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WORKFORCE MANAGEMENT IN THE NEW ERA- CHANGES AND CHALLENGES

KEYNOTE SPEECH

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Introduction

The workforce management plays a significant role in the ever changing era. In the liberalized environment managing, developing and retaining employees in any organization is a taunting task. The role of HR manager is always difficult for coping with the employee expectations. It is also critical to face different attitudes, approaches of employee's generation gaps. Employee's behavior has been changing from individual to group activities. Any conflicts among the employees and the relationship between the employer and employees have taken time consuming process in order to make amicable solution. On the other hand, the corporate attitudes focus only on profitability, productivity and overall efficiency. They are taking more sophisticated tools to acquire global talent and matching the skill gaps. To meet out the contradiction between the employer and employees are more sensitive, personalized and cannot be managed with any pre-specific strategies. This paper has been focusing on the real changes and challenges of workforce management in the new era.

Significance of Workforce Management

Workforce Management encompasses all the activities needed to maintain a productive workforce. The human capital has emerged as the make or break factor of any organization survival and growth. Failures in talent management are an ongoing source of pain for executives in modern organizations. (Peter Cappelli, 2008).

The workforce is becoming a key theme driving strategic Human Resources Management (HRM).Workforce management is critical and difficult because of four trends:

1. Ongoing retirement of the "Baby Boom Generation"1,
2. A widening skills gap2,
3. Work ethics of Gen X and Gen Y workers3 and
4. Large-scale social integration4.

Challenges of Workforce Management

Changing Workforce Description

Due to changes in the demographic profile of workers the following impact has taken place:

1. Take advantage of developing countries at present especially India.

2. Young generation working population is higher in developing countries.

3. It will force all types of organization in order to recruit, integrate, development and retain a changing working population.

It has been predicted that the women workforce in the coming years to flow in the global workforce in large numbers. Women workforce is demanding for higher pay and promotion which is equal to other group employees. The roles of temporary and part-time workers have a significant one because the corporate entity has to prepare for them. When you add the issues of a multi-generational workforce and growing cultural diversity, it is no surprise that people management is cited to be by far the most substantial challenge facing companies over the next five to ten years, according to a 2013 survey of The Economist Intelligence Unit, sponsored by the SHRM Foundation. The employment of a multi-generational workforce and developing cultural diversity in multinational companies will dominate in near future.

Ageing population has been dominating in the industrialized and developed countries will have an impact on three aspects: First, highly experienced employees are relieved from their service. Second is placing the right candidate for the right time at the vacant post. Third, rising pensionable persons especially in European countries and keep them in the workforce for longer. Moreover the present incentive system is no longer satisfying the entire group of workforce because of different generation gaps and global workforce.

The organization has to face the problem of finding suitable candidate even they are finding the right person for the right job at the right time but their demand for compensation is huge. Once "war for talent" exists in the market retaining the workforce is always critical. Identifying the demand and supply of skills required for their jobs is warranted.

Understanding the skills Mismatch

It is important to recognize that there is no consensus in the literature on how to conceptualize skills and skills mismatch. (Cappelli P.H. 2015). European Commission (2015) has defined skill is, as the ability to apply knowledge and use know-how to complete tasks and solve problems. There is a wide gap exists in the global market between the expectations of corporate and skill acquired by the workforce. Two types of skills needed in the workforce: hard and soft skills. Hard skills refer to technical skills. It is the abilities to perform specific tasks such as establishing machine and welding. On the other hand soft skills are applied specific knowledge in order to complete the workforce task. Nowadays, workforces who have the soft skills are earning more than the hard skills.

Drawing on Cappelli (2015) and ILO (2011), *skills mismatch* is defined in this publication as *imbalances between the supply of skills and the demand for skills in the world of work*. There is lack of standardization in education, especially in a global context. As businesses expand and hire beyond borders, the need for HR to scrutinize job qualifications carefully becomes ever more important. Major disparities exist between various regions and institutions in individual countries, as well as between countries.

In order to reduce the widening the skill gaps the universities and colleges had tried to change their curriculum according to requirements of market demands. STEM education has (science, technology, engineering and mathematics) play a pivotal role to capture the minds of young people in the globe. Those who are come out successfully from the university is facing difficult to find jobs because of the reason is the curriculum of university or colleges are not applicable to practical or not matched with the expectations of the companies.

Retention of the workforce

The motivations and expectations of the workforce always differ due to demographic composition. It is essential that HR manager know what is the key factor of the workers? Whether their compensation or status or perhaps freedom at workplace. It is indispensable that HR manager have to consider financial and non- financial incentive to their workers. The job of the HR department is not come to end after recruiting the talent workers. They are considered the real asset of the company makes use of their potential efforts, effectively and more over at any point of time they are not leave the job.

The attitudes, attitudes and behavior of workers may change from one generation work to other. HR manger has also known these and also keeps it in their mind. They may be allotted the task according to the perception of the HR manager. Once the company predicts their nature it will easy to handle all the workers effectively.

The workforces in many developed economies have begun to stagnate or even decline, despite a continually growing global population. It is vital that all the economically advanced countries must rely the potential employees from developing countries in order to manage rapid ageing population. Moreover, the percentage of workforce enlargement in many middle-income economies has also dramatically slowed, basically reflecting demographic variations due to declining fertility rates.

Labor Portability

The past two decades have witnessed a substantial increase in international labor migration, particularly in migration from developing to developed regions (45% of total migratory flow), followed by South–South migration (35%), North–North migration (17%), and North–South migration (3%), according to World Migration Report (IOM 2013). Labor Portability depends on the number of factors due to skill shortage; better economic opportunities and reducing the employment opportunities in government sector especially in developing countries. In general, service sector plays a dominant role for providing employment opportunities at global level at the cost of agriculture and industry sector.

Technology Concentration for global strategy

The new communication technology, such as email, mobile phones and web and videoconferencing has reducing the distance between the company and clients and also help to understand deeper without physical contact for the past 20 years. It has to help the multinational companies to speed up the productivity of the employees they can communicate with each other constantly both the home and host countries. Across the cross-border teams virtual relationship enables savings on business travel and relocation costs not only the individual employees but also employer.

Technology up gradation in any organization has redefining the role of workforce management. In order to manage the mobile workforce the firms required to come up with innovative strategies which has remain engaged and connected. But, the most of the employees may inadequate technology literacy. An improved ICT infrastructure and increased usage in developing nations will certainly continue to expand the availability of local talent for recruiters and HR managers. HR departments in global firms has need to engage with local governments, universities, community colleges and vocational schools to offer ongoing training for all existing and new employees as familiar with technologies change.

Off shoring Vs. Outsourcing

Globalization of business has made a sea change in the corporate manufacturing process and marketing strategies, leading to the emergence of new approaches. To lower costs, improve efficiency, and to meet skills needs, multinational companies have changed away from old production models and shifted to off shoring. Off shoring is the process of relocation of in-house production or accounting to other country. At the same time, organization has not neglected the advantages of off shoring which include lower cost, business development and expansion.

Now a days, companies has doing the practice of outsource a number of tasks or services, especially information technology services as well as technical support. They frequently outsource customer service and call service activities. It is a process of involving third-party in which companies hires another organization or an individual to perform the tasks or providing services.

Companies have been using the service of third party provides to perform the outsources work overseas is known as off shoring. Both the off shoring and outsourcing can produce the gains and challenges for companies. The gains are lower costs, increased efficiency and free up resources On the other hand employees' point of view, if the companies outsourced frequently it threat to their job security and they fear to lose their jobs to workers who may be paid less.

Hiring and retaining talent while lowering labor costs

For the past few decades labor productivity benefits at any point had not been comparable with wage gains. Because companies have focus on increased technology adoption and concentrate more on wealth maximization of shareholders are the other substantial factor. China and India have largest population countries in the world. HR is always assumed a special significant in these countries. Both the countries, workforce cost is cheaper than the other countries which led to reducing the cost of production. On a day-to-day basis, workers may not be as motivated and engaged. Hence, continue to explore retention strategies and benefits models that focus on factors beyond financial compensation. To reward high-performing part-time and flexible workers and to retain them in the work pipeline for future work is a difficult job of HR manager.

Winning the war for talent

Recruitment is not selling the product or service at present. It is a process of selecting or hiring the people that they have the skills in communication, creativity, initiative, problem solving and team work. Most of the multinational companies have stopped asking for resumes from people. They insist the practices link of social media i.e., LinkedIn profile or ORCID ID while applying for the post. The companies need not go for further process to verify the candidate profile such as recommendations of their work and common connection of the candidate.

The financial crisis all over the world has attempted to change the HR department regarding their people and resourcing models. The biggest problem facing the company is a war for talents along with retaining the talent one. In the competitive market, the companies have compelled to adopt the off shoring, outsourcing, downsizing and reorganization process. The companies always to access and improve their attentiveness to their employees and benchmark HR function against those of competitors.

Conclusion

Compared with all other management functions, workforce management is more sensitive, personalized, and context-dependent and cannot be managed through a set of predefined techniques. In fact, it is difficult to practice worker-centric strategic management without first achieving employee satisfaction. Thus, workforce has a prerequisite to customer satisfaction. Effective organization depends on having the right system of HR policies and practices in place to recruit, select, develop, compensate and send away employees. Based on a careful analysis of the needs of the business, organization must prioritize their choices around workforce engagement. So many fundamental issues -which have to be considered at present- changes in the age, cultural and gender profile of workers, flexible working, skills shortages, technological impact, the decline of the job for life— cue are have an impact and now confront the HR strategist.

Note

1.   The 'Baby Boom Generation" is a term that portrays those born in Asia, Australia, Europe and North America after the second world war, essentially between 1946 and 1955.

2.   A skill gap is a discrepancy between an organization's current capabilities and the core competencies of its human capital capabilities. Capabilities are the operational routines or systems composed of set jobs linked together by technology whereas core competencies are capabilities that enable sustained superior firm performance.

3.   Gen X employees who were born in the 1980s and Gen Y employees who were born in 1990 and who make up large portions of the employees population.

4.   The large-scale social integration that constitutes: (i) Historical socioeconomic and cultural factors strongly influence talent mindset (ii) sharper specialization of the segments of society e.g., division of labour integration with social system and virtual teams.

5.   This conceptualization of skills draws on definitions from sources, including World Bank (2010) and ILO (2015a). It is most similar to the definition from the World Bank, except that it treats both cognitive and no cognitive skills as "soft skills."

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REMEDIATION ACTIVITIES: AN INTERVENTION TO IMPROVE SENIOR HIGH SCHOOL PERFORMANCE IN TECHNICAL VOCATIONAL EDUCATION TRACK

DR. REGIDOR T. CARALE

Thesis Abstract

The purpose of this study was to gather information on the extent of remediation activities observed by Technical Vocational Track teachers of public and private Senior High School schools in the City Division of Dumaguete. Specifically, it was directed to know the common practices of teachers regarding remediation activities observed, common problems experienced, and the extent of support from the administrators to teachers and students. Respondents were teachers and students under Tech Voc track. The statistical tools used in this research were the percentile for frequency distribution, weighted mean to get the common perceptions, Pearson's product moment correlation coefficient to find if there was a significant relationship between variables identified and "t" test for the significant difference on perceptions of teachers and students. The top 10 remediation activities observed by the public and private school were the following: Hands-on activities, group works and collaborative approach activities, setting of a good learning environment, curriculum adaptation or contextualized learning activities to suit learning needs, providing more opportunities to learn through practice and drills, support with parents, organized group activities, video review, independent study, and discovery exploration and experimentation approach activities. Major findings revealed that there is a significant relationship between the common remediation activities observed by the public and private schools to the academic performance of the students while a need to vary teaching strategies during remediation is a must. It is compulsory for all Tech Voc teachers to continually update and align personal competencies in the industry to answer the needs of the students.

Keywords: Remediation, Technical Vocational Track

Introduction

Effort is in all educational institutions both tertiary and secondary levels to establish and promote high standards for student learning are ongoing process. Department of Education (DepEd) policies have been set to challenge, support and monitor schools as they work to improve the academic achievement for all students. With the different standards movement maturing and with increasing numbers of remedial programs developers showing both research bases and effectiveness data to support their programs it is hoped that low-performing students will have the chance to improve and reach their potentials.

Remediation activities are mandated by DepEd Order No. 31. s.2012-2013 on Policy Guidelines and Implementation of Grades 1 to 10 of the K-12 Basic Education Curriculum (BEC) Effective School Year 2012-2013 on Independent Learning Period. It is also an enclosure to DepEd Order No. 70 s. of 2012 on Guidelines in Preparing Daily Lessons specifically on the conduct of learning interventions by providing an avenue for teachers to extend their time and offer one-on-one instructions to students who need more remediation for a particular subject. For Technical Vocational Education it is expected that higher standards are set by teachers in terms of teaching the skills. However, with the limited time

and resources it is prevalent that some teachers and students will become more ambiguous with the expected knowledge and skills to be learned. It is a challenge to all teachers on how they can extend and maximize the resources present in school. The teacher has the responsibility to develop particular activities that would cater to the needs of the students.

In the implementation of the Senior High School program it is but right and fitting to evaluate the program particularly in the extent of promotion of students in the Senior High School. Remediation activities should be visible in the school activities and should be constantly evaluated to improve its purpose. Albuquerque Public Schools (2011) stress out that remediation activities should be carefully planned and different strategies should be incorporated in order to cater the individual needs of the students. More so, remediation program must be strictly supervised by considering all the activities and students' progress in order to give some possible adjustments of the strategy for better learning.

This article elucidated the importance of constantly evaluating the program for its improvement which is also confirmed by the Nevada Legislature (2005), which state that remediation program should incorporate strategies, procedures and guidelines in

order to be effective. It requires step by step method and guidelines by catering the different learning styles of the students as we answer their individual needs.

This study sought to know the extent of remediation activities observed by Technical Vocational (TechVoc) teachers in the Senior High School of public and private schools in the City Division of Dumaguete. Subsequently, it was directed to know the common practices of teachers regarding remediation activities observed, common problems experienced by Technology and Livelihood Education teachers in giving remediation to students and the extent of support from the administrators to teachers and students who experienced difficulties in coping with the standards under the Technology and Livelihood Education curriculum.

Statement of the Problem:

This study focused on the extent of remediation activities observed by teachers under Technical Vocational Education subjects in the Senior High School of Public and Private Schools in the City Division of Dumaguete. Specifically, it answers the following questions.

1. What is the profile of the teachers in terms of:
   1.1 educational attainment;
   1.2 area of specialization;
   1.3 number of years in teaching the subject;
   1.4 seminars attended related to Technical Vocational education, and
   1.5 TESDA related qualification, and
   1.6 Relevant industry experience?

2. What is the profile of the students in terms of:
   2.1 private or private school;
   2.2 academic performance;
   2.3 area of specialization in grade 9 and 10;
   2.4 Senior High School area of specialization; and
   2.5 Participation of remediation activities?

3. What are the most common practices observed by teachers under Technical and Vocational Education subjects in terms of remediation to enhance students' academic performance?

4. To what extent are the following significant factors influence students' learning in Technical Vocational Education subjects:
   4.1. Teachers' preparation;
   4.2. Teaching strategies;
   4.3. Administrative mentoring and supervision on remedial activities?
   4.4. Linkages and supports; and
   4.5 Physical plant?

5. How effective is remediation activities in responding to the needs of the students in Technology and Livelihood Education?

6. What are the common problems experienced by Technical Vocational Education teachers in giving remediation to students in terms of:
   6.1 teacher preparation;
   6.2 teaching strategies;
   6.3 administrative support, and
   6.4 physical plant/resources support?

7. To what extent do school administrators supervised remediation program in school?

8. Is there significant difference between teachers and students perceptions in terms of the following;
   8.1 Common practices observed by teachers and students on remediation program
   8.2 Factors that affect students learning in Technical Vocational Education program, and
   8.3 Impact of remediation towards academic performance?

9 Is there significant relationship between the academic performance of students and the common remediation activities observed by the public and private schools in the City Division of Dumaguete?

10 Is there significant relationship between the common remediation activities observed by the public and private schools in the City Division of Dumaguete and the:
   10.1 educational attainment of teachers;
   10.2 area of specialization;
   10.3 number of years in teaching the subject;
   10.4 seminars attended related to Technical Vocational education,
   10.5 TESDA related qualification, and
   10.6 Relevant industry experience?

11 Is there significant relationship between the effectiveness of giving remediation activities in responding the needs of the students and the:
   11.1 educational attainment of teachers;
   11.2 area of specialization;
   11.3 number of years in teaching the subject;
   11.4 seminars attended related to Technical Vocational education;
   11.5 TESDA related qualification, and
   11.6 Relevant industry experience?

12. Is there significant relationship between the common problems experienced by students in Technical Vocational Track and the:
   12.1 Students' area of specialization in grade 9; and

12.2 Students' area of specialization in grade 10?

13. Is there significant difference between the perceptions of students on the significant factors that influence learning and to their problems experienced through remediation activities in terms of the following?
    13.1 Teachers' preparation;
    13.2 Teaching strategies;
    13.3 Administrative support; and
    13.4 Physical plant TLE related resources?

14. Is there significant difference between the perception of teachers and students in terms of:
    14.1 Common remediation practices observed by the public and private schools;
    14.2 Significant factors that influence learning in Technical Vocational Track;
    14.3 Effectiveness of remediation activities;
    14.4 Common problems experienced during remediation activities; and
    14.5 Extent of administrators' support/supervision for teachers during remediation activities?

Theoretical Background

This study shows an interrelationship among the three theories on **Behaviorism, Constructivism, and Cognitivism in Remedial Education approaches**. Learning theories revolved around on the *teacher-centered instruction, student-centered instruction, and learning as a dynamic process.* Every theory has ideas and methods in helping low achievers overcome their difficulties and remediate their skills deficits. Behaviorist believes that learning is a product of *"Teacher – Centered Approach"* by creating appropriate positive environment for students to elicit the desired response behavior. This includes the physical factors that affect learning. In this theory it is a daily challenge to all teachers on how to support learning by providing all the necessary resources, equipment, and related material. While, this approach could be deepened when it is coupled with the desired remedial programs. It has been rightly said that there is no single strategy that is effective through different conditions. Learning will take place through varied teaching strategies that would fill-in the gap of individual preferences of learning. This approach, *"Student – Centered Instruction"* is not just influence by the classroom but by society and culture. Constructivist stressed that if learning can be influenced by social mediation, then conditions can be created in schools that help students learn. Underlying the two significant theories, cognitivists believed that learners construct knowledge through constant adaptation of reality and testing their

nowledge through actual applications in to the world using established procedures.

Behaviorism and Remedial Education for Low Achievers:

Behaviorism, refers back to work of Watson and Skinner where focus was on changing the observable or measurable behavior with no attention to student's mind. It is teacher – centered approach since it requires big efforts from the teacher to create appropriate positive environment for students to elicit the desired response behavior.

According to Jarrar (2014) "Teaching is arranged into contingencies of reinforcement under which students learn, however, students often learn without being taught in their natural environment, therefore teachers arrange special contingencies, these speed up the emergence of behavior which would otherwise be acquired slowly or never occurred"

In the area of teaching students with difficulties, Steele (2005); Ellis and Purdie (2005); Dickson (2003) supported Mercer (1997) as cited by Jarrar (2014) saying that the application of behaviorist theory to classroom has generally been referred to as explicit or direct instruction, although these approaches have been criticized for use in the general education setting, they have shown promising research results, particularly for children with learning difficulties. They assured that despite the popularity of student – centered and activity based approaches; direct teaching has a big effect on students' performance particularly when delivered through the medium of interactive whole – class lessons.

Steele (2005) supported Olson and Platt (2000) and Grobecker (1999) regards to the importance of explicit instructions: Breaking down the task into small. Manageable segments for students to learn and complete the task easily and modeling in which teachers explain and demonstrate the steps for carrying out the task. These techniques have great deal values and effects on teaching low achievers who are in need of more care than normal students due to their learning difficulties.

Cognitivism and Remedial Education for Low Achievers:

Cognitivism arose largely in response to behaviorism. It focuses on the human mind and how it operates. The most influential exponent of cognitivism was "Jean Piaget (1968) who rejected that learning was a passive assimilation of given knowledge, instead he proposed that learning is a dynamic process comprising successive stages of adaptation to reality during which learners actively

construct knowledge by creating and testing their own theories of the world".

Unlike behaviorist learning theory, where learners are motivated by extrinsic factors such as reward and punishment, cognitive learning theory sees motivation as largely intrinsic, because it involves significant restructuring of existing cognitive structures, so as successful learning requires a major personal investment on the part of the learner (Perry, 1999). This is also emphasized by Delisle and Berger (1990); Whitmore (1980) that supportive, intrinsic and remedial strategies are effective as they focus on students' strengths to create their intrinsic motivation while remediation is done in a safe environment so that learners can make their own understanding of knowledge and make connections with relating issues.

According to Ertmer and Newby (2013) cognitivism like behaviorism, emphasizes the role that environment conditions play in facilitating learning, it focuses on the conceptualization of student's learning process. To do so, they stressed that instructional explanations, demonstrations, illustrations, and illustrative examples and matched non – examples are considered to be instrumental in guiding student learning with emphasizing on the role of practice with corrective feedback.

Constructivism and Remedial Education for Low Achievers:

The teaching methods that are based on student – centered instruction accord with constructivist learning theory which has the most popular and dominant perspective in remedial education for students with difficulties (Ken, 2006).

Solso (2009) supported Vygotsky (1978) because both of them explored the difference between the actual development level of the students and their potential of development through problem solving and more capable peers. Vygotsky added that students' learning is influenced by not just the classroom but by society and culture, he stressed that if learning can be influenced by social mediation, then conditions can be created in schools that help students learn.

In the area of constructive base remedial instruction, Johnson (2004) and Honebein (1996) emphasized that constructivism is a collection of educational practices that are student – focused, meaning – based, process – oriented, interactive, and responsive to students personal interest and needs. For them, constructivist classroom is characterized by authenticity by a focus on students and by creating relevant environment in which learning is functional; therefore, constructive learning is experiential in that people create knowledge and draw meaning from that knowledge through their own experiences and ideas. In this sense, the researcher believes that learning should be based on real life situations to become meaningful for learner who construct his new knowledge on previous one in asocial and experiential contexts, this is in accordance with tenets of remedial education that focused on the identification of students with difficulties, their strengths and weaknesses (Jarrar, 2014).

With regard to learners' role in constructive learning, Ken (2006) also emphasized that learners have a basic role. They should be active contributors to the learning process, this reflects the importance of scaffolding process for students at the beginning of learning or remediation; and teaching methods should focus on what the student can bring to the learning situation as much as on what is received from the environment.

In the area of constructive learning environment, Weegar and Pacis (2012); Rummel (2008) as cited by Jarrar (2014) indicated that though the role of the teachers in explicit or direct instruction was to provide extrinsic motivation to elicit students' learning or behavior, their primary role in constructivism is to motivate children to create their own knowledge through their personal experiences, in other words, they focus on increasing the intrinsic motivation of students for learning.

Significance of the Study

The findings of this study redound to the benefit of the Senior High School students in the public and private schools in the City Division of Dumaguete considering that remediation plays an important role in helping the students who experienced difficulties in learning Technical Vocational track related subjects. The greater demand for students with difficulties in learning justifies the need for more effective and life changing remediation approaches. This study was geared to find the most effective remediation practices observed by the public and private schools thus, the results of this study will be used as basis to improve and to come-up with a uniform policy and guidelines in doing remediation activities, identify problems and suggest possible solutions to improve remediation activities, ascertain significant factors that influence students' learning under Technical Vocational track, and to evaluate how effective are the present remediation activities observed by the public and private schools to support learning.

Research Methodology

To achieve the purpose of the study, the researcher utilized the descriptive survey method using the questionnaire to gather primary and secondary data. The survey focused on the common practices of teachers regarding remediation activities observed in the private and public schools in the City Division of Dumaguete. It also sought to know the common problems experienced by TLE teachers in giving of remediation to students and the extent of support of the administrators to students who experienced difficulties in coping with the standards under the Technology and Livelihood Education curriculum.

The first part of the questionnaire is composed of demographic data or personal information about the teachers and students under the Technical Vocational Track (TechVoc-Track) in the Senior High School. The second part comprised the common perceptions of Teachers and Students on the following: 1) Common remediation practices, 2) factors that influence learning, 3) impact of remediation activities, 4) common problems experienced related to remediation activities, and 5) supervision for remediation activities.

The third part of the questionnaire were on statistical questions that proved the significant relationships and differences between the independent and dependent variables regarding the remediation practices in the Senior High School under Technical Vocational curriculum.

To ensure the validity and consistency of the items in the questionnaires, the researcher conducted a pre-test to two of the private and public Senior High School provider in the City Division of Duumaguete. The result was subjected to the test of internal consistency using Cronbach's Alpha test. The Cronbach Alpha value is equal .89 and interpreted as highly acceptable items/questionnaire. Therefore, no change in the items was made and the same questionnaire was administered during the pre-test and final administration of the tool.

Summary of Findings:

The top 10 remediation activities observed by the public and private school are the following: 1st **Hands-on activities**, 2nd **group works and collaborative approach activities, 3rd setting of a good learning environment**, 4th **curriculum adaptation or contextualized learning activities to suit learning needs**, 5th **providing more opportunities to learn through practice and drills**, 6th **support with parents (Liaison with parents)**, 7th **organized group activities**, 8th **video review using internet literatures related to the topic**, 9th is **independent study**, *and* 10th rank is

discovery, exploration and experimentation approach activities.

While teachers and students have different perceptions on how remediation activities was observed, the common factors that affects learning, and the effects of remediation towards academic performance.

However, there is a positive impact of remediation activities towards students' academic performance. Most of the students underwent remediation program was able to cope up with the challenges experienced in Senior High School specifically in Technology and Vocational Track. While teachers preparation like; area of specialization, number of years in teaching, and TESDA related qualifications affects the delivery of remediation activities. On the other hand, educational attainment of teachers, number of years in teaching, and seminars attended affects how teachers delivered remediation activities to students.

Conclusion:

The top 10 remediation activities observed by the public and private school were the following: Hands-on activities, group works and collaborative approach activities, setting of a good learning environment, curriculum adaptation or contextualized learning activities to suit learning needs, providing more opportunities to learn through practice and drills, support with parents, organized group activities, video review, independent study, and discovery exploration and experimentation approach activities. Major findings revealed that there is a significant relationship between the common remediation activities observed by the public and private schools to the academic performance of the students while a need to vary teaching strategies during remediation is a must. It is compulsory for all TechVoc teachers to continually update and align personal competencies in the industry to answer the needs of the students. More so, effective remediation activities can be influenced by teachers' preparations and specialization, teachers' experience in teaching the subject and TESDA qualifications.

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EFFICIENCY OF BRINJAL CULTIVATORS IN VAVUNIYA DISTRICT: AN APPLICATION OF TRANSLOG PRODUCTION FRONTIER MODEL

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Abstract

The objectives of the study are to estimate the technical efficiency and its determinants of brinjal farmers in Vavuniya district, Sri Lanka using translog stochastic frontier production function. Using multi-stage sampling method, 50 farmers selected from five villages in the study area during the year of 2017. The results of variance parameter (γ) is statistically significant with a larger value of 0.99 implying that variation in brinjal output is due to the inefficiency effects rather than random variability. The mean technical efficiency score of sampled farmers is 0.79 indicating that, farmers are only producing on average nearly 80% of their maximum possible output and there is an opportunity to increase the output by 20% with a given production technology and input combinations. Results of translog frontier model showed that coefficients of labour and capital have negative effects while raw materials have positive effect on brinjal production and these impacts were statistically significant at 1% level. The interaction coefficients between land and labour and the interaction coefficients between capital and raw materials have the negative values of 1.97 and 1.30 respectively showed that they have competitive relations each other. But interactions between land and capital, land and raw materials, labour and capital, labour and raw materials have positive values with statistically significant at 1% level reveals that they have complementary relations each other. Results technical inefficiency effects implied that, farmers' education, extension services and ownership of land were the important determinants in the efficiency of brinjal cultivation in Vavuniya district in Sri Lanka.

Keywords: Brinjal cultivation, Technical efficiency, Multi-stage sampling technique, Translog production frontier, Tobit model

Introduction

The agricultural sector of Sri Lanka has been traditionally considered as one of the main sectors using labour intensive and engages an important role in terms of contribution to the Gross Domestic Product in the national economy. In the domestic agricultural sector, paddy is the main sub- sector, which provides the food security in the country and followed by vegetables and fruits are the second major sectors in Sri Lanka. In 2017, 1.5 million Metric ton of vegetable production produced and nearly 26.1% of the people employed in the agricultural sector as well as, it contribute to generate new employment opportunities, earning farm income and export revenue in Sri Lanka. (Central bank report, 2017) Sri Lanka has a wide variation in soil and climate with different agro-ecological regions facilitate to cultivate different kinds of vegetable crops. The upcountry vegetables constitute crops such as cabbage, carrot, beetroot, cauliflower, bean, tomato, etc., and the low-country vegetables, which include brinjal, bitter gourd, pumpkin, luffa, cucumber and snake gourd, cultivating less intensively under low input systems.

Vavuniya is predominantly an agricultural district, majoring paddy cultivation and in addition, field crops, livestock, forestry and inland fisheries sectors available in the district. There are 30,912 farm families engaged in agriculture and agricultural related activities and the district has one major tank, 21 medium tanks and 674 minor irrigation tanks including 26 anicuts in the district. The water resources mainly depend on rainfall and out of 674 minor irrigation schemes, 41 are abandoned. Recent surveys indicated that 38% of the total land is engaged in agriculture and 47% of the land is under forest. The cultivated field crops include cereals, pulses, oil seeds, root and tuber crops, low country vegetables, up country vegetables and minor export crops etc. (District development plan, Vavuniya-2018-2022). Due to war, the district severely affected and nowadays, it is an emerging district and most of the rural farmers are engaged in cultivating a variety of vegetable crops especially brinjal, long beans, tomato and other field crops and fruits by using traditional agricultural knowledge and techniques (Thayaparan and Gunathilaka, 2018). Among the vegetable crops, Brinjal is one of the most preferable crops for farmers, which is cultivating mainly for local consumption purpose in most parts of the Northern Province in Sri Lanka.

The cultivation and production of brinjal in Maha season is 200(Ha) and 3436Mt in 2016/2017 respectively (Five Year Development Plan Vavuniya District 2018 -2022).

