other higher education institutes undergraduates is questionable due to the inherent recruitment of students throughout the places in the country. This study intends to find knowledge on the motivating factors on the perception of becoming professional accountants.

Based on the literature, the conceptual framework developed tested seven independent variables, namely Salary, Job security or stability, Opportunities for advancement, Prestige or status, Advisory Received, and Grit personality. According to the results, other than Grit Personality, all other independent variables significantly influenced towards the perception to become a professional accountant. This result is consistent with the earlier studies by Aziz, et al., (2017) Sugahara, et al. (2008), Mustapa, et al. (2012) and Germanou and Hassall (2009).

The study intended to divulge findings related to the present context and provide insights for decision-makers from academia and industry. And, future researchers can investigate different factors in same scenario and these identified factors in different professions.

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# Impact of Integrated Reporting Six Capitals on Corporate Financial Performance: Evidence from Sri Lanka

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## Abstract

*The increasing evolution of economic conditions in the global business world demands more financial and non-financial information to satisfy their stakeholders. The study investigated the impact of the six capitals disclosures, including Financial capital, Manufactured capital, Intellectual capital, Human capital, Social and Relationship capital and Natural capital, on the corporate financial performance of the CSE listed companies in Sri Lanka. According to GICS classification, the consumer staples sector and financial sector were used as the sample based on the criteria of highest market capitalization. As a result, Financial capital reporting was the most common form of capital reporting, and Natural capital reporting was the least common form of capital reporting. The multiple regression analysis that applied to test the impact of the disclosure extent of the six capitals of IR on the corporate financial performance revealed that financial capital and intellectual capital disclosure make a significant positive impact on corporate financial performance. The study found an insignificant positive impact of Social and Relationship capital and Natural capital on financial performance, while Manufactured capital and Human capital had an insignificant negative impact on corporate financial performance.*

*Keywords: corporate financial performance, integrated reporting, six capitals*

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## INTRODUCTION

In the contemporary business world, corporate accomplishments tend to be balanced between the economic, social and environmental perspectives in order to guarantee corporate sustainability. Therefore, financial and non-financial information disclosures have become prominent in corporate reporting. The International Integrated Reporting Council (IIRC) in 2010 launched a new form of reporting, namely Integrated Reporting (IR), to provide a holistic view of the corporate value creation process (IIRC, 2012). IR aims to improve the quality of information exist to financial capital providers, promote a more unified and efficient approach to corporate reporting, enhance accountability and stewardship for the broad base of capitals and promote integrated thinking in the decision-making process (IIRC, 2021).

The IR framework, which is a principal based approach, highlights the seven guiding principles, which are strategic focus and future orientation, connectivity of information, stakeholder relationships, materiality, conciseness, reliability and completeness, consistency and comparability that underpin the preparation and presentation of an integrated report and eight content elements include an organizational overview and external environment, governance, business model, risks and opportunities, strategy and resource allocation, outlook and basis of presentation that are fundamentally linked to each other (IIRC, 2021). These principles and elements ensure the clearly reported nexus between financial and non-financial information for assessing the current performance and future corporate state (Adegboyegun et al., 2020). The driver behind IR was the focus on value formation (PwC, 2015). All organizations depend on various types of capital for their value formation. According to the IR framework, the capitals consist of financial, manufactured, intellectual, human, social and relationship and natural that are stocks of value for corporate success. The overall stock of capitals is not fixed over time, and there is a constant flow between and within the capitals as they are increased, decreased or transformed (IIRC, 2021).

**Table 1:** Six capitals in IR framework (2021)

| Type of Capital         | Definition  |
|-------------------------|---|
| Financial               | The collection of funds available to an organization that can be obtained through financings such as debt, equity or grants or generated through operations or investments.                     |
| Manufactured            | Physical objects that are produced by humans and available to an organization including buildings, equipment, or infrastructure.  |
| Intellectual            | Organizational knowledge including intellectual property such as copyrights, patents, software, rights and licenses, tacit knowledge, systems, procedures and protocols unique to the business. |
| Human                   | People’s competencies, capabilities and experience.   |
| Social and Relationship | The network of relationships and communities a business holds, including stakeholders, investors, customers and other groups.   |
| Natural                 | All renewable and non-renewable environmental resources and processes including air, water, land, minerals, forests, biodiversity and ecosystem.  |

IR emphasizes the importance of integrated thinking on the wide range of capitals in the value creation process. This integrated thinking has been identified as a wider organizational reporting philosophy which is supposed to bring a shift in the traditional corporate reporting and integrate various reporting platforms (Haji and Hossain, 2016). The traditional view of value creation focused on purely financial, indicating that corporate value was narrowly defined in monetary terms. According to the IIRC Framework, value has a broader meaning than financial, and it includes a wide range of interactions, activities and relationships. The IR framework has mentioned that an integrated corporate report should include information about its business model and how it integrates with the six capitals, and also the company should mention their strategies to recognize how each capital is used, consumed or transformed in its value creation process in the short, medium and long term (Jayasiri, 2020). Flower (2015) has mentioned that the corporate capital concept in IIRC would certainly facilitate organizations in reporting their impact on sustainability. Therefore, it is vital for the firms to report all the capitals affected by organizational activities for sustainability reporting. This multi-capital reporting help organizations to provide a meaningful assessment of the long-term sustainability of the organization's business model and strategies, meeting the information requirements of stakeholders and assisting for the effective allocation of scarce resources (IIRC, 2011).

There are a few empirical studies that have been conducted based on the area of capital reporting and identifying the effect of capital reporting on firm performance. The existing findings provide mixed results that differ by country and different business sectors. IIRC (2015f) found a majority of South African firms focused only on financial capital without any consideration to other forms of capital. Wild and Van (2013) found that most of their sample companies have disclosed financial, human, social and relationship and natural capital. Baharudin et al. (2019) found that the most common forms of capital to report and disclose in annual reports are financial capital and manufactured capital most difficult capital to report on is natural capital.

There is a continuous interaction and transformation between the capitals, and many business activities cause an increase, decrease or transformations of capitals in a more complex way, and hence, impact organizational performance in a different manner (IIRF, 2021). Therefore, it is important to analyze the Sri Lankan perspective to include multi-capitals as prescribed in IIRF (2013) in preparing corporate annual reports for the value creation process. The current study was conducted to identify the disclosure level of IR six capitals of selected companies and to investigate the impact of IR six capitals on corporate financial performance. The findings will aid corporate decision-makers in preparing integrated annual reports and improving their value creation by integrating various types of capital.

### **Research Objectives**

1. To examine the disclosure level of IR six capitals of CSE listed companies

2. To investigate the impact of IR six capitals on the financial performance of CSE listed companies

## **LITERATURE REVIEW**

The stakeholder theory introduced by Freeman (1984) explains that organizations should strive to do right to all the stakeholders, including shareholders, managers, employees, suppliers, customers, government and the public. Therefore, an integrated report should include financial and non-financial information to meet the information requirements of various stakeholders (Eccles and Krzus, 2010, Adegboye et al., 2020, Suttipun, 2017). The signalling theory indicates that IR and its credibility provide the signal that the business is taking steps to meet the information requirements of various stakeholders (Fernando et al., 2017). Organizations can use profitability as an indicator to measure corporate performance as more lucrative organizations looking for more voluntary information disclosure to be sent as a signal to the market that the higher level of information revealed might lead to more uneven information (Cahan et al. 2016). Jeroe (2016) studied the effect of IR and non-financial information on firm performance using 44 firms across the world in 2012 and 2013. Non-financial disclosure index, IR index, firm size, risk and market value were used as independent variables, and ROA and EPS were used as dependent variables. The study found that IR and non-financial disclosure has a negative effect on firm performance. The study conducted by Albetairi et al. (2018) to assess the effect of IR on the financial performance of five firms in Bahrain with the use of ROA as explained variable and business model index, risk and opportunities index, strategy and resource allocation index and performance disclosure index as explanatory variables found that IR indices have mixed effect on firm performance.

Setia et al. (2015) found growing disclosure of four types of capital: human, social and relational, natural and intellectual in top 25 listed companies after the introduction of IR as a mandatory requirement for the Johannesburg Securities Exchange (JSE) in South Africa.

The exploratory study conducted by Jayasiri (2020) to analyze IR in Sri Lanka found that except for financial and manufactured capital, which are mandatory to report, other three forms of capital: human capital, social and relationship capital, natural capital showing an improvement in disclosing but, the intellectual capital was not well addressed by Sri Lankan listed companies.

Suttipun (2017) conducted a study to find the effect of IR on the corporate financial performance of 150 firms in Thailand. The study found that intellectual capital reporting was the most common form of capital reporting and environmental capital reporting was the least common form. The study further found that manufactured capital reporting and CSR practices positively impact financial performance while environmental capital reporting negatively impact financial performance.

A similar study has been conducted by Baharudin et al. (2019) to investigate the impact of capital's disclosure extent of the IR six capitals of the Malaysian oil and gas PLCs within Bursa Malaysia, moderated by the woman board of directors. The independent variables of the study were IR six capitals, and dependent variables were Return on Equity (ROE), and Return on Assets (ROA) woman board directors were used as moderating variables. The study has followed the content analysis method to analyze the extent of capital disclosure in annual reports of sample companies. A study found that the publication of IR six capitals has an insignificant impact on firm performance. The most common capitals to report and disclose within the annual reports were the financial capital and the manufactured capital. Human capital, intellectual capital and social and relationship capital were not disclosed much, and natural capital was the least disclosed capital in the annual reports. The study has further mentioned that IR disclosures are still in their infancy amongst Malaysian oil and gas PLCs.

The current study developed six hypotheses to identify the effect of IR six capitals on financial performance based on the existing literature (Suttipun, 2017; Baharudin et al., 2019) to achieve research objectives.

H1: Financial capital reporting has a significant positive impact on corporate financial performance

H2: Manufactured capital reporting has a significant positive impact on corporate financial performance

H3: Intellectual capital reporting has a significant positive impact on corporate financial performance

H4: Human capital reporting has a significant positive impact on corporate financial performance

H5: Social and Relationship capital reporting has a significant positive impact on corporate financial performance

H6: Natural capital reporting has a significant positive impact on corporate financial performance

## **METHODOLOGY**

The population in this was all the companies listed on the CSE in Sri Lanka. CSE listed companies are comprised of 11 sectors according to GICS classification, and the Consumer Staples sector and Financial sector were used as the sample based on the highest market capitalization criteria as of 31st March 2020. The sample consists of 122 companies: 57 Consumer Staples sector companies and 65 Financial sector companies. The data were collected from 2019/2020 corporate annual reports. Annual reports are conveniently available and provide an overall picture of corporate performance. Many previous studies relating to IR have used annual reports as their main basis of information (Amran and Devi, 2008, El Deeb, 2019).



The IIRC has defined six capitals underpinning for the value creation (IIRC, 2021), which are Financial capital, Manufactured capital, Intellectual capital, Human capital, Social and Relationship capital and Natural capital were used as independent variables. Key items and data coding according to the content analysis method were used to measure six capitals in annual reports (Suttipun, 2017; Gamerschlag et al.,2011; Gray et al.,1998; Baharudin et al., 2019). Key items were extracted from Background Paper for IR (2013) and from a similar study conducted by Baharudin et al. (2019). (Annexure 01)

Return on Assets (ROA) was used as the dependent variable, which is proportional to the total assets divided by the book value of the shareholders' equity to assess firm performance (Huang et al., 2006, Baharudin, 2020). Descriptive analysis and multiple regression analysis were used to meet the research objectives.