Developing countries like Sri Lanka, the agricultural research efforts are more important to direct towards development of agriculture technologies and to maximum utilization of local inputs in crop production, which is directly impact on increasing production, and reducing costs. In order to improve brinjal production and its productivity, an efficient use of production inputs has necessary for smallholder farmers in the district as well as in the country. Thus, an understanding of the relationships between productivity, efficiency and the farm production techniques would provide policy makers with information to design programs that can contribute to increase the food production among smallholder farmers in the study area.

Literature Review

Traditionally, technical efficiency measured as a ratio of output to input and the optimization of technical efficiency can occur by maximizing the outputs for a given input or by minimizing the inputs for a given output. It is not possible to maximize output and minimize inputs at the same time. Technical efficiency is used to estimate the capacity of an industry or firm or farmer to achieve the maximum output with given and obtainable technology. The concept of the technical efficiency has been fundamental for the development and application of econometric models of frontier functions, which enhance the productivity of the output and as well as stability of production in the country as well. Estimates on the extent of inefficiencies could help to make the decision whether to improve efficiency or to develop new technology is necessary to raise the productivity of the output.

Previously, there are many studies have been carried out to analysis for the measurement of efficiency of any agricultural production in worldwide. However, a few empirical studies done by the researchers to estimate the technical efficiency of brinjal production among smallholder farmers particularly in Vavuniya district using stochastic frontier model. In this background, there is a need to do a study related to brinjal production in the district which may contributes to identify the factors influencing the efficiency of the output in the area.

Determinants of technical efficiency differentials among maize farmers in Nigeria were analysed by Olarinde (2011). For this purpose, he was select a sampled of 300 maize farmers from Oyo and Kebbi States and it was analysed using translog frontier production function. Their results indicated that, extension services and farm distance was found as the major determinants of technical efficiency in both states Oyo and Kebbi. Besides that, farming experience in Oyo State and credit accessibility, number of other crops grown and rainfall in Kebbi State determined the technical efficiency in maize production, but age of farmers was insignificant factor in both states.

Basnayake, B.M.J.K. and Gunaratne, L.H.P (2012), studied on estimation of technical efficiency and its determinants in the tea small holding sector in the mid country Wet Zone of Sri Lanka. The primary data collected during the period September - January 2001 relevant to sixty smallholder tea producers in the Mid-country Wet Zone was used for the study. They analyzed the data using maximum likelihood estimates of the stochastic frontier model for green leaf yield as a function of land extent, family labour, hired labour, fertilizer, chemicals, and dolomite, using CobbDouglas and translog models. Results of the Cobb-Douglas suggested that, extent of land, family labour, hired labour, fertilizer and dolomite significant effects on yield while the estimation with the translog model showed that, age of farmer, education, occupation, type of crop and type of clone have significant effects on efficiency.

Estimation of technical efficiency in the translog stochastic frontier production model with an application to the oil palm produce mills industry in Nigeria were analysed by Amaechi et al (2014). They used a multi stage sampling method to select 30 mills in the study area and their estimated technical efficiency results showed that, firm level technical efficiency means of 70.62 varies with the range of 37.48% to 93.46%. This wide variation in oil farm output of millers from the frontier model found that those differences were arisen from differences management practices of millers than random variability. In addition, their study implies that education, processing experience, membership of cooperative society, credit, capital, fruits petroleum energy and water are the major determinants of technical efficiency. Their results further highlighted that age, household size and interest on loans negatively affected to technical efficiency among oil palm produce mills industry in Nigeria.

Shrestha, Huang and Thapa (2016) have examined the determinants of inefficiency in vegetable farms and its implications for improving rural household income in Nepal (2016). They employed stochastic translog production function and their results suggested that labour, traction power, seed and organic matter accounted for the efficiency of vegetable production and the efficiency level in vegetable production can be increased by greater accessibility to agricultural materials, higher levels of

farmer's education and increased the number of trainings to farmers in the country.

Geta, et al. (2016) conducted a study in order to ascertain the productivity and efficiency analysis of smallholder maize producers in Sothern Ethiopia. Results of the normalized translog production function revealed that use of human labour, application of chemical fertilizer, planting methods, use of hybrid maize seed and application of integrated soil fertility management practices are the important factors, which positively influenced on productivity of maize. Further, results of the data envelopment analysis indicated that 0.4 average technical efficiency among smallholder maize producers' in the country.

Another study done by Wudineh Getahun Tiruneh and Endrias Geta (2016) on technical efficiency of smallholder wheat farmers in the case of Welmera district, Central Oromia, Ethiopia for their study, they collect primary data pertaining to farm production, input usage, and socioeconomic and institutional factors during 2012/13 cropping year through a structured questionnaire from randomly selected 180 wheat farmers. The stochastic frontier and translog functional form with a one-step approach employed to assess efficiency and factors affecting efficiency in wheat production and according to that, technical efficiency was found that 57%. Factors such as sex, age and education level of the household head, livestock holding, group membership, farm size, fragmentation, tenure status and investment in inorganic fertilizers positively effect on efficiency in the district.

Umar et al (2017) compared Cobb-Douglas and translog frontier models in the analysis of technical efficiency in dry season tomato production in Jos-South area of Plateau State. Based on the 60 dry-season tomato farmers the analysis of Cobb Douglas frontier function, it revealed that 89% mean technical efficiency while 54% mean efficiency identified under translog frontier function. The findings of the study concluded that estimated elasticities, efficiency scores and inefficiency effects are significantly different between Cobb Douglas and translog frontier model.

Methods and Materials

In order to select the farmers who are cultivating brinjal, multi-stage sampling method was applied in the study. In first stage, the Vavuniya district purposely selected among the Northern Province in the country based on the extent of brinjal cultivation. In the second stage, five villages chosen by the researcher where most of the farmers involved in brinjal cultivation and finally ten farmers from each

village randomly selected in the study area during the year of 2017.

In the beginning, to estimate the efficiency scores of brinjal production the variables related to farm inputs were gathered from the respondents. In the second stage, the variables related to the determinants of technical efficiency the data set consist of two sets such as demographic characteristics and farm characteristics among the smallholder agricultural farmers in the study area.

Specification of the model

This study used stochastic frontier function through Translog production to estimate the technical efficiency of brinjal and it is the generalized form of the Cobb-Douglas functional form. It can be shown as a model given below:

$$\ln y = \alpha + \sum_{k=1}^{K} \beta_k \ln x_k + \tfrac{1}{2} \sum_{k=1}^{K} \sum_{m=1}^{K} \gamma_{km} \ln x_k \ln x_m$$

Where, α is constant, β is the production function parameter which to be estimated for each input, Y is the quantity of brinjal output.

Results and Discussion

This study focused to measure the technical efficiency scores and identify the determinants of technical inefficiency of brinjal farmers in Vavuniya district, Sri Lanka. There are many measures can be used to estimate the efficiency even though, this study used translog production function with the major four inputs such as, cultivated land, expenditures of labour, capital expenses and cost of raw materials of brinjal cultivation. The results of maximum likelihood estimates of the translog stochastic production parameters shown in the table 01 and according to that, the coefficients of variance parameters that are the sigma squared (σ^2) and the value of gamma (γ) for the model has 0.025 and 0.99 respectively. The sigma squared is 0.071 and it is statistically significant at 5% level indicated a good fit of the model and as well it confirmed that the specified distribution assumption of the composite error term is correct. At the same time, the value of gamma in the model is 0.99 and it is statistically different from zero at 1% level showed that, 99% of the deviation in brinjal output attributed due to the presence of technical inefficiency in the four inputs used during the production period. The estimated parameter gamma (γ) was closed to 1.0 in the translog stochastic frontier and statistically significant at 1 per cent level suggesting that inefficiency effects are highly significant in the analysis of production of brinjal by the farmers.

Further, it illustrated that, these factors are under the control of the farmer and influence of which can be altered to enhance technical efficiency of brinjal cultivation in the district. The above results confirmed that the effect of technical inefficiency is significant and a classical regression model of the production function based on an ordinary least squared estimation would be inadequate representation of the data. Therefore, stochastic parametric production function and maximum likelihood estimation are more relevant and appropriate in the study.

The estimated results from translog production function and the influence of each inputs used in the production of brinjal and their interactions are presented in the table 01.

Table 01: Results of maximum likelihood estimate of Translog production frontier

Variable	Coefficient	t - ratio
Intercept	29.32	30.35*
ln land	1.26	1.24
ln labour	-10.30	-15.17*
ln capital	-4.38	-4.95*
ln raw materials	2.67	4.125*
ln land^2	-0.511	-1.72
ln labour^2	-0.147	-0.63
ln capital^2	0.518	0.71
ln raw materials^2	-0.040	-0.47
ln land* ln labour	-1.97	-3.50*
ln land* ln capital	1.08	2.73*
ln land* ln raw materials	0.90	2.80*
ln labour* ln capital	2.08	6.13*
ln labour* ln raw materials	0.67	-3.30*
ln capital* ln raw materials	-1.30	4.38*
log – likelihood function	39.16	....
sigma square (σ^2)	0.025	2.35**
gamma (γ)	0.99	25.34*
Sample size	50	....

Source: Calculated by authors` from survey data, 2017.
*and ** represents the 1% and 5% significant levels respectively.

In the above results showed that out of four inputs, labour cost, capital expenses and cost of raw materials have statistically significant impact on brinjal production while cultivated land area has insignificant in the study. In the frontier model, the coefficients of raw materials cost were positive and significant implying that an increase to some optimum level in the raw materials would increase brinjal output while coefficients for costs of labour and capital were negative indicating that an increase in these input costs would reduce the average production of brinjal in the district.

The coefficient value of labour cost was 10.30 with negative sign and significant refers that an increase in labour cost by 1 % would likely to reduce the average production of brinjal by 10.30 % assumed that all other inputs held constant. In other words, increasing labour cost in brinjal production in operations such as land preparation, planting, application of fertilizer, and weeding would significantly reduce the brinjal productivity. In case of capital expenses, as the farmers increase their expenditures on capital by 1 % will reduce the average production of brinjal by 4.38% assumed that other three inputs held constant. This result depicts that farmers who spend more money on capital such as machinery and water pump receive less yield in brinjal cultivation. Therefore, to make efficiency in brinjal production, the farmers should take necessary actions to reduce these types of labour costs and capital expenses in their farming.

On the other hand, positive sign of raw materials 2.67 showed that, increase in raw material costs by 1% enhances the average production of brinjal by 2.67% without changing other inputs in the district. This finding revealed that, applications of raw materials have significant and positive influence on brinjal production and it is statistically significant at 1% level and an increasing the current expenditures on capital instruments would help to raise the average production of brinjal. In the square terms of coefficients for land, labour and raw materials showed negative while capital has positive signs. However, all are insignificant effect on brinjal output in the study. In the interaction term, all possible interactions between the inputs have significant impact on the yield of brinjal. The interaction coefficient between the inputs revealed the substitution elasticity of the inputs used in brinjal production and all possible interactions are significant at 1% level in the study. In table 01, interaction between cultivated land and labour cost and the interaction between costs of capital and raw materials have negative sign with statistically significant implying that there is a competitive relationship exist among these pair inputs in the model. The negative substitution elasticity for pair inputs of land and labour cost has1.97, and for costs of capital and raw materials has 1.30 indicated the competitive relationship among these pair inputs. These may happen since an increase of one input use had compensated by the reduction of other input.

Conversely, the positive elasticity for other pair inputs indicated the complementary relationship among them and implied that these pair inputs should be increased together to obtain the higher production in brinjal cultivation. In the table 01, positive sign of the estimated substitution elasticity for cultivated land and capital cost (1.08), land and cost of raw materials (0.90), costs of labour and capital (2.08)

and costs of labour and raw materials (0.67) implied the complementary relationship and thus, these inputs need to be increased together to increase the production.

The dispersion of the scores for all 50 brinjal farmers depicted in a stem and leaf diagram as below:

Figure 01: Stem and leaf of technical efficiency scores
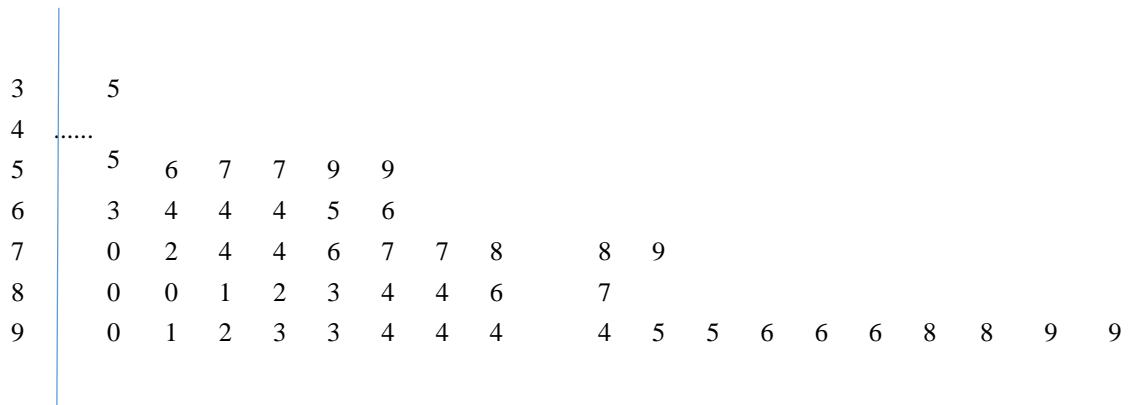
Source: Calculated by authors using Frontier 4.1

The following table presents the frequency distribution of efficiency scores obtained from translog stochastic frontier models and according to that, their scores vary with the minimum value of 35.54 and the maximum value of 99.86. Further, in the table revealed that, the mean technical efficiency was nearly 80% implies that on the average, brinjal farmers have an opportunity to increase the output by 20% with a given production technology and input combinations.

Table 02: Frequency distribution of technical efficiency in brinjal cultivation

Range of technical efficiency (%)	Frequency	Percentage
Less than50	01	02
50- 59	06	12
60- 69	06	12
70-79	10	20
80-89	09	18
90 and above	18	36
Total	50	100

Mean technical efficiency	79.98
Minimum technical efficiency	35.54
Maximum technical efficiency	99.86

Source: Calculated by authors` from survey data, 2017.

Out of 50 sampled farmers, 36% of them were achieved the technical efficiency at 90% indicates that those farmers were the best practice farm and they used their inputs optimally. Thus, they could decrease the inefficient effect on the brinjal production. On the other hand, only 2% of the farmers attained the efficiency at less than 50% showed that need to be improved and thereby they could not attain the maximum output as achieved by the best practice farmers in the study area.

Sources of technical inefficiency

Determinants or sources of the technical inefficiency for brinjal production were identified by the estimated coefficients of the inefficiency effect model and its results presented in table 03. A perusal of the factors affecting technical inefficiencies suggests that education of the farmer, available of extension services, and ownership of land whether they cultivate own land or other land had a significant effect on the technical inefficiencies of the farmers. On the other hand, other demographic and farming characterise such as age of the farmer, household size, farming experience, credit accessibility and extend of irrigated land have insignificant impact on technical inefficiency scores in brinjal cultivation. The coefficient of education in years of schooling is negative and significant at 5% level in brinjal cultivation as a priori expectation implying that, increase in education help to the farmers to adopt new techniques and skills which reduces the technical

inefficiency. Also, education improves the ability of the farmers to make informed decision about production inputs and it help them to access better agricultural information and higher tendency to adopt and utilize improved inputs more optimally and efficiently. Thus, this finding suggests that education is one of the factors in determining the technical efficiency in brinjal production.

Negative sign of the extension services revealed that the farmers who are having extension services, they were able to reduce the technical inefficiency of brinjal farming in the study area. The estimated coefficient for ownership of land has negative sign with significant at 1% level, indicating that the farmers who are cultivating the brinjal by their own land reduce the technical inefficiency that the other farmers cultivating the crops by tenant or leased land. In other words, as it was in priori expectation own operated brinjal farms are more efficient than tenants operated farms and thus, to increase the efficiency better to cultivates the crops by own land than other tenant or leased land in the district.

Table 03: Determinants of Technical inefficiency of Brinjal cultivation

Variable	Coefficient	t - ratio
Constant	0.90	4.38*
Age	0.38E - 02	0.72
Education	-0.047	-2.74**
Household size	0.30E - 03	0.055
Farming experience	-0.0034	-1.05
Extension services	-0.246	-2.06*
Ownership of land	-0.588	-3.33*
Credit accessibility	0.221	1.63
Extend of irrigated land	0.0372	1.09

Source: Calculated by authors` from survey data, 2017.

*and ** represents the 1% and 5% significant levels respectively.

Finally, the overall results of the above table concluded that among demographic characters only education of the farmer has significant impact on technical inefficiency while among farming characters two variables such as availability of extension services and ownership of land have significantly influencing the technical efficiency in brinjal cultivation in the study area.

Conclusion

This study examined the estimation of the technical inefficiency and its determinants of brinjal cultivation in Vavuniya district, Sri Lanka. By applying stochastic frontier production model inefficiency scores was measured and to identify the factors causing inefficiency over the reference period 2017 inefficiency effects also used in the study. Results obtained from the stochastic frontier estimation concluded that, the average technical efficiency score of brinjal production given by the translog model is 0.79 indicates that farmers are only producing on average nearly 80% of their maximum possible output and there is a scope to further increase the output by 20% without increasing the levels of inputs. From the maximum likelihood estimates, value of gamma (γ) is 0.99 and it is statistically different from zero at 1% level, interpreted that 99% of random variation is the value added among the brinjal production due to inefficiency than random variability. The determinants of technical inefficiency are identified by the inefficiency effects model and its results showed that, among three demographic factors such as age, education and household size of the farmers only education has significantly contributed to improve the technical efficiency in brinjal production. On the other hand, out of five farming characters namely farming experience, availability of extension services, ownership of cultivated land, credit accessibility and extend of irrigated land only availability of extension services and ownership of cultivated land are the major variables contributed to improve technical efficiency in brinjal production in the district. Rest of other demographic and farming characteristics were not significant implying that, these variables are not important factors in determining the technical inefficiency of brinjal production in Vavuniya district, Sri Lanka.

ANALYZING THE IMPORTANCE AND IMPACT OF TECHNOLOGY MANAGEMENT FOR NATIONAL SCHOOLS IN SRI LANKA

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Abstract –

Research investigates the gravity and the degree to which the information technology assists in planning, organizing, decision supporting, communication and integration beneath the scope of process management in the context of Sri Lanka national schools. The advance of information technology over the fact of education is a crucial point of discussion. In concise, corresponds to the state of development, the potential use of technology over education is limited in scope. Questionnaires were independently distributed and interviews were conducted for the group of respondents, representing each of the selective distinctive educational divisions in Uva province, Sri Lanka reliant to the nature of their tasks of performing as principals, teachers, students, and parents. Research carried out a descriptive data analysis with a literature review. The qualitative results generated employing the statistical tool, evinced for technological implementation over the conventional pattern of operations. In extending a solution, designed and implemented a web-based logical framework integrated with artificial intelligence technology, offering a productive potential on ordinary issues. This research creates an open arena for the researchers to investigations on the fact that the management of the use of information technology as an integrated tool in the educating process of the national education sector.

Keywords— Education, Information Technology, National Schools, Process Management

I. Introduction

The intergradation and the applied potential of the information technology on the operations, transactions, production, quality assurance and people beneath the concept of industrial management are vast in scope. Incorporation to the above fact, the utilization and the advancement of information technology over the educational sector is a decisive factor to be discussed. Corresponds to the current measures of development, Sri Lanka is considered as a country indicating the majority as a developing nation. Being dependent on the above fact as a significant issue, the research focused on influencing the contemporary education of younger generations via exposing to the notable value of information technology [1].

In the past decades, many types of research have focused on, the concept of teaching and learning with association to the technology and through the integration of technology [2]. Addition to above, researchers also have brought out the views on technology usage in the school management emphasizing the significance also the limitations of the investigations mostly being based on the non-identical structures of their states and their pattern of exertion [3].In the context of the education sector in Sri Lanka, this is indicated as a country that tends to have a long history which dates back to two millennia [4] . The education system of the country has been evolved throughout the years with the evolution of society, environment, andtechnology. The constitution of Sri Lanka provides free education for the citizens. Majority of the schools are maintained by the central government forming three categories of government schools as national schools, provincial schools, andpirivenas. Relying on that foundation, the central government controls 353 schools as national schools [5]. Researchers identified the fact that a national school should facilitate 2000 or more students, adequate laboratory facilities, infrastructures and more specifically adequate facilities for teaching and learning the technology related subjects.[6]. Moreover significantly, one-third of students should have qualified for admission to the universities each year, counting on the number of students appearing for the examination during the previous three years [7].

Corresponds to the investigations on the above facts, it remains unclear, why Sri Lanka exists in the current indicators of development referring to the

section of education. More specifically, it elaborates a gap correlated to the level of internal adequacy of knowledge and the external expansion or the advancement over the application and usage. The research brought out evidence to depict the fact that there is a hindrance in the integration, communication, and distribution of processes, knowledge, and people due to the lack of a proper, effective, advanced communicative bridge placed in-between. The major purpose of the study was to explore the gravity and the extent to which the contemporary processes management system in Sri Lanka national schools operate and to disclose the degree of importance, impact and the value of Information Technology on the process management and functional integration.[8] The study was conducted centralizing the national schools in Uva province; comprising individuals correspond to different tasks of the institution. In order to build up the research question; the magnitude and the value of the technology in upgrading the process manipulation at the national education segment, the research adopted strategies for data acquisition from the selected group of respondents. Based on the statistical analysis of the distinctive responses of the participants at each category, discovered that majority of the respondents involved in a contemporary paper-based system and in a passive mechanism of communication and information processing and similarly showing a high tendency over a technological advancement. The literature reviews suggest that Information technology has spread to the extent that it is hard to envision any organization in an industrialized nation, and even in a developing nation, not using some form if IT/IS[9]

II. Methodology

The acquisition and the study of information correlated to every level of management at the organization is an advantage for the organization itself to reform and re-engineer the operational, tactical and strategic sequence of process management. Therefore, the approaches are needed to be extended and design, in order to achieve organizational excellence. The research was conducted, to statistically provide evidence and similarly to recognize the importance, impact and the usage value of technology for the national school sector of Sri Lanka, employing Uva province as a segment in the initial study. Corresponds to the statistics of the ministry of education, Uva province consists with nine educational divisions in which these were later classified and ranked in the study based on the Sri Lanka preliminary level; Ordinary level evaluation percentage. Research represented all the national schools reside in each of the mentioned educational divisions while specifying selective three educational divisions based on the examination of descriptive statistical analysis. The research was independently conducted for a selective group of respondents including 150 in the count, representing the particular selective educational

divisions corresponds to their role of performance as principals, teachers, students and parents rely on their exertion. Questionnaires were equally distributed and interviews were independently conducted for the selected group of respondents. Comparably, a feasibility study was done for clarifying the technical, operational, management and organizational feasibility in case of determining the viability of system implementation. The responses belonged to each of the categories of participants were analyzed using the statistical tool Minitab 17, producing a quantitative data analysis.

III. Result

Based on the outcome of the data analysis generated under the category of teachers; the majorityof the percentage utilize the conventional paper-based mechanism where a minor percentage of respondents utilize Microsoft office based applications. In addition to that, the consent over the capability of decision supporting is poor for the existing mechanism whereas the majority of the respondents prefer a fine technological implementation. In the context of the category of students majority from the percentage of respondents are willing to experience an environment of better technical execution. Parents, being an influential external linkage to the school system, admit the fact that the existing method for information gaining is inconvenient and correspondingly a greater percentage of the responses suggest for an advanced operational environment. Results generated suggest that parents are satisfied with the approach of extension of a technologically integrated system and evince with a higher satisfaction over the accuracy and the security of the proposed mechanism. Results are summarized in the figures.
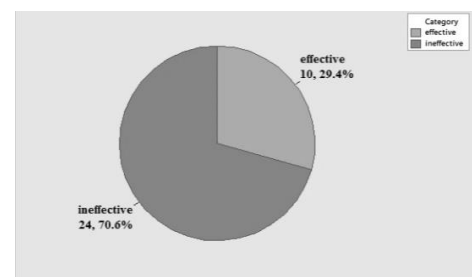

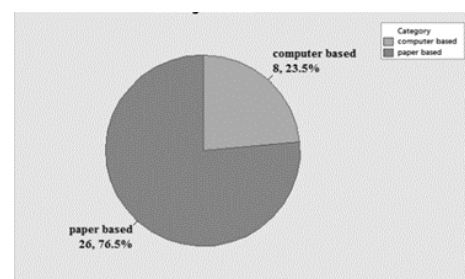**Figure 1 Current method of process management by Teachers**

Figure 2Influence of the current process management over the decision supportiveness of teachers
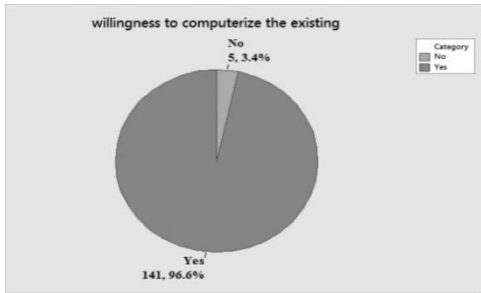
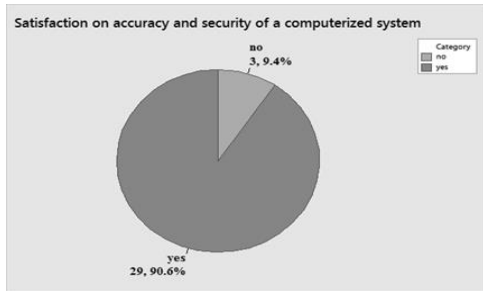**Figure 2 Students response for a system implementation**

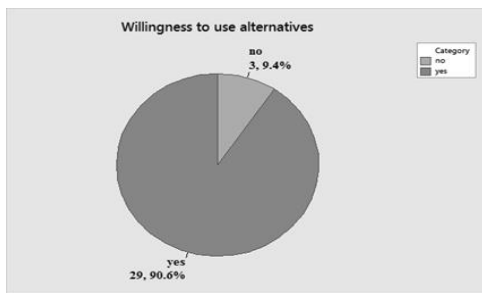**Figure 4 Parents' satisfaction over the accuracy and the security of the advanced technological implementation**

Figure 5 Parents' willingness over a new system implementation

Discussion

Findings of the study clearly illustratethat the selected group of respondents involve over the different levels at the process management hierarchy of the national school segment encounters with a hindrance of an absolute, integrated and systematic system for the simultaneous process management.[10]

Education is one of the key indices of a country. Sri Lanka possesses a free education system with a higher literacy rate of 92 which is above the average by the world and the regional standards. In concise, Individuals should be benefited by a system where the management of the use of advanced technology survives human endeavor.

The results generated through the statistical analysis combined with literature review exhibit the fact that the technology reaches the gap of communication, extending solutions triggering under the dimensions of capacity, efficiency, effectiveness, security, accuracy, decision supporting ability and the manipulation of live information.

The study was limited by factors encountered during the processes of data collection and data analysis. During the task of information acquisition, this presented a low tendency of response under the categories of teacher and parent in the age group above 50. More specifically, discovered reluctance on accepting the technologically advanced process flow. In addition to the above, found issues correlated to the inadequate supply and distribution of physical resources and human resource at the specific influential domain.

Based on the results generated, in case of applying an absolute solution, this designed and implemented a web-based logical framework "School Process Management System " adopting the model, view, controller architecture of the Laravel version 5.5, as the system designing framework and MySQL version 5.7.19 as the open source relational database management system.[11] Moreover, within the system employed jasper reports; the JAZZ reporting service with the Net Beans IDE 8.0.2. for report generation utilizing the technologies of Hibernate, sturts, and spring. The system also applied the chatter facilitator in the application utilizing the wookimii chatter concept. The system was hosted in a cloud environment, in a cloud server providing benefit over the conventional sharing of servers. Parallel to the development of the web-based framework, an artificial intelligence application utilizing the technology of "Watson" was implemented as a help desk supporting tool modifying the conservative office environment.[12] The system architecture was designed to provide the authentication for the distinctive user roles, clarifying the particular user levels while integrating the functionalities.[13]

Under the user role students, they are allowed to involve with the academic and non-academic history respective to the particular year in need and are continuously motivated toward the learning process. In addition to the above, academic and non-academic staff is provided with the facility to involve productively in the tasks classified based on their division of exertion. More specifically, parents are preceded with the ability to the continuous access of child's details, communication interchange across the forum and be aware over the school environment. In conclusion, the school community is benefited through the accessibility of live information which leads to a better systematic environment.

IV. Conclusion

Application of information technology, the industrial application of information technology, demands as being the perfect solutions in answering the unique and collaborative needs of an organization. Education is a key fact, in which it brings out and interchanges an individual's capacity of thinking and working with an extraordinary significance. Upgrading the process flow determines, under the concept of education is a vital task in continuous development. Building internal and external linkages and creating collaborations between the processes enhance the quality of performance and decision making. The results generated through the statistical analysis of the research and the issues encountered during the research evinced for the contemporary system of management. This introduces the implementation of technology, "School process management system" as a solution in answering analysis. This research facilitates a space for the researchers to conduct investigations on the management of the use of information technology as an integrated tool in the learning, teaching, and communication of the national education sector.

Acknowledgment

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EXAMINE THE INTERCONNECTED NATURE OF IDENTIFIED MANMADE ENVIRONMENTAL PROBLEMS

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Abstract

Manmade environmental problems are increasing in numbers with time. Study proved the links between manmade environmental issues based on cause and effect relationship from real world evidences, for instance, manmade climate change is caused primarily as a result of deforestation, draining of wetlands, intensive farming and air pollution (greenhouse gas emission), and each of these problem such as air pollution is caused by intensive farming, burning of fossil fuels (due to global energy crisis), urbanization, methane emission from solid waste dumps, etc. Furthermore, the deforestation is mainly caused by increasing human population, poverty, overexploitation of natural resources, urbanization, mining minerals, intensive farming, establishment of dams, wild fires during el niño, acid rain and global warming (cyclic as cause and effect). In addition, each of these manmade environmental problem may causes various other environmental problems, for instance, air pollution causes ocean acidification, ozone depletion, acid rain, disease, visual pollution (smog), etc. Similarly, deforestation causes issues such as biodiversity loss, land degradation, human animal conflict, etc. About 207 links are examined among 40 identified environmental issues, in this web certain causative environmental problems establish keystone links. Solving a keystone issue would result in the extermination of many linked manmade environmental problems (in a hypothetical situation where human adaptability factors such as economic, political, social, health and behavioral factors are absent). Eight manmade environmental problems are found as keystone such as air pollution, deforestation, population explosion, overexploitation of natural resources, global energy crisis, intensive farming, urbanization and urban sprawl and plastic waste.

Keywords: environment, environmental issues, manmade environmental issues, key environmental issues, interconnected environmental issues

1. Introduction

According to [1], in the early days environmental issues gained public attention due to either their impacts on communities or prediction of such problems by scientists and others on likely effects of certain issues before these problems capture the wide recognition. According to [1], early environmental issues such as fish kill in contaminated surface waters, smog hazes over many American cities, the effects of DDT and other pesticides on wildlife, effects of acid rain on ecosystems, effects of lead on infants and children, effects of tributyl tin on marine environment were considered as environmental problems and increased public concern on these issues caused US EPA to pass few laws in order to protect the environment such as clean air act, clean water act and safe drinking water act. As a result, problems such as lead poisoning, air and water pollution were successfully mitigated in the period between 1978 and 1995. In addition, international treaties such as Montreal protocol (1987) which led to take measures to protect stratospheric ozone layer by banning CFC and related products globally and enabled us to recover from the impacts of UV radiation. It is further stated in the [1], that environmental systems are **complex and interconnected**. It is further stated [1] that present humans are experiencing the environmental problems that have not been experienced before in this century and they are manmade.

It has been stated in [1] that problem-by problem approach to environmental protection has also influenced the nature of environmental research at EPA, and Office of research and Development (ORD)'s strategic plan also set a goal of working with others to identify, characterize, and resolve emerging environmental problems. Thus, it is vital on providing evidences on the interconnections between identified global environmental issues, in order to create a model showing its major interconnections or links between environmental issues based on their causes and impacts. This model showing interconnections between currently known or identified environmental issues could help us in drawing appropriate mitigatory measures on them. In addition, it also helps us to predict the possible environmental problem that could emerge in the future. Study initially aimed to identify and funnel all major manmade environmental problems into 40 labeled categories and then the links are established

based on causes and effects relationship provisioned by following hypothesis.

Hypothesis: Both origin (causes) and impacts of manmade environmental problems are also manmade environmental problems. Accordingly, links between environmental problems depict its complex nature. E.g. Eutrophication caused by intensive farming or agrochemicals and its impacts are biodiversity loss, water pollution, loss of wetlands, etc.

2. Methodology

Our approach of the study is inductive reasoning, as the premises support the conclusion (as in qualitative methodology) not premises give guarantee of the conclusion (as in quantitative methodology). Here, we do not quantitatively guarantee the links between environmental problems. For instance, it is obvious air pollution causes acid rain, we can prove this link by providing evidences from real world examples such as in a particular region in Canada air pollution caused acid rain.

In addition, we have well identified the major manmade environmental issues in advance and the links between environmental problems are established from the collected evidences of our pilot study based on manmade environmental problems, causes and impacts. Precisely 207 links are found. In order to generate a hypothesis it is mandatory for us to prove the existence of all 207 links with the support of real world examples collected from reliable scientific literature. In theoretical sampling methodology as mentioned by [4], data collection is based on concepts or themes derived from data, here we are sampling concepts. Unlike random sampling here the data collection is solely driven by the theory that are being developed. In our study the codes or links between manmade environmental problems are predefined, the data collection to be done by searching the scientific literature for the predefined codes. Unlike purposive sampling, our study (theoretical sampling) attempts to discover categories and their elements in order to detect and explain the interrelationship between them. 40 manmade environmental problems are categorized and the inter relationship between them based on their elements (causes and effects) to be explained or proved by the collected data.

3. Results and discussion

In the UNEP (2012) report 21 issues are categorized based on the following criteria:
i)   Issues that are critical to the global environment. Issues can be either positive or negative. But must be environmental in nature or environmentally related.

ii)   Given priority over the next 1-3 years in the work programme of UNEP and/or other UN institutions and/or other international institutions concerned with the global environment.
iii)   Issues have a large spatial scale, and they should be global, continental, or 'universal' in nature (issues that occur many parts of the world).
iv)   Issues that are recognized as 'emerging' based on newness, which can be the result of: new scientific knowledge, new scales or accelerated rates of impacts, increased level of awareness and/or new ways to respond to the issues.

[N.B. - Numbers given to the manmade environmental problems in the table 1 are used as superscript in this part of the discussion.]

Report gives 21 emerging environmental issues for the 21st century were ranked based on their linkages to the various dimensions of sustainable development. These issues cut across major global environmental themes such as food production, food security[38], urbanization[10], biodiversity[5], freshwater[12], marine[13,16,17and18], climate change[27], energy[3], technology and waste[19]. In addition it also concentrated on bridging the technology among countries, giving adequate funds or support to developing countries in order to combat the global environmental change and inclusive green economy. On 25th of September 2015 at United Nations Sustainable development summit, 2030 agenda for sustainable development was developed with the participation of world leaders from more than 150 nations. The 17 sustainable development goals are aiming to end poverty[38], end hunger[38], ascertain good health[38] and wellbeing, quality education, gender equality, clean water[12] and sanitation, affordable and clean energy[3], decent work and economic growth, develop industry, innovation and infrastructure, reduce inequalities, establishing sustainable cities and communities, ensure responsible consumption and production, climate change[27] and disaster risk, protecting aquatic life[5], protecting the life on land or secure the biodiversity[5], democratic governance and peace building and establishing global partnerships to achieve these goals [5]. Similarly, in the recent 2012 GEO5 report, issues such as heavy metal toxicity[20], invasive or alien species[42], and water scarcity[12] such as groundwater depletion[15] were classified along with other modern issues.

Two dozens of reports were reviewed by [2], included reports of National Research Council, EPA's Science Advisory Board, technical societies and research institutions. They are funneled into 40 manmade environmental issues as given below (see table 1).

Table 1 Environmental problems studied for interconnections

Over Exploitation of Natural Resources	1	Ocean Acidification	13	Air pollution	25	Human and Animal Conflict	37
Vector borne diseases	2	Eutrophication	14	Animal Slaughter and Cruelty	26	Poverty, Disease, Disability and Food insecurity	38
Global Energy Crisis	3	Groundwater contamination	15	Climate change and Global warming	27	Nuclear Explosion, Radiation and Nuclear waste	39
El-Niño and La-Niño	4[1]	Oil spills	16	Destruction of Forests and mangroves	28	Agrochemicals	40
Biodiversity Loss	5	Marine Plastic Pollution	17	Coral destruction and bleach	29	Population Explosion	41
Wetlands or degradation of wetlands	6	Thermal Pollution	18	Ozone depletion	30	Invasive species or Exotic species	42
Land degradation, sedimentation, and soil erosion	7	Solid Waste and sewage	19	Acid Rain	31	Intensive farming	43
Pollution through mining activities	8	Heavy metal contamination	20	Light Pollution	32	Aquatic Weeds	44
Establishment of Dams	9	Plastic Wastes	21	Noise and Vibration pollution	34		
Urbanization and Urban Sprawl	10	Hazardous waste	23	Impacts of biotechnology and Nanotechnology	35		
Water Pollution and Water Scarcity	12	E-Waste	24	Visual Pollution	36		

[1]The El-Niño and La-Niño is not a manmade environmental problem and it caused naturally.

Manmade environmental problems are interconnected as cause and effect to one another. For instance, **water pollution and water scarcity[12]** is caused by several other manmade environmental problems such as agrochemicals[40], solid waste[19], plastic waste[21], e-waste[24], heavy metal contamination[20], pollution through mining activities[8], establishment of dams[9], sedimentation and soil erosion[7], over exploitation of natural resources[1], hazardous waste[23], intensive farming[43], global warming and climate change[27], groundwater contamination[15], urbanization and urban sprawl[10] and wetlands or draining of wetlands[6]. And the effects of water pollution[12] are eutrophication[14], biodiversity loss[5] and disease and food insecurity[38]. Thus, manmade environmental problems are interconnected to one another as causes and effects. The following mental map depicts the interconnected nature of 40 manmade environmental problems based on causes and effects relationship. After a prolonged study (since 2013 Dec. – 2019 Jan.) On real world evidences from inter connections between selected manmade environmental problems the above mental map was published [3] See fig.1.
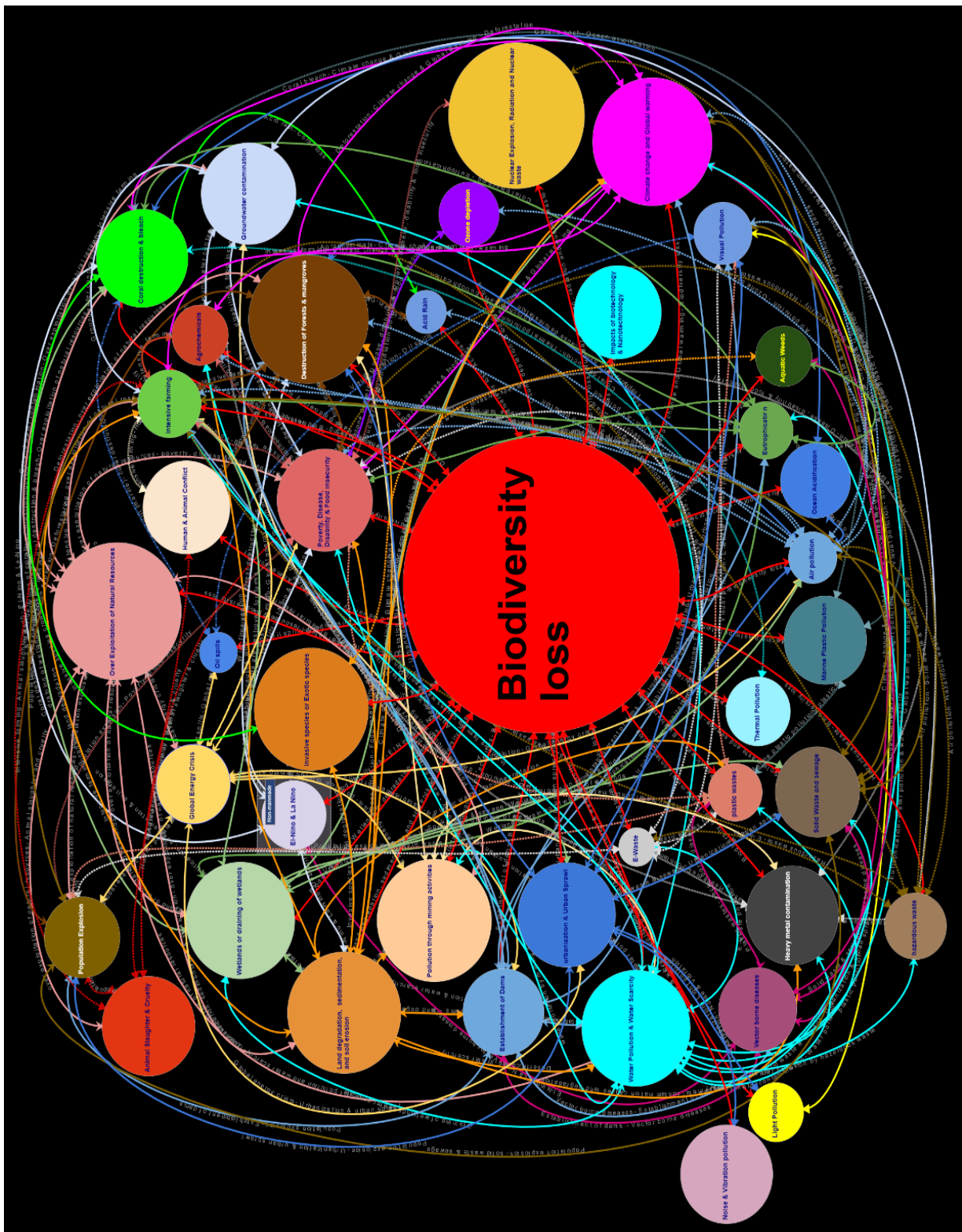
Figure 3 Mental map of interconnected manmade environmental problems as causes and effects

Similarly, causes of Land degradation, desertification and soil erosion[7] are deforestation and destruction of mangroves[28], agrochemicals[40], pollution through mining activities[8] , over exploitation of natural resources[1] (excess sand usage), intensive farming[43], heavy metal contamination[20], water pollution and water scarcity[12] , establishment of dams[9], invasive species or exotic species[42](e.g. *Eucalyptus* sp. Causes land degradation through its oily litter). Similarly, impacts of Land degradation, desertification and soil erosion[7] are poverty, disease, disability and food insecurity[38] in this group of problems, land degradation[7] causes impacts such as food insecurity[38] (while the disease and disability caused by famine or malnutrition are less pronounced) and biodiversity loss[5] (poor soil no longer harbor organism and biodiversity). In the aforesaid scenario twelve environmental issues are directly linked to the land degradation, desertification and soil erosion[7] (ten causes and two impacts).

At present, based on above evaluated history on the environmental challenges stated by international authors, treaties, summits and conferences including the research gaps specified by [4] which is based on the interconnected nature of the manmade environmental issues, the main hypothesis of this study has been derived, that "**Manmade environmental problems are interconnected and complex**" Thus, finding solutions to the major environmental issues must consider the interconnected environmental problems as well. Accordingly, it is not possible to find a complete solution for most of the environmental issues as they are linked (their causes and effects also environmental problems), in other words, due to the complex nature of the environmental issues it is important to find mitigation to the key environmental issues when finding solutions to the rest of the environmental problems. For instance, human population explosion[41] could be considered as the precursor link. When the human population remains unchanged, nearly half of the environmental problems now we are experiencing can be mitigated. However, in case of deforestation[28] (a key link), that it amplifies the impact of air pollution[25]. Air pollution[25] is a general term, it refers to air pollution by carbon soot, particles, toxic fumes, increased methane, CO_2, CO, NO_x, SO_x, CFC, etc. These gasses cause global warming or climate change[27], ocean acidification[13], acid rain[31], ozone depletion[30], etc. And each of these problem linked to many other problems for example, global warming[27] causes coral bleach[29], biodiversity loss[5], draining of wetlands[6], desertification[7], poverty, disease and food insecurity[38]. And the chain continues further. Thus, Deforestation[28] is a key environmental issue here. In order to prove the aforesaid hypothesis this study attempts to provide evidences from real world examples such as in order to explain the link between

invasive species[42] and coral destruction[29], the impact of crown of thorns starfish on Great Barrier Reef, Australia can be exemplified.

4. Identifying key environmental problems or keystone links

When solving a manmade environmental problem exterminates many other manmade environmental problems, then the solved environmental issue is considered as a keystone link (in a hypothetical situation where human adaptability factors such as economy, social and political factors are absent). In addition, when an environmental problem caused by more than one manmade environmental problems, then their causative environmental problems cannot be considered as the keystone links.

E.g. 1. Air pollution causes global warming, ocean acidification, acid rain, ozone depletion, respiratory diseases, etc. Mitigating air pollution would stop all the resulted environmental issues. Thus, air pollution is a keystone environmental issue.

E.g. 2. Deforestation is caused by intensive farming and urbanization. Mitigating or stopping intensive farming does not end the deforestation. Thus, intensive farming is **not** a keystone link.

Study identified 8 keystone manmade environmental issues from our funneled and selected environmental issues such as solving **air pollution** and **deforestation** could lead to the extermination of several resulted environmental issues. Air pollution is linked to climate change and global warming, ocean acidification, acid rain, ozone depletion, respiratory diseases, biodiversity loss, deforestation (low level ozone affects the trees) and visual pollution (smog). Similarly, deforestation is linked to biodiversity loss, deforestation, human and animal conflict, global warming and climate change, ocean acidification and coral destruction (loss of mangroves affect the corals). And removal of all kinds of air pollution put an end to global warming (almost), ocean acidification (almost), acid rain (totally), ozone depletion (totally), visual pollution (totally end the smog) and respiratory illness (almost). Similarly, removal of deforestation put an end to human and animal conflict, global warming and climate change (almost), ocean acidification (almost), desertification (to an extent) and biodiversity loss (to an extent). Thus, Air pollution and deforestation are keystone links.

In addition, **population explosion** is the precursor and a keystone link. We can find solution to more than half of the environmental problems when human population is reduced. Increasing population causes over exploitation of natural resources, deforestation, urbanization and urban sprawl, solid waste and

sewage, establishment of dams, intensive farming, global energy crisis and burning of fossil fuels, plastic waste, e-waste and animal slaughter and cruelty. When human population get reduced natural resources sustained, and problems related to deforestation, urban sprawl, solid waste, dams, intensive farming, energy crisis and fossil fuel burning, plastic and e-waste generation, animal slaughtering and cruelty all come to an end, along with, indirectly linked problems such as biodiversity loss due to intensive farming and deforestation also reduced to a great extent. Similarly, **over exploitation of natural resources** is a keystone link, because it causes biodiversity loss (to a great extent), deforestation, land degradation, coral destruction, wetlands or draining of wetlands, animal slaughter and cruelty, groundwater contamination, water pollution and scarcity, pollution through mining activities. And problem varies based on the type of resource being exploited. When the resource depletion come to an end problems such as biodiversity loss (almost) come to an end. Similarly, deforestation, land degradation, coral destruction, wetlands or draining of wetlands, animal slaughtering and cruelty, groundwater contamination, water pollution and scarcity, pollution through mining activities all get disappeared. Furthermore, **global energy crisis and burning of fossil fuel** causes over exploitation of coal and other resources, pollution through mining activities including fracking, intensive farming of oil palm also cause deforestation, air pollution, establishment of dams for hydro power generation, etc. And solving the global energy crisis put an end to several of above mentioned problems such as pollution through mining activities, air pollution, and to certain extent deforestation and intensive oil palm cultivation. It also solves indirect links such as groundwater contamination by pollution through mining activities such as fracking and biodiversity loss due to deforestation, etc.

In addition, **intensive farming** causes over exploitation of natural resources, desertification, deforestation, biodiversity loss, animal slaughtering and cruelty, agrochemicals, solid waste and sewage, eutrophication, groundwater contamination, establishment of dams, water pollution and water scarcity, wetlands or draining of wetland and hazardous waste from toxic pesticide chemicals. If intensive farming comes to an end, problems such as resource depletion, desertification, deforestation, animal slaughtering and cruelty, agrochemicals, eutrophication, groundwater contamination, wetlands and biodiversity loss (to certain extent) come to an end. In addition, **urbanization and urban sprawl** causes solid waste and sewage, air pollution, water pollution and scarcity, visual pollution, deforestation, light pollution, noise and vibration pollution, global energy crisis, draining of

wetland and biodiversity loss. If it is possible to find a clear solution for urbanization and urban sprawl most of the environmental problems such as solid waste and sewage, air pollution, water pollution and scarcity, visual pollution (by manmade structures), light pollution, noise and vibration pollution, global energy crisis, draining of wetlands, deforestation (almost) and biodiversity loss (to certain extant) get solved. In addition, the indirect links such as climate change and global warming also get reduced. Furthermore, **plastic waste** is a keystone environmental issue and it is the only cause for marine plastic pollution. When plastic waste generation is mitigated the marine plastic pollution which causes severe damage to oceanic biodiversity also get mitigated. Plastic waste causes vector borne diseases (provide breeding grounds for dengue mosquitoes), biodiversity loss, visual pollution, water pollution and water scarcity, land degradation and food insecurity (micro plastic pallets in sea food). When plastic pollution come to an end problems such as marine plastic pollution and prevalence of mosquito borne diseases get reduced.

(Above given 8 highlighted manmade environmental issues are keystone links).

❖ **In reality, removing keystone links is not possible due to the presence human adaptability factors such as economic, social, health and political factors.**

E.g. removing deforestation is not possible due to economic needs. And some government policies can influence severe deforestation (politics).

5. Conclusion

Manmade environmental problems are interconnected as causes and effects. Study found 207 links between 40 identified environmental issue from real world events, in this web certain causative environmental problems establish keystone links. Solving a keystone issue would result in the extermination of many linked manmade environmental problems (in a hypothetical situation where human adaptability factors such as economic, political, social, health and behavioral factors are absent). And, when manmade environmental problems caused by more than one manmade environmental problem their causative environmental problems cannot be considered as keystone links, for instance, air pollution causes global warming, ocean acidification, acid rain, ozone depletion, respiratory diseases, etc. And mitigating air pollution could halt all the resulted environmental issues; thus, air pollution is a keystone environmental

issue. However, when deforestation is considered, it is caused by intensive farming, energy crisis (oil palm) and urbanization, here mitigating intensive farming alone is not going to halt the deforestation, thus, intensive farming is not a keystone link. Study founds eight manmade environmental problems as keystone links such as air pollution, deforestation, population explosion, overexploitation of natural resources, global energy crisis, intensive farming, urbanization and urban sprawl and plastic waste.

6. Acknowledgement

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REASONS FOR THE DIFFICULTIES TO ACQUIRE LANGUAGE SKILLS: WITH REFERENCE TO THE FIRST YEAR UNDERGRADUATES IN THE FACULTY OF ENGINEERING

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ABSTRACT

Proficiency in English is very important for students of Engineering and other professional courses because it's the medium of instruction in all higher academics and is widely used as the medium of communication in all firms within the country besides being the lingua franca of all global transactions. The research aims to investigate on the reasons for the difficulties to acquire language skills among the undergraduates who have just initiated their life as a university student. The main objective of this study was to identify the problematic areas in acquiring language skills of the first year undergraduates in the Faculty of Engineering in University of Ruhuna and to examine the reasons for the difficulties and finally to arrive with solutions. Data were collected through quantitative data collection method. 60 questionnaires were distributed to a randomly selected sample of 60 first year undergraduates from faculty of engineering, University of Ruhuna. The results revealed that the most serious problem reported by the students was that they lack speaking skills. The reason for this was they were shy, anxious and not confident. Other problems revealed in the study were writing skills, listening skills and the least problematic skill is reading skills. Besides that, they also have problems in vocabulary and grammar. One of the main reason for the above problems were due to the fact students felt that the subject matter boring at school and uninteresting. In addition the focus mainly on their Advanced level main disciplines. In order to overcome the problems English academics ought to focus more on practical activities and make the students aware of the importance of English language for the betterment of their future.

Keywords: Engineering, English language, Language skills, Undergraduates, Subject matter, Speaking skills

1. INTRODUCTION

Education is one of basic needs and a right of all human beings. Even though universities are considered as excellent centers for education, some students are unable to gain its full benefits due to various reasons. The deficiency in English skills has also been identified as a factor that has limited the capacity of students. English is also the predominant language for international commerce, trade, international relations, tourism, science, technological research and education. Proficiency in English is very important for students of Engineering, because it's the medium of instruction in all higher academics and it is widely used as the medium of communication in all firms.

Academic success therefore is predominantly dependent on English language proficiency of the students. Everybody has an idea about a language but only a few knows the language. The demands of the 21st century calls for the ability to think critically, listen, speak, collaborate and communicate effectively. These skills build a necessary foundation that influences and shapes the types of engineers.

Majority of students, particularly from rural areas consider the English as a mystery. The moment they hear something in English they start feel uneasiness. As a result of this educators face difficult to teach and students too find it difficult to listen and to understand the English language.

2. METHODOLOGY

The samples selected were 60 first year engineering students of University of Ruhuna. Students were randomly selected. The group comprised of both male and female students. The questionnaires were distributed and some oral discussions too were conducted. The data were synthesized and analyzed theoretically and graphically.

3. RESULTS

Table 01 show the findings based on the first language of the students.
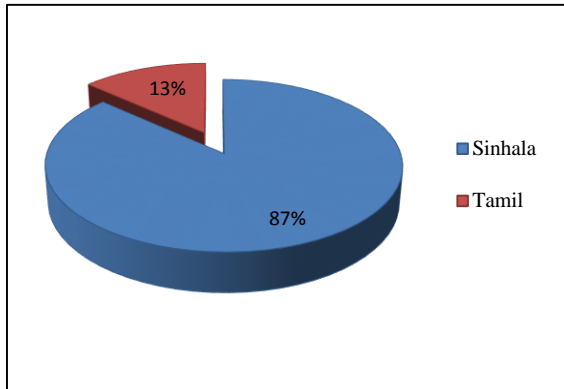
Table 01: Students' first language

The sample of study consisted of 60 first year engineering students of university of Ruhuna. The sample had a contribution of 34 male students and 26 female students. Table 1 depicts the first language (L1) of the students. 87% of the students' L1 is Sinhala whereas 13% Tamil. This clearly shows students are non-native English speakers. Therefore it is identified as one reason for the difficulties to achieve language skills. Since the students have to follow English medium in their degree. Therefore students want to have a remarkable English knowledge to deal with engineering studies
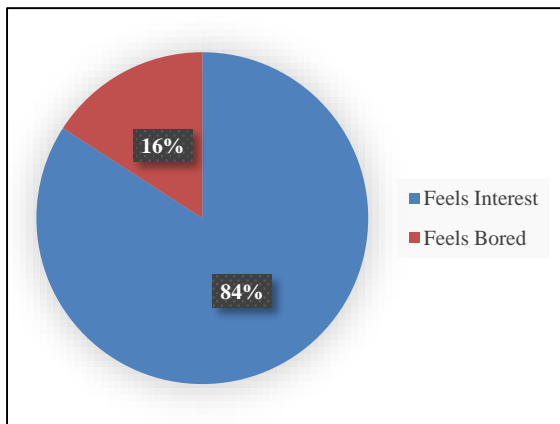
Table 02: Students' perceptions towards English

Figure 2 shows the students' own feeling regarding learning English language. This graph clearly shows most of the students were interested to learn English. That is, 84% of the students were keen in learning English, whereas least amount of students were feeling bored to learn English. That is 17% of the students. Therefore language teachers should focus more on such students and prepare the lesson plan with fun and interactive activities to get students' attention. However, it is also considered as a factor that discriminates those who are less proficient in English.
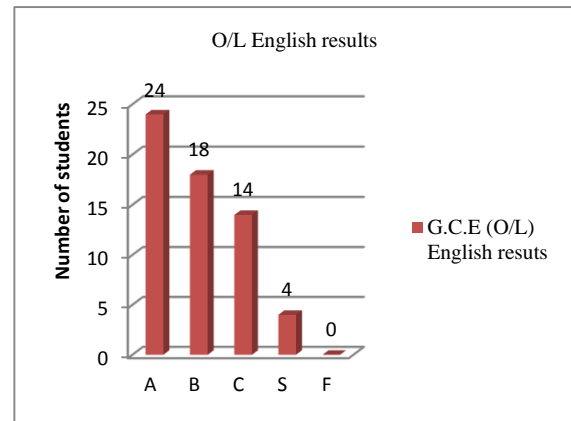
Table 03: G.C.E O/L English results

Table 03 depicts the students' performance on G.C.E O/L English examination. The results show that the students have performed significantly well in the G.C.E (O/L) English language. Most number of students has got Grade 'A'. That is 40% of the respondents. The second most number of students has got Grade 'B'. That is 30%. The third most number of students has got Grade 'C'. That is 23). The least number of students has got Grade 'S'. That is 7% and significantly none have failed the examination. It highlights the fact that the students have a moderate knowledge in English.
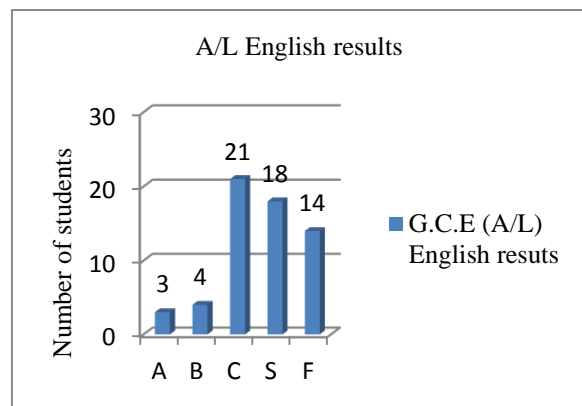
Table 04: G.C.E A/L English results

Table 4 depicts the performance of the samples in G.C.E A/L English language is comparatively low. According to table 04only 3 students (5%) got Grade 'A' and 4 students (7%) got Grade 'B'. Majority of the students have got Grade 'C'. That is 21 students (35%). The second largest number of students has got Grade 'S'. That is 18 students (30%). Nearly one fourth of the students have failed. They are 14 (23%).This clearly highlights the fact that students focus more on their main disciplines during A/L's.
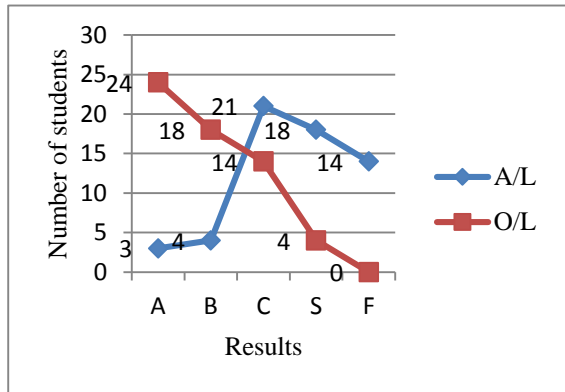
Table 05: Comparison of English language results in G.C.E O/L and G.C.E A/L

This line graph (figure 5) shows the comparison of G.C.E O/L and G.C.E A/L English language results of sample students. It was analyzed through question number 4 of the questionnaire. There are two graphs in the chart. The red graph shows the level of performance in English language reached at G.C.E O/L and the blue graph deals with the level of performance in English language reached at G.C.E A/L. This clearly shows the students' performance or pass rate in English language decreased in G.C.E A/L rather than G.C.E O/L. In O/L most of the sampled students got Grade 'A' but in A/L most got Grade 'C'. Grade 'A' and 'B' have suddenly decreased and fail rate increased in G.C.E A/L. It highlights, students did not pay their attention for English language in the A/L period.
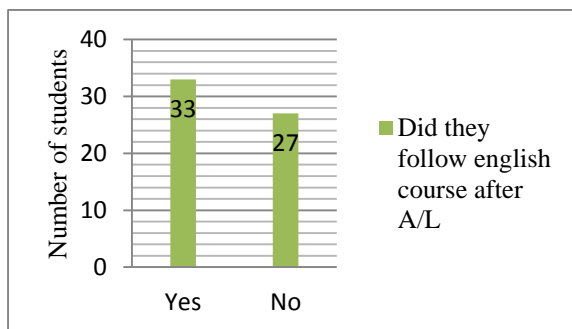
Table 06: Students' efforts to improve English skills

Table 6 shows, the students' efforts to improve English skills. Among the sample students 55% have followed English courses and 45% have not followed any English courses. It reveals nearly half of the samples have taken an effort to improve their English language after General Certificate of Education – Advanced Level examination (G.C.E A/L).
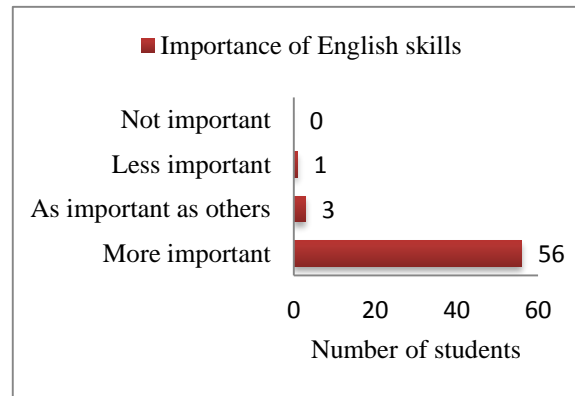
Table 07: Students' attitudes on the importance of English skills for engineering students

The students' attitudes towards, English skills are important for engineering students. Under this question the sampled students were requested to indicate their response in terms of more important, important as others, less important and not important. It can be seen from table7, that the most 56 (93%) of the respondents indicated as 'more important' while 3 (5%) indicated as 'as important as others', 1 (2%) indicated as 'less important' and no one indicated 'not important'.