### Conceptual Framework

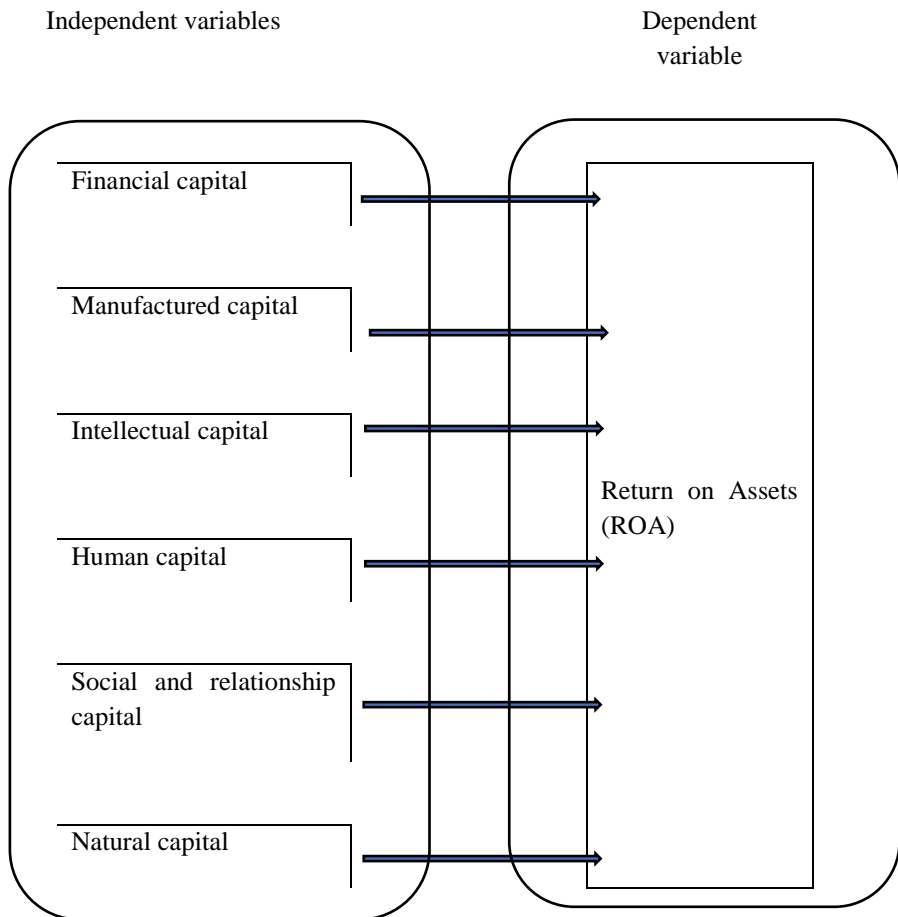


Figure 1. Conceptual Framework

The following model was used for the multiple regression analysis.

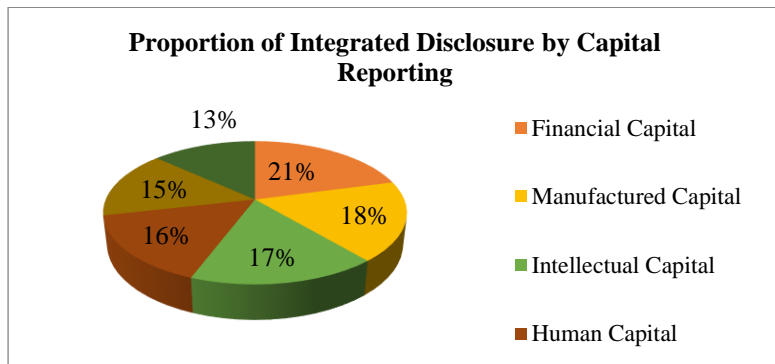
$$\text{ROE} = \beta_0 + \beta_1\text{FC} + \beta_2\text{MC} + \beta_3\text{IC} + \beta_4\text{HC} + \beta_5\text{SRC} + \beta_6\text{NC} + \varepsilon$$

Where,

- FC = Financial capital
- MC = Manufactured capital
- IC = Intellectual capital
- HC = Human capital
- SRC = Social and Relationship capital
- NC = Natural capital
- $\beta_0$  = Constant
- $\varepsilon$  = Error estimation

## FINDINGS

Figure 2 shows the proportion of integrated disclosure by capital reporting. The finding reveals that the most common form of capital reporting is Financial Capital representing 21 per cent of the total, followed by manufactured capital reporting 18 per cent, Intellectual Capital reporting 17 per cent, Human Capital 16 per cent, Social and Relationship Capital reporting 15 per cent and Natural Capital representing 13 per cent.



**Figure 2. Proportion of Integrated Disclosure by Capital Reporting**

Table 1 shows the extent and level of IR six capital disclosures in the annual reports of selected companies listed in the CSE. The results show that the most common form of IR was Financial Capital reporting (mean, 9.18), followed by Manufactured Capital (mean, 7.92), Intellectual Capital (mean, 7.48), Human Capital (mean 6.91), Social and Relationship Capital (6.4) and the lowest was Natural Capital (mean, 5.85). Within two industries, Financial Capital provided the highest IR reporting. Social and Relationship Capital reporting was high (mean, 7.21) in the financial industry compared with consumer staples (mean, 5.88). Natural Capital reporting was high in the Consumer Staples industry (mean, 6.43) compared with the Financial industry (mean 5.19).

**Table 1: Descriptive statistics**

|                         | Financial Capital | Manufactured Capital | Intellectual Capital | Human Capital | Social and Relationship Capital | Natural Capital |
|-------------------------|-------------------|----------------------|----------------------|---------------|---------------------------------|-----------------|
| <b>Total</b> Valid      | 122               | 122                  | 122                  | 122           | 122                             | 122             |
| Missing                 | 0                 | 0                    | 0                    | 0             | 0                               | 0               |
| Mean                    | 9.18              | 7.92                 | 7.48                 | 6.91          | 6.74                            | 5.85            |
| Std. Deviation          | .386              | 1.699                | 1.512                | 1.992         | 2.040                           | 2.848           |
| <b>Consumer staples</b> |                   |                      |                      |               |                                 |                 |
| Valid                   | 57                | 57                   | 57                   | 57            | 57                              | 57              |
| Mean                    | 9.23              | 8                    | 7.34                 | 6.95          | 5.88                            | 6.43            |
| Std. Deviation          | .426              | 1.629                | 1.676                | 2.331         | 2.351                           | 2.897           |
| <b>Financial</b>        |                   |                      |                      |               |                                 |                 |
| Valid                   | 65                | 65                   | 65                   | 65            | 65                              | 65              |
| Mean                    | 9.14              | 7.84                 | 7.50                 | 6.71          | 7.21                            | 5.19            |
| Std. Deviation          | 0.346             | 1.765                | 1.357                | 1.669         | 1.372                           | 2.732           |

Multiple regression analysis is applied to examine the impact of the IR six capital disclosures on the financial performance of the selected companies. The results are shown in Table 02. The study found a significant positive impact of Financial Capital and Intellectual Capital on corporate financial performance. Further, the study found an insignificant positive impact of Social and Relationship Capital and Natural Capital on corporate financial performance. Manufactured Capital and Human Capital had an insignificant negative impact on corporate financial performance. Therefore Hypothesis 1 and Hypothesis 3 were accepted, and others were rejected.

**Table 2: Multiple Regression Analysis**

| Model | R                 | R Square | Adj. R Square | Std. Error of the Estimate |
|-------|-------------------|----------|---------------|----------------------------|
| 1     | .447 <sup>a</sup> | .200     | .158          | 11.983103                  |

|            | Sum of Squares | df  | Mean Square | F     | Sig.              |
|------------|----------------|-----|-------------|-------|-------------------|
| Regression | 4118.913       | 6   | 686.486     | 4.781 | .000 <sup>b</sup> |
| Residual   | 16513.397      | 115 | 143.595     |       |                   |
| Total      | 20632.310      | 121 |             |       |                   |

| Model                | Unstandardized Coefficients | Standardized Coefficients | t      | Sig. |
|----------------------|-----------------------------|---------------------------|--------|------|
|                      | B                           | Beta                      |        |      |
| 1 (Constant)         | -90.719                     |                           | -3.269 | .001 |
| Financial Capital    | 8.563                       | .253                      | 2.961  | .004 |
| Manufactured Capital | -1.179                      | -.153                     | -1.536 | .127 |
| Intellectual Capital | 3.359                       | .389                      | 3.330  | .001 |

|                                 |       |      |       |       |      |
|---------------------------------|-------|------|-------|-------|------|
| Human Capital                   | -.640 | .827 | -.098 | -.774 | .440 |
| Social and Relationship Capital | .527  | .664 | .082  | .794  | .429 |
| Natural Capital                 | .322  | .561 | .070  | .574  | .567 |

a. Dependent Variable: ROA (Return on Assets)

## DISCUSSION

The study aimed to identify the extent of IR six capitals disclosure in corporate annual reports and to test the impact of IR six capitals on the corporate financial performance of the sample of listed companies. The study found that Financial Capital was the most common form of capital reporting. This result is consistent with the previous studies conducted by Jayasiri (2020) and Baharudin et al. (2019). Natural Capital was the least common form of capital reporting in the corporate annual reports. Baharudin et al. (2019) found a similar result in their study that natural capital is the most difficult capital to report amongst Malaysian oil and gas PLCs. Social and Relationship Capital which is one of the most influencing determinants for the success of the financial industry, showed a greater mean value compared with the consumer staples industry. Natural capital disclosure was high in the consumer staples industry than the financial industry. In testing the impact of IR on financial performance, the study found that Financial Capital and Intellectual Capital make a significant positive impact on corporate financial performance while other types of capital had no significant impact. Corporate financial capital consists of debt and equity collected from the credit market and capital market that play a vital role in the sustainability of a firm, such as an indicator of defining emerging capital performance (Bontis et al., 2007). The finding of the impact of Intellectual Capital on firm performance is similar to the results of Bramhandkar et al. (2007), Pew Tan et al. (2007), Clarke et al. (2011), Ozkan et al. (2017), proving that company's financial performance is positively influenced by intellectual capital. Intellectual capital is one of the key emerging elements that provide the future earning potential for business organizations.

The positive impact of Social and Relationship Capital and Natural Capital indicates that the high disclosure of such capitals increases corporate financial performance. The development of sustainability reporting over recent years has seen an increase in reporting with respect to Social and Relationship Capital and Natural Capital (Fasan, 2013). Sustainable disclosures boost demand for the firm's products and services, consequently increasing the firm's return (Baumunk, 2009). Social and relationship capital disclosures create more value for corporate stakeholders and improve internal capabilities while minimizing cost that leads to better financial performance (Preston and O'bannon, 1997). The study found an insignificant negative impact of Manufactured capital on firm performance that is inconsistency with prior studies that manufactured capital disclosure can prevent conflicts between principles and agents by increasing financial performance so that company can earn profits more than offset the cost of manufactured capital reporting (Aceituno et al., 2014; Suttipun,

2017). The study found an insignificant negative impact of Human Capital on financial performance. The reason may be that companies are likely to view voluntary reporting of Human capital as a cost acting to reduce corporate performance.

## **CONCLUSION**

The current study has some implications and provides contributions to the literature in the field of IR. The study improves the understanding of the effect of IR six capitals on corporate financial performance in developing countries. It also provides the value of IR disclosure in terms of financial and non-financial information on firm performance to different stakeholders. In light of the limitations of the current study, it is better to expand the sample size, use more proxies to measure financial performance and consider guiding principles and content elements of IR structure in order to provide improved results about IR on corporate value creation.

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# Outlier based Adaptive Threshold for Determining Overutilized Hosts in Cloud Computing

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## Abstract

*The delivery of computing services over the internet is an emerging technology referred to as cloud computing. The provision of convenient on-demand network access has made it one of the fastest-growing fields. Cloud computing enables its users to use different infrastructure, software, and platforms on-demand and pay-as-you-go basis. Resources play a vital role in this model as it is the main objective of a cloud for satisfying client requests. Higher resource usage consumes more energy and brings up the necessity of VM consolidation. Overloaded host detection is one of the main concerns in the consolidation process. The threshold value in which a host is determined as over-utilized is a crucial factor since it highly affects the overall performance of the cloud environment. In this research, the outer fence of CPU utilization data is considered as a threshold for over-utilized host detection; and assesses the performance change over existing threshold-based approaches. It is observed that the use of utilization outlier as a threshold for determining overutilized hosts improves the energy consumption, and the number of host shutdowns while minimizing the service level agreement violations of the cloud environment.*

**Keywords:** Cloud Computing; Data Outliers; Threshold Approach; VM Consolidation

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## INTRODUCTION

A cloud is a model comprising a network of virtualized PCs providing services based on pay as use concept. Cloud offers three service models named, Software as a Service (SaaS), Infrastructure as a Service (IaaS), and Platform as a Service (PaaS) and four deployment models named public cloud, private cloud, community cloud, and hybrid cloud. Either model is the backbone of virtualization; and it's a matter of a few seconds managing the virtual machines on demand (Ranjana, Radha and Raja, 2016).

In virtualization technology, users utilize cloud resources as a service. A service provider is a virtual machine (VM) that is hosted on a physical machine (PM) in the cloud data centre. Thus, the virtual machine acts as a complete system to its user. But the PM holds the real underlying hardware and software. Hence every VM request is to be mapped into the PM and the allocation of the best PM is crucial to the overall performance of the cloud.

As per Hamdy, any mechanism aiming for correct assignment of physical and/or virtual resources in cloud computing is a definition of Resource Allocation Strategy (RAS) (Hamdy, 2017). These allocation strategies are widely optimized to be performed well so as it is a key factor for providing a high level of Quality of Service (QoS) for the cloud users. At the point of allocating resources, it is an essential factor to monitor its utilization. The cloud resources should neither be over-utilized; nor under-utilized. In a cloud environment, both under-utilized hosts and over-utilized hosts are identified to be unhealthy hosts. P. Gupta (Gupta, Kumar and Krishan, 2017) states “*Data Center in any part of the globe may be over-utilized in daytime (from 9 AM to 9PM) but same Data Center may be under-utilized during night*”. This statement emphasizes the uncertainty of resource utilization and the necessity for managing over-utilized and under-utilized conditions to achieve a balanced condition.

Balancing the workload of a machine could be achieved by shifting the workload to the local machine to remote nodes or machines which are less utilized (Domanal and Reddy, 2014). Management of dynamic resources is efficiently done in VM consolidation. It involves Overloaded host detection, Underloaded host detection, VM selection, and VM Placement.

There're many approaches for detecting overloaded hosts. Beloglazov (Beloglazov and Buyya, 2012) proposes a heuristic based on utilization thresholds for VM migration from a host. In (Adhianto, 2010) proposes four robust methods for detecting over-utilized hosts by extending their previous work; Median Absolute Deviation (MAD), Interquartile Range (IQR), Local Regression (LR), and Local Regression Robust (LRR). Moreover, they propose three algorithms; Minimum Migration Time (MMT), Maximum Correlation (MC), and Random Choice (RC) for selecting the target virtual machines. Once an over-utilized host is detected, suitable VMs are selected to migrate from these hosts. In underload detection, the hosts with minimum CPU utilization are selected to migrate their VMs. The ultimate goal of this underload detection is to deactivate hosts in order to eliminate unnecessary energy consumption. But, if this deactivation is done excessively, it will incur extra power consumption for invoking the hosts back in case of increasing the demand (Yadav, 2018) and a risk since it could cause the failure of the PM in the long run.

Beloglazov and Buyya (2012) states three crucial issues to be addressed by an effective consolidation policy. Reduction of reliability due to excessive power cycling of a server, Assuring QoS when turning resources off in a dynamic environment, and Challenges to accurate application performance management while ensuring SLAs. Considering these issues, many researchers propose different VM consolidation approaches aiming to improve performance focusing energy efficiency while maintaining SLA to a minimum. Hence, this paper proposes a statistical method for selecting overloaded hosts for improving

overall performance. The proposed approach shows better performance over Energy consumption, SLA violation, and the number of host shutdowns.

## PROPOSED METHOD

Many studies propose threshold-based techniques for the consolidation of virtual machines. From such techniques, adaptive threshold-based techniques proved to perform better than static threshold-based techniques. An adaptive threshold for overutilized host detection is commonly computed based on the CPU utilization of each host. The utilization history of the host can be used to determine the change in demand for the host and compute a threshold based on that. In such a dataset, outliers can occur by chance.

Outliers are identified as the data points that lie at a farther distance from other data points. The Tukey method (Tukey, 1977) states any data outside the range (1) for some non-negative constant  $k$ , where  $k=1.5$  indicates an outlier and  $k=3$  indicates data that far out.

$$(Q1 - k(Q3-Q1), Q3 + k(Q3-Q1)) \text{ -----(1)}$$

Moreover, the range in (1) can be classified into four fences based on the value of  $k$ . Inner fences are formed for  $k=1.5$  and the outer fences are formed for  $k=3$ . The four fences are as follow, and these fences can be used for identifying extreme data points in the tails of the distributions.

lower inner fence:  $Q1 - 1.5*IQ$   
upper inner fence:  $Q3 + 1.5*IQ$   
lower outer fence:  $Q1 - 3*IQ$   
upper outer fence:  $Q3 + 3*IQ$

According to Osborne, even simple analyses can be affected by a significantly small proportion of outliers (Osborne and Overbay, 2004). As per the data set of hosts CPU utilization, the outlier data values can occur for minimum CPU utilization as well as maximum utilization. But since the overutilized host is determined by the upper utilization, both the lower fences were not considered for the evaluation. Therefore, the utilization thresholds were set at both upper outer and upper inner fences and assessed the data center performance. Algorithm 1 depicts the Pseudo-code for determining overloaded hosts where  $k=1.5$  for the upper inner fence and  $k=3$  for the upper outer fence.

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**Algorithm 1: Outlier based Overutilized Host Detection**