The above attitudes suggest that the majority of the participants understand the significant influence of the English skills in their academic and career advancement and for opening up opportunities for youth. However, few participants do not understand the vital part of the English skills for their future.
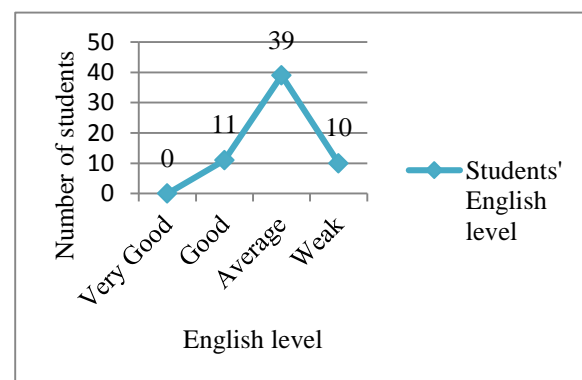
Table 08: Students' perception of their current level of English language

Figure 8 depicts the perception of the sample on their current level of English language were analyzed. Under this question the sample students were requested to indicate their own English level in terms of very good, good, average and weak. Although only a few participants stated that their level of English was 'Good' (18%), the majority (65%) stated that their English level was 'Average'. However, 17% stated that their own English level was 'Weak' and

no one was 'Very good'. This clearly shows that, the students are not satisfied with their current English level. It highlights the fact that all the students have difficulties in English skills.
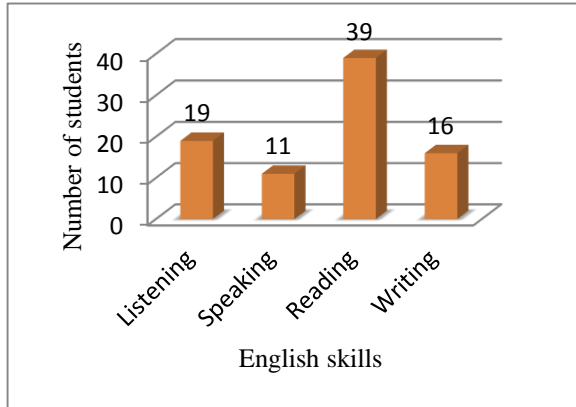
Table 09: Competency in English skills

Table 9 depicts the competency in English skills in the four areas: listening, speaking, reading and writing. Under this question the students were requested to indicate more than one English skill that they are competent in. Only a few students stated that they are competent in speaking kills. That is 11 students. Majority of students perceived that they are competent in reading skills. That is 39 students. The number of students competent in reading skill is relatively high among the sample. The number of students competent in listening skills is average. It is noted that only a few students are good in speaking and writing skills. It reveals that students come from an inappropriate linguistic environment. And these are the vital reasons for less proficient in English language.
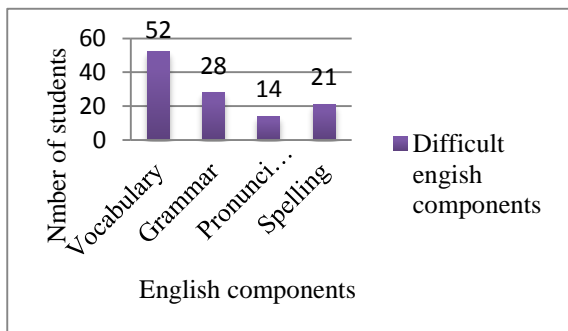
Table 10: Difficult English components for students

Table 10 depicts the English components that students face difficulties in relation to the four significant areas: vocabulary, grammar, pronunciation and spelling. It was analyzed through question number 9 of the questionnaire. Under this question the sample students were requested to

indicate more than one difficult English component. The majority of students faced difficulty in 'vocabulary'. That is 52 students. Although only a few students stated that they face difficulty in 'pronunciation'. That is 14 students. It noted that the number of students facing difficulty in 'vocabulary' is relatively high among the sample. Among the sample, number of students facing difficulties in 'grammar' and 'spelling' is average. A few amount of the students facing difficulty in 'pronunciation'. It highlights students have lack of knowledge in "vocabulary". It causes difficulties mainly in writing and speaking skills.

4. DISCUSSION

English is very much important in almost every field. Engineering is the biggest field of study in the world. First of all English is a tool that significantly affects engineering students in academic life. While most of the theories in engineering are taught in English, it requires having good English communication competence. In academic life, engineering students have to deal with the countless English lectures, guest lectures, tutorials, labs, project reports, assignments, references and papers. Finally, they have to submit important theses, still in English. Most engineering professors in various universities are also conducting lectures in English. Most of the scientific papers or journals in the world are written in English. Most of the engineering graphs are marked in English. The most convenience source of information e.g. Internet provides most of the information in English. For engineering students whose mother tongue is not English, mastering English is even more important, not only for their academic life but also for their prospective career.

Once engineering students graduate from the university and become real engineers, they will find that English appears even more crucial than it used to be. At present, every company requires communication in English, to achieve an efficient connection between co-workers, clients or superiors. Engineers usually work in groups since their task can seldom be solved by an individual. The property of their work determines that being an engineer needs to cooperate and communicate with different people from different part of the world. For non-native English speakers, unfortunately, most of the engineers speak English as the first language or the working language. In order to understand and coordinate with their colleagues and accomplish their projects fluently, engineers have to speak good English. English is by far used language in international engineering meetings. Therefore it is necessary to know English language in order to work with many developed countries.

If students are equipped with English they will never feel tongue tide in front of others. It's a widely spoken language. People take pride in speaking language. The once who don't know English, will lag behind the other. Today we can't deny the importance of English in our life, especially in field of Engineering. All in all, non-native English engineering students should try hard to improve their English ability, which could help to make both their academic life and career more successful and enjoyable.

4.1 Factors affecting the difficulties to acquire English skills

Each learner has his own issues but the most common according to the research are the following; hesitation in speaking, lack of vocabulary, difficult to understand the grammar structure and incorrect pronunciation.

The factors affecting first year undergraduates in learning English skills are; all are non-native English speakers, diversity of living areas, inappropriate linguistic environments, improper learning of English skills in school level, traditional teaching methods and misusage of English in social networking activities. Major reason is in the school English language education.

In the process of language teaching and acquisition, general classroom procedures are followed. Text books are prepared in such a way aiming at the success rate in the examination. Teachers also believe that the higher success rate is a good indication of better teaching but at the cost of no language acquisition which ultimately affects the students' appreciation of higher levels of academic learning. As observed in schools, English is almost treated as a boring subject by the students, because of text book teaching and traditional teaching methods. Text book teaching in schools develops the ability of reading and writing skills only. It does not support speaking and listening ability. This is the reason for hesitation in communicating for first year undergraduates when entering the university.

Most of the students use the translate method to understand the second language in this case English. Again, they think of the reply in their mother tongue first and then form a reply by translating. This results in lack of ability to clearly express their thoughts in both written and spoken forms. It causes high communication failure potential. Once students from such a background enter higher education, they are certainly disadvantaged and often are unable to adapt to the discourse-based environment in the universities and institutes of higher education.

Many teachers in rural area schools themselves have low levels of proficiency in English and they too operate at the literal level. Although they are required to teach in English, they often resort to code switching while teaching and hand out summaries and notes in English which the students' rote-learn to pass examinations. At the end of the school curriculum, students sit for examinations and are awarded scores. But these scores in reality do not appear to be reflecting the true proficiency of the students.

The students' learning problem is compounded by the lack of appropriately trained English language teachers at all levels. The linguistic competence is crucial for the students and teachers as well. Focus on improving English language proficiency of the teachers and teaching methods could help in improving the situation. The teaching-learning process should ensure that learning does take place and the learners do achieve their long-term goals which include learners' ability to communicate in the target language outside of classrooms and realize various professional/career opportunities.

Significantly in A/L period, teachers and students avoid the English subject. Students give importance for only main three subjects. The reason for this is, A/L English result is not a mandatory requirement for university entrance. It is also a factor affecting the downward of English language for students. Students aim to enter the university but they are unaware of the fact that they have to continue their higher studies in English. Some students psychologically disgust to learn English language and practice English skills and some students do not understand the importance of English skills in academic activities and profession.

With reference to mobile messaging and social networking activities students tend to use misspelled words that have no sense of grammar or pronunciation. This is one of the threatening issues to the downfall of the English language for the next generation and generation to come.

5. SUGGESTIONS AND RECOMMENDATIONS

Ways to improve the teaching and learning English language skills in school.

A child learns its mother tongue by listening, speaking, reading and writing, whereas English is learnt in the reverse order. This is the reason why most of the learners do not master the language. It is the duty of the teachers to enable the learners to

master the language. Due to tremendous progress in information and communication technology, on this scenario suggest other useful teaching methods that can be attempted in imparting knowledge to the students. The teacher of 21st century should shed traditional concepts and techniques of classroom teaching and should adopt the recent and innovation techniques not only to improve English language but also to empower people to achieve the goal by developing English communication skills.

It's also a well-known fact that different people respond to different learning methods. Learning English doesn't always have to mean sitting in the classroom and studying tricky grammar or reading a course book. It is not right for students. All English teachers ask students to do a step ahead from books. There are plenty of ways to learn English better. Most of them are fun and interactive, making the process easier too.

Language is the most powerful medium of oral and written communication. So, it must be learned and taught well. A language teacher has a great responsibility of teaching his students in such a way that they can make the best use of language. Therefore, a language teacher must equip himself with teaching of English as a foreign or a second language. This paper is humble effort to help the teachers of English to teach English language well to their students.

6. CONCLUSION

English has acquired the position of the world's leading language. Listening, speaking, reading and writing are the four language skills we need to develop for complete communication. English language seem to be regaining a strong position in universities due to the commonly shared view that a higher level of proficiency in English is essential for a higher level of performance in higher studies and to secure an attractive job. However, the findings reveals that the extent of support received by the students through school and university education for improving the level of proficiency in English does not appear to be adequate to fulfill their expectations.

Using Digital resources in schools, universities and at home, has resulted in positive impact and ease in teaching learning process being very effective and powerful tool in causing paradigm shift in pedagogy. The role of technology in making English language teaching and learning possible is the most crucial one.

Practice makes perfect, which means that if one wants to improve a certain skill one has to practice it. To achieve these four basic language skills, students need to surround themselves with English: make English part of life at home, at work, during free time. Students have to expose to the language as much as possible. A good command over English language is all time high demand skills in the present scenario of 21st century developing Sri Lanka. It is the only means to communicate and transact worldwide especially in engineering field. Improving your language skills will make you a more effective.

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DATA ANALYTICS IN FOG COMPUTING USING TENSORFLOW AND GOOGLE CLOUD PLATFORM

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ABSTRACT –

Fog computing introduced by Cisco for local processing of tasks on edge Internet of Things (IoT) devices known as fog devices. Nowadays IoT applications produce a large amount of data and require powerful analytical approaches. These data should transmit to cloud data centers to extract useful information. In fog computing, these kinds of data handle by fog layer. The fog layer consists of geo-allocated servers which are deployed on the network periphery. Each fog server can be known as a lightweight version of the cloud server. In particular, it is preferred to the expand fog server, which reduces data amount before sending them to cloud data centers by using TensorFlow, one of the most popular deep learning library and Google Cloud Platform (GCP). In this scenario fog server known as fog station. We implement analytical applications in fog stations with the help of Docker and Kubernetes (used to provide easy installation and monitoring) except implement them in main cloud server. Those applications belong to one or more fog devices. We have studied and compared the effects of using TensorFlow with cloud Datalab. Cloud Datalab is one of the powerful tool created to analyze data and build machine learning model on GCP. The experiment results demonstrate the feasibility, efficiency and the applicability of the proposed fog station. Finally, we achieve (i) Centralized Management using Fog Station, (ii) Dynamic Deployment using Docker, (iii) Efficient Management & Resource Monitoring using Kubernetes, (iv) Real Time Data Analytics using TensorFlow and GCP.

Keywords - Fog Computing, Docker, Kubernetes, TensorFlow, GCP, Datalab

1. Introduction

Nowadays Internet-of-Things (IoT) applications produce a large amount of data and require a powerful analytical process. These data should transmit to data centers for analytical process. These kind of data may affect to the networks, overload server memory, Increase security vulnerabilities as well. Figure 1 presents the growing IoT market, 8.4 billion IoT devices will be in use all over the world in 2017, which is 31% more than that in 2016; and the count will increase to 20.4 billion by 2020. [8]
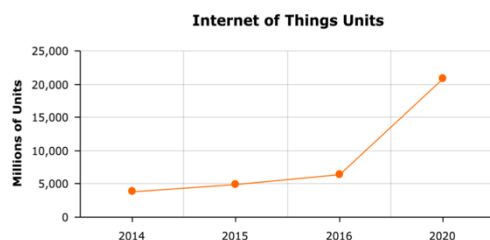
Figure 1 - Population of IoT devices

When the IoT devices are getting higher, the amount of data is also getting larger. To extract knowledge from data, require powerful analytical approaches, because IoT devices usually have limited resources. IoT applications transmit data to resource-rich data centers for analytics. However, it may congest networks because of large amount of data, overload data centers, and increase security vulnerabilities. [17] This research about to expanding fog server of fog computing architecture [10] to reach specific targets. The idea behind of fog computing is for utilizing the processing and storage resources at the edge of the network by deploying IoT services on available edge devices as well as on fog servers that consist in fog layer.
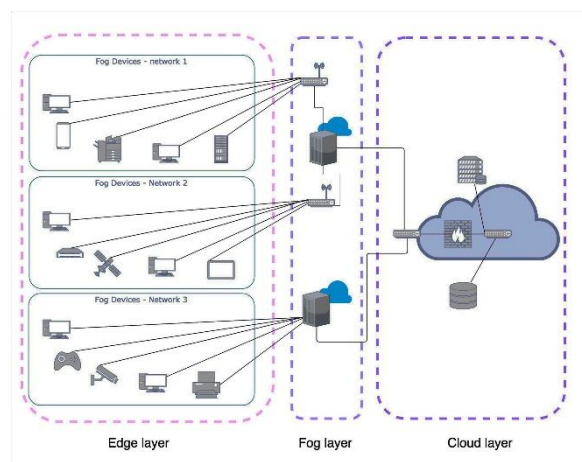
Figure 2 - Overview of Fog Computing

Fog servers in fog layer responsible for a large number of fog devices. All the data originate by the devices passing through the fog server. Hence the Fog server is the best place that allows us to interact with the data before storing them in cloud data centers. These fog servers are more similar to the cloud servers. Each fog server can be known as fog station. Most server operations apply to the fog stations like cloud servers as well. If could preprocess the data in fog station before sending them to the data centers, it helps to reduce the amount of data. That's why this research work adopts machine learning approaches.

The main objective of this research is centralized management using fog station. Fog station responsible for handle connected fog devices and link between cloud layer and fog layer. Then this architecture support to dynamic deployment. Hence there is huge number of applications running on devices and fog stations as well. We use container technologies to manage data efficiently. Next objective is Efficient Management & Resource Monitoring. Fog stations are monitored for performance. As above mentioned, another objective is real-time data analytics. Those objectives are achieving through several latest technologies.

- TensorFlow

TensorFlow is one of the most popular deep learning library. TensorFlow [15] use to splitting application in to small operators. TensorFlow deploys operators on fog devices and expectation is analyzed data generated by multiple distributed fog devices. In this case, use multi-dimensional data arrays called tensors. With the support of TensorFlow could create relevant machine Learning applications.

- Google Cloud Platform

Google Cloud Platform [9] use for real-time data analysis, resource monitoring, deploy ML applications and train them, generate the result by TensorFlow based programs using Cloud Data Lab and monitor ML models using Tensor Boards.

- Docker

Docker uses for dynamic deployment. In this case hard to install all the libraries on every fog device. Therefore, use Docker containers to package the operators and required libraries into Docker images. [2] Then Docker images pull from the stored registry (Docker Hub, Google Container Registry or local registry) and run for implementations.

- Kubernetes

Kubernetes [12] is a container orchestration system and could use for monitoring purposes. Cloud applications and Docker containers running on multiple servers at different locations, we use Kubernetes to monitor them and manage them. We

could monitor the performance of every application that running on servers using Kubernetes. Kubernetes monitor the status of the application and need to modify the application, need to replace the container. It helps to avoids interrupting other application.

2. Method and Materials

This research work mainly focusses, reduce data amount that generated from devices before storing in the main server, Centralized management and monitoring and dynamic deployment. As a model, implement end devices using Raspberry-pi and add some sensors to the device. Sensors could be any type. Specifically Fog use for Location awareness, real-time, mobility support. We use those features for build the model for fog station.

The first thing we are going to do is replacing fog nodes with fog servers. Because fog layer consists of fog nodes. Fog nodes could be any type such as switches, routers, servers, etc. But in this perspective server is required as a fog node. That's the reason for replacing fog node with fog server called fog station.

Figure 3 - Fog Node and Fog Station

Those fog stations are a mini version of the cloud server. When consider about the data flow of the fog station is originate data from fog devices and send all the data to the fog layer. Then filter data and direct them to organize for sending to the cloud storage. It means sensors could to be any type and there Is a large number of similar devices connected to the fog layer. If didn't filter them according to the type of sensor and type of device those could be mixed when sending to the cloud storage.

In the new architecture, we used Tensor Flow application for filter the data and clustered them in efficient way to avoid confusion of data. [7] This scenario uses to categorize data and direct them to pre-implemented programs in fog stations for analyzing them. It identifies data that not need to analyze for generate result. This kind of data directly forward to the cloud data centers to do required functions. There are some reasons to direct data to cloud data centers without pre analyze. When additional data may require from another source,

when past data required for predictions and when suitable applications are not implemented in the Fog station directly forwarded to the cloud server without analyze.
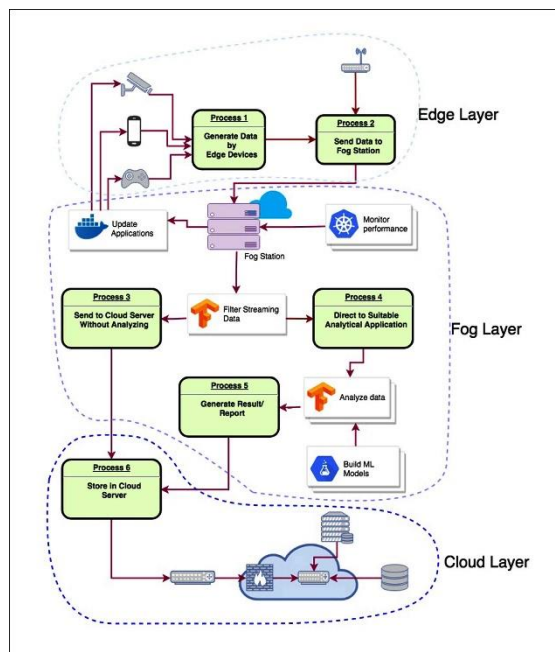
Figure 4 - Overview of the Architecture

Figure 4 illustrates the expanded fog layer from this figure. When filter data by using TensorFlow applications it decides whether data direct to the cloud server or direct them to suitable analytical application. There are pre implemented TensorFlow based applications for real time analytics. Those are trained by relevant data sets by using machine learning. For train, the model, use GCP Service called Cloud Datalab. [3] Cloud Datalab is one of the powerful tool created to analyze data and build machine learning model on GCP. According to the perspective create machine learning models and train the applications to extract the expected result. Most of the time use a supervised learning approach to do training. But when resources are rich, use unsupervised learning approaches as well for generating results from machine learning applications.

Other than that in every time' performance of the fog station is monitored by Kubernetes. Kubernetes is the container orchestration tool and monitoring tool as well. For monitoring can use Prometheus and Helm charts as well. And one of the major approach of this research work is dynamic deployment. For that get help from Kubernetes to handle Docker containers. Docker containers are running on heterogeneous devices at different locations, we need a tool to manage and monitor them, such as Kubernetes. There could be issues in resource allocation and instant errors as well. Because in fog stations there are

limited resources than cloud servers. But by monitoring process can identify problems and resource allocation status before occurring issues and affect them to the process. If there are any issues while analyzing the process, data could be a loss. To overcome these issues can take actions if we identify them in an early stage.

The outcome of the fog station is result or report from TensorFlow application other than sending all the data to the cloud data center. This report or result send to the cloud data center for future use and rest of the data will be removed from fog station. This is the way to do reduce data amount that needs to store in servers.

When we consider about the Dynamic deployment process, mainly it targeted edge devices of the edge layer. Those devices could be any type and there are considerable numbers of devices connected to the fog layer. It is impossible to manage one by one if there are any issues or when update required. As a solution for this issues focus on container technologies. As a result, we implemented efficient dynamic deployment approach for fog computing.
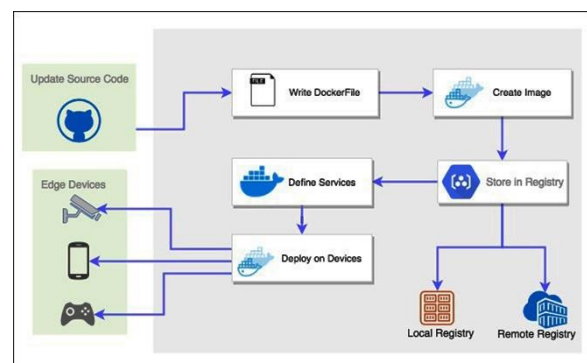
Figure 5 - Dynamic Deployment using Docker

Figure 5 shows, how the dynamic deployment process organize in the fog computing architecture related to this research work. According to the figure 5 it shows if there is an update related to the application, need to be update source code. Source code can store in Git repository or locally. Anyhow when update the source code, update the Docker file [6] also required. Then create the Docker image based on Docker file. Then the Docker image stored in the image repository. Those repositories could be any type. Those could be remote repositories such as Docker Hub [5] or GCR [4] or if not it could be local repository as well. When the update is required those images are pulling from the repository to Fog Station and define services. Then deploy them on required fog devices. At the same time, it is possible to update the same kind of multiple fog devices through these approaches. This scenario not only use for deploy applications on fog devices. But also apply to update analytical applications in fog station as well.

Real time data analysis process also acts as one of significant role in this architecture. The scenario of this approach is a little bit complex. But when consider about the outcome of this approach it is more useful and applicable than existing methodologies.

For this approach require some latest technologies such as TensorFlow, Google Cloud Platform, Cloud ML Engine [11] and Cloud Datalab. TensorFlow consists of TensorBoard. TensorBoard is a suite of visualization tool to make it easier to understand, debug and optimizing TensorFlow programs.
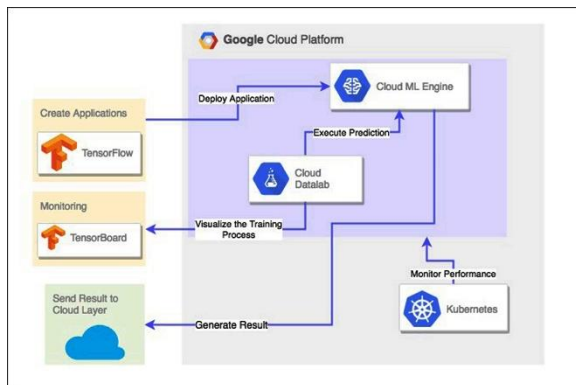
Figure 6 - Real Time Data Analytical Approach

Figure 6 shows how Google Cloud Platform (GCP) use for reaching the machine learning approach. This figure shows how GCP services use with TensorFlow for create ML models, training applications and visualize process using TensorBoard. [16]

You can see TensorFlow applications are deploying in Cloud Machine Learning (ML) Engine. Cloud ML Engine is a managed service that enables developers to use training and prediction services.

When deploy TensorFlow application in Cloud ML Engine, Cloud Datalab use to execute prediction. And also using Cloud Datalab can deploy TensorBoard and it use to Visualize the training data. Kubernetes monitor all the processes and finally the generated result send to the cloud data centers.

3.   Results

This research helps to evaluate the efficiency and applicability of the expanded fog computing architecture. In this section provide a detailed introduction about the platform and how the technologies organize in the platform to achieve objectives. These results followed by sample object detection TensorFlow based application and used raspberry-pi to implement the device. [13] As a test application created the real-time object detection program using TensorFlow and used Raspberry-pi camera to capture video. In general scenario, it

records the video and send it to the data center. However, in our research we capture the video and make a report of detected objects during the specific time period. Then send the result to the data center. The reason for use object detection program is, it demonstrates the power of Machine Learning. [1] Because the model trained with thousands of labeled samples for around hundreds of objects.

Figure 7 - Setup of the device and system

Figure 7 shows the setup of the TensorFlow object detection application. The video is captured through the camera and directly send it to the fog station. [14] In this case we implement the server on GCP.

Figure 8 - Device with Camera *Figure 9 - Detected objects*

Figure 8 and Figure 9 shows how to capture the video and how to detect objects using TensorFlow application. When captured video send to the fog station it identifies the application that needed to direct the video. Then streaming video start to analyze and identify objects that can be seen in the video.

Figure 9 shows how to capture the video and how to detect objects using TensorFlow application. To send the captured video to the fog station it identifies the application that needed to direct the video. Then streaming video start to analyze and identify objects that can see in the video. Figure 9 shows how the same application works on raspberry-pi device. It labeled data with identified probability percentage. But in Fog Station we just generate the report of the video. It shows the same result that had shown from raspberry-pi device. In the Fog Station we conduct the training session for the object detection application using Cloud Datalab and used TensorBoard to visualize the process of training and execution. Deploy the Cloud Datalab session and executed the relevant commands.

Figure 10 - Training models using Cloud Datalab
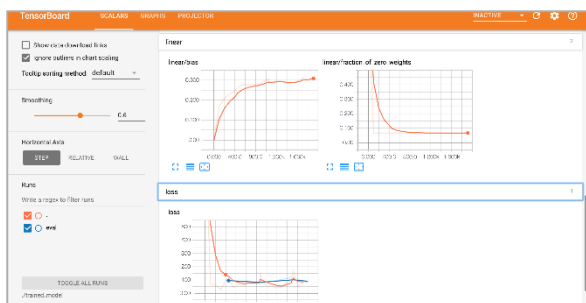
Figure 11 - TensorBoard Visualize the Process

Figure 10 shows the interface of the Cloud Datalab. The notebook allows to execute relevant commands and visualize the result. By using the notebook can launch TensorBoard. Figure 11 shows how to visualize the execution process in TensorBoard. We can see the progress of the training process visually through the TensorBoard.

After launching the analytical application, monitored by the CPU usage of the device. When it compares with the previous version of the raspberry-pi application (Deploy application on device) reduce CPU usage of the device has diminished in considerable amount.

Figure 12 shows how CPU usage varies against time when object detection application is running on device and Fog Station. You can see the enormous gap between this chart when considering the exact time.
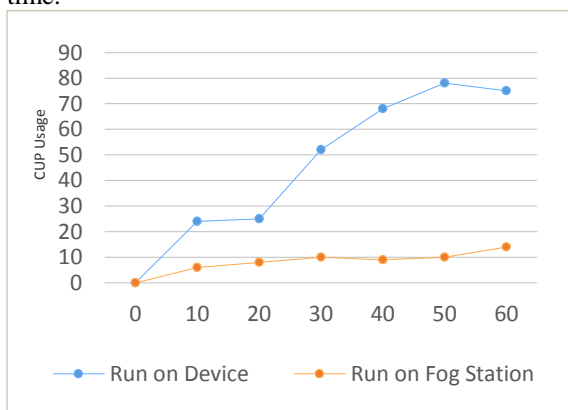
Figure 12 - CPU usage of Raspberry-pi Against Time

The application on device in 50s runs shows 78% device CPU usage. In the same time when application run on fog station device CPU usage is 10%. It clearly shows Fog Station reduce the workload of the fog devices. Then we can assume no need to add more resources to the edge devices. Most of IoT devices have limited resources. It helps to save money that spend for vertical scale. In this case, when run the application in Fog Station resources require only for capture data and send them across the internet. Other than that no need to allocate processing power for analyzing. When considering required storage capacity for the video is, without analyzing the video it required 225MB from the server. But when analyze it and generate report from the video using ML application it required only 55KB space. You can see the different and can easily get an idea about data amount reduction using machine learning. If not have to send the whole video to the data centers to store it for future use.

4. Discussion

The research will contribute for implementing a separate analytical platform called "Fog Station" for generating a result before sending data to cloud data centers. Additionally, by using the platform can manage IoT devices through a centralized server. There are four main objectives achieve through the research work. Those are (i) Centralized Management using Fog Station, (ii) Dynamic Deployment using Docker, (iii) Efficient Management & Resource Monitoring using Kubernetes, (iv) Real Time Data Analytics using TensorFlow and GCP.

With the help of latest technologies such as TensorFlow, Google Cloud Platform and container technologies such as Docker, Kubernetes implemented the platform. The main concept is applying machine learning approaches to IoT in applicable and effective way.

Analytics application is launched using machine learning and container management technologies among the devices without sending all the data to the data centers. Machine learning applications create and train them with the help of cloud native technologies such as Cloud Datalab and Cloud Machine Learning Engine.

This contribution will be significant because it focuses on Fog Devices and pre-processing the data before transmitting them over the Internet and monitor performance of Fog Station. This helps to identify issues in the prior stage and monitor the performance of fog station to ensure efficient resource allocation.

5. Conclusions and Future Recommendations

In this paper we propose a platform to enhance the fog computing architecture with the help of several latest technologies. This platform not only considers the data analysis part, but also resource monitoring and efficiently manage connected devices and applications. In this paper we mainly focus on implement machine learning and analyzing environment with high usability and applicability. As we expect the results have shown the importance of the implementation and it could customize according to the perspective.