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```
1: Input: An array R of CPU utilization history of host
2: Output: True or False depending on whether host is overutilized or not
3:   Sort R in increasing order
4:   Q3 ← Third Quartile (R)
5:   IQR ← InterQuartile Range (R)
6:   Tu ← Q3 + k* IQR
7:   if utilization (host) > Tu
8:       Return true
9:   else
10:      Return false
```

**EXPERIMENTAL SETUP**

In this section, the characteristics of the hosts, workload, and the simulation environment of the experiment are described in detail.

Simulator: All the simulations were done with the Cloudsim toolkit (Calheiros, 2011). It is an efficient simulation environment for cloud modelling and computations.

Workload Traces: In this research, the data was derived from real Planet Lab workloads:20110303 with 800 heterogeneous hosts and 1052 virtual machines.

The experiment was done using a maximum correlation VM selection algorithm and compared with the similar adaptive utilization threshold approaches, Inter Quartile Range (IQR) and Median Absolute Deviation (MAD) overloaded host detection algorithms.

**PERFORMANCE ANALYSIS AND SIMULATION RESULTS**

The simulation result of the experiment for different performance metrics are given in Table 1.

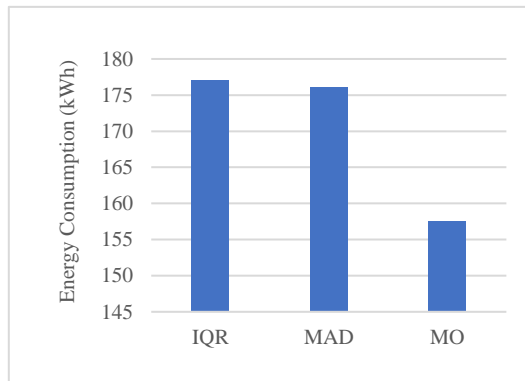
**Table 1:** The simulation results

| Algorithm                   | Energy Consumption | No of VM Migrations | SLA     | Performance Degradation | SLA Violation | No of Host Shutdowns |
|-----------------------------|--------------------|---------------------|---------|-------------------------|---------------|----------------------|
| IQR                         | 177.1              | 23035               | 0.00701 | 0.1                     | 0.12          | 5439                 |
| MAD                         | 176.13             | 23691               | 0.00739 | 0.1                     | 0.13          | 5417                 |
| Outlier based (where k=1.5) | 157.53             | 25868               | 0.00669 | 0.1                     | 0.11          | 4391                 |

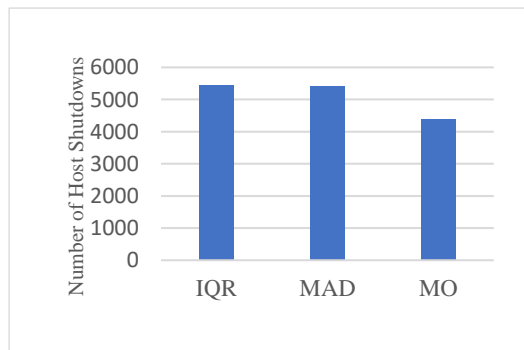
|                           |        |       |             |      |      |      |
|---------------------------|--------|-------|-------------|------|------|------|
| Outlier based (where k=3) | 175.96 | 28240 | 0.0072<br>0 | 0.11 | 0.11 | 5121 |
|---------------------------|--------|-------|-------------|------|------|------|

When comparing the performance of the algorithm for k=1.5 and k=3, it is clearly identified that the algorithm performs better when the threshold is set at the upper inner fence where k=1.5 than at the upper outer fence. The upper outer fence returns utilization that is much farther than that of the upper inner fence. Moreover, greater utilization thresholds lead to aggressive consolidations. Hence, the utilization threshold was set at the upper inner fence that refers to the mild outliers (MO) of utilization data.

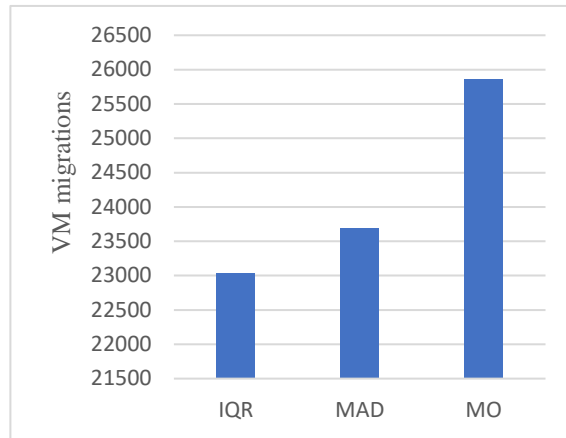
The comparison of energy consumption, number of VM migrations, overall SLA violations, and number of host shutdowns are depicted in Figures 1–4.



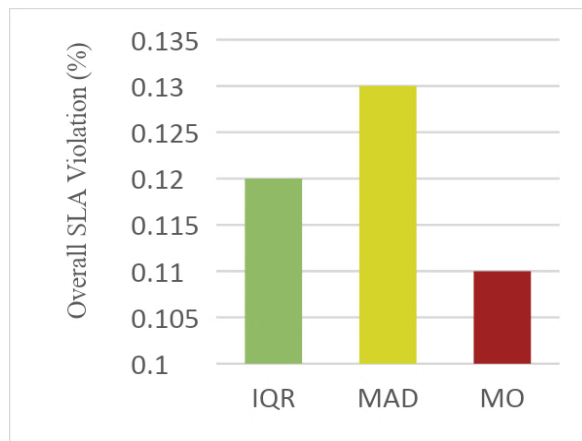
**Figure 1.** Energy Consumption



**Figure 2.** Number of Host Shutdowns



**Figure 3.** Number of VM Migrations



**Figure 4.** Overall SLAV

Energy consumption is mostly depending upon the utilization of the CPU. Lower the energy consumption better-reducing expenditure/cost. Figure1 is the comparison of energy consumption. Notably, the MO has smaller energy consumption than the other two methods.

Shutting down more hosts improves energy consumption. But frequent host shutdowns lead to additional energy requirements and failure of the PM in the long run. Thus, eliminating unnecessary host shutdowns will support better performance. The MO selects overutilized hosts based on utilizations that are much farther than the other data points. It prevents some unnecessary migrations

and restarting previously shutdown hosts. This results in a reduction in the number of host shutdowns as in Figure 2.

The number of VM migrations in the MO approach shown in Figure 3 is higher compared to other methods. But it has not negatively affected the SLA violations. Instead, the SLA violations of MO shown in Figure 4. are also less than the other similar strategies.

## **CONCLUSION**

In the workload consolidation process, overloaded host detection plays a vital role. There are many algorithms introduced to enhance the performance of consolidation. Based on the dynamic behaviour of resource utilization, heuristic methods show better performance than static thresholds. Therefore, in this research, the Tukeys' mild outlier was used as an adaptive upper threshold and tested for the Maximum Correlation VM selection policy. The experimental results have proved that the threshold set at Tukeys' mild outlier performs better compared to existing adaptive threshold-based techniques. The novel overloaded host detection approach shows a reduction in energy consumption while minimizing SLA violations. In the future, the proposed outlier-based overloaded host detection can be improved to find optimal threshold among all possible data outliers for improving VM migrations as well.

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# Estimation of Software Development Effort Based on Decision Tree Approach

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## **Abstract**

*Human effort can be taken as the significant parameter to decide the price of software projects, hence that estimating the effort can be taken as an essential point as it leads to effective project management. Due to the inexactness of the requirement of a software project, estimating the effort has become harder at the initial stage. The technique of estimating software efforts falls under different categories Expert Judgment and Algorithmic models are two of them. COCOMO, Function point analysis, Use case point analysis can be taken as widely using Algorithmic models. Some Machine Learning algorithms such as Support Vector Machine, Nearest Neighbors, Decision Trees etc... have drawn the attention of the researchers and changed the direction of Effort Estimation towards computational intelligence. Though a wide variety of approaches have been proposed, the accuracy and the simplicity of the approach are still questionable. This study proposed Decision tree-based models to predict the software effort. A decision tree is a simple yet powerful approach and it can be taken as the base for Random Forest, which is known as an ensemble of decision trees. This study exposes that ensembles of decision trees outperform single decision trees in terms of the mean magnitude of the relative error and prediction rate.*

**Keywords:** *Effort Estimation, Decision Tree, Random Forest, COCOMO*

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## **INTRODUCTION**

The prices for computer hardware have decreased while the price of software is continuously increasing. Software Industry spends billions on the installation and maintenance of software annually (Goyal and Parashar, 2018). Human Effort can be mentioned as the key factor that determines the price of the software. The amount of labor force to fulfill the requirement in a specific task is called effort and typically, it is measured in person-month units. The effort offers methods to predict the cost, schedule to achieve the desired goal.

Regardless of the software process model, estimating the real effort in the early stage of a software project is complex. Since clear specification and complete details cannot be taken at the first phase in software development, it has become a challenge for project managers to decide the price of the software project.

Nevertheless, predicting accurate effort is a must at the front phase to decide the price and the duration of software. Amount of losses, delays and the effectiveness of project management activities such as planning, monitoring, and control of the project is depending on the accuracy of effort (Mittas, 2020).

There are several metrics that are using in software effort such as computer hardware, network facility, programming language, software tools used and so forth. Among them, the size of the software can be taken as the significant factor that affects the effort. Most of the factors are not able to be measured accurately since that remains a challenge for researchers to improve the accuracy of software effort estimation. During the last decades, the area of software effort estimation has drawn the attention of researchers in the field of empirical software engineering. Various techniques are using to measure the software development effort. Expert judgment, Cost constructive model (COCOMO), Use case point analysis (UCP), function point analysis are some of them. With rapid development of Machine learning, it takes considerable attention by the researchers to apply Machine Learning over software effort estimation. According to Najm and et al., three general classifications of software effort estimation can be identified: 1) Expert judgment, 2) Algorithmic models (COCOMO II, Function Points Analysis, UCP, etc...) and 3) Computational intelligence which include (artificial neural networks (ANN), support vector machines (VM), decision Tree Learners, etc.) (Najm, Zakrani and Marzak, 2019).

A study has conducted by Nassif et al. based on Use Case Point with some machine learning approaches. Linear Regression, fuzzy and Neural Network-based models have described in that study where Multi-Layer Perceptron (MLP) performs a high prediction rate (Nassif, Ho and Capretz, 2013). Another machine learning-based Software effort estimation has been described by Abdelali et al. based on Random Forest-based effort estimation on the COCOMO model. The research was conducted on the publicly available dataset and was able to get around a 40% prediction rate (Abdelali, Mustapha and Abdelwahed, 2019).

Pospieszny et al. has proposed an effort and duration prediction model based on Support Vector Machines (SVM), Multi-Layer Perceptron Artificial Neural Network (MLP-ANN) and Generalized Linear Models (GLM) with aggregating using ensemble averaging prediction. The results showed that SVM is more accurate than Ensemble (Pospieszny, Czarnacka-Chrobot and Kobylinski, 2018).

Many research endeavors have published over the last three decades in the Software effort estimation (SEE) employed to develop different models but it has lagged in terms of advancements (Goyal and Parashar, 2018). As a result, this area is wide open for research. The main objective of this study is to investigate the performance of different tree-based machine learning algorithms on software development effort estimation.

## METHODOLOGY

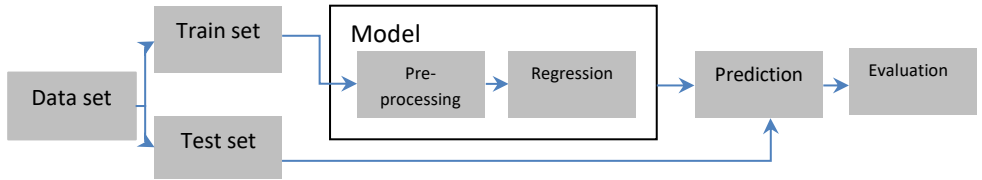


Figure 3. Approach

### Dataset

Publicly available cocomo81, cocomonasa v1 and v2 and china dataset were used in the study. Three cocomo datasets: cocomo81, cocomonasa v1 and v2, were taken as a single dataset. As shown in the Table 1, cocomo dataset consists of 17 attributes related to the software matrix measured in the COCOMO model and the actual effort as the dependent. China dataset consists of 14 function point related metrics, Project ID attribute, Duration, Development Type and both actual and measured Effort. Among them, Project ID, duration, and Measured Effort were not taken into the consideration as having no impact on the effort. Development type also removed since the same value used in every record. As Figure 1, the train test split was performed on the whole dataset to take two-third of the dataset as a train set and one third as the test set and the train set was fed into the preprocessing.

Table 1: Dataset description

| Dataset |               | Number of records | Number of attributes |
|---------|---------------|-------------------|----------------------|
| cocomo  | Cocomo81      | 63                | 17                   |
|         | Cocomonasa v1 | 60                | 17                   |
|         | Cocomonasa v2 | 93                | 24                   |
| China   |               | 499               | 19                   |

### Preprocessing

Preprocessing improves the quality of the original dataset as it will enhance the performance of the predictions in a machine learning context. Dataset fed into a standardization process as most of the machine learning algorithms are required to scale the numerical input variables into a standard range. Scaling each input variable separately by subtracting the mean and dividing by the standard deviation to shift the distribution to have a mean of zero and a standard deviation of one is called standardization. Removing null values, discarding duplicate records and attributes was also carried out but hence no null values and duplicate records or attributes in the above two dataset effects were minimum.

## Regression

Dataset is then fed into the regression algorithm to train the model. Three different Tree-based approaches were selected to measure the performance comparatively. 1. Decision tree (DT), 2. Random Forest (RF), and 3. Extreme Tree (ET).

### 1. Decision Tree

A decision tree can be taken as a supervised Machine learning algorithm that uses a splitting mechanism of data according to a specific parameter. In DT s, by learning simple decision rules inferred from the data features the prediction will be made. The DT configured in this study used 2 as the minimum sample split and the split process continued until all nodes contain leaves less than 2, which is the minimum sample split mentioned above.

### 2. Random Forest

As the name implies, Random forest is an ensemble of a large set of decision trees that are uncorrelated to each other. Each decision tree in RF makes the prediction and the mean will be represented as the final prediction (Al Asheeri and Hammad, 2019). RF improves the predictive accuracy, control over-fitting and reduces the variance rather than one single decision tree. The RF allows us to perform the bagging with bootstrap sampling which is a technique where samples are chosen from the original dataset with replacement. When configuring a Random forest, it is needed to determine proper parameters setup. The random forest in this study has used 200 estimators which means the number of decision trees and trained with bootstrap sampling.