This approach manages large number of IoT devices with centralize approach. In processing power, resource usage and storage capacity more effectively use in this platform and one of the major problem is answered through container technologies. It is managing large number of IoT devices with centralize approach.

However, some critical issues have to be considered with future work. Those are resource allocation for the analysis process, resource sharing among multiple fog stations, improve machine learning techniques for handle big data approaches and expanding the edge layer with edge computing perspective that supports to the existing fog stations.

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A MODEL DEVELOPED FOR HOUSEHOLD SOLID WASTE GENERATION FOR A BETTER WASTE MANAGEMENT SYSTEM

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ABSTRACT-

Municipal solid waste is growing concern in Sri Lanka without any proper treatments over the years. Households are less willing to manage solid waste, and local authorities are not practicing better waste management methods than dumping in open dumps or landfills. Proper solid waste management should be implemented as a solution for this issue. This paper examines the factors which influence household solid waste generation and developed a multiple regression model based on household income to identify solid waste weight generated. Data was collected from 335 households in the Colombo district. Results indicate that waste generation in the Colombo district is significantly affected by household size and family income. The study found that households are only motivated to manage waste but they are lacking in knowledge, time, awareness, co-operation and attitude factors. Identifying waste weight generated in households for the Colombo district can be used to develop an effective waste collection plan for the area, indirectly contributing to a better waste management system.

Keywords: Households, Municipal Solid Waste, Solid Waste Management

Introduction

Municipal Solid Waste (MSW) is a byproduct of urbanization. MSW also known as household solid waste is up surging without any proper treatment and is negatively affecting Sri Lanka, socially, environmentally and economically. In order to have sustainable economic growth and to ensure a safe and healthy human environment, solid waste management is an integral part of the urban environment and planning urban infrastructure [1]. Among the entire districts in Sri Lanka 68% of household waste is generated in Colombo. According to the World Bank estimates, the per capita solid waste generated per day in Sri Lanka is 5.10Kg for an average household size of 3.8 persons [2].According to the waste management authority in the Western province, between 7000MT-7500MT of solid waste is generated in Sri Lanka per day [3]. Within that, 2000MT-2100MT of waste is generated in Colombo district per day. This proves that the Colombo district has the highest amount of solid waste generation, and leads this study to focus on household waste generated in the Colombo district. Waste management practices are an emerging trend after the tragedy at Meethotamulla, where a landslide occurred in a garbage dumpsite. The majority of household attitude to waste is that, when they dump waste the local authority

(LA) will collect it. The government had different projects to control MSW but most of them have not been enforced effectively. After the Meethotamulla

tragedy the court approved 350MT of daily garbage disposal at the Karadiyana site, and the Dompe landfill may accept another 100MT. But the rest of the garbage has nowhere to go [4]. This study aims to develop a model to identify waste generated in households based on the income level. This model laid the foundation to implement a better solid waste management system which is suitable for the Colombo district.

Method and Materials

Generation of solid waste is an inevitable consequence of economic growth. Estimation and prediction of MSW generation play and important role in MSW management. The relationship between waste generation and urbanization is highly correlated. The urban population in Sri Lanka predicted for years 2001, 2007 and 2030 by the World Fact Sheet 2001 and World Bank report 2003 was 12.27%, 17.35% and 32.43 respectively. Estimated MSW generated recorded for the aforesaid years was 0.56Kg, 0.59Kg and 0.73Kg per person per day [5]. This situation is still occurring in Sri Lanka without any effective treatment even though it is close to two decades since the above situation. The per capita per day solid waste generation average was 0.85kg in Colombo Municipal Council, 0.75kg in other Municipal Councils, 0.6 in Urban Councils (UC) and 0.4kg in Pradeshiya Sabha (PS) [6]

A study was conducted in Colombo district using 335 respondents representing Maharagama UC and

Kotikawatte-Mulleriyawa PS, which are the most affected areas from the issue of solid waste. Non-households like boarding residents were excluded from the sample. The sample was divided based on the rural and urban sector with three different socio-economic groups: low, middle and high income groups. In order to get reliable data for the given study, mix sampling was applied as the sampling procedure. A survey done by Central Environment Authority in 2005 indicated that the success of the waste management system in these two divisional secretariat divisions were 25%-50%. When compared with available data, Maharagama UC had a slight improvement and Kotikawatte-Mulleriyawa PS data was not recorded. Waste collection per day in Kotikawatte-Mulleriyawa PS is 38MT and Maharagama UC is 82MT per day [7]. Each division is sub divided into Grama Niladari (GN) divisions which can be taken as clusters. By giving an equal chance of being select for the sample, the researcher selected six GN divisions for the sample. Kottawa West, Wattegedara, Talawathugoda and Depanama selected to represent urban population and Kelanimulla and Mulleriyawa North selected to represent rural population in Colombo district. This study is primarily an empirical analysis, which is based on the primary data collected through the specifically designed questionnaire. Responded data were collected from the six GN divisions based on 75% of urban population and 25% of rural population. The weight of the waste based on the type of waste categorized as food waste, polythene/plastic and paper, factors of the waste generation (questionnaire used five points Likert scale to analyse based on six dimensions) and waste composition was analysed in this section based on ten categories. The preliminary survey for thirty households yielded an average waste generation rate of 0.165 Kg capita per day with the standard deviation of 0.0717 without considering the income level.

In this research, the independent variables are family size, family income, land Arce, age, gender, education level and occupation. Apart from that, waste generation factors are identified under several dimensions which are motivational, cultural, behavioural, collection, age and attitude. Waste weight (in kilogram) is the dependent variable that the study measured using three categories as food residues, polythene/plastics, paper and not separated waste measured for a week. Solid waste composition was categorized under ten categories and households were asked to rank these in ascending order. Waste management factors are identified under knowledge (KNO), motivational (MOT), time (TIM), awareness (AWA), co-operation (COO) and attitude (ATI) dimensions.

Results and discussion

Respondents have averagely good education where 95% of the study sample had at least their secondary education or above. More than 50% of the respondents were working as public or private sector employees while housewives, students and retired people were having non-paid occupations. A minority of the respondents were engaged in business or self-employed, where their income varies within time. Considering the respondents' age a majority of them were mature respondents. Most families were nuclear families with an average family size of four and very few numbers of large families were significantly affected for the skewness of the distribution. Urban residents have small lands when compared to rural residents.

Solid waste composition in households consists of 21% of food waste, 18% of polythene plastic and 15% of paper. Apart from that 12% of leaves and branches have significant position in households' solid waste category.
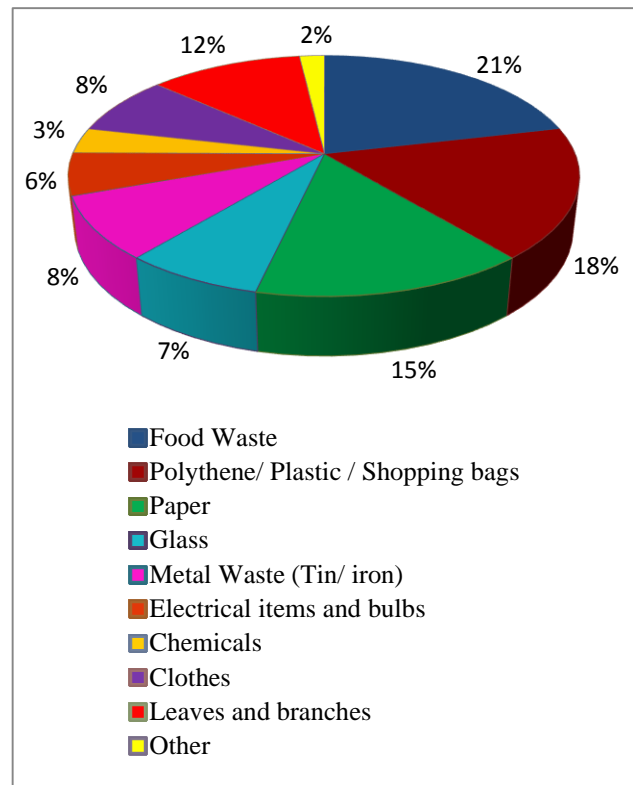
Figure 4: Households Waste Composition

Most of the waste in the sample area was organic. A large number of residents use shopping bags as waste containers and they even tend to use plastic containers with it. The composition of biodegradable waste is 48% which consists of food waste, paper, leaves and branches. 12% of leaves and branches are highly contributed from the rural sector.

According to the responses given by the households during the survey, two independent samples of urban and rural households had equal variance because p value of the Levene test and Bonett test (0.284, 0.622). Results of the two sample t-test by assuming equal variance as given in table 1.

Section	St Dev	Variance	95% CI for St Dev
Rural	1.789	3.202	(1.536,2.135)
Urban	1.168	2.853	(1.491,1.928)
Ratio of standard deviations = 1.059			
Ratio of variances = 1.122			

Table 1: Equal variance for two sample t-test

Mean solid waste generation by rural household was 4.34kg and by urban household was 4.3kg. With pooled standard deviation of 1.7146, test specify that there is no significant difference between solid waste generation of the rural and urban sector as given in table 2, where t value of 0.21 is not significant. Statistically there is no significant difference between urban and rural sector solid waste generation in the study area with 95% confident level. In the Colombo district every city and town has facilities and houses are situated close to one another. There is no significant difference between the urban and rural sector in Colombo district except from its definition.

Section	Mean	St. Dev	T value
Rural	4.34	1.79	0.21
Urban	4.3	1.69	

Table 2: Two Sample t-test for urban and rural waste generation

All the waste generation factors previously mentioned in the methodology were analysed using the weight of the waste generated in households per week. Spearman rho correlation matrix indicate correlation between dependent variable of weight of the waste (in kilogram) generated in household per week with independent variables of family size ($r = 0.466$), family income ($r = 0.537$) and motivation index ($r = 0.108$) were significant at 5% level of significant. Based on the results of the multiple linear regression model family income and family size is the influential factors for weight of the waste generated in households among given independent variables with 62.20% of the model variability had been explained by two explanatory variables. Three multiple linear regression models were developed based on the family income level.

Waste Weight for high income group = 2.636 + 0.6117 Family Size

Waste weight of the high income households is expected to increase by 0.6117 Kg for one unit increase in family size. Without the effect of family size high income households tends to generate 2.636Kg of waste per week.

Waste Weight for middle income group= 1.940 + 0.6117 Family Size

Waste weight of the middle income households is expected to increase by 0.6117 Kg for one unit increase in family size. Without the effect of family size middle income households tends to generate 1.94Kg of waste per week.

Waste Weight for low income group= 0.740 + 0.6117 Family Size

Waste weight of the low income households is expected to increase by 0.6117 Kg for one unit increase in family size. Without the effect of family size low income households tends to generate 0.74Kg of waste per week.

In order to analyse the households behaviour on waste management researcher developed six composite indexes based on six dimensioned previously explained under methodology. Table 3 represents the results generated from one sample t-test.

Except for motivational index all the other indexed were rejected at 5% level. Therefore it can be concluded that households are motivated to manage their waste generate in households but due to a lack of other influencing factors, waste management in households are ineffective. They do not have proper knowledge of how to manage their waste, they do not have enough time to manage their waste, they are not aware about waste management plans, programs organized by the council, members in the households lack of contribution towards waste management and lack of positive attitudes regarding waste management.

Variable	Mean	St.Dev	t - value
KNO - Index	20.110	22.750	-32.10
MOT - Index	94.000	10.896	57.12**
TIM - Index	29.310	32.810	-17.12
AWA - Index	19.300	22.710	-32.80
COO - Index	11.879	15.190	-57.98
ATT - Index	29.480	30.430	-18.36
** Significant at 5% level			

Table 3: One Sample t-test for waste management indices

Conclusion and Future Recommendations

Family income and family size significantly influence on waste generation in households. Hence, this model can be used to identify waste generation in households per week in the Colombo district based on the households' income level. Although, identified waste weight generated in households for a given area can be used to develop effective waste collection plan for the area. Most of the households were not aware of government initiatives on solid waste minimization. These factors have to be considered when developing waste management models for Sri Lanka. As identified in the study, the current waste collection system is not successful and several issues are correlated with it. In this case illegal dumping is very high in most of the rural areas and cross lanes which are not reachable. On the other hand, bad odour, environmental pollution, spreading flies and mosquitos are improved because of improper behaviour of residents as well as poor administration by authorities. LA and households does not have a proper way of collecting and disposing waste. The developed model can be used to identify the waste generation rate per week in households by considering the way of improving waste generation factors in households. Further research can be implemented to identify challenges and opportunities in waste management based on political, legal, institutional, social, environmental, technical, financial and economic aspects. It will help to identify loopholes in the current system and give facts to improve suitable and practicable waste management system for Sri Lanka. New laws can be implemented and new strategies have to be identified to improve these factors within households. A proper waste collection plan based on the waste generation in area will be cost effective for the MC and PS and also applicable to solve most of the other issues in the areas regarding solid waste. Households should be educated and informed to collect waste separately and legal action should be taken against them for negligence. Increase awareness regarding 3R concepts and implement concepts like "Garage Sales" in order to collect used items in households and sell it to a lower price. Since waste management is a value creating process, identifying households' waste generation is essential for a better system.

Acknowledgements

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EXPLORING THE FACTORS AFFECTING THE INCREASE OF ILLEGAL MIGRATION FROM SRI LANKA (A CASE STUDY ON ILLEGAL IMMIGRATION TO AUSTRALIA)

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ABSTRACT

The illegal migration is a contemporary issue at the interstate relations of the global context. Therefore, countries make all efforts to mitigate negative impacts of illegal migration around the world, and Sri Lanka has been an exception. Global community presently has recognized adverse impacts of illegal migration and they have played a key role by making rules and regulations for discouraging illegal migrants. Despite of the fact that a considerable studies were undertaken in this regard a very few studies have been done in the Sri Lankan context by exploring number of factors which have influenced the people moving to Australia illegally. The key objective of this research is to find out potential factors affecting them and provide solution for neglected but crucially important national issue. Three main districts were selected namely Jaffna, Negombo and Hambanthota for the research. And also qualitative methodology was applied. Secondary data was collected from written sources and primary data was collected from 10 case studies. Random sampling method was utilized to select illegal immigrants and in-depth interviews were conducted. Data was analyzed by applying discourse analysis and phenomenological data analysis tools. Findings of the research showed that variety of factors including war and post war conflict, political instability, lack of better political environment, less economic development, social and cultural disharmony, myth of society are leading factors which have contributed to increase of illegal migration.

Keywords: Conflict, Illegal Immigrants, Migration, Political Instability

1. INTRODUCTION

Migration is a complex phenomenon that deals with multiplicity of politics, economics, and security aspects that closely affecting human daily lives at the interstate relations. Initially migration discussed by universe than ever before as a result of globalization "migration is a key element of globalization and can be seen both as cause and effects of global integration" (Movroudi& Nagel, 2016, p.14). However migration is a process that takes place from one place to another for the various purposes by various means across the political boundary (World migration report, 2000, p.1). Global migration is therefore not a new phenomenon as well as modern concept in the field of geo-politics. But this definition is no longer existed and today the meaning of migration has tremendously changed some scholars distinguish migration from other form of movement, such as communicating and residential relocation that are largely confined to metropolitan area (Movroudi& Nagel, 2016, p.4). Generally migration is applicable to fundamental characteristic of human being those always energetic and seeking new experiences by roaming the world. A late reputed civilization declared that the movement of people in different parts of the world. In history, people have moved to various parts of the world as result of slavery and colonialism.

Migration is considered as vitally important process because this process has immensely attributed to emerging diverse nations around the world. In fact migration takes place as usual as people's choices yet there are several influential factors which inspired the movement of people from ancient to modern. Reasons for migration including invasion, civil conflict, political crisis, economic crisis, natural made disasters and mercantile out rich, colonial settlement and even slavery have been critical during past (World migration report, 2000, p.23).

In recent migration rate has become double world over due to various reasons. "There were around 244 million international migrants in the world in 2015, which equates to 3.3 percent of global population" (World migration report, 2018, p.2). It is expected that migration rate will grow up than existence by 2050 could be 405 million of the stock of international migrants' worldwide (Betts, 2011, p.1). With the increment of global trade, business and commercial activities, people attempt its fullest efforts make their ambitious possible. The key importance of migration is to facilitate improving people's lives in both origin and destined countries and has offered opportunities for millions of people worldwide to forge and meaningful lives aboard" (World migration report, 2018, p. 1).

Worldwide migration has not accepted as a concept after adoption of United Nation that made a

declaration of universal human rights in 1948. According to the article 13ᵗʰ of the declaration stated that "everyone has the right to freedom of movement and residence within the boarder of each state and everyone has the right to leave any country, including his own and return to his country". After making this right, people are enthusiastic for safe movement. Currently migration is included types of migration pertaining permanent- temporary migration, labor migration, irregular migration, refugee and students' migration (Betts, 2011, p.5). Migration is primarily divided into two forms such as internal and external. Further external migration lies on two parts including emigration and immigration. Immigration can be taken place either legally or illegally to destine country. Illegal immigrant is a non–citizen who enters, or seeks to enter, or has to entered the state unlawfully (Illegal immigration trafficking act, 2000).

During past twenty years, illegal immigration created many obstacles for nation states by endangered its security, peace and economic prosperity. Illegal migration is increasingly seen as a high-priority policy issues by many government, politicians and the boarder public throughout the world (World migration report, 2018, p.2). Illegal immigration issue makes some countries risky by entering unauthorized channels. The top ten immigrants – receiving countries today are including America, Russia, Australia, Canada, etc. (Movroudi& Nagel, 2016, P.9).

Sri Lanka is today considered as one of most peaceful and secured country in South Asia. This harmony was taken after elimination of most powerful and brutal terrorist group namely LTTE ruined away by military from the territory. This conflict is known as serious protracted conflict in the world lasting 26 years (Orjuala et al, 2011, p.201). After ending this conflict, most people continuously attempted to migrate to Australia illegally. Hence it needs to be understood that illegal immigration is a critical issues for Sri Lanka and Australia. Stories from boats depict complex political and economic factors that have motivated for their journey (Howie, 2013, p.97). There are several factors to migrate Australia illegally. Therefore it is timely important to consider exploring factors affecting increase illegal immigration to Australia.

2. LITERATURE REVIEW

This section is allocated some of literature that has been developed about migration. Mainly, literature review discusses three ways in this research, such as,

2.1 Conceptual Framework
2.2 Theoretical Framework
2.3 Review of Previous Studies

2.1 Conceptual Framework

This section demonstrates some of the main concepts associated with the study, such as migration and illegal immigration.
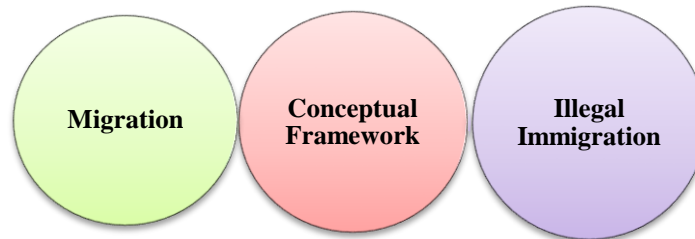
Figure 1: Conceptual Framework   Source: Formulated by the author, 2019

- **Migration**

Migration is more complex and confounding than one might expect, social scientist often define migration simply as movement from one geographical location to another (Movroudi& Nagel, 2016, P. 14). Therefore it's not an easy to explain such a complicated term in simple words. While "Human migration is not a new phenomenon to the world" (World Migration Report, 2000, p.1). Migration derived from Latin word "migration" which means movement of people across the boundaries. However migration is intended that people's physical

movement from place to place across the political boundaries (World migration report, 2000, p.12). Roughly one in seven of the world's populations are migrants (World Migration Report, 2011, p.73). Migration is the principle term within which there are several subfields are discussed. In recent years some scholars effort to create an alternative to nation state centric definition of migration, have begun to specify in general terms about mobility rather than immigration and emigration (Movroudi & Nagel, 2016, P.7). Migration has become an inevitable discourse and salient phenomenon. "Migration is intertwined with geopolitics, trade and cultural

exchange and provides opportunities for states, business and communities to benefit enormously" (World migration report, 2018, p.1). Migration is considered as a core term which can be moreover divided into several categories such as immigration and emigration and also, both these processes can be occurred both legal and illegal means.

- **Illegal Immigration**

Illegal immigration is rather discussed subject by interstates relation in global world. Most recently some developed countries changed its immigration policy as sudden undocumented entrance from different parts of the world. "Illegal immigrant is any person, who does not, or no longer, fulfill the conditions for entry to, presence in, or residence on the territories of the member states of the European union" (European commission report, 2004). Today international immigration has grown up unexpectedly as results of worldwide issues. The number of people cross the international boarders as various reasons and most of them enter on temporary basis (Movroudi& Nagel, 2016, p.8). Thus illegal immigration can be badly caused to nation states existence. Some countries already have taken steps and some of are being prepared new immigration policies for new comers as illegal immigrants. These illegal immigrants not only enter country illegally but also endanger entire nation in risky. "All of the 9/11 hijackers entered the America using invalid documents and made huge destruction its prosperity (Terri et al., 2009, p.1). According to the Australian immigration and emigration department, most of illegal immigrants use boats for reaching to Australia.

2.2 Theoritical Framework

This section focuses on describing theories related to the migration. The theoretical framework is based on five fundamental theories such as,
- Dual Labor Theory
- The Theory Of Push And Pull Factors
- Worlds Systems Theory
- Migration Systems Approach
- Choice Theory

2.3 Review of Previous Studies

Mavroundi and Nagel (2016) refer that in their book called "global migration patterns, processes and politics". This study has focused on migration that is clear, concise and well organizes discussion on patterns and contemporary trends of migration. Furthermore, this book is included history of migration, that describes a number of facts for increasing rate of migration and factors which have been associating with migration.

World migration reports, (2018) published by international organization for migration applied to discuss several migration related fields. Considerable reports used to build up theoretical frame work. Reports from 2000 to 2018 referred to analyzing statistic and concepts.

Petras &Veltmeyer(2001) book called "Globalization unmasked" used to study globalization and migration relationship. This book deeply illustrated that contemporary globalization process how advocated to development of migration on world stage.

Terri et al. (Ed) (2009), book called "Immigration policy and security", demonstrated that how immigration can cause to leading security threats entire world. Further this study has recognized trends of illegal immigration in the world.

03. MATERIAL AND METHODS

This study is mainly based on mix methodology which including qualitative and quantitative methods. Research was carried out three main districts where illegal immigrants were tremendously recorded. Three main districts were selected namely Jaffna, Negombo and Hambanthota for the research. And also qualitative methodology was applied. Secondary data was collected from written sources and primary data was collected from 10 case studies. Random sampling method was utilized to select illegal immigrants and in-depth interviews were conducted. Data was analyzed by applying discourse analysis and phenomenological data analysis tools.

04. DATA PRESENTATION AND ANALYSIS

4.1 Introduction

Illegal migration is top of the list of the current issue entire world, while Sri Lanka is also now critical such arrivals for abroad. Post war period, Sri Lanka has emerged as illegal immigrants sending country. Therefore this study is expected to exploring factors affected of increase illegal immigration from Sri Lanka to Australia. Finally this study aims to find out sustainable solution to mitigate negative impacts of illegal immigration to Australia. According to Sri Lankan Navy report in 2015, within the past five years they have arrested a number of boats which had tried to enter into Australia illegally. Navy has directly involved in this issue and has arrested approximately 93 boats, including 4487 illegal migrants successfully.

4.2 Different factors led to illegal migration to Australia

This section is mainly focused on the finding different factors that have caused to escalation illegal immigration to Australia. After end of civil conflict,

in 2009, people started sailing to Australia illegal means, finally this became an international issue that why this study conducted. Throughout this section, research is sought to list out potential factors.

4.2.1 Political factors

Political factor is considered as influential factors for any decision of people. History witnessed of human migration took place even due to political factors. Despite of many reasons for migration, illegal migration was reported its first time during the world war periods. "Millions of people had been forced to abandon their homes as a result of political terror, armed conflict and social violence, a number of states recorded densely human displacement" (United Nation high commissioner for refugees global trends report, 2011, p.19). Political factors has caused to most probably to migrate people. Illegal immigration has become a growing issue entire world and rather national security of nation states. "Immigration may also threaten security when the pace or specific circumstances of immigration destabilize or weaken the host states" (Petras & Veltmeyer, 2001, p.14). Sri Lankan civil conflict has become a major political factor to escalate illegal migration in Sri Lanka. "I lived in a war-operated area in northern province, attempted to migrate Australia illegally as a refugee" (R-1). As result of war, people were displaced, those who also have migrated illegally to Australia. " in recent years we have also seen a significant increase in displacement, both internal and cross borders, which has largely stemmed from civil and transnational conflict, including acts of violent extremism outside actual war zones, Current data indicate that in 2016, there were 40.3 million internally displaced persons worldwide and 22.5 million refugees" (World migration report, 2018, p. 02). While Sri Lanka also have had same experience as a result of war, it was estimated that 300,000 had displaced during final stage of the war, occurred between 2008 and 2009 (Amnesty international report, 2009). "I lived half of my life in this war zoon area that displacement caused me to leaving and seeking for another place for my safety" (R-2). Another factor for illegal migration demarcated that lack of proper political administration in this particular area. "I did not have a chance to go Australia legal means; therefore I had chosen this illegal boat to reach to Australia (R-1). Human right is critical in Northern Province in this time. It was reported that illegal migrants were faced human rights violation. "There were countless human rights violation during that time, at the same time; we were suffering lack of sustainable solutions to civil war"(R-1). People who resided during war were critical of life "I had to respond on one side to military forces on the other hand terrorist group" (R-3). Over a third of the world's migrants population comes in descending order from Mexico, India , Bangladesh

and Pakistan" (Movroudi& Nagel, 2016, P. 08). During the war, considerable people left this country as asylum seekers thus Sri Lankan 1.6 million became either refugee or displaced (Dickwella, 2013, p.01). According to research one respondent stated that "I needed asylum in Australia, because I can no longer stay here due to persecution" (R-2).

Apart from those above factors, there also have been reported practical political factors including "Changing power of government, less performance of government, inequality of opportunities, dissatisfaction on government role, unnecessary political interference, political revenge are considered as leading fresh political factors that founded during the research. Political interference was one of major characteristic in politics during the conflict. "I was very badly affected political interference as not a being of supporter in existed government by the time. Further I was discriminated and finally interdicted from my job" (R-6). Government derails from welfare services has become a leading political factor which motivated people fleeing from Sri Lanka "we cannot bear up hiking prices and be happy with this poor condition in my life, therefore I had to agree with human smuggler to illegal immigration" (R-5). To sum up, it is very clear that political factors are critical making illegal immigration to Australia.

4.2.2 Economic factors

Economic factor is rather important each and every countries for its wellbeing and strong existence in world stage. Sri Lanka today emerged as migration sending country in the world. Sri Lanka experienced long year's protracted conflict between main ethnic groups, resulted backwards economy entire nation. Ending war in 2009, northern people attempted to migrating Australia as economic benefits. "It's very clear that most of the boat migrate may have purely economic reasons for leaving Sri Lanka to Australia" (Howie, 2013, p.97). As a result of war, this man lost his job and earning income "I did not have chance to go Australia by legal means therefore I had to choose this illegal channel to migrate Australia illegally" (R-1). At the same time, Australian economic prosperity acted as full economic factor, "my main aim was to save my family and being richer than I was" (R-1). Australia is famous as random job opportunities " my economic conditions was very poor and had no any proper mechanism to survive as others, later on I was inspired to move to Australia to get a better job, I believe that if I reach Australia my family might be able to gain economic benefits"(R-2). As this reason, economic background inspired people in Sri Lanka. Global level, economic factors are highly related with globalization, "Migration is a key element of globalization and can be seen both as a course and effect of global integration" (Movroudi & Nagel,

2016, P.14). According to one of respondents declared that "i was born to a very poor family as the youngest, but after demise of my father, a big duty was assigned to me, and also family protection was rested on my life, in order to helping family, I decided to go Australia illegally (R-5). Finally most of people were attracted Australian job opportunities and salaries which they provide to labors. " my main objective was to get a better of job than the one I did in Sri Lanka, that's why I tried to move to Australia by illegal means" (R-9). To sum up, economic factors are considered as valuable factors to motivate illegal immigration to Australia.

4.2.3 Social and cultural factors

Social and cultural factors are highly effective for migration both of legal and illegal. Sri Lanka is a nation that known as pearl of Indian Ocean today that has very unique geo-political importance; therefore Tamils, Muslims and Sinhalese have migrated to here and located different parts of the country. "Jaffna Tamils who are descendent from tribes of India and first arrivals on the land over 1500 years ago" (Pannilage, 2017, p.1). But rest of others came to be here during the British colony with the emerging economy in up country; later Tamil labors had to be imported by British for their cultivation from south India. Tami's arrivals later became complicated issue.

Social and cultural factors are most probably influential in human migration. This study founded that socio-cultural factors have escalated not only migration but also illegal immigration. Research made evidence that the social factor was chiefly responsible for illegal immigration. Sri Lanka is one of the major emigration nations in the world today. According to the report of united nation in 2013, pointed out "there were 1.25 million Sri Lanka-born persons living outside of their country of birth, equivalent to 5.9 percent of the current Sri Lankan resident population". Socio-cultural factors have

caused to migration to abroad. It was clear that Sri Lanka faced long year conflict that inspired people for leaving in Sri Lanka. Tamil and Sinhala division and tension appeared during British ruling period affectively. Conflicts between two groups were gradually increased over the economic and political rights after in 1948. Sinhala community alleged to Tamils who were fevered by British policy. "The conflict root causes were originated as a result of failure of the state to deal with minority aspiration. British divide and rule theory tactically used primary factors such as religion and ethnicity for discourage the national uprising "Ethnicity considerably politicized during British period" (Orguela et al. 2011, p. 211).

Lanka was able to get free under British imperialism in 1948. Independence led further disbelief among ethnic groups. Several legislations passed by parliament created a flow moreover separation. For instances; Sinhala became official language in 1956, replacing Tamil as second language. Hereafter, 1972 was another turning point that marked Buddhism the foremost place in state. "Civil disobedience campaigns gradually pushed the Tamil struggle towards militancy" (Orjuala et al, 2011, p.15). As result of communal violence north people claimed firstly their own land, believed military approach is only solution to resolute the issue.