### 3. Extreme Tree

ET is an extended version of Random forest where randomness goes one step further in the way splits are computed. As in random forests, a random subset of candidate features is used, but instead of looking for the most discriminative thresholds, thresholds are drawn at random for each candidate feature and the best of these randomly generated thresholds is picked as the splitting rule. This usually allows reducing the variance of the model a bit more (Scikit Learn, 2021). The same parameter setup used in Random Forest applied for ET.

## Evaluation criteria

The regression algorithms evaluate with multiple metrics. The mean magnitude of the relative error (MMRE) and pred (0.25) are two widely used metrics on software effort estimation and regression problems in machine learning. The relative error is defining as the ratio of the absolute error of the measurement to the actual measurement. This gives a good measurement relative to the actual size of the value. MMRE takes as the mean magnitude of the relative error. Generally, 25% is the acceptable target for the MMRE (Abdelali, Mustapha and Abdelwahed, 2019).

$$MRE = \frac{Effort(actual) - Effort(Predicted)}{Effort(actual)} \quad (1)$$

$$MMRE = \frac{1}{N} \sum_{i=1}^N MRE (i) \quad (2)$$

Pred(0.25) is a matrix that represents the percentage of MRE that is less than or equal to the value 0.25 among all projects. This measure is often used in the literature and it is the proportion of the projects for a given level of accuracy. The Pred(0.25) represents the percentage of projects whose MRE is less or equal to 25%. The definition of Pred(0.25) is mentioned below (3), where l equals 0.25, k is the number of observations whose MRE is less or equal to l and N is the total number of observations.

$$Pred(l) = \frac{k}{N} \quad (3)$$

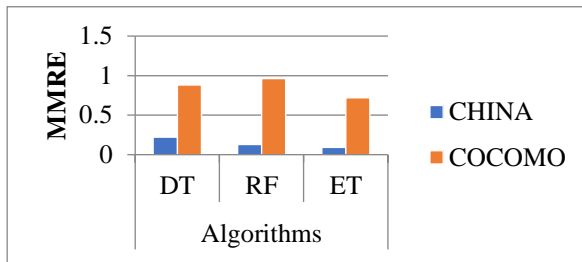
## RESULTS AND DISCUSSION

**Table 2:** Results description

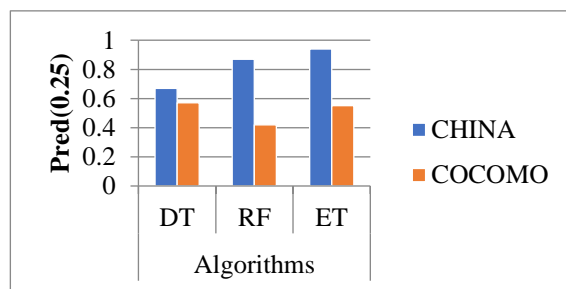
| Algorithm | China dataset |             | Cocomo dataset |             |
|-----------|---------------|-------------|----------------|-------------|
|           | MMRE          | Pred(0.25)  | MMRE           | Pred(0.25)  |
| DT        | 0.22          | 0.67        | 0.88           | <b>0.57</b> |
| RF        | 0.13          | 0.87        | 0.96           | 0.42        |
| ET        | <b>0.09</b>   | <b>0.94</b> | <b>0.72</b>    | 0.55        |

As Table 2 exposes, 0.09 can be taken as the lowest value for MMRE which was given by the ET regression algorithm on the china dataset. RF and DT have given fairly acceptable MMRE as 0.13 and 0.22 on the china dataset. Which express that the above measures satisfy the evaluation criteria set in previously as MMRE should be less than 0.25.

The ET gave the highest prediction rate as 0.94 on the china dataset. Moreover, RF has given a considerable prediction rate of 0.87 on the china dataset. The three regression algorithms failed to perform in the cocomo dataset as giving a higher MMRE value. Nevertheless, around 50% prediction rate has been achieved as depicted by Figure 4 which is a considerable prediction rate when compared to the previous literature.



**Figure 3.** MMRE Comparison



**Figure 4.** Pred(0.25) Comparison

## CONCLUSION

This paper includes a comparative analysis on different tree-based machine learning algorithms on cocomo and china datasets, which are publicly available for software effort estimation. Decision Tree and Random forest regression algorithms were taken into consideration to build the models. The Decision tree is easy to understand since it does remain as simple, at the same time Random Forest is known as an ensemble of Decision trees. The Extreme Tree is an extension of the Random Forest which used here to examine the effort. The study exposes that the ensemble mechanism (RT and ET) has outperformed a single Decision tree in terms of MMRE and pred(0.25) values. In this study, the china dataset gives the highest performance than the cocomo dataset. It exposes that; dataset can influence the result of a model drastically. It can be concluded that the Decision tree-based approach gives more than 50% prediction rate and can be gained more than 80% prediction rate by enhancing the quality and the amount of data used in the dataset.

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# A Study on Metacognitive Strategies in Listening Comprehension Used by High and Less-skilled ESL Learners

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## **Abstract**

*Even though teaching listening remained a neglected field a few decades ago, recent attention has been paid to the importance of teaching listening and particularly to the strategies learners can employ. The present study investigates the metacognitive strategies in listening comprehension among ESL learners in Sri Lankan context. The study aimed to explore what metacognitive strategies are adopted by L2 listeners when they listen and the difference between the use of metacognitive strategies by high and less-skilled listeners in the listening process. The sample consisted of 40 students grouped as high-skilled (20) and less-skilled (20) learners selected on the basis of the results of a listening test. MALQ was administered to both groups, and the results revealed that both high and less-skilled learners employ problem-solving strategies mostly and, planning-evaluation, person knowledge strategies to a satisfactory level. Less-skilled learners were found to use the directed attention strategy least. Further, high-skilled learners demonstrated a higher frequency in using metacognitive strategies than less-skilled learners except in mental translation strategy. It is recommended to incorporate metacognitive strategy instruction in the HNDE listening curriculum.*

**Keywords:** *Metacognitive strategies, Listening comprehension, High and less-skilled learners.*

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## **INTRODUCTION**

Listening is a fundamental skill in language learning which provides input for the learners. However, despite being the most used language skill in everyday life, until recently it has remained the least studied and most neglected skill in language classrooms compared with other skills (Yildirim and Yildirim, 2016). Listening has long been considered a passive skill that does not need to be taught. Nunan (2002) introduces it as “the Cinderella skill in second language learning” since it has been an overtly neglected skill.

However, more recent attention has been paid to the listening process and the strategies that listeners can employ considering listening has been identified as something that requires complex mental processes from the listener’s part. Most ESL listeners encounter issues in listening comprehension and, strategy awareness to manage such issues is proven vital. Learning strategies affect the learner’s motivational or affective state, or the way in which the learner selects, acquires, organizes, or integrates new knowledge. (Weinstein and Mayer, 1986)

Among three types of process-based language learning strategies as metacognitive, cognitive, and social affective strategies, metacognitive strategies are researched as most beneficial for L2 learners (O'Malley & Chamot, 1990).

Metacognition is a term first coined by John Flavell to denote 'cognition about cognitive phenomenon' or 'thinking about thinking' (Flavell, 1979). It consists of two dimensions as metacognitive knowledge and metacognitive regulation. Metacognitive knowledge refers to person knowledge, task knowledge and strategy knowledge of the learner. During metacognitive regulation, learners engage in a process that includes planning, monitoring, and evaluating stages. O'Malley and Chamot (1990) explain that metacognitive learning strategies involve thinking about the learning process, planning for learning, monitoring the learning task, and evaluating how well one has learned. These strategies enable learners to effectively manage their listening process and gain improved performance when faced with difficulties. (Anderson, 2002)

Contrary to the researched benefits of metacognitive strategies, in most contexts, including Higher National Diploma (HND) in English where the research is set, exclusive instruction on metacognitive strategies is still not incorporated as a part of the listening curriculum. The study based on the Sri Lankan context aims to investigate what metacognitive strategies are adopted by L2 listeners when they listen and the difference between the use of metacognitive strategies by the skilled and less-skilled listeners in the listening process. The metacognitive strategies researched here are based on the classification available in Metacognitive Awareness Listening Questionnaire (MALQ).

As literature is reviewed, it can be found out that many researchers have examined the metacognitive strategies used by learners in listening comprehension (Bacon, 1992; Goh, 1998, 2000; Mareschal, 2007; O'Malley and Chamot, 1990; Rahimi and Katal, 2010; Vandergrift 1997, 2003). O'Malley, Chamot, and Küpper (1989) researched the listening strategies used by ESL learners and the results revealed that students employ selective attention, and self-monitoring strategies in the perceptual processing stage, grouping, and inferencing in the parsing stage, and elaboration strategies in the utilization stage. It was also found out that effective listeners use metacognitive strategies more successfully than the ineffective listeners. A study conducted by Vandergrift (2003) based on junior high school students of French in Canada concluded that students used more planning, monitoring and problem identification strategies while evaluation strategies were not used. The proficient learners were found to use metacognitive strategies more frequently than the less proficient listeners. Rahimi and Katal (2010) in a study based on university and high-school students found that that university and high-school students use person knowledge, and mental translation strategies differently from each other. Further, Ratebi and Amirian (2013) examined that more proficient learners frequently used metacognitive strategies than the less proficient learners in Iranian context. They also found that problem-solving strategies are most used strategies while person knowledge strategies are least used.

The present study expects to fill the gap of dearth of studies on metacognitive strategies employed by high and less skilled ESL learners in Sri Lankan context.

## **METHODOLOGY**

### **Participants**

The sample consisted of forty students following their first year in HND in English at Advanced technological Institute Kegalle selected on the basis of non-random purposive sampling technique. Listening in English is included as a subject in the diploma.

### **Instruments**

A listening test and Metacognitive Awareness Listening Questionnaire (MALQ) were used as instruments in data collection. MALQ is a questionnaire validated by Vandergrift, et al. (2006) to assess the awareness of metacognitive strategies under five areas as problem-solving, planning and evaluation, mental translation, directed attention, and person knowledge. The MALQ questionnaire consists of 21 items ranked on a six-point Likert scale ranging from strongly disagree (1) to strongly agree (6).

### **Procedure**

Prior to the research, a listening test was administered to 100 students following HND in English at ATI Kegalle to identify 20 less-skilled learners and 20 high-skilled learners. Twenty students picked on random basis from students who obtained 20 or fewer marks (total 40) for the test were grouped as less-skilled learners, while 20 students picked on random basis from students who obtained 30 or above (total 40) for the test were grouped as high-skilled learners. Then MALQ was administered to both high and less-skilled groups to research the metacognitive strategies used by them. In answering the MALQ, students in both groups were advised to reflect on the strategies they used in the test before and during listening tests in the classroom in general.

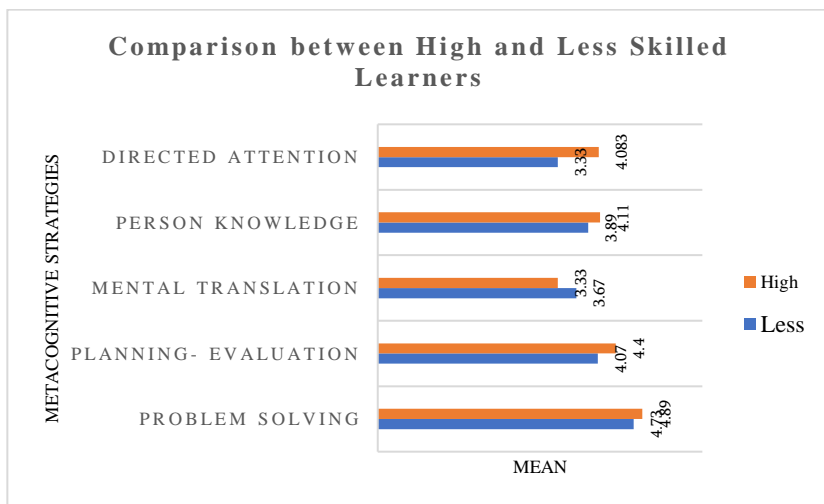
## **RESULTS AND DISCUSSION**

Table 01 below presents the use of metacognitive listening strategies by learners in the study. As the mean scores are examined, it can be found that the most frequently used strategy type is problem-solving metacognitive strategy while most minor used is mental translation metacognitive strategy. The mean score of all subscales is 4.0 from 6 points which shows a considerable level of awareness on metacognitive strategies among learners.

**Table 1:** Distribution of mean scores on MALQ and subscales

| Scale   | No of items | Mean  | SD    |
|---|-------------|-------|-------|
| Problem-solving strategies:                   | 6           | 4.8   | 0.661 |
| Planning-evaluation metacognitive strategies: | 5           | 4.23  | 1.460 |
| Mental translation strategies:                | 3           | 3.5   | 1.912 |
| Personal knowledge:                           | 3           | 4.11  | 1.488 |
| Directed attention                            | 4           | 3.71  | 1.812 |
| MALQ  | 21          | 20.42 | 7.333 |

Figure 1 compares the metacognitive strategy used by high and less-skilled learners. High-skilled learners have demonstrated a higher frequency in using metacognitive strategies than less-skilled learners except in mental translation strategy. The mean scores of all subscales for less-skilled learners is at 3.9 while high-skilled learners stand at 4.1. Both high-skilled learners employed problem-solving, planning and evaluation, person knowledge strategies most while directed attention and person knowledge are less used. However, high-skilled learners seem to use a satisfactory level of directed attention strategies (4.0) compared to less-skilled learners (3.33) with a mean difference of 0.7.



**Figure 1.** Comparison of metacognitive strategy use in listening comprehension between high and less-skilled learners

Problem-solving strategy is identified as the most frequently used strategy, confirming the findings of previous researches (Chamot and Küpper, 1989;