By the 1970s the Tamil in north and east had begun accumulating for self-determination and starting anti-ethnic violence around the Sri Lanka before early 1980s several Tamil militant groups had irrupted, as a result of communal violence, political instability and social unrest accelerated people out bound migration. According to international labor organization report stated that 43,069 migrants' departure recorded but begun of war, migration rate had increased suddenly (International labor report, 2014).
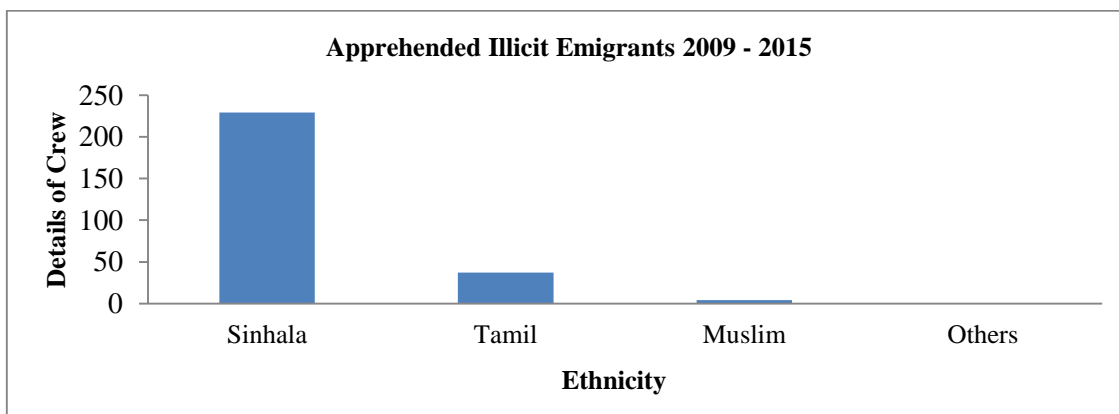
Figure 2 : Apprehended Illicit Emigrants 2009-2015   Sources: Sri Lanka Navy Report

According to Sri Lankan navy, above table illustrate very clearly ethnic motivation to illegal migration from Sri Lanka. These huge scale ethnic groups were arrested by navy during their illegal immigration to Australia.

4.2.4 Psychological factors

Sometimes, psychological factors might be reasonable to expanding human migration. People are in born inherited various beliefs, thoughts, feelings, choices and attitudes and these all can be caused to take place people from one place other. As well as number of psychological factors such as hate, fear, suspicion, threats can further increase migration ratio around the world. During last stage of war, people had fled to abroad as a result of fear, from terrorism. During that time, displaced people sought an option, as they fled to nearby countries for safety. "I lived half of my life war zone that caused me to leave here and seek batter place where life is secured" (R-1). Sometimes people can hold various beliefs and perceptions regarding host country. One respondent stated that "if I reach to Australia my family might be able to succeed economically"(R-2). Most probably attitudes can be a leading factor to illegal immigration "If I go to Australia, they will provide us everything" (R-8).

5. CONCLUSION

Sri Lanka has become a famous island as illegal immigrants sending country last few decades. Illegal immigration is today takes place around the world due to various factors. Initially political, economic, social, cultural and psychological factors are influential always in comparison with the records of migration around the world. Sometimes, legal immigration is lower than illegal immigration. Countries today take big efforts to discourage illegal immigration from neighbor or remote countries. Australia is considered as one of highly recognized country of illegal immigration. Sri Lanka is very frontier country which enables people for illegally entering to Australian boarders. This study main objective is to exploring the factors affected the increase of illegal immigration to Australia. Thus study attempted to provide a feasible solution to mitigate negative impacts of illegal immigration to Australia. Research problem of this study was undertaken why people migrate to Australia through the illegal means. Finding of the study included that illegal migration took place not having a single factor because it is nexus of all these consisting of political, economic, social, cultural and psychological factors". According to finding of study, it is very pure fact, most of illegal immigrants attempted to migrate not to Australia but also New Zealand. To sum up, five out of ten of sample, were arrested by Sri Lankan navy during its journey. Two of ten were arrested by

Australian coastal guard's service and deported back. Three out of ten were, spent few days in Australia and deported to Sri Lanka. According to findings of study distinguished after end of civil war in 2009 recorded 176 people had attempted to migrate illegally but nobody was recorded in 2010, whilst this was stared once again in 2012, it pinpointed that 3008 this was the highest record within this five years. 2013 it was 1019, but this became lower in 2014 it was 132, by 2015 it was 82 people were arrested" (Sri Lankan Navy Annual Report Data In 2015). In the final analysis; it's very clear that little by little this rate is being decreased. Lastly, nobody achieved its hopes to be Australian citizen therefore; illegal immigration to Australia is useless efforts taken by Sri Lankans. Recommendation is for this issue to strengthen immigration policies and work to work further both countries to control illegal immigration.

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STUDY ON CONCENTRATION OF CD, CR, PB AND ZN IN GREEN LEAFY VEGETABLES AND ESTIMATION OF BIOCONCENTRATION FACTORS (BCF) AT DIFFERENT LOCATIONS FROM MEDIRIGIRIYA AREA, POLONNARUWA

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Abstract

The present study was carried out to assess contamination of four heavy metals (Cd, Cr, Pb and Zn) in five different types of green leafy vegetables:*Basella alba*-'Nivithi', *Ipomoea aquatic*-'Kankun', *Sesbaniagrandiflora*-'Kathurumurumga', *Centellaasiatica*-'Gotukola', *Manihotesculenta*-'Manioc' and also the soil was collected from five agricultural areas of Medirigiriya in Polonnaruwa district. Atomic absorption spectrometer was used to determine the concentrations of these metals in a total of 45 test vegetables. Results showed a substantial accumulation of heavy metals in roots and leafy shoots of the vegetables. The range of various metals was 1.0-11.7, 2.6-14.9 and 16.8-157.4 mg kg^{-1} in roots and 3.2-19.1, 5.3-31.9 and 25.9-221.3 mg kg^{-1} in leafy shoots of the test vegetables for Cd, Pb and Zn respectively. However, the levels of Cr were found below the detection limits. Results revealed that the average concentrations of all metals (both leafy shoots and roots together) in the vegetables were found in order of their abundance as Zn>Pb>Cd. It was also found that Pb and Cd levels exceeded the maximum permissible limits set by FAO/WHO for human consumption. The bioconcentration factors (BCF) of heavy metals from soil to vegetables were estimated. Results showed that among the five leaf vegetables, Kathurumurumga had the lowest capacity for heavy metal enrichment, whereas Nivithi showed high values. Zn had the highest capacity for transferring from soil into vegetables. Sewage irrigation and fertilization were likely the main sources of heavy metals accumulated in leaf vegetables grown in agricultural areas of the Medirigiriya. We conclude that a monitoring plan and a health risk assessment are necessary to evaluate the levels of metal concentration in vegetables in order to develop the proper measures for reducing excessive build-up of these metals in the food chain.

Keywords: Leafy vegetables, Heavy metal, Accumulation, Bio Concentration Factors

INTRODUCTION

Vegetables are common diet taken by populations throughout the world, being sources of essential nutrients, antioxidants and metabolites (John Siame, 2016).They also act as buffering agents for acid substance obtained during the digestion process. However, both essential and toxic elements are present in vegetables over a wide range of concentrations as they are said to be good absorber of metals from the soil (Khwaounjoo, 2013). Reports have shown that, vegetables grown in heavy metal rich soils are also contaminated (Li, 2013). Vegetables absorb these metals from contaminated soils as well as from polluted environmental deposits through the roots and incorporate them into the edible part of plant tissues or deposit on the surface of vegetables (Oliveira, 2012). Some heavy metals (e.g., Mn, Ni, Zn, Cu, and Fe) are considered essential components for biological activities in the body. However, their presence in elevated levels is reported to cause problem to human. On the other hand, Pb, Cd, Hg & As are non-essential and play toxic role to living organism and hence are considered as toxic

elements. A number of factors influence the concentration of heavy metals on and within plants. These factors include climate, atmospheric deposition, the nature of soil on which the plant is grown, application of fertilizers and irrigation with wastewater (Surukite O. Oluwole*et al.*, 2013).

The major sources of heavy metals are industrial effluents and indiscriminate disposal of domestic or sewage drainage directed to the rivers untreated or partially treated. Most of the vegetable farms are situated either along the bank of polluted rivers, roadsides or highways which might be receiving deposits of metals from vehicle emissions. Besides, due to the population increasing as well as rapid development of transport infrastructure, agriculture and industry, heavy metals such as Cu, Zn, Cd, Pb, Cr, As and Hg are emitted into environment in large quantities through atmospheric deposition, solid waste emissions and wastewater irrigation (Rathnayaka, 2004).

Degree of metal enrichment in crops can be described with enrichment factor. In soil research, BCF is

defined as the ratio of the content of a particular element in a plant to that in soil. BCF is an important quantitative indicator of crop contamination and has commonly been used for estimating metal transfer from soil into plants. BCF-based research shows that the extent of metal enrichment in vegetables is highest in leaf vegetables, followed by tubers and fruit vegetables. Regarding metal concentrations, cadmium (Cd) and lead (Pb) commonly occur at high levels in leaf vegetables while the Zn content of tubers is higher than other metal contents (Rathnayaka, 2004).

It is therefore anticipated that the most consumed green leafy vegetables such as *Basella alba-*'Nivithi', *Ipomoea aquatic-*'Kankun', *Sesbaniagrandiflora-*'Kathurumurumga', *Centellaasiatica-*'Gotukola', *Manihotesculenta-*'Manioc' in agricultural areas in Medirigiriya area either in the valley itself or neighbouring areas are contaminated with heavy metals. Hence, the aim of the present study was to determine the concentrations of heavy metals in the selected green leafy vegetables collected from different agricultural areas in Medirigiriya and the accumulation of heavy metals in leaf vegetables was interpreted using BCF.

Sample collection

Five vegetable samples and respective soil samples were collected in Medirigiriya area during August-October'2017. Five kinds of leaf vegetables were collected during the harvest period, including (*Basella alba-*'Nivithi', *Ipomoea aquatic-* 'Kankun', *Sesbaniagrandiflora-*'Kathurumurumga', *Centellaasiatica-*'Gotukola', *Manihotesculenta-*'Manioc').

A total of 45 samples (each five vegetable types from the nine different sites) were collected over a period of three months during the wet season (August-October). All the collected samples were separately packed up in polythene bags and brought to the laboratory for sample treatment and analysis.

Sample treatment

The samples thus collected were washed with clean tap water to remove the soil particles adhered to the surface of the vegetables. Then, the root and leafy shoot stalks of each sample were separated and both of these portions were sliced into pieces and dried separately on a sheet of paper to eliminate excess of moisture contents. Once air dried, each sample was weighed and further oven dried at 60 °C till constant weight. The dried samples were grinded and passed through a sieve of 2 mm size. Finally, the samples were stored at room temperature in clean and dry polyethylene bottles with screw caps for further analysis. Prior to sample storage, all bottles were pre-

washed with nitric acid, rinsed with deionized water, dried and tested for contamination by leaching with 5% nitric acid.

Sample digestion and analysis of heavy metals

Vegetable samples (1.0 g) were digested after adding 15 ml of tri-acid mixture (HNO_3, H_2SO_4, and HClin 4:1:1 ratio) at 80 °C until a transparent solution was obtained (Rathnayaka, 2004).After cooling, the digested sample was filtered using Whatman No. 01 filter paper and the filtrate was finally maintained to 50 ml with distilled water. The samples were analyzed by atomic absorption spectrophotometer (AAS-GBC *SensAA Dual*) using an air-acetylene flame for Cd, Cr, Pb and Zn.

Data analysis

Concentrations of all heavy metals were determined by their absorbance while projecting in AAS. And the data were analyzed by using Microsoft excel. The coefficients of variation of replicate analysis were determined for different determinations for precision of analysis and variations below 10% were considered correct. All the concentration of the metals is expressed in mg kg^{-1}in dry weight.

Determination of Bio Concentration Factor (BCF)

BCF was calculated as follows:

$$BCF = \frac{C\ vegetable}{C\ soil}$$

Where $C_{vegetable}$ is the total concentration of a particular heavy metal in the vegetable (mg kg^{-1}dw), and C_{soil} is the corresponding heavy metal concentration in the soil habitat of the vegetable (mg kg^{-1}).

Statistical analysis

All statistical analyses were performed on an *acer*-PC computer using the Microsoft Excel (version 2013). Statistical test were employed to examine statistical significance of difference in the mean concentrations of metals between groups of families of vegetables using Statistical Package for Social Sciences (SPSS) program, version 11.5. Similarly, the significance of differences between the concentrations of heavy metals in vegetables was shown by using Student's *t*-test. A probability level of $p < 0.05$ was considered statistically significant.

RESULTS AND DISCUSSION

Levels of heavy metals in the vegetables

Heavy metal concentrations (mean, ranges and standard deviation) in leafy shoots and roots of different types of green leafy vegetables from Medirigiriya areas in Polonnaruwa are presented in Table 1. Results revealed that the variable metal levels in different types and parts of the vegetable samples under investigation. The levels of Pb in all commodities were ranged between 5.5 and 11.4 mg kg^{-1}in leafy shoots of Manioc and Nivithi while the metal ranged between 7.5 and 9.4 mg kg^{-1}in leafy shoots of Kathurumurumga and Kankun respectively. Cd contents varied from 1.0 mg kg^{-1}in roots of Manioc to 3.7 mg kg^{-1}in roots of Nivithi from 4.6 to 5.9 mg kg^{-1}in leafy shoots of Kathurumurumga and Kankun respectively. Similarly, Zn levels were ranged from 16.8 to 29.9 mg kg^{-1}in roots of Kankun and from 60.5 to 70.4 mg kg^{-1}in leafy shoots of Kathurumurumga and Nivithi respectively. Among the vegetables, the highest mean levels of Cd (5.9 mg kg^{-1}), Pb (11.4 mg kg^{-1}) and Zn (70.4 mg kg^{-1}) were detected in leafy shoots of Nivithi and so with the roots (3.7 mg kg^{-1}for Cd and 41.6 mg kg^{-1}for Zn) except for Kankun roots (9.1 mg kg^{-1}for Pb). The contents of Cr, however was found below the detection limits in all the test vegetables (Table 1). Based on the results, the average concentrations of all metals (both leafy shoots and roots together) in the vegetables can be ranked by abundance in the order as Zn>Pb>Cd. Among all the heavy metals, Zn showed maximum and Cd minimum levels in all the vegetables. Thilini Kananke *et al*., (2014) also reported that the Ni, Cd, Cr and Pb levels exceeded the maximum permissible limits set by FAO/WHO for human consumption in market sites in the Piliyandala area of Colombo District, Sri Lanka. Similar trends were also reported by Radwan and Slama. Uptake of heavy metals by plants is often influenced by plant species, growth stage, soil type and metal species. Availability of heavy metal ions are influenced by various factors including soil pH, physical and chemical soil properties, clay content and Mn oxide concentration. Besides, they are also altered by innumerable environmental and human factors and nature of the plant (Sharma *et al*., 2007).

When the present concentrations of metals were compared with permissible limits given by FAO/WHO (FAO/WHO, 2001).Pb and Cd levels were found to exceed the maximum permissible limits for human consumption (Table 1). Zn level was however found within the permissible limit. It was found that most of the vegetable types in Polonnaruwa were grown along the bank of rivers, roadsides and highways irrigated with wastewater as well as from vegetable farms with possible use of fertilizers and pesticides in excessive amount. Continuous irrigation of agricultural land with sewage and wastewater may cause heavy metal accumulation in the soil and vegetables. Besides, pesticides and fertilizers are known to be the main sources of heavy metal pollution in agricultural areas. Moreover, the transportation and marketing systems of vegetables play a significant role in elevating the contaminant levels of heavy metals which may pose a threat to the quality of the vegetables with consequences for the health of the consumers of locally produced foodstuffs

Table 1. Heavy metal concentrations of Green Leafy Vegetables (mg kg^{-1} dry weight) collected from Medirigiriya area in Polonnaruwa (mean ± SD, n = 9)

Vegetable	Parts	Cd	Cr	Pb	Zn
Basella alba- 'Nivithi'	Leafy shoots	7.7 ± 2.2 (5.9-11.4)	ND	17.1 ± 7.1 (11.4-31.9)	101.5±37.1 (70.4-221.3)
	Roots	6.1 ± 1.7 (3.7-11.7)	ND	7.4 ± 3.6 (4.3-11.4)	72.2 ± 16.3 (41.6-157.4)
Ipomoea aquatic- 'Kankun'	Leafy shoots	5.7 ± 1.4 (5.9-8.7)	ND	11.3 ± 3.7 (9.4-11.2)	32.8 ± 7.7 (25.9-37.5)
	Roots	4.1 ± 0.7 (3.1-4.4)	ND	8.6 ± 3.4 (9.1-14.9)	25.6 ± 6.1 (16.8-29.9)
Sesbaniagrandiflora- 'Kathurumurumga'	Leafy shoots	7.4 ± 4.2 (4.6-17.3)	ND	10.3 ± 3.1 (7.5-11.0)	73.1 ± 12.7 (60.5-100.2)
	Roots	6.2 ± 1.7 (2.9-10.0)	ND	7.4 ± 2.3 (4.8-11.5)	55.9 ± 11.0 (44.3-71.1)

Centellaasiatica- 'Gotukola'	Leafy shoots	6.9 ± 3.4 (4.7-10.2)	ND	9.3 ± 2.5 (7.9-12.3)	103.2 ± 24.8 (80.4-137.9)
	Roots	3.1 ± 2.1 (2.1 -4.6)	ND	5.7 ± 1.7 (4.6-7.1)	65.8 ± 8.9 (54.8-71.6)
Manihotesculenta- 'Manioc'	Leafy shoots	6.9 ± 2.7 (4.0-9.6)	ND	10.9 ± 3.3 (5.5-16.9)	84.7 ± 19.5 (81.5-124.7)
	Roots	4.1 ± 2.2 (1.0-7.7)	ND	4.8 ± 2.7 (2.6-7.5)	33.7 ± 12.3 (32.5-58.0)
Recommended maximum limits for vegetables*		0.20	2.30	0.30	99.40

*ND = Not detected, Levels were below the detection limit. Values in the parentheses are minimum and maximum concentration of each element.*Source: FAO/WHO (2001)*

In the present study, significant differences were found in Pb concentrations between the test vegetables (p = 0.00) but not in Cd concentrations. Results also showed a significant variation in the levels of Zn between the test vegetables (p = 0.005). Moreover, a positive correlation between Cd and Zn (r = 0.783, p<0.05), Pb and Zn (r = 0.801, p<0.05) and Cd and Pb (r = 0.857, p<0.05) could indicate a common source of the metals in the test vegetables in Polonnaruwa. The common sources of such contamination could either be the farming sites irrigated with polluted water or during transportation and marketing of the vegetables (Darshani Wijayawardhana *et al.*, 2016).

Bioaccumulation of heavy metals from soil to vegetables

Bioaccumulation assessment is important in the scientific evaluation of risks that heavy metals may pose to humans and the environment and is a current focus of regulatory effort. In this study the BCF value is high in *Basellaalba* (Nivithi) whereas accumulation of Zn and Pb into leaves from the soil is comparatively high.
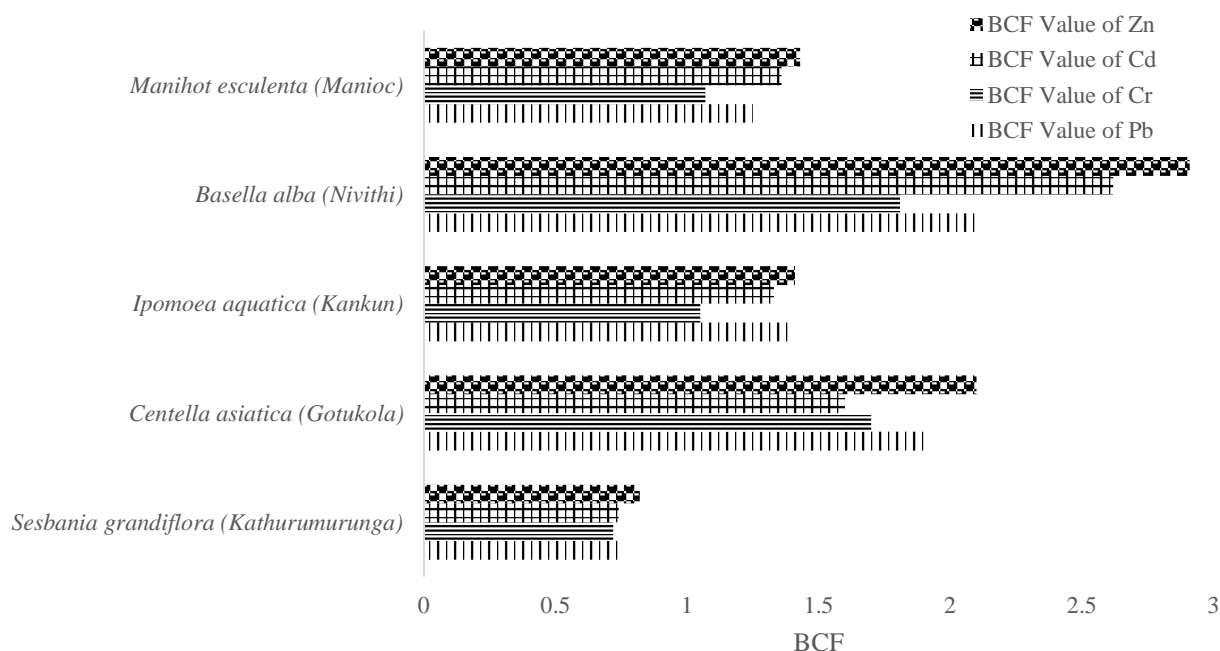
Figure 1. Bio Concentration Factor (BCF) values of four heavy metals in five kinds of leaf vegetables collected from agricultural in Medirigiriya area, Polonnaruwa

The BCF values of Pb in vegetables ranged from 0.74 to 2.10 and averaged 1.476, and those of Cd, Cr and Zn in vegetables varied in similar ranges, i.e., 0.74-2.62, 0.72-1.81, and 0.82-2.91 respectively.

By comparison, the BCF values of Zn in vegetables were significantly higher, varying from other vegetables (Fig. 1). Since a greater BCF value indicates a higher accumulation potential of metals in vegetables (Chumbleyand Unwin, 1982) the above results indicate that Zn has higher capacity for transferring from soil to the shoot parts of vegetables than the other three heavy metals in agricultural soil of the Medirigiriya area. This can be attributed to the competition between Zn^{2+} and Ca^{2+}. It is easier forCa^{2+} to be replaced by Zn^{2+} than other metals because of their closer ionic radius and valence. In addition, Ca is an essential element for crops and it can enter plant tissues by active transport, while most heavy metals (as nonessential elements) can only enter plant tissues through passive methods (e.g., concentration diffusion and permeation)(Costa and Morel,1993).Differently, Zn can also enter plant tissues through Ca channels.

CONCLUSION

From the present study it can be concluded that Cd and Pb concentrations in all the vegetables were above the permissible limits set by FAO/WHO for human consumption. The levels of Zn, however fall within the maximum permissible limit. Although the test vegetables have significant accumulation of heavy metals in their root portions which are usually discarded for cooking purpose, the remaining metal levels accumulated in leafy shoots are still not safe for consumption.

Besides, the metal contaminated areas should be discouraged for commercial farming of such leafy vegetables. Instead, those areas may be replaced by some other non-metal accumulating plants.

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ASSESSING THE EFFECTS OF RESPONDENT DRIVEN SAMPLING ESTIMATORS ON POPULATION CHARACTERISTICS

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ABSTRACT –

Individuals having a common secretive concern that they together mask from the rest makes a hidden population. Thus the access of their sampling frame becomes beyond the bound of possibilities and thereby prevents the use if probabilistic sampling techniques in practice. Among those available thus far, Respondent driven sampling (RDS) is most favorable as it composes of probabilistic sampling characteristics and the mechanism used encourages the respondents to respond truthfully. Terminologies such as seeds, waves, coupons, and estimators encompass RDS and the right combination of these aids to produce accurate estimates. It is noted in many instances that researchers are unable to find the correct combination since it solely depends on the characteristics of the hidden population. Extensible consumption of resources questions the ability to do pilot studies on RDS. This study addresses this concern by proposing an algorithm to generate RDS populations. The algorithm is armed with the ability to change the characteristics of the population which will greatly enable the researcher to find the optimal number of seeds, waves, coupons prior to the data collection and the use the best estimator for the parameter of interest.

Keywords: Respondent-Driven Sampling (RDS), Algorithm

1. Introduction

Hidden populations are extremely difficult to access due to its secrecy. Yet these are the populations that should be urgently accessed since they are more likely to consist of individuals that pose a threat to society. Shaghaghi, et al. [8] listed most likable hidden populations to be those being under social pressure of the broader community, those living in faith-based communities, those who fear to confront legal authorities, Illiterates, migrants, newly arrives residents, etc. As stated by Heckathorn [3], "Hidden populations" are inherently hidden, due to the nonexistence of a sampling frame and higher privacy concerns leading respondents refusing to cooperate. Snowball sampling, respondent-driven sampling, indigenous field worker sampling, capture recapture sampling are some of the sampling techniques that can be used on these populations [8]. Of those available RDS happens to be the most promising technique since it consists of probabilistic sampling. RDS enables to produce credible estimations than using non-probabilistic techniques. Yet the method consumes a considerable amount of resources which restricts the researchers to use RDS in its full potential. The algorithm and the steps proposed in the study aids to fill this gap which will boost the popularity of RDS among researchers. In order to exhibit the usage of the algorithm the performance of five most commonly used estimators on different populations is used. Hence objectives of the study can be brought forward as,

- Develop an algorithm to simulate RDS populations

- Assessing the effect of RDS estimators on population characteristics

2. Respondent driven sampling (RDS)

The term RDS does not solely refer to a single methodology but to a series of methods that share a common core [4]. RDS is a chain referral mechanism that shares common characteristics with snowball sampling yet differ by being a probabilistic sampling method [2]. Researcher recruits the first few respondents who are referred to as 'seeds. Thereafter seeds contribute to expanding the sample by recruiting their peers into the study. Respondents are provided with coupons for recruitment. For each participation and recruitment, individuals are rewarded in order to attract and keep them engaged. Another important terminology used in RDS is 'wave' which is formed by the set of people that got recruited by the respondents in the wave latest formed wave. Seeds belong to the 0th wave. Participants in the first wave are recruited by the seeds and similarly, waves are formed. Theory suggests that six recruitment wave is enough to reach equilibrium irrespective of the initial seed selection [5].

3. Algorithm

RDS populations are bound to have a flying price tag due to the extensive consumption of resources. This

restricts researchers to use one, occasionally two or more populations in their studies. Validation of estimators and inspection of their behaviour has been limited. A simulation is used to evaluate a tree bootstrap method to measure the uncertainty of RDS using the two populations, Colorado Springs Project 90 study and National Longitudinal Study of Adolescent Health [1] can be brought up as an example. It is unwise to solely depend on these validations and discoveries since,

- There can be properties that are not present in the population that is used for validation but in other populations.
- Some populations may have highly correlated variables while others don't
- Diversity of populations is drastically high. Considering populations that has the same characteristic of interest but differ demographically, geographically, etc. is the only condition that has the slightest possibility to produce similar populations. Considering drug users in two cities as two populations would be an appropriate example.

Additionally, tremendous effort has to be invested in gathering data of the RDS populations resulting in these populations to be overly expensive. A detailed description on the sampling mechanisms used in Latino gay men and transgender persons reveals that $60 had to be paid to every respondent for taking part in the study and $20 for recruiting participants. It should be noted that the working staff had to be experts on their respected working area and their service also does not come costless. Furthermore, the study openly put forward the costliness of RDS [7].

This is where the need for the algorithm which has the ability to stimulate a variety of populations arises. The study produces introduces an algorithm that has the capability to simulate RDS populations. It allows changing many factors in order to produce diverse populations.

Project 90 is a dataset that is mostly used in the studies of RDS. One such usage would be to identify the optimal number of seeds, coupons and waves to be used in RDS empirical studies Pathirana & Ramanayake [6] used project 90 considering 'gender' to be the response variable. Through their study they found out that the best combination of seeds, coupons, waves and estimator that gives the optimum results as 14, 5, 8 and SS estimator respectively. In order to verify the credibility of this result populations similar to project 90 are simulated. One population considered gender to be its response variable as did Pathirana and Ramanayake [6] and the other considered HIV to be its response variable which is the true population parameter of the dataset. Also, the following degree distributions are considered.

o The response variable associated with only the Characteristic variable (indicated as C).
o The response variable associated with the Characteristic variable and degree (Indicated as CD).
o The response variable associated with only the degree (indicated as D).
o The response variable is randomly allocated (indicated as R)

Thus, in total $2 \times 4 = 8$ populations are generated.

From those simulated population samples are extracted using the algorithm which was developed with reference to a study done by Pathirana & Ramanayake [6]. For this extraction the combination recommended by their study was used. That is 14 seeds, 5 coupons and 8 waves.

Both sampling and population simulation algorithms will be wrapped into a R package in the near future.

4. Estimators

It is understandable since RDS merges the two extreme ends of sampling that is probabilistic sampling and non-probabilistic sampling, population parameter estimation is going to be complicated. Over the period of time researchers has contributed immensely for the development of a proper estimator by enhancing the exciting estimators or by developing a brand new estimator. Among the many developed thus far, 5 are used to investigate in this study for the reason to explain how the developed algorithms be used by a researcher who uses RDS. Those estimators are,

- Salganik– Heckathorn (SH) estimator
- Volz–Heckathorn (VH) estimator
- Successive sampling (SS) estimator
- Model assisted (MA) estimator
- Homophily configuration graph (HCG) estimator

SH, VH and SS estimators are the most popular estimator, in the field of RDS, MA and HCG estimators are novice. Parameter estimation from the extracted sample is done using these estimators.

5. Results

Association of the response variable with other variables in a population is represented using colour codes as given below.

🔵 Degree and Character (DC)   🟣 Degree (D)
🟢 Character (C)   🩷 Random (R)
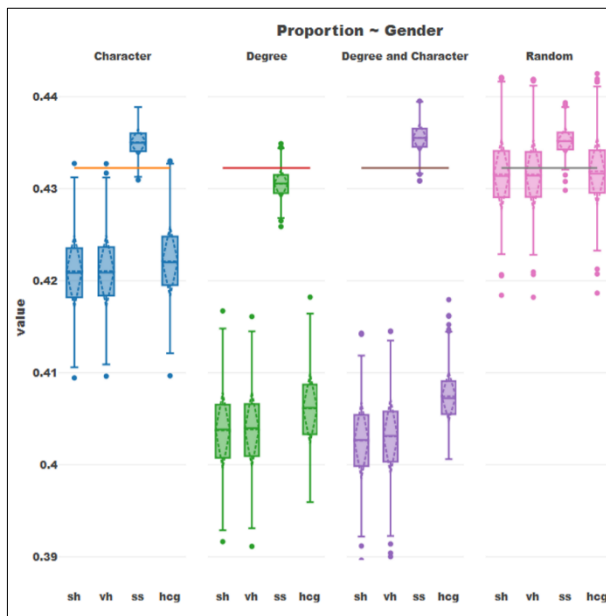
Figure 1: Boxplots representing the sampling distribution of the estimators in populations similar to 'Project 90' when response proportions are equal to that of 'Gender' in 'Project 90'

Figure 1 gives the sampling distributions for SH, VH, SS, and HCG estimators for populations with p = proportion of 'Gender' in 'Project 90' with the four varying association types. Solid lines represent the true population parameter value p (= 2374/5492). It clearly shows that the performance of the estimators depends on the underlying association types in the population. The SS estimator always gives a higher value than others and also possess a lower variability in all four scenarios. When the response variable is independent of degree and the characteristic (R), all estimators perform well. When the response variable is associated with the degree (D), all estimators severally underestimate the true parameter, except for the SS estimator.
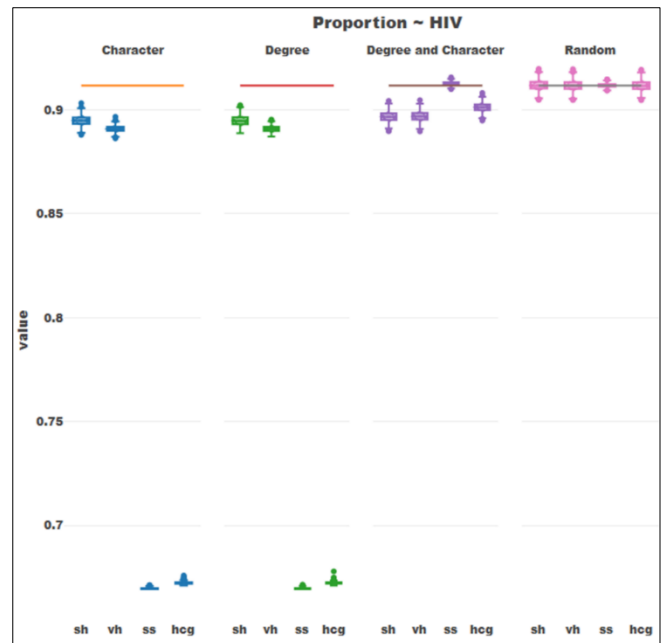
Figure 2: Boxplots representing the performance of the estimators in populations similar to 'Project 90' when response proportions are equal to that of 'HIV' in 'Project 90'

Figure 2 give the sampling distribution of SH, VH, SS and HCG estimators with populations with p=proportion of 'HIV status' in 'Project 90'with four varying association types. Solid black lines represent the true population parameter value (=0.91). Both SS and HCG estimators severely underperform when response is associated with either D type or C type. The SH estimator's underperformance is considerably low in all Scenarios. When the assignment is done with respect to both the Degree and characteristic (DC) or Randomly (R), the SS estimator performs extremely well. Distribution of the estimators, even for the SS estimator.

6. Conclusion

Algorithms which were introduced in the study works well in the purpose of assisting a researcher in order to withdraw many drawbacks if they were used in the proper way. The study does validate the finding done by Pathirana and Ramanayake [6], that is in the sampling combination when the parameter is as that of the proportion of the gender variable SS estimator out performs the others in all considered scenarios. Yet it shows that inability to generalize this combination. When the population parameter is as of the proportion of HIV the sever underperformance of the estimator could be seen. This alone leads the path to question the findings that already exist in the field. The developed algorithm will help the researchers in a greater deal to take RDS research into a broader level.

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EXPERIENCES ON WORKFLOW MANAGEMENT SYSTEMS FOR DATA-INTENSIVE BIOINFORMATICS AMONG SRI LANKAN SCIENTISTS

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ABSTRACT-

The amount of data processed, analyzed, visualized and managed by biologists are enormously increased day by day. For complex analyses, scientists often must combine multiple processing steps into a larger "analysis pipelines" or "workflows" that can involve a number of algorithms, specialized tools, databases and web services. Such scientific workflows are executed repeatedly with different combinations of inputs and parameters and increasingly adopted in the domains such as bioinformatics where a enormous amount of scientific data is generated. In the recent past, considerable effort has been made to develop Scientific Workflow Management Systems (SciWMS). There are several such workflow management systems for bioinformatics community including Taverna, Galaxy, Kepler, Pegasus, VisTrails, and Triana, which have reached a level of maturity that in principle allows them to be used by scientists for their analysis requirements. The goal of these systems is to avoid the difficulties of using the state-of-the-art methods of data analysis, implementing custom programs, mostly in Perl or similar scripting languages. SciWfMS enable easy provenance management, process control, recovery, scheduling and parallelization of individual tasks. They also enhance the understandability and sharing of workflows among the scientific community. This study presents the experiences on workflows and workflow management systems among the bioinformatics community in Sri Lanka. Based on the survey results we have come up with some recommandations to improve Workflow Management systems for efficient and simple workflow development and reuse.

Keywords: Workflow, Scientific workflow management systems, Bioinformatics, Data analysis

1. Introduction

With the advancements of biotechnology, the amount of data processed, analyzed, visualized and managed by biologists are enormously increased day by day. For instance, the Next Generation Sequencing (NGS) technologies generate a massive amount of data that are complex in nature. For complex analyses, scientists often must combine multiple processing steps into a larger "analysis pipelines" or "workflows" that can involve a number of algorithms, specialized tools, databases and web services. Such scientific workflows are executed repeatedly with different combinations of inputs and parameters and increasingly adopted in the domains such as bioinformatics where a huge amount of scientific data is generated.

Workflow Management Systems

In the recent past, considerable effort has been made to develop Scientific Workflow Management Systems (SciWMS). There are several workflow management systems for bioinformatics community including Taverna[1], Galaxy[2], Kepler[3], Pegasus[4], VisTrails[5], and Triana[6], which have reached a level of maturity that in principle allows

them to be used by scientists for their analysis requirements. The goal of these systems is to avoid the difficulties of using the state-of-the-art methods of data analysis, implementing custom programs, mostly in Perl or similar scripting languages.

Taverna is an open source SciWMS. Taverna workflows can be designed and executed on local desktop machines through Taverna workbench or through other clients and web interfaces using Taverna server. Omics analysis workflows including transcriptomics, proteomics and metabolomics are included in Taverna. Workflows in Taverna are written in Simple conceptual unified flow language (Scufl), a MoC is designed to overcome the complexity of data-intensive and service-based processes automation in Taverna. Taverna can be used in several different domains and sciences to support scientific experiments.

Galaxy is another workflow management system developed as a system for the integration of genomic sequences, alignments, and functional annotation. Galaxy allows users to gather and manipulate data from existing resources in a number of ways. Galaxy system pioneers a new generation of interactive tools for large-scale genome analysis by allowing large-

scale data analyses that previously required programming experience and database management skills. History system that record and store every action of the user is a key element of Galaxy. The Galaxy history page is identified as simple to use but powerful hence able to handle large genome annotation data sets. Users of Galaxy can perform multiple types of analyses including query intersections, subtractions, and proximity searches and can also display the results using existing browsers like UCSC Genome Browser(https://genome.ucsc.edu/) or Ensemble (https://asia.ensembl.org/index.html).

In 2010 [7] Galaxy platform designed and implemented to explore how an open, web-based approach can address the accessibility and reproducibility challenges of data in genomics research. Galaxy project (*Galaxy Community Hub*, 2005) is a popular, web-based genomic workbench that enables users to perform computational analyses of genomic data. The public Galaxy services are listed as analysis tools, genomic data, tutorial demonstrations, persistent workspaces, and publication services. These services are available to any scientist that has access to the Internet. One can set up the local Galaxy servers by downloading the Galaxy application and customizing it to meet particular needs. Galaxy has established a significant community of users and developers by now. Figure 1 below shows the Galaxy workflow designing window.
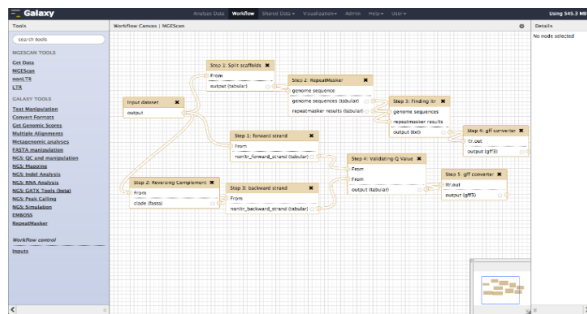
Figure 1: Galaxy workflow designing window

Contributions of this study are twofold. First articulate the benefits and features of the WfMS and to investigate to what extent the biotechnology community in Sri Lanka use workflow systems including the problems they face in using workflow systems. Second, based on the feedback of the biotechnology community, to make recommendations by identifying and prioritizing the areas of research in workflow management.

The remainder of this paper is structured as follows. Section 2 describes the materials and methods used in the study. In section 3, we present the results and discussion on our findings followed by section 4 that

describes the conclusions and recommendations for future research.

2.Materials and Methods

We conducted several discussions and workshops with the collaborators of Galaxy workflow systems and perceived the benefits of using workflow systems including both current and potential benefits.

With that knowledge we had discussions on the use of Bioinformatics workflows in data analysis, with a group of biotechnology researchers in Sri Lanka who are involved in biological data analysis

This section presents the perceived benefits of using currently available workflow systems.

2.1   Benefits of using workflow systems

Enables easy development, reuse and sharing of workflows

Scientific workflow management systems (SciWfMS) enable easy provenance management, process control, recovery, scheduling and parallelization of individual tasks. They also enhance the understandability and sharing of workflows among the scientific community.

My experiment[9] is a workflow repository for sharing, reusing and repurposing workflows. Currently, my Experiment provides access to more than 2000 Bioinformatics workflows written in Taverna, Galaxy, Kepler. Workflows can be combined and modified to assemble new executable protocols, using published and established pipelines as components. My Experiment (http://www.myexperiment.org) is an online research environment and public repository of workflows for bioinformatics community for social sharing of bioinformatics workflows and it is the largest collection of workflows currently available. These workflows are procedures consisting of a series of computational tasks that uses web services. They perform various tasks including data retrieval, integration and analysis and visualization of results. Workflows in my Experiment can be accessed by anyone and then be reused and repurposed to their specific requirements. Moreover, developers can submit their workflows to my Experiment and can be shared with the scientific community. My Experiment encourages users to register to create the social community and by registering as a user one can get richer user experience than being anonymous. My Experiment currently has around 9000 members and contains around 3000 workflows. Similar to other social networks users in my Experiment can request friendship from other registered people having the same research interests. Friendship links can make a

network of trusted individuals. Figure2shows the interface for workflows in my Experiment.
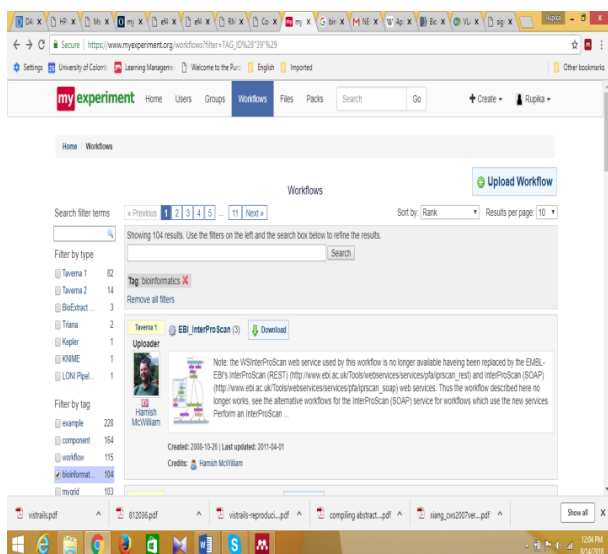
Figure 2: my Experiment

Containerization of Workflow systems

Workflow Development and reuse issues such as different operating systems, different packaging and versions of tools can be avoided using containerization. Containers are lightweight software components alternative to full machine virtualization that involves encapsulating an application, it's dependencies and configuration in a single image, running initsown operating environment.[10]. Docker [11] is a popular container platform. A Docker container image is a lightweight, standalone, executable package of software that includes everything needed to run an application including the code, runtime, system tools, system libraries, and settings .When an image is run, it creates a container, which you can start and stop and delete without affecting the image. Docker images enable Cross-platform Installation since they contain their own operating system. Files in the container cannot access the files in the host machine, so users can trust dockerized applications. Docker containers can always be run using one single docker run command. The upgrade is made easy as the Docker containers can be easily upgraded to newer versions. Docker images are available for most of the workflow systems including Taverna and Galaxy.

Common Workflow Language

Because of the interoperability issue of workflow systems a workflow developed for one workflow system cannot be reused in another. Ensuring a workflow definition can be executed in multiple workflow systems or interoperability among workflow systems has become an important aspect of workflow management and if so the provenance of the workflows can be captured and used across heterogeneous execution environment.

Common Workflow Language (CWL) [12] ensures execution of a workflow definition in multiple workflow systems. CWL is a multivendor community-led standardization effort. It defines a workflow language that can be implemented by multiple workflow systems capable of executing on a range of computer platforms. CWL focuses primarily on coordinating and parallelizing command line tools that exchange files on bioinformatics pipelines. Further CWL has primarily started in the bioinformatics community and later the usage and adoption of it have spreaded beyond the life sciences to several other fields including astronomy, hydrology, digital humanities, and more. CWL makes use of several existing standards, including support for cluster computing using SLURM or PBS, containerization using Docker, and deployment using common packaging formats. In addition, the CWL ecosystem has grown to include workflow visualization tools, graphical workflow editors, libraries for interacting with CWL programmatically and tools that convert to and from CWL and other workflow formats.

CWL viewers [13] are for visualizing workflows written in CWL. Using CWL viewers public open source workflows can be visualized graphically and textually, as well as metadata are accessible to the public in different formats such as linked data. To ensure that the workflow is well presented in the CWL Viewer, some CWL best practices are recommended.

CWL is supported by analysis environments such as Apache Airflow (CWL-Airflow), Arvados, Rabix, and Toil. In 2017 CWL was identified as one of the future trends for bioinformatics pipeline development and several analysis environments such as Apache Taverna, Cromwell workflow engine, Galaxy, and REANA - Reusable Analyses, implemented the support for Galaxy.

Distributed computing

WfMS systems like Taverna offers distributed services. Since most of the computational processing in the workflow occurs remotely with the service providers there is no requirement to install tools and data sources locally, which reduces local infrastructure and maintenance costs. It also enables rapid workflow creation and testing. Consequently, using distributed tools and resources, the data analyses can be performed regardless of the local infrastructure.

With the knowledge of the benefits of using workflow systems we had several discussions with

biotechnology community to understand the difficulties they face in using workflow systems.

3. Results and Discussion

When consider the usage of workflow systems by Sri Lankan biotechnology community we found majority of them are not using workflow systems. As shown in figure 3, only 27% of the scientists are using while the others do not use because they have not heard about such systems or due to several other reasons.
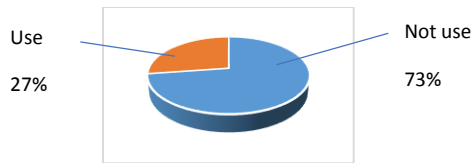
Figure 3: Use of workflow systems by Biotechnology community

We had further discussions with them to identify the reasons for not using the workflow system though they have heard about workflow systems and with the scientists those who use the workflow systems to understand any difficulties they face in using them.

Discussion data was analyzed using content analysis to draw the categories of difficulties faced by the community.

Categories of problems identified are as listed below.

1) Lack of required computing skills in setting up the workflow system environments.
2) Lack of Computing facilities like HPC environments.
3) Workflow systems are not easy to use i.e. not user-friendly.
4) Specific data analysis requirements are not found in the workflow system they use.

When consider the problems 1) and 2) listed above we realized that the currently available workflow systems are with solutions for these two problems. For instance if the scientists do not possess the computing skills required for setting up the workflow systems they can always choose the containerization option since containerization does not require any installation. Docker images are available for most of the workflow systems including Taverna and Galaxy. As of the August 2014 release, Galaxy supports running tools within Docker containers.

With regard to the problem 2) listed above "Lack of Computing facilities like HPC environments" there are free public Galaxy servers with considerable amount of space accessible to any academic

researchers. Galaxy Cloud Man [14] is an integrated solution developed by extending the existing tools and packages providing a generic method for utilizing those tools on cloud resources and has abstracted low-level computing details. Cloud Man handles all of the details related to cloud computing including resource acquisition, configuration, and scaling to deliver a personal compute cluster. All interactions with Galaxy Cloud Man and the associated cloud cluster management are performed through a web user interface and computing expertise is not required. Furthermore there are academic cloud providers which are free to eligible researchers within a certain geographic area.

In addressing the problem 3) it will be useful to identify common patterns/sub structures in workflows and implement an easy to use interface for the workflow systems. Bioinformatics is a field where an enormous amount of data is handled, and the bioinformatics workflows are developed by combining various services and data sources thus makes designing and understanding workflows difficult. Effective, usable WfMS plays an important role in bioinformatics research. By identifying the patterns or high-level abstractions in workflows, the understandability, reuse, and modularity of the workflows can be enhanced. By identifying and incorporating easy to use reusable high-level patterns that combines several steps in a workflow, the usability of those systems can be enhanced.

With regard to the problem 4), if it is possible to use a workflow developed for a particular workflow system in another,it is beneficial in terms of workflow reuse. There were efforts in the past to convert Taverna workflows to Galaxy – Taverxy [15]but it has not been continued. But today more research is on developing and using workflows in CWL hence the problem 4) will be solved in near future.

4. Conclusions and future recommendations

As mentioned above there are several sophisticated visual WfMS for scientists to help in their data analysis requirements. But we have observed the use of these WfMS by the domain experts, for instance, the life scientists in case of bioinformatics domain, are limited. Many of the WfMS are easily used by computer scientists or trained bio informaticians but for actual domain experts like life scientists, designing complex workflows is a challenge. In that sense, the WfMS has not reached a level to cater their actual users yet.

A major reason behind this is many of the scientific workflows including bioinformatics workflows are complex in nature and composed of several

intertwined tasks hence it is not much easier for the general users to design workflows. Moreover, the reuse of workflows is also difficult as it is difficult to understand the inner processes of complex workflows. With the integration of necessary external services, they become even more difficult to understand.

As future recommendations, in addition to the recommendations provided in section 3, we can suggest making workflow systems GPU Computing enabled. At present most WfMS are not GPU computing enabled. GPU computing is the use of a GPU as a co-processor to accelerate CPU for general purpose scientific and engineering computing. Developing GPU computing enabled workflow systems is also important in data-intensive bioinformatics.

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FALLACIES OF POSTMODERNISM IN FRAMING A WEDDING AS A "MARKET EVENT" IN CONTEMPORARY SRI LANKAN SOCIETY

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ABSTRACT

Postmodernism has appeared in art, literature, culture and society in the contemporary context. Thus, actions, decisions and even thoughts of human beings are influenced by postmodernism. In this context, this research study mainly explores whether 'wedding' has become a "market event" in the postmodern society and if so, how weddings have become commodified in the contemporary Sri Lankan society. To explore the above research questions the study is inspired by visual research methods under the qualitative research approach. Mainly data were generated through photo elicitation technique and loosely structured interviews. The findings indicated that, in the contemporary society, every sphere of a wedding is subjected to market value. Rather than a cultural event, a wedding has become a "market event" which is controlled by numerous organizational actors with profit earning motives. These organizational actors who are in the wedding industry target the psychological vulnerability of couples who expect to get united. They create a fantasy world around the wedding event and make people vulnerable to dream a "postmodern wedding" which transcends all the customary rationalities. Thus, people end up with a huge financial burden after celebrating a wedding. With these findings, this study concluded that the socio-cultural event—wedding—has entered the wider market today especially, with the influence of postmodern conditions. Within this tendency, the precious human relationship like 'marriage' has become an "object of trade" in the contemporary Sri Lankan society.

Keywords: Commodification, Commodified wedding, Postmodernism, Postmodern wedding, Wedding

1. INTRODUCTION

The concept of postmodernism has a long history. It goes back to the early nineteenth century. Postmodernism explores "how our society has viewed stereotypes throughout history and how the cultures of our world are intermingled/interlinked in a globalized society to become hybrids of each other" (Fischer & Graham, 2014, p.24). In the contemporary society, all human beings have experienced postmodernism in different forms. Decision making, consumption patterns, communication, social and cultural structure, economic and market structure as well as life style and living standards of people have been influenced by postmodernism.

The age of corporate capitalism is privileged in this era (Jameson, 1991). Thus, the individual subject is not much important. Because every social sphere comes under the mass market and mass consumption under the process of commodification. Therefore, the phenomenon of individual subject has faded (Jameson, 1991). Hence, people imitate others and they are in the process of reproducing old styles as new styles (dead style) to the society. As well as people who live in postmodern era always think on imaginary situations (utopian situations) and try to achieve this imaginary situation (Jameson, 1991). Thus, people do whatever the activities necessary to

achieve their imaginations. Therefore, fallacy/worthless items have come to the society with high attention.

At the present, we are living in a globalizing world which consists with variety of distinguished socio-cultural practices. Thus, postmodern society can be called as a cultural episode (Tonder, 2003). Hence, postmodern society is not just a one cultural style, but it is a multitude of cultural styles (Jameson, 1991; Chute, 2011). Due to the advanced technology in the postmodern era (Tonder, 2003; Jameson, 1991), the traditional boundaries of the society have been stretched with the influence of globalization. Then, cultural practices of the society have been changed and people embrace new changes without rationality. Therefore, postmodern society is called as a less rational and cognitive society (Bouagina & Triki, 2014). In this background, human lives are highly interrelated with commodities. Hence, socio-cultural practices in nowadays come under the brand of commodity.

A wedding is one of the places where once own culture is represented. Wedding can be defined as "cultural narratives" (Dobscha, & Foxman, 1998, p.132) because weddings are narratives with many rituals. The details differ from one culture to another culture, but it conveys similar meanings. The changes of the postmodern era have influenced the cultural

celebration of a wedding. Dobscha and Foxman (1998) bring the view that a wedding is a place that inter mingles cultures. In ancient times, a wedding was celebrated in a simple manner based on their religious, ethnic and social perspective. For example, for most men and women from the colonial period, during the nineteenth century. Weddings were celebrated without consumer rights, but rather were communal celebrations of the creation of a new household (Howard, 2010). But after the colonization and world war, the traditions of weddings have been radically changed (Howard,2010). Impacts of those changes such as appreciating the symbolic value, imitating and irrationality can be seen greatly with regard to wedding at present.

As per Tonder (2003) and Bauman (2000) in the late nineteenth century the concept of postmodernism was established mainly in the form of liberalization. Within this liberalization process, middle classes came forward. Then, they were in the process of competition with the upper class in order to show their social status one over the other. Within this background, organization's actors initiated to market the inanimate life and family events. Hence, it is worth to inquire what are the radical changes that has happened to wedding events in postmodernism, basically with the force of capitalist's version of liberal feminism. Likewise, weddings have been influenced by the fallacies of postmodernism not only in the global context but also in the Sri Lankan context. Because earlier there were no big wedding ceremonies in Sri Lanka (Knox, 1861). But after the colonization and with the influence of western cultural practices Sri Lankan weddings have changed (Perera, 1976).

As human lives are highly interrelated with commodities, businesses want to sell more and intend to earn super profits. Hence, commodification is a highly spoken term in the corporate world today. Not only business people, average laymen too are interested in the process of commodification. "The proliferation of consumption practices and domains in late capitalism, including the commodification even of fetuses and the means of reproduction, creates doubts as to what-if anything-exists outside of commodity exchange…" (Constable, 2009, p50 as cited in Russ, 2005, p.142). Then, marketers bring the earlier unmarketable items to the market context and make profit out of them. Under this process human lifestyle and culture is also vulnerable to the process of commodification (Firat & Shutz, 1997). Also, a celebration of a wedding is in the dangerous process of commodification. Because of that nowadays a wedding is a place where it gives chances to generate income for many corporate bodies. Therefore, the wedding has become the object of trade in the market (Marx, 1867). Fallacies and changes of postmodernism such as imitating,

irrationality, fear of marginalization, dream to achieve imaginary situations, contextual truth and reality and advance technology have shaped the commodified postmodern wedding in today's Sri Lankan context. Therefore, every sphere of a wedding in the postmodern society is attached with a monetary value. Nowadays, the Sri Lankan wedding has become a social event which is in the wider market.

2. RESEARCH QUESTION

Having explained the above background, the research question was formulated relating to postmodernism and consumption (celebration) of wedding in the contemporary society as follows: Has the wedding become a "market event" in the postmodern society? If so, how the wedding has become commodified in the contemporary Sri Lankan society?

3. METHODOLOGY

Methodology drives the work of research as it is a systematic way to explore the articulated problem of the study. The research question under the study extensively deal with individual attitudes, individual behavior, individual perceptions and attitudes towards the postmodern wedding, basically how these concepts influence and how they contribute to commodify the wedding in contemporary Sri Lankan context. These concepts are highly related with how people think and behave. These matters are hard to be explored by collecting numerical data and at the meantime, it is very difficult to express them in a quantitative way. Accordingly, comprehension of individual sentiments, approaching to individual insights is a paramount imperative. That is, the researcher needs to expose the feelings, attitudes, emotions and perceptions which is very hard to be understood via a quantitative approach. Having learnt the nature of quantitative and qualitative approaches to research, it is less effective to use a quantitative approach in this regard, since the amount and nature of data that could be collected is limited. Therefore, qualitative approach was selected for this research. Mainly, qualitative approach was inspired by the photo elicitation technique under the visual methodology.

Photo-elicitation interview technique; inserting photographs to the research interview was used as the basic technique with the purpose of generating more data from the research participants (Harper, 2002). The interviews were designed and carried out in a loosely structured (Mason, 2002) manner. Visual images (i.e. photographs and pictures) were used as the interviews procedures. The rationale behind selecting the interview technique was that, it is more effective in capturing individuals' sentiments and their different dynamics related with commodified

postmodern wedding. Specially, photo elicitation interview enables to narrate their story properly and that stimulus to knock the past/memory (Strano, 2006). Therefore, it is the most suitable technique to generate data regarding individual sentiments.

The fieldwork was carried out after the selection of the research participants. Research participants were selected based on the 'purposive sampling technique' (Mason, 2002). It was based on the purposive as the selected research participants should have the ability to explore the theoretical understandings concerning the research study. Participants had been selected from the two extremes; six wedding couples who have already celebrated their weddings and three organizational actors (a professional wedding planner, a professional wedding photographer and a beautician) who contribute to commodify weddings in contemporary Sri Lankan context. Specially, the six wedding couples who was enable to represent generation gap (time-period gap) were selected to narrate how the wedding has been evolving from time to time with the influence of postmodernism. Data were collected through photo elicitation interview and semi structured in-depth interviews with the selected research participants, particularly individuals who had celebrated their weddings and organizational actors who are employed in the wedding industry in the area of Colombo. Audio taped interviews were transcribed to convert those in to text format which can be used for the analysis. The content of these interviews was analyzed to know how the respondents have expressed their views and organized to identify the themes arising from the data sets. Thus, the thematic analysis method was used to analyze and synthesis the gathered data (Mason, 2002).

4. DATA ANALYSIS, FINDINGS AND DISCUSSION

This section outlines how earlier unmarketable items come to the platform of the market with huge market affiliations in the era of postmodernism and how the socio-cultural event; -wedding -has been subjected to the process of commodification in the Sri Lankan context.

4.1 User Value and Appreciating Exchange Value in Case of Wedding

The wedding is an intermacy bond of two people. Now a wedding has taken different angles than past as it consists of many organizational actors. Hence at present, a wedding properly outlines the social relationship (others contribution) which is associated with it because, a wedding is the place for many people to earn profit. Therefore, there are many people (organizational actors) behind the final outcomes of the wedding. Hence, a wedding is not only an object, it is a collection of social and human relationships. As per Johnes et al (2005), though commodity merely reflects an object in the market, it is not only an object but also the collection of social and human relationships. This idea was mentioned by a research participant as follows:

> *Certainly. Need to have a wedding without any debts, within your budget. Nowadays it is a [lavish event] as many would be depending on the weddings. Today it is a source of income for many professionals. When two people get together it is a source of income for many.*

Wedding is the collection of social relationships that implies mental and physical labour effort associated with the wedding. As per Marx (1867) if there is work of labour independent of each other then only there is a user value of utility. So, in the context of celebrating the wedding, there is user value because there is a higher utility of work of independent people. People are more concern on price before taking decision on wedding, so, this act of putting monetary value to wedding is considered as the exchange value of wedding. According to the Marx (1867) the act of exchanging gives to the commodity converted into money, not its value, but its specific value-form. Therefore, wedding also have both user value and exchange value. Therefore, the wedding fulfills two features of commodity: user value and exchange value.

4.2 Making Wedding Dreams: Dreaming a Postmodern Wedding

Dreaming is common for all human beings. From childhood, people are dreaming about their future. The wedding is one of the most important events in human lives as most respondents say since this is mainly a one-time event – as in one for a life time. So, people tend to celebrate wedding because it's only a one-time chance for a life time. So, it was a 'must have' event for them. Therefore, wedding is highly vulnerable for dreaming since past. Even, wedding dreams are common to all, significant changes can be seen in relation to the dreaming on wedding since the change of time. This idea was brought forth by one of the research participant as follows:

> *[We] don't have freedom to decide how our wedding should be celebrated. All the things were handled by our parents. At that time parents, did not want their children to involve in such activities and we cannot go beyond*

their ideas. Therefore, we did all the things which they told us on that day. Past social and family systems were not like today so, we (younger people) were powerless party at home. It's dreams of our parents.

In the past, Sri Lanka was a country which valued unity, high interaction with each other as well as ordered societal system. Mainly, there was 'patriarchal' society in the modern era and anyone did not go beyond that societal rule (Ligorio, 2004). Hence, the whole system of this patriarch society was highly ordered. As the comment of respondents their wedding dreaming also countered by their parents. Even, their (younger couple) wedding dreaming was marginalized, someone else dreamed on behalf of them. Hence, dreaming in relation to the wedding was with the society, since past. The interview which was held with a couple who are belonging to the late modernity period, their wedding dreams were quite surprising at that time, put it as follows:

We wanted to have a wedding with fresh flower bouquets with a group of [ten] and a [big] wedding cake. It turned out that way.