Graham, 2003; Vandergrift, et al., 2006; Ratebi, 2013). The factors that come under this strategy enable listeners to make inferences and monitor the inferences (Vandergrift, et al. 2006). The findings here verify that both high and less-skilled learners manage problem-solving processes, the knowledge retrieval processes, and the verification (monitoring) processes to a greater extent. (Kintsch, 1998, p.189). The second highest used strategy is planning and evaluation strategy, which listeners use to prepare themselves for listening, and evaluate the results of their listening efforts (Vandergrift, et al. 2006). Since listeners have to plan their own process of listening Vandergrift views these strategies as an indication of shifting responsibility of learning from the teacher to the student (2002:571). Accordingly, together with awareness of higher planning and evaluation strategies, higher responsibility is shown to be assumed by learners in handling listening tasks. The third highest reported strategy is person knowledge strategies. It reviews learners' understanding of the difficulty of listening, linguistic confidence in second or foreign language listening, and the anxiety level experienced. (Sparks and Ganschow, 2001). The findings reveal that learners possess considerable confidence and reduced anxiety towards listening by being aware of the perceived difficulty of listening. The fact that they have been exposed to listening tasks in the classroom for nearly eight months might have influenced this result.

Directed attention which deals with learners' concentration is the fourth used strategy marked by students in the study. Less-skilled learners in particular, seem to have issues in attention and concentration compared to high-skilled learners. The strategy used least is mental translation strategy which is considered an inefficient approach used by beginning-level listeners and must be avoided to become skilled learners (Vandergrift, et al. 2006). Significantly the high-skilled learners in the study secured the lowest mean frequency for this strategy which confirms the above point. The fact that all learners exhibited most minor employment of mental translation strategy further indicates that learners have been considerably exposed to adequate listening tasks to move from beginner level.

## **CONCLUSION**

The study confirms that the learners possess a satisfactory level of metacognitive strategies although they have not been deliberately instructed on them. Both high and less-skilled learners demonstrated a metacognitive strategy use in problem-solving, planning-evaluation, person knowledge strategies. Use of mental translation strategy of all learners and directed attention strategy by less-skilled learners are found to be least used skills. However, as the less use of mental translation strategies is identified a strength of the listeners, directed attention in the case of less-skilled learners can be highlighted the strategy that requires improvement most. The study further concludes that high-skilled learners use metacognitive strategies more frequently and effectively than less-skilled learners. The findings shed light on the necessity of incorporating metacognitive strategy instruction in the HNDE listening curriculum to benefit the learners and particularly the less-skilled learners.

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# The Issue of Identity and Homeland in Sri Lankan Diasporic Fiction

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## **Abstract**

*In this global age, Postcolonial texts in their attempt to redefine the self often transcend the traditional borderlands or the binary oppositions of the colonizer and the colonized and explore the hybridity or the confluence of all cultures on each other. This seems particularly true in diasporic writing where migrant authors are often obsessed with the issues of identity in relation to both homeland and the host land. The essay closely examines the issue of identity depicted in relation to the diasporic protagonists of the two novels, 'Anil's Ghost' by Michael Ondaatje (2000) and 'The Island of Thousand Mirrors' by Nayomi Munaweera (2012). The protagonists of the both novels are seen continually grappling with their hybrid identity and ambivalent sense of belonging which oscillates between the conflict in homeland and more secure and privileged West. It is noteworthy that both these internationally acclaimed Sri Lankan diasporic authors underscores the significance of political turmoil in contemporary Sri Lanka as defining factor in denouncing the identity of homeland.*

**Keywords:** Identity, Sri Lankan Diaspora, Postcolonial Literature, Novel.

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## **INTRODUCTION**

Diasporic Literature is an umbrella term that includes the literary works written by the authors outside their native country, but are associated with native culture and background in terms of theme or subject matter. Diasporic literature has its roots in the sense of loss and alienation, which emerged as a result of migration and expatriation. Sri Lankan literature in English constitutes an emergent canon of writing in the field of postcolonial studies where many internationally acclaimed diasporic writers such as Michael Ondaatje, Shyam Selvadurai, Romesh Gunasekera have made a significant contribution.

Homi Bhabha's (cited in Sawant, 2011) points that Postcolonial texts in their attempt to redefine the self, often transcend the traditional borderlands or the binary oppositions of the colonizer and the colonized and explore the hybridity



or the confluence of all cultures on each other. In line with this view, this study aims to explore the issues related to identity and homeland in Sri Lankan diasporic fiction in relation to both homeland and the host land.

## **METHODOLOGY**

The research presents a textual analysis of two novels by internationally acclaimed diasporic authors, *Anil's Ghost* by Michael Ondaatje (2000) and *The Island of Thousand Mirrors* by Nayomi Munaweera (2012). Set in tumultuous political environment of contemporary Sri Lanka, with its diasporic protagonists both novels exhibit the complexity and multiplicity in issues of identity and belonging.

## **DISCUSSION**

The question of identity remains central to the plot throughout the novel *Anil's Ghost* by Michael Ondaatje, a Canadian- Sri Lankan author. In fact, Ondaatje seems to be engulfed in the complexity and multiplicity of identity especially depicted through his diasporic female protagonist, Anil Tissera, a young forensic anthropologist, an advocate for international human rights group investigating extra-judicial executions in Sri Lanka. In terms of her individuality, Anil seems to constantly float across the dictates of conventional gender roles, relationships, taboo and most importantly between the binary oppositions of the East and the West. For instance, it is interesting to note her continuous and conscious effort to redefine and reconstruct her identity throughout the novel. The most fascinating aspect of her identity is her name which was purchased from her brother when she was twelve for a “hundred saved rupees, a pen set he had been eyeing for some time, a tin of fifty Gold Leaf cigarettes she had found and a sexual favour he had demanded in the last hour of impasse” (Ondaatje, 2000). “Anil” is traditionally a male name of Asian origins. It is intriguing that it is a deliberate and tenacious choice by the eponymous character when she was a barely teenage girl purchased with a much tabooed “sexual favor” to her own brother. This definitely brings out her non-conformist attitude towards the preconceived notions of gender roles in Sri Lankan socio-cultural context. Furthermore, such complexity of her relationships also brings out the multiplicity of her identity. For an example, Anil as a subordinate, abused woman in her marriage to an unnamed Sri Lankan strongly contrasts with the independent and even dominant woman who is in a relationship with paradoxically straitlaced and already married Cullis with his European origins. Similarly, she is seen reasserting her identity upon returning to Sri Lanka after 15 years vehemently rejecting the trappings such as “the prodigal”, “the swimmer” or “married” associated with her identity. Thus, it becomes evident that the protagonist, Anil is involved in a continuous struggle to redefine and reformulate the self –image that she strongly desires.

On the other hand, the hybridity in her cultural identity depicts her ambivalence towards her homeland. The young student who migrates to the United Kingdom for her studies at the age of eighteen seems to be alienated and typically lost her

moorings in the intricacies of the Western world. Her attempt to retain her cultural ties to Sri Lanka through marriage results in a divorce and failure in her own eyes. A migrant's nostalgia for the homeland is apparent in her flashback reminiscing

He too was from Sri Lanka, and in retrospect she could see that she had begun loving him because of her loneliness. She could cook a curry with him. She could refer to a specific barber in Bambalapitiya, could whisper her desire for jaggery or jackfruit and be understood. This made a difference in the new, too brittle country. Perhaps she herself was too tense with uncertainty and shyness. She had expected to feel alien in England only for few weeks. (p. 137)

Anil's divorce not only sets her free from a suffocating marriage but also distances herself from the memory and language of her homeland severing her ties with Sri Lanka. Thus, Anil following her scholarship to the United States emerges as a fully westernized altered ego which prompts her to reply Cullis on his question on her background "I live here [...] in the West" (p. 32). When she returns to Sri Lanka on her mission, she considers herself to have "lived abroad long enough to interpret Sri Lanka with a long-distance gaze" (p. 7). However, once again the readers witness the fluidity of her cultural identity as her eventual acceptance of her Sri Lankaness which transcends her role as a foreign delegate "I think you murdered hundreds of us," (p. 269). Thus, it is interesting to note that being a diasporic how Anil's cultural or collective identity constantly traverses the binary of insider and the outsider. This fluidity is enhanced opposite to the static identity of Sri Lankan characters such as Sarath and his brother Gamini.

Furthermore, the characterization of these major characters highlights Anil's ambivalence towards her motherland as she does not completely belong to either culture. While she is fully obsessed in discovering the identity of 'the sailor', the very process forces her to confront her own dilemma of belonging "this isn't 'another job'! I decided to comeback. I wanted to comeback" (p. 196) which eventually results in her hasty withdrawal from the country once she realizes her own powerlessness in a homeland in crisis "there was no wish in her to be here anymore. There was blood everywhere. A casual sense of massacre" (p. 280). On the other hand, Anil remains 'the other' throughout her stay in Sri Lanka perceived as a Westerner and outsider by the local community signified by Lalitha's lack of communication, Dr. Perera's betrayal, Sarath's attitude. Gamini's words seem to sum up the attitude towards diasporic identity equated with that of a westerner "The American or the Englishman gets on a plane and leaves. That's it. The camera leaves with him. [...]. Go home. Write a book. Hit the circuit." (p. 283). Thus, the fluidity and plurality of diasporic identity and the ambivalent sense of belongingness towards homeland particularly during a crisis become the core of the novel '*Anil's Ghost*'.

Likewise, in her award-winning novel, "*Island of a Thousand Mirrors*", Nayomi Munaweera (2012), Sri Lankan-American writer traces the literary cartography

of Sri Lankan civil war in the backdrop of Colombo- commercial hub of Sri Lanka, its unnamed and underprivileged counterpart in the Northern coastal village and ‘desert city’ of Los Angeles in America. The novel consists of a dual narrative unfolding through the voice of young Sinhalese woman, Yashodara Ranasinghe and her foil, Saraswathi, a young Tamil woman turned to be a LTTE suicide bomber. Thus, this narrative becomes an account of personal struggle in the face of otherness caused and intensified by the Civil war in Sri Lanka.

Especially, taking the Sinhalese protagonist, Yashodara’s experience into account, the common traits of diasporic identity such as intense nostalgia for the lost paradise or the past is clearly tangible in her narrative. For instance, Colombo and Wellawatte house of Yashodara’s childhood is idyllically characterized with scent of jasmine and salt, gastronomical delights prepared by Alice, adventures with her sibling and Siva. In addition, unlike Ondaatje’s protagonist, Anil who is unwilling to immerse herself in the past, Yashodara seems to retrace and embrace her ancestry and heritage despite certain dark memories such as 1983 July riots which become a turning point in her narrative resulting in their exile from homeland.

Next, the readers are introduced to the host land, the city of Los Angeles, “a dry as salt landscape marked by rectangles in every shade of blue. A desert city of swimming pools.” (Munaweera, 2012). The Ranasinghas as a migrant family struggles to survive assimilating to a foreign land overcoming the otherness. This otherness manifests itself in myriad forms such as dress and language itself. The narrator’s own words; “quickly we learn to shed our old clothes, our old manners. We say ‘cookie’ now quite effortlessly. Knowing that the word ‘biscuit’ will be answered with blankness.” (p. 110) mirrors the alienation of the migrant family. However, it is interesting to note that as the family embraces Americanness, the increasing number of newly arrived Sri Lankan immigrants are perceived as the Other as evident in the line “for now we keep our distance lest the aura of foreignness so laboriously shed rubs off on us.” (p. 122). Once again, the fluidity of diasporic identity becomes evident where the migrants become part of the West.

However, it is interesting to note that unlike in *Anil’s Ghost* by Ondaatje (2000), it is not the chaos of the homeland but the personal crisis of a failed marriage that prompts Yashodara’s return to Sri Lanka. Temporarily the homeland offers sanctuary to Yashodara’s emotional crisis but quickly become a nightmare as the civil war progresses, Colombo of Yashodara’s childhood become ravaged by LTTE suicide bombing ultimately claiming the life of Lanka, Yashodara’s sister named after the country.

Much similar to Anil’s reaction, Yashodara choose to flee from the homeland with Siva to San Francisco reformulating their identities in an attempt to recover from trauma and renounce the ties with the motherland. Whereas Anil’s story is unknown, Yashodara observes that “In this, most European or American cities, exile, forgetting, escape seemed possible, even common. We sought solace here,

found work, and bought a small house. We put down crude roots". (p. 215). On the other hand, her rejection of homeland is evident in the latter part of the novel;

These days, I do not even speak of that place to myself. There is no thread of life I want to follow there. The ocean does not call me. I no longer long for those myriad shades of green. The island dropped away from me the moment I left it framed in the airplane porthole. This is the only way we may survive. (p. 215)

Thus, when analyzing both the novels, "*Anil's Ghost*" by Ondaatje (2000) and "*The Island of Thousand Mirrors*" by Munaweera (2012), the issues of identity, belongingness and diaspora remain the central thematic concern. Both writers have masterfully depicted both the strong attachment and the denunciation of homeland by the diasporic subject. The identity in this context is portrayed in its complexity as a deliberate choice and extremely unsolidified status in diasporic subject characterized by the Western consciousness which seems to echo Salman Rushdie (1992) in his view "we are now partly of the West. Our identity is plural and partial. Sometimes we feel that we straddle two cultures; at other times, that we fall between two stools."

## **CONCLUSION**

In conclusion, it is evident that in both novels, "*Anil's Ghost*" by Ondaatje (2000) and "*The Island of Thousand Mirrors*" by Munaweera (2012), the multiplicity of identity and conflicted attitude towards homeland becomes the defining character trait of both the protagonists and convey the central theme. In this context, identity in diasporic subject is portrayed as an extremely unsolidified status in all its complexity characterized by her Western consciousness. This ambivalence ultimately leads to a deliberate choice of denouncing the homeland associated with loss and political turbulence.

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# **Tertiary Level Students' Perception of Online Learning During the COVID-19 Pandemic**

## **(A study based on students in Kegalle District, Sri Lanka)**

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### ***Abstract***

*During the recent COVID-19 crisis, with the purpose of maintaining uninterrupted learning, academia from the majority of Sri Lankan higher education institutes had started utilizing various e-learning tools and digital platforms such as Zoom, Google Classroom, Edpuzzle, Learning Management Systems, web and social media groups to actively engage students in the teaching-learning process and to conduct e-assessments continuously. In order to identify the strengths and limitations of current e-learning practices in the tertiary level learning context, researchers have set up a comprehensive foundation for this study by conducting some interviews with some academics and students as a pre-study. Based on the indications of the pre-study, data has been collected through a structured questionnaire, and the study was carried out with a sample of 844 students representing the disciplines, namely, Information Technology, English and Management. The data was gathered using a Google form. Descriptive statistics, paired-sample t-test have been used to analyze the data. The results evidence that the students show a positive intent towards e-learning despite the limitations caused by the lack of infrastructure facilities. The paired sample t-test results indicate a significant difference between students' confidence levels after studying the subjects in online modes and physical classrooms/ labs. The Gap of those confident levels is high related to lab base subjects and speaking skills related subjects. And the poor response rate of this study (55%) indicates that most students do not have accessibility facilities for online learning methods.*

**Keywords:** *e-learning, students' perception, pandemic, tertiary education*

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## **INTRODUCTION**

Broadly defined as delivery of education (all activities relevant to instructing, teaching, and learning) through various electronic media (Harman and Koohang, 2005), e-learning has proven successful worldwide for effective academic engagement and assessment of students on a continuous basis. With the renewed interest in e-learning at the face of the recent COVID-19 outbreak, many Higher

Educational Institutes around the globe have opted for various e-learning tools as a means of ensuring uninterrupted learning during containment. Although the Sri Lankan higher education sector had remained below the par level before the pandemic, on a positive note, the crisis has prompted the local higher educational institutes to come up with innovative and effective e-learning solutions recognizing its true potential for future advancement.

Therefore, the main objective of this study is to identify the strengths and limitations of e-learning practices in the Sri Lankan context, with special emphasis on the student communities in less-privileged districts where the majority of students are from middle-income families possibly deprived of equitable access to technology or the internet. In terms of e-learning, any academic activity conducted using the internet has been considered for this survey. The majority of Sri Lankan higher education institutes have used Zoom via Lanka Education and Research Network (LEARN) as a key tool to conduct online lectures. Also, lecture notes, reading materials and video lessons are uploaded to Learning Management Systems and Google Classrooms to facilitate easy access for students. In some cases, social media platforms like WhatsApp groups, Facebook groups, and YouTube channels have also been used to share lecture materials and conduct online forums (Source: Interviews conducted with academics).

University Grant Commission Sri Lanka (UGC) and Sri Lanka Institute of Advanced Technological Education (SLIATE) being the two main bodies that grant higher education under the higher education category in Sri Lanka, researchers have collected data from the students who resided in the Kegalle district and have enrolled in UGC-SL and Advanced Technological Institute-Kegalle the regional centre of SLIATE.

## **LITERATURE REVIEW AND RESEARCH GAP**

As Carey (2020) points out that the whole world had to face the COVID-19 outbreak, educators had to shift totally towards online teaching without considering the quality of education as online teaching was the only option. Thus, examining the existing literature, it is imperative to identify factors affecting students' perceptions of successful online learning.

Swan et al. (2000) has indicated that the instructor's interaction with students has a significant impact on the student's perceptions of online learning. In comparison, Sun & Chen (2016) have concluded that the success of an online class depends upon well-structured course content, well-prepared instructors and advanced technologies. And also, Gilbert (2015) has mentioned feedback and clear instructions as another factor for successful online teaching and learning. At the same time, the literature includes shreds of evidence of weaknesses and barriers related to online learning as listed below.

- Delay in responses (Hara and Kling, 1999; Petrides, 2002; Vonderwell, 2003).
- Skepticism of their peers' supposed expertise (Petrides, 2002).

- Lack of a sense of community and/or feelings of isolation (Woods, 2002; Vonderwell, 2003).
- Problems in collaborating with the co-learners, technical issues (Piccoli, Ahmad and Ives, 2001; Song et al., 2004).
- Issues related to the instructor (Muilenburg and Berge, 2005).
- Higher student attrition rates (Frankola, 2001; Ryan, 2001).
- The need for greater discipline, writing skills, and self-motivation; and the need for online users to make a time commitment to learning (Golladay, Prybutok and Huff, 2000; Serwatka, 2003).

While worldwide higher education sectors are balancing COVID-19 outbreak impact, researchers from foreign contexts have conducted some studies to identify the vital factors related to online teaching and learning processes. Dhawan (2020) has disclosed the importance of online learning while analyzing the Strengths, Weaknesses, Opportunities, & Challenges (SWOC) of e-learning modes during the COVID-19 outbreak. Li & Shan (2020) have conducted an Analysis of Teaching Cases from Offline to Online Mode. Muthuprasad et al. (2021) have conducted a study on Students' perception and preference for online education in India during COVID -19 pandemic. Related researches from the Sri Lankan context are few and limited. Hayashi et al. (2020) have conducted a survey on Online Learning in Sri Lanka's Higher Education Institutions during the COVID-19 pandemic and consider the overall picture nationwide.

Generally, Sri Lanka is known as a developing country. Although Sri Lanka has reduced income poverty from 26.1 % in 1990/91 to 4.1% by 2016, income inequality has remained unchanged for more than four decades. The richest 20 per cent enjoy more than half the country's total household income, while the poorest 20% get only 5 per cent. The situation of the poorest 10 per cent of the households is worse, with the share of household income being just 1.8 per cent or less. Furthermore, income gaps between different regions are even wider than the income inequality at the national level (Nanayakkara, 2018). So, based on the analysis of Nanayakkara (2018), it is not rational to analyze as a whole country the perception of online learning because all the students do not have equal opportunities to access the online learning process. Especially, households have to incur additional capital to purchase at least a primary device (if they are not having any) and recurrent expenses as the data charges. In addition, inadequate countrywide telecommunication coverage has a significant impact on the online teaching-learning process. Therefore, based on these facts, it is vital to have regional analyses of the learning context, which will be helpful for policymakers in taking decisions, managing the same type of cases in the future. Thus, the researchers have focused on the tertiary level students who are residing in the Kegalle district, Sri Lanka.

## METHODOLOGY

**Pre-study:** As a pre-study, researchers have interviewed 25 academics and 50 students from various disciplines. The majority of the academics interviewed, namely, ten were from as Management/ Accounting/ Finance/ Entrepreneurship disciplines and the rest comprised of five academics from Information



Technology/ Computer Science, four from Languages and six from other disciplines. Similarly, 22 students following Management related subjects participated in the pre-study and 12, 10 and 6 participants from the remaining disciplines mentioned above, respectively. The pre-study revealed that academics adopt varying tools and methods for teaching such as online platforms like Zoom, Google Classroom, Edpuzzle, LMS, web and social media groups to actively engage students in the teaching-learning process.

Based on the discussion which had with these students, researchers noted the following.

- In the case of IT & Management students, the majority were anxious about lab-based subjects than the theoretical/ classroom-based subjects in online learning.
- In the English language (as a Second Language), the majority were concerned about Speaking skills related subjects than listening and reading skills related subjects.

As the pre-study results implied some critical implications related to lab base subjects and speaking skills related subjects, researchers developed the methodological approach to investigate that deeply using some statistical tools.

**Methodological Approach:** Quantitative Methodological Approach.

**Population:** Kegalle district Students who follow their higher education through state universities and Advanced Technological Institute- Kegalle.

**Sample:** 844 students who follow the courses from the disciplines of IT, Management and English/Language.

**Sampling method:** Convenient Sampling Technique.

**Data collection:** Through a structured questionnaire which was developed by the researchers based on prior researchers.

**Data Analysis techniques:** Descriptive statistics, Paired sample T-test.

**Used software:** IBM SPSS Statistics version 23

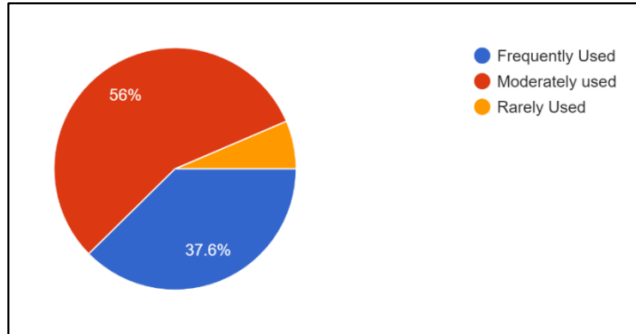
## RESULTS AND DISCUSSION

The results & discussion section of the study has been classified into five subsections.

### Availability of IT equipment

As per the survey findings, 56% of the students claim to moderately use the internet, while 37.6% of students frequently use the internet. Only 6.4% of the students rarely use the internet. Out of the students who rarely use the internet,

the majority are from the English/Language discipline. Students mainly use mobile data to access the internet (87.9%), while a fair number of students (69) connect to the internet via a Wi-Fi router. Only 14 students out of 844 use a dongle to access the internet.

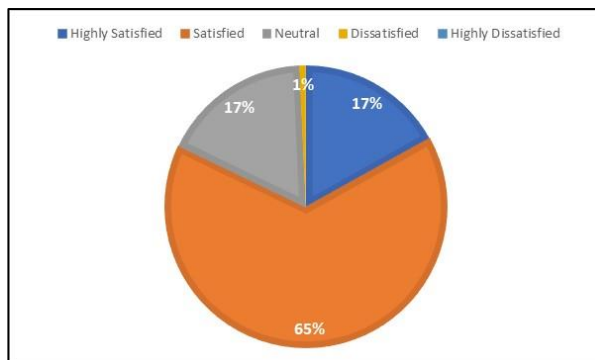


**Figure 1. Extent of using internet**

The survey findings provide an interesting result on the availability of a computer among students. As per findings, two-thirds of the students own a computer, and this can be regarded as a higher than expected ratio given that most students are from remote Kegalle area. Further, it has been noted that 92% of the students in the IT discipline have their own computer while only 42% of the students in the English/Language discipline own a computer.

**Satisfactory level of students on e-learning activities**

The survey has assessed the satisfactory level of students on e-learning in five stages as Highly Satisfied, Satisfied, Neutral, Dissatisfied and Highly Dissatisfied. As per the findings of the survey, 65% of the students are Satisfied with e-learning, while 17% are Highly Satisfied. 17% of the students are Neutral in their opinion on the satisfaction of e-learning. Therefore, it can be observed that the vast majority of the students following higher education in the Kegalle district show a positive intent for e-learning.

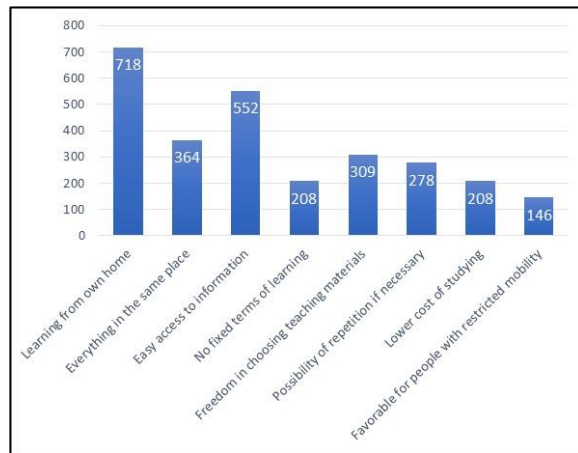


**Figure 2. Satisfactory level of students on e-learning**

In terms of the most preferred learning method, 16% of the students are happy with e-learning, while 14.8% of the students still like traditional learning. However, 69.2% of the students preferred a mixed method combining both traditional and e-learning aspects. This implies the fact that the majority of students are reluctant to embrace e-learning as the sole method of learning.

### Advantages and Disadvantages of e-learning

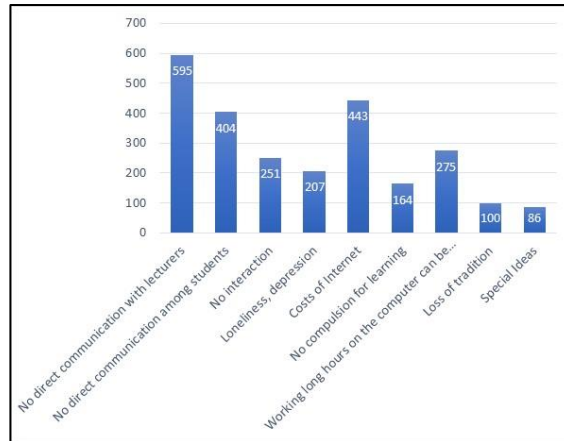
Through this survey, it was attempted to determine the advantages and disadvantages of e-learning from students' perspectives. It was given eight possible advantages and disadvantages for students to choose from. Possible advantages and the respective scores are presented in the table below.



**Figure 3. Advantages of e-learning**

As per the scores presented above, the majority have chosen to learn from their own home as a key advantage of e-learning. Secondly, easy access to information has been selected as the second-best advantage of e-learning by 552 student participants. The third best advantage of e-learning is the possibility of finding all the lecture materials in the same place. This can be expected since the students seem to be less motivated to use library facilities in their respective educational premises. Although there is a monetary cost involved in e-learning, as per the students' opinion, such a cost is lower than the amount indirectly incurred in the traditional method of learning such as transportation cost, material printout cost, expenses for food and accommodation etc.

The possible disadvantages of e-learning and their respective scores are presented in the table below.



**Figure 4. Disadvantages of e-learning**

According to the study, the absence of direct communication with lecturers has been identified as the main disadvantage of e-learning. The lack of communication with fellow students has also been identified as a key disadvantage of e-learning. Hence in general, lack of proper communication can be regarded as the biggest issue with e-learning as per the students' point of view. The cost of the internet has also been identified as another major drawback of e-learning. During the COVID-19 pandemic, although online lectures were conducted through zoom via LEARN with zero data charges for students, most of the students have emphasized that due to the poor network strength, a considerable number of students were not able to join online for the lectures.

#### **Paired Sample t-test results**

Through the pre-study, researchers have noted a sign which implies that students from English Language Departments/ Courses are suffering a lot in studying speaking related subjects than listening and writing skills related subjects when adopting online teaching methods. So, researchers have tried to investigate this matter deeply. Researchers collected data pertaining to the confidentiality level of students after studying the subjects related to Writing, Speaking and listening skills related subjects. Through the questionnaire, researchers asked the confidentiality level of students in case of studying those types of subjects in online mode and in physical classrooms (This is based on their experience in previous semesters). Then the results were analyzed using paired sample t-test.

**Table 1: Paired sample statistics – English/Language discipline**

|         |  | Paired Samples Statistics |     |                |                 |
|---------|--|---------------------------|-----|----------------|-----------------|
|         |  | Mean                      | N   | Std. Deviation | Std. Error Mean |
| Pair 1  | Online_Writing_Skills_Related_Subjects       | 2.7510                    | 261 | .92987         | .05756          |
|         | Physically_Writing_Skills_Related_Subjects   | 2.8544                    | 261 | .72977         | .04517          |
| PPair 2 | Online_Listening_Skills_Related_Subjects     | 2.8621                    | 261 | .34549         | .02139          |
|         | Physically_Listening_Skills_Related_Subjects | 3.0230                    | 261 | .60084         | .03719          |
| PPair 3 | Online_Speaking_Skills_Related_Subjects      | 1.9655                    | 261 | 1.13118        | .07002          |
|         | Physically_Speaking_Skills_Related_Subjects  | 4.1341                    | 261 | .72935         | .04515          |

**Table 2: Paired sample statistics – English/Language discipline**

|        |   | Paired Samples Test |                |                 |   |          | t       | df  | Sig. (2-tailed) |
|--------|---|---------------------|----------------|-----------------|---|----------|---------|-----|-----------------|
|        |   | Paired Differences  |                |                 |   |          |         |     |                 |
|        |   | Mean                | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference |          |         |     |                 |
|        |   |                     |                |                 | Lower                                     | Upper    |         |     |                 |
| Pair 1 | Online_Writing_Skills_Related_Subjects - Physically_Writing_Skills_Related_Subjects     | -.10345             | .75500         | .04673          | -.19547                                   | -.01142  | -2.214  | 260 | .028            |
| Pair 2 | Online_Listening_Skills_Related_Subjects - Physically_Listening_Skills_Related_Subjects | -.16092             | .63622         | .03938          | -.23847                                   | -.08337  | -4.086  | 260 | .000            |
| Pair 3 | Online_Speaking_Skills_Related_Subjects - Physically_Speaking_Skills_Related_Subjects   | 2.16858             | 1.36520        | .08450          | 2.33498                                   | -2.00218 | -25.663 | 260 | .000            |

Above table 3 & table 4 present the results of paired sample t-tests in three pairs in English language-related courses, which have been developed according to the pre-study results. According to the results of this, the mean values, which imply the confidence levels of students, have significant differences. In all three pairs, the mean values related to online learning are less than mean values related

to physical learning. And the all significant values in table 4 are less than 0.05, and that implies there are significant differences (with 95% confidential level) in confident levels of online learning and physical leanings. The results show that while there is a huge difference in mean values (2.167) related to the confidence level in speaking skills related subjects, the difference in mean values (0.103 and 0.160) related to confidence levels in the other two categories are relatively insignificant.

These results imply that, in common view, students from English language-related courses have less confidence towards online learning compared to physical classroom learning. And in the case of speaking skills related subjects, students suffered a lot compared to subjects of other two categories. These results show a consistency with the indications of the pre-study, which was conducted by the researchers to set the foundation for this study.

Below table 5 & table 6 below presents the results of paired sample t-tests in two pairs in Management and IT related courses, which developed according to the pre-study results.

**Table 3: Paired sample correlation – IT & Management disciplines**

| Paired Samples Correlations |   |     |             |      |
|-----------------------------|---|-----|-------------|------|
|                             |   | N   | Correlation | Sig. |
| Pair 1                      | Lab_Base_Subjects_Online & Lab_Base_Subjects_Physically               | 583 | .476        | .000 |
| Pair 2                      | Class_room_Base_Subjects_Online & Class_room_Base_Subjects_Physically | 583 | .847        | .000 |

**Table 4: Paired sample test - IT & Management disciplines**

| Paired Samples Test |   |                    |                |                 |   |         |         |     |                |
|---------------------|---|--------------------|----------------|-----------------|---|---------|---------|-----|----------------|
|                     |   | Paired Differences |                |                 |   |         | t       | df  | Sig.<br>2 tail |
|                     |   | Mean               | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference |         |         |     |                |
|                     |   |                    |                |                 | Lower                                     | Upper   |         |     |                |
| Pair 1              | Lab_Base_Subjects_Online - Lab_Base_Subjects_Physically               | 2.56261            | .7682          | .03182          | -2.62510                                  | -2.5001 | -80.545 | 582 | .000           |
| Pair 2              | Class_room_Base_Subjects_Online - Class_room_Base_Subjects_Physically | -.11664            | .6232          | .02581          | -.16733                                   | -.06594 | -4.519  | 582 | .000           |

Similarly, the results based on the mean values clearly indicate a significant difference related to the confidence levels of students in the above pairs. In both cases, the mean values related to online learning are less than mean values related to physical learning. And the all significant values in table 6 are less than 0.05, and that implies there are significant differences (with 95% confidential

level) in confident levels of online learning and physical leanings. And the results show there is a huge difference in mean values (2.562) related to the confident levels up to Lab base subjects, while there are small differences in mean values (0.117) related to confident levels Classroom base subjects.

These results imply that, in common view, students from IT/ Management related courses have less confidentiality towards online learning compared to physical classroom learning. And in the case of Lab base subjects, students are suffered a lot compared to classroom-based subjects. These results show a consistency with the indications of the pre-study, which the researchers conducted to set the foundation for this study.

### **Suggestion to enhance the effectiveness of e-learning**

Through this survey, students were asked to provide their suggestions to improve the efficiency and effectiveness of e-learning. The overall assessment of the students was "Good and Satisfied" on the use of existing e-learning techniques. Further, students who dwelt in the Kegalle district have provided the below suggestions in order to enhance the effectiveness of e-learning.

- Recording and delivering mini lectures in a creative manner in order to avoid long sessions.
- Developing a separate discussion forum platform where students in can clarify the doubts on relevant subject areas.
- Conducting online lectures at night rather than in the morning hours.
- Including interactive and reality-based scenarios.
- Providing students with necessary infrastructure and other facilities to access internet.
- Conducting interactive activities for students online.
- Developing and introducing a mobile application for the respective institutes where any student could access.

### **CONCLUSION**

The study clearly indicates that only one-third of the student respondents frequently use the internet, while the majority are moderate users of the internet. It is interesting to note that almost two-third of the respondents have claimed that they own a computer, and it is equivalent to the proportion of respondents who are satisfied with e-learning activities. According to the responses received, the ability to learn from home and easy access to information were the two main advantages of e-learning, while the absence of direct communication with the lecturers and the cost of the internet was emphasized by the majority as its key disadvantages. Further, researchers have found that there is a significant difference in students' confidence levels of online learning and physical learning with respect to lab-based subjects and speaking related subjects.

At present, more attention has been drawn towards e-learning because of its broader benefits. However, in the Sri Lankan context, the full potential of e-learning has not yet been executed. Therefore, this study provides some strong

recommendations for various parties, including policymakers, institutional heads, academics, students' unions, and students in order to enhance the level and standard of e-learning based on the findings of the study on students' perception of online learning during the covid-19 pandemic with special reference to students residing in Kegalle district.

It is imperative for policymakers to provide internet-accessible devices for the students in higher education, increase the internet coverage and network strength, and introduce packages at concessionary rates to access the internet for educational purposes. Students need to be educated on e-learning techniques and provide some hands-on experience at the orientation level. Blended learning methods are the preferred means of the students, and academics need to play an active role in creating a positive attitude toward the e-learning of the students.

It is recommended to give priority to these lab-based subjects and speaking related subjects in cases where higher educational premises are open for students with limited access, as experienced in the pandemic period. It is important that students' unions positively contribute to the efforts of online learning and play an active role in enhancing the positive attitude of the students towards e-learning and taking action to obtain necessary facilities for online learning.



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