From the surface level, if we read this reply of the participant, it is not a surprising; it appears as a very simple dream on wedding. But if we read it in a "literal" and a "reflective manner" (Mason, 2002) by considering the time period before 2000s and social conditions at the time period, it can be seen as somewhat a radical dream on the wedding of the wedding couple because they want to do all the stuffs in a 'big' manner; a big wedding crew and big wedding cake. Even, these items are not essentials for the wedding. But they want such big items as they want to get the attraction of people and make it memorable on others mind by doing such big celebration at the day of their wedding.

Contemporary youth who live in postmodern era also make dreams in concern to their weddings. The interview held with couple who belongs to the postmodern era, put their wedding dreams as follows:

We wanted it (wedding) to be a perfect event. So, first it was the [bridal dresser]. Then, it had to be suited for our budget. We eliminated many unnecessary expenses and tried to focus on the essential. So, the first thought was a beautician and then we arranged the other stuff. We wanted to have three dresses for the whole wedding. One has to be Kandyan,

which was in the morning. Then, it has to be a going away frock. Later for the home coming, I was thinking about two ideas as in whether to go for a saree or an Indian Lehenga. Mmmm.... Later Lehenga is seen as a good idea. So, we went with it.

Even though the "Poruwa" ceremony is the main and utmost important custom/event in the wedding (Chandrasiri, 2006) at present, people have a trend to put it into a second place and pay more attention to artificial and show-off objects in their entire wedding. Therefore, the dreaming also contains the snobbish aspects in the contemporary society. According to Jameson (1998) postmodernism occurs as a cyclic process as earlier dominated or central objects in the society are later converted as secondary important objects and newest objects have been dominated in the society context. As per the above comment their dreaming is also subjected to the process of postmodernism. As per above mentioned comment, they (contemporary couple) have paid more attention on their appearance and how to bring the extra ordinary look for their wedding rather than paying attention on customs, rituals and real meanings associated with the wedding. Even though the tradition is wearing a red saree or red kandyan on the second day (day of home coming) of the wedding bride selects a red lehenga which is an attire most popular in the contemporary Sri Lankan society with the influence from South India. This enables us to represent how couples go beyond traditionally institutionalized phenomena as well as how they follow up social trends to their personal life though dreaming, where the entire postmodern society goes with new trends and fashion (Jameson, 1998).

The notion of the "uniqueness" also plays a major role in contemporary youth wedding dreams. This concept was emerged during the interview in the following way:

Waruni: No no not exactly. I wanted to have a unique "Poruwa" – something others never had before. So, I got a wooden Poruwa with two exotic birds in the front. Settee back was a normal one. But the oil lamp was different with lamps in separate containers. I had the desire to be unique on my special day (smiling).

It is interesting to inquire why this unique notion comes to the wedding and why people want to have unique weddings. Simply, it's because postmodern consumers try to represent their self-identity and self-

ideology through consuming customs and rites (Firese, 1997). Also, they try to achieve fantasy situations (Jameson, 1998). Therefore, they want to represent/present their identity to the society by having a unique consumption of customs and rites. That's why they dream to have a unique wedding. However, people try to achieve this unique aspect in the wedding to have an extra vibrant and to do something others never had done before. Such aspects do not represent real essence of having a wedding. But this is how couples dream about their wedding today. This clearly represents how traditional wedding dreams have converted to postmodern wedding dreams. One female research participant put this idea as follows:

> *I wanted to shine and look sparkly. So, went with a lot of stones. As it's [my] day and I wanted to feel extra vibrant on that day.*

Even though the bride wants to be shiny and look sparkling, these elements are not necessary. Her dream is to have a brilliant look than all others on her wedding day. Why is this? it is because she wants to get the highest priority/attention on their wedding. To fulfill that dream, her tendency is to spend more and more money as well as time for that. Then, the dream of bride has become more expensive in today. And specially, there is pressure from the present society saying, "this is your day" (for bride), "you should look stunning" and "your wedding day should be the most fabulous day of your life" (Balkery, 2008). Such kind of emotional vulnerable promotion campaigns are conducted by the wedding planners (Balkery, 2008). Thus, if there is no effort put in to practice dreams remain as dreams. Wedding dreams are also likely to be only a dream if there is no effort to achieve these dreams. Therefore, wedding couples take much more effort to achieve their dreams. Most of the time, they get assistance from different people and different sources to achieve these dreams. Dreaming is put in to practice as a process of wedding planning. The interview held with the organizational actors brought different viewpoints on how postmodern wedding dreaming has evolved in the context, as follows:

> *Normally with their own research on the internet, couple come up with the ideas and dreams. They check for weddings in the other western countries and try to apply it here. Some of them are not really practical to play in the Sri Lankan context, but they try to do it in the sense. It is mostly a platform to show off.*

As per this comment, people are aware of new trends quickly through the internet. Then, technology plays a vital role in making wedding dreams because it is very easy for organizational actors to introduce novel items in the domestic contexts as people are aware of such novelties. Therefore, not only to carry out marketing activities but also to do novelties, they also use these technologies. These are possible as we are now in the "informational era" (Tonder, 2003, p.3). People tend to follow these new changes/trends just because of the fear they have. When they do not follow these trends, they will be isolated from the society. Therefore, as a society we unanimously follow up the established trends and visualize the new consumption culture in relation to the wedding in the cotemporary Sri Lankan society. Following up the new trend and fashions and then, make new consumption culture is the basic feature of postmodernism (Jameson, 1998). This basic feature of postmodernism helps to figure out the surreal and astounding dreams within the mind of people as mentioned above.

Wedding planners and other organizational actors in the market define "Utopia" (Hall, 2002) as a highly imaginary situation and it is not reality. Then, people also follow up these fashion and fades which are introduced by these organizational actors without considering reality. As a result of that wedding couples end up with unachievable dreams. This utopian gesture of wedding dreaming properly can be reflected through the following comment:

> *Comic media: There is some practical limitations. Some would like to have a [huge] cake, but the hole will be smaller. Some want a thing sit back like "Yapahuwa" but have too much of crowd which cannot be controlled etc... Some want to have a beach side wedding etc. Some of them are not really pragmatic in the Sri Lankan context. If you are taking a Poruwa ceremony in a beach side, it is not possible. The sunlight is scorching and those things like "Beatle leaves, the grains spreading" customs are impossible. The photos too would be affected.*

Therefore, people live in a utopian situation at present (Jameson, 1998) and they are subjected to unending process of dreaming on imaginary/perfect situations. This process is never ending because people cannot totally be satisfied as their imaginations cannot be achieved totally. Throughout this discussion, it reveals, how couples dream on their wedding, how these dreams become bladder-dash and the degree to which these dreams can be put in to practice. Finally,

it was discussed how these dreams will be exploited as well as made by organizational actors who are involve in the wedding industry. Then, also it is discussed how organizational actors contribute to create co- modified utopian wedding dreams.

4.3 Fuzzy Wedding

People follow up new trends and fashions. This new trends and fashions stretch the boundary of a traditional wedding. At present, couples have willingness to follow these novelties which have been done by others, believing these are the social trends without putting their cognitive aspect or rationality for the actions which are done by them. This practice was limited in the modern era, but this practice can be widely seen in the present scenario. In the interview held with young couples who belong to postmodern era this scenario is visible as follows:

> *Waruni: Mmm…., normally most of the girls do that and since it (going away) is a [trend] and a fad. Also, the groom specifically said that he would want to change from the traditional dress and it is uncomfortable to wear for the whole day.*

All most all the young wedding couples in the contemporary Sri Lankan society use to dress a new going away costume. For the present Sri Lankan context, these have become new trends but for the western context these are not new as these items are already there. What Sri Lankans do as global south? We are in the process of reproducing objects which are in the global north as our new trends. As per the data elaborated above contemporary youth wedding couples go beyond the traditional boundary and they create multi-cultural context to the Sri Lankan wedding industry by imitating dead styles. This multifaceted situation was revealed by one of the organization actor in the following way:

> *Now what happens to the couple will be changing for going away, that would take more than 45 minutes, as they have to change what they were initially wearing etc.? Then another one hour for the photos and all. So, they won't have much time to interact with the family and friends. Then dance a little and go. No time for an even some small chats. All is the part of acting. No natural setting which needs to be changed.*

As per this comment, couples act in their wedding as fancy-dress competition. Priority has been changed.

They dress up lot of dresses within this limited time. As well as shoot photos from different dresses in different places as explained in the above discussion. Then, they don't have time to stay at the wedding. Hence, real value of a wedding is diluted, and it has become a concert rather than a cultural event. Items such as couple dance, surprise dance, group dance and group singing session are not common to the Sri Lankan wedding celebration in the past. But today these [un]valued items in the wedding get the highest attention not only from the ordinary people but also the professional people in the society. Everyone wants to celebrate their wedding in a different way from the other's wedding. But when it comes to customs and traditions in relation to the wedding, they are common. Therefore, by only using customs and traditions people cannot create a different wedding. Hence, such kind of items are added to the wedding as new trends due to 'imitating' others.

Couples follow these new trends just because of social trend which exist in the society. As well as these trends altogether characterized today's "Pop" wedding culture, as per Jameson (1998) who views postmodernism as a popular culture. In that pop culture, all objects are in the form of temporal. Therefore, people follow temporary entities in the society and not universal entities. Hence, such tendencies which are in postmodernism or popular cultural context are followed by every people. In order to bring a wedding to the pop-culture, organization actors play a vital role. This idea was mentioned by a research participant as follows:

> *We (wedding planners) always try to incorporate [new] themes. If we do ten weddings we try to do it in ten different ways because novelty is a must. We need to be updated constantly, check on the internet for new themes because we have to go on progressing with novelty. Mmm, Otherwise, there are thousands and one wedding planners, so we have to keep up the competitive advantage. If we see something good, we ask for the couple to try it out. Also, we have to choose a right couple because not everything is going to suit everyone. Then, we telecast it (innovative wedding function). Then, couple check those things and ask to so many things in TV shows and on. So, they have a preconceived idea that a wedding should be like this and try to match the ideology.*

Then, personal style and individual ideology is added to the past and popular or mass consumption patterns emerged to the world (Jameson, 1998) in the field of 'weddings' with the support of organizational actors as above. Therefore, the wedding has also entered to the mass consumption culture in postmodernism (Howard, 2011). Hence, individual style and personal style is dead in relation to wedding as well as people are in the process of reproducing (imitating) temporal dead styles to the society by a way of doing novelties. Therefore, wedding couples speak through the mask because their real identity is hidden or dead. They do not produce novelties to the society. They only grab the things from the society and embrace these things which are institutionalized in the society as their own. Through this they hide they self-identity and produce what another person wants via them. Now, the wedding industry is a competitive field with one trying to go against the other which is a pathetic never-ending race. For the wealthy it is an event to spend some money on all the elements. They would spend for necessary and almost ridiculous amounts for unnecessary elements too. So, at the end, it becomes as a grand platform for showing off your status etc. But what happens is when someone who sees a grand wedding like this, he or she wants to add even a tiny part of it to his or her wedding. Then they try to imitate without putting cognitive rational to it. It's a very normal behavior but a much-uncivilized manner/beheviour.

As per the above discussion, today, people are worried about the decorations or the colors, catering, dressing, wedding planning especially about the reporting aspect of the wedding (Photography and videography) and how to make it creative rather traditions and customaries. Normally the couple has serial requirements whether its pre-shoot or during the wedding in which they want to take several photos with nice backgrounds with the influence of postmodernism. According to that, wedding couples (laymen) have different needs and wants time to time. Then, the corporate body comes to this context in order to cater solutions to those needs and wants. Therefore, in order to fulfill that requirements of the ordinary people, huge market have been created under the name of the wedding industry in contemporary Sri Lankan context. Within this framework organizational actors identify good marketable opportunities and they come up with continuous series of new changes in relation to the wedding. Then, wedding has subjected to the process of commodification in the postmodern Sri Lankan society.

5. CONCLUSION

Due to the enormous effort of marketers and social trends the wedding has become a "market event" in the contemporary Sri Lankan society. Due to imitating social trends and new fashions in relation to the wedding; the wedding becomes a place for profit generation. Then, marketers are in the process of dream making by targeting psychological vulnerability of laymen in order to earn a profit. They make dreams and laymen embrace these dreams by imagining these dreams are for them, and then, they dream of new things. Hence, ultimately the wedding has become a good marketable event and a market event. Worthless items have been added to the wedding and now cultural and traditional values associated with a wedding has vanished. Now, the wedding has become a place to show their colors or status and it has become a highly competitive platform. The real essence of having to wed has vanished and due to the symbolic meaning associated with it, people get a wedding. As postmodernism give priory to symbolic meaning associated with the objects and imitating social trends, due to the fear of being rejected by the society people follow those trends. Fallacies (imitating, fear of marginalization, irrationality, value symbolic meaning…etc.) of postmodernism is in the process of a commodified postmodern wedding in Sri Lanka. The commodity has user values as well as exchange values. The wedding also has both user values and exchange values. Then, it has become a commodity. As per the discussions, every sphere of the wedding event in the postmodern society is attached with an economic value and have become commodified. Finally, nowadays the Sri Lankan wedding has become a 'commodity' in the 'mass market'.

6. FUTURE RESEARCH CONSIDERATIONS

Postmodernism is a problematic phenomenon for each and every aspects or field such as art, architecture, economy, and culture…etc. Therefore, it is a very interesting area to research. Even though there are wide empirical research findings on postmodernism and its influences on a wedding, in the local context there were very limited scholars who have talked about this concept. Therefore, there is a considerable research gap to fulfill. So, future research can be done with regard to 'influence of gender to the postmodern wedding'. As most scholars present the problematization of gender can be seen in relation to wedding professionals (with the glass ceiling effect) as well as gender make impacts for the celebration of a wedding and change the wedding ceremony in to an ordinary wedding celebration. Hence, it is a good area for further research.

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MANAGING IMPRESSION AT WORK: A COMPARATIVE CASE STUDY ON NEWLY HIRED FEMALE EMPLOYEES

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ABSTRACT

All kinds of organisations comprised of individuals with variety of personal characteristics. However, individuals do not express and display their characteristics directly; rather they manage impression consciously/ unconsciously using different techniques and approaches. Further, such behaviour is affected by organisational political climate, norms and values. Hence, understanding the IM techniques and approaches of employees is vital as it helps to uncover the "real" personality of individuals. In this context, this study attempts to identify the different IM approaches used by newly hired female employees at work, while keeping a keen eye on the effects and its interrelatedness with different organisational contexts. As such, this research used a qualitative approach by adopting the comparative case study method as the strategy of inquiry. Two leading Sri Lankan organisations operating in service sector were selected to conduct the study where each represent a male dominant and a female dominant context. The findings mainly depicted the success or failure of IM approaches is influenced by the organisational context, where particular strategies are likely to be seen as more appropriate in some contexts than in others. Female employees are conscious to maintain a balance while being authentic and knowing boundaries of exploring specially in a context where masculine characteristics are prioritized. Moving further, the study found that the image projected by the individuals through managing impression provides new insights to the organizational (mis)behaviour field. Further, these findings provide many practical implications in organisational Human Resource Management practices and individuals' survival and development within an organisation.

Keywords: **Impression Management, Impression management Techniques, Organizational (mis) behaviour, Personal image**

1. Introduction

When a new person enters an environment, people have a need to gather information on her, or use the information they already have against her. The most curious subjects are, her social and economic situation, how she sees herself, her attitude and whether or not she can be trusted (Jacobson, 2010). As thus having aware about this situation and in order to get accepted in the new organization female employees manage their impression using different approaches in their early days at work. It follows the success of that impression management may vary depending on the political climate of the organization (Zivnuska et al., 2004). Organizational context (Male dominant Vs Female dominant) and corresponding norms for behavior affect the ways females manage their impression at work. As an example, research on this topic indicates that women in masculine gender-typed organizations receive severe punishment for violating behavioral expectations based on their gender. Therefore, the current study aims to find out the how the female employees manage their impression at different organizational contexts (Male dominant vs female dominant) in their early days at work.

Research Question

How newly hired female employees manage impression at workplace?

Research Objectives

The purpose of this study is to examine the ways in which the female employees manage impression in their early days at workplace. Sub objectives of my research are as follows;

To identify different IM approaches used by female employees in their early days at work.

To identify whether there are any differences in IM approaches in different organizational context.
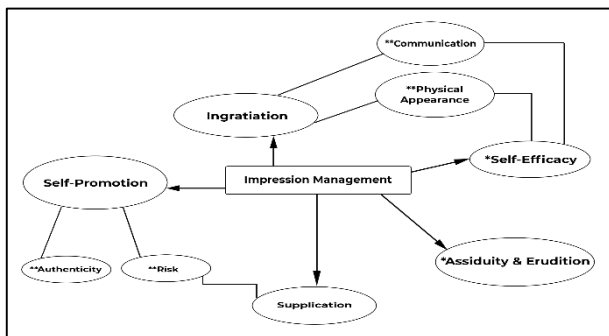
2. Research Methodology

The research objective of this study is ultimately intended to study and interpret the underlying human interaction relating to managing impression in an organizational setting. Hence, as a way of improving the quality of research conducted from the interpretive perspective. Moreover, strategy inquiry

of this research is aimed to investigate individual perceptions, experiences and views through in depth interviews to retain a holistic and meaningful characteristic regarding to the research question. Moreover, the research is intended to carry out in two different organizational contexts comparing and contrasting the data. Hence conducted a comparative case study in two organizations each representing male dominant context and a female dominant context. "Comparative case study method provides means to examine a multiplicity of perspectives to illustrate an organizational entity or pattern and to test behavior and processes" (Hakim, 2000; Ritchie, Lewis& Elam,2006).First Mozy Gas a pioneer in LPG Distribution Company in Sri Lanka was selected as the male dominant organization where as a leading private educational provider Fiat International School was selected as the female dominant organization. 10 sample were selected using convenient sampling method. 5 from each organization selected who fills the criteria of being hired not more than 6 months and being executive level female employees. Then thematic analysis method is used to analyze the data focusing on extracting similarities and differences from interview transcripts in order to conduct a proper comparative case study.

3. Findings

Source: Author, 2018
* Themes (Emerged)   ** Sub Themes (Emerged)

3.1 Ingratiation

Employees attempt to adopt all the traits and behaviors which are likable by others through ingratiation. The aim is to be likable (Grant & Mayer, 2009). It is observed that ingratiation comes in many facets in corporate world. Specially referring to the case Aura majority of individuals agreed that in their early days in career they impress others mainly through the ingratiation. The first facet is opinion conformity, where individual act in a manner consistent with the preferences to a target (Jones, 1990). Further when it comes to the case Mozy, female employees more tend to agree with another person's view point even without a rational.

"Especially in early days we can't go against others' opinions even if they are wrong [...] In worst case I at least managed to shake my head & smile just to fit in & once you get familiar gradually you can change the way you react." – Mozy

Further another individual in case Mozy added that the intention is not to be likable it's merely because that they do not have the enough courage to go against to a male point of view (particularly with superiors) confirming that the opinion conformity is also encouraged in situations where there are power differences (Rosenfeld, Giacalone, & Riordan, Impression, 1995). Respondents reveal another set of interesting ingratiation technique; seeking advice from targets, arguing with the intended party in prior to conforming, praising the target in front of others and narrating an opinion which the target recently express in front of others, adding further comments to increase the value of the opinion etc. Frequently compliment on others or flatter one another with credibility in order to be likable was identified in Fiat. This occurs when employees use flattery and praise others which they might find attractive to keep up with the intended party (Rosenfield, Giacalone & Riordan, 1995)

"Male dominant culture is highly competitive and aggressive, as thus we need to have direct approaches towards men, sweet chit chats are not gonna work in every case."- A participant of Mozy

Moreover, in case Mozy it was noticed that favor or the likability comes naturally on their way by being a female employee in a male dominant culture. Confirming from the literature that the ingratiation as an IM tactic differs depend on the parties involved, who the target is and under what condition the behavior occurs (Jones, 1990). Individual has come across an experience where the target being victims of suspicious about her ingratiation motives (Jones, 1990). Another concern emerged, where in low structured situation (referring to case Aura) ingratiation is more effective compared to high structure highly competitive situations (referring to case Mozy). Ingratiation sometime uses as an entrance ticket to fit in to the culture by new comers. Ingratiation goes hand in hand with self-promotion.

In corporate sector there is interdependence among the parties as they are driving through a same organizational goals and objectives. They either engage in interpersonal relationship intentionally or unintentionally by managing their impression in front of others (Bolino, 1999). New comers have always to get to know 'how to do things' through others. So, the frequent interaction needs to be there. Thus, they are highly motivated to ingratiate in order to survive. In this scenario two supportive sub themes emerge from the respondents as communication and physical appearance.(Figure4.1)

3.1.1. Physical appearance

A person's physical appearance and clothing communicates a rich ensemble of codes and signals, whether through fashion, dressing up or disguise (Rideal, 2005). Moreover,in corporate sector female employees consider that physical appearance can be used as a method to maintain their professional and social standards, through which they can impress others easily. Majority of respondents were aware that their physical appearance is one of the first points that the target instinctively recognizes and interprets (Kornberger et al, 2011).

"As teachers we need clean and perfect clothing, because we are the role model for students and they expect it from us." A participant of Fiat

As mentioned, despite of the context a positive and outgoing physical appearance is identified as a significant factor in IM of new comers. Especially among women tailored and formal attire generally expected to be conveyed a higher status than informal casual clothes (Komberger et al, 2011). Despites of having chances majority of individuals highlighted it as a workable IM technique.

3.1.2 Communication

There is a difference between men's and women's communication styles in a workplace. Women's communication style is generally indirect, not louder, narratively focused rather for a private sphere not the public (Cameron, 2004). But according to the individuals' opinions the variations to the general view can be occurred. Specially referring to the case Mozy narrative and direct approaches are not considered to be much effective for dealing in a male dominant culture. Instead they use direct approaches to keep up with the men. But three individuals in case Mozy mention that still they use mixed approach to communicate consisting with both masculine and feminine characteristics. Further elaborating that they use feminine approach to build a rapport and connect with others and masculine approach continue with the work-related conversations (Barrett, 2009). Further an individual narrates that

"There is a clear difference between 'I need to talk and we need to talk', it's us who have to identify the situation clearly and then talk accordingly."

But when it comes to case Mozy a free and frequent interaction using communication is observed. Moreover, four individuals in case Mozy expressed that involving with lunch break conversations, Elevator conversations and verbal compliments have helped them in their early days to being likable and impress others. Further in literature says that the verbal component of a face to face conversation is less than 35% and nonverbal component consists of over 65%. As thus NVC considers as a powerful method in communication and IM. Nonverbal communication is highly supported to make initial judgments like trustworthiness, attractiviness, competence and aggressiveness. Despite of the context where they are in, respondents say that they make impression through silent smiles, pleasant face impressions and body gestures.

3.2 Self-Promotion

Self-Promotion refers to the behavior which individual use to convey their skills, competencies and expertise (Bolino, Long, & Turnley, 2016). It was observed that this behavior can be generally seen among new comers of an organization who eagerly seek for organizational socialization (Figure 4.1). Further it considered as a masculine oriented behavior. In case Mozy majority of interviewees agreed that they do not need to promote themselves narrating that "You do not have to tell everyone what you are capable of. Just do it and assure." It confirmed that unlike of male employees' female employees tend to keep their competencies to themselves until they get a responsibility. The situation is much strict in a male dominant culture where some female experiences have got humiliated by male employees while they are trying to promote themselves among the crowd. In such a situation this behavior may cause to more penalty than benefits for female employees (Bolino, Long, & Turnley, 2016). Whereas the situation is significantly different in female dominant culture, they are free to promote themselves and it was identified that even some employees in case Aura sometimes try to over emphasize their capabilities especially in front of their superiors. There female employees tend to present themselves and attract peers to them in early adaptation. Moreover, through that they expect to get stabilize in the new culture with making an own identity for themselves. Most importantly in case Mozy it was observed that females using humility to mask bragging, through that they thrive to reduce the risk of rejection due to self-promotion. Using humor, they can still promote themselves and be likable among the crowd. There is another side of self-promotion where overemphasizing and unauthentic bragging are related. Some individuals were willingly narrated some stories.

Self-Promotion is accepted to be a process which should carefully implement and situational. In fact, the situational self-promotion was elaborated by another individual. *Everything has its own time;(Hamadetama welawak thiyenawa.)* Further insisted that the self-promoter should have a clear idea about her audience especially about their level of attention and willingness to engage. Moreover, it was found that the occurrence of self-promotion increases

where they have the opportunity to openly impress someone with a higher status about their competence (Rosenfeld, Giacalone, & Riordan, Impression, 1995). Another opinion emerges related to Self-Promotion as one individual impress other by,

"Let others know that you are worth to remain in the organization/ position and to take responsibilities, if you have qualifications, hardly acquired experiences and skills use it as a weapon, you don't have to hide. After all what is so bad about telling what you have?"-A participant of Mozy

Female employees tend to promote themselves especially when the chance of their claims being challenged or discredited is low (Rosenfeld, Giacalone, & Riordan, 1995). Most frequently this can be seen among the new employees as the new comers their opinions, suggestions and comments are generally are not given the priority. In order to earn the respect, they impress others with Self-Promotional tactics. When employees attempt to overemphasize it was observed that there can occurs a paradox, where superiors and peers will identify them as Self-Interested and exists a risk of labeling them as less competent individuals. Thus, majority of individuals were aware that being credible and authentic is compulsorily required. As thus Authenticity and Risk were identified as two emergent themes in this study (Figure 4.1).

3.2.1 Authenticity

A key consideration of individuals was engaging in Self-Promotion while being authentic. A tension between being genuine and desire to appear competent was observed from one individual. Further being genuine and authentic considers as key drivers of an effective Self-Promotion. In case Mozy the females work in relatively an aggressive and fast pacing environment, thus observes that they have to face difficulties in balancing boundaries of authenticity while seeking to be seen as credible and attractive to peers, superiors and clients. There was a contradiction where an individual from case Mozy bring an idea where,
"Females are naturally emotional. Corporate world cannot survive with emotions [. . .]. In this competitive environment if we show our weaknesses to men, they tend to use it against us."- A participant of Mozy
As thus being too much authentic can be seen as "over-sharing". It can be a potential threat for them instead of act as a way of managing impression. In fact, situational unauthentic IM techniques can be seen among female employees especially in a male dominant culture.

3.2.2 Risk

The risk related with Self-Promotion of female employees can be discussed through different aspects. First as scholars call Self-Promoters paradox was observed among the individuals. There is a risk of labeling less competent and Self-Interested when individuals trying to overemphasize their credentials (Berman, Levine, Barasch, & Small, 2014). As a solution of this one individual suggested that a balance should always maintain with being authentic and knowing boundaries of exploring.

Then in Sri Lankan context traditionally women are bound with some moral aspects and values imposed by the culture. As examples being emotional, affectionate, less talkative and wear descent outfits. Where these aspects are broken, they are considered to be "*Too much*" (A participant of Mozy). In this scenario, negative outcomes and feedback are comparatively higher in a male dominant context compared to the female dominant context. All individuals were aware of the risk of being explored. Three individuals from case Mozy commented on the fear of rejection and being judged due to Self-Promotion.

4. Supplication

Supplication is a passive way of managing impression Further it is considered to be a strategy through which individuals, publicize their, shortcomings, in an, effort to, be viewed, as disadvantage (Bolino & Turnley, 2016). Employees engage in supplication to seek support and held of others or to get sympathy from others. Even though supplication considers as a feminine gender role, all but one individual mentioned that supplication is not a powerful strategy for women in corporate sector. Whereas three individuals in case Mozy have experienced their peers using this IM technique specially in their early days at work.

It was observed that females tend to use supplication especially in male dominants context, from which they think a tactical way to get the attention and support of male for their work. By supplication, individuals expect to get the assistance of others through capitalizing the norms of social responsibility, as thus they believe that others should assist them to cover their shortcomings and weaknesses (Berkowitz & Daniel, 1964). There can be many aspects of supplication just beyond a way of IM such as getting extra help or sidestepping from an undesirable job. Moreover, it was observed that through supplication some have a desire to be authentic through supplication than showing off a capability/ skill which they do not really possess. Instead of being "too much" in a male dominant culture they expect to be likable through using the

natural feminine characteristic of gaining sympathy (Parhankanga and Ehrlich, 2014). But an opponent comment came from an individual in case Mozy itself,

"Just because you are a female, what you are lacking of? You don't have to play that 'Aneh' card"- A participant of Mozy

As thus some individuals had hidden the fact of their inability towards given task instead, they have attempted to learn by themselves. Moreover, one third of individuals emphasized that supplication is not a long-lasting way to impress others. When it applies to the case Aura, generally individuals have a neutral view towards the supplication. Majority agreed that being a female in a female dominant culture that they cannot seek others sympathy or a higher level of assistance towards their work, "*after all other coworkers also busy doing their jobs*".

According to figure 4.1 the risk of exposure and rejection is compulsorily followed with supplication. (Refer0) The more women expose their weaknesses the more the potential risk that others use it against them. Instead of being adapt in the new culture there is a risk of getting reject especially in a competitive context. Research has shown that it can lead the supplicants to get lower performance outcomes which are clearly not a good impression to make in the early days of a new job (Harris et al., 2007).

5. Exception from Exemplification and Intimidation

According to Jones ad Pitman model that the way individual manages their impression mainly fall into five categories. Extending above three main themes; Ingratiation, Self-promotion and Supplication there are two other categories as exemplification and intimidation. Individuals use intimidation to deal toughly with others who interfere in their matters, or use forceful behavior towards others to get things done (Jones, 1990). Respondent added that the cost of intimidation may overcome its benefits. The second reason is that being new comers / employees in executive level they do not have a power to intimidate others and considered it is rather a workable IM for people who are in higher positions and not for them. Then exemplification, the person shadows the impression of overly dedicated and committed to his/her job. Individuals attempt to make them appear like ideal employees by working beyond the call of duty (Jones & Pittman, 1982). As thus these themes considered as an irrelevant in this study.

6. Self-efficacy

Self-efficacy is defined as a set of beliefs about one's own capacity to efficiently manage a situation or

specific task (Bandura, 2000). It is significantly contributing to the level of motivation. Especially in IM self-efficacy considers as a major influence for others. Eight individuals out of ten strongly emphasized of being self-efficacy in the early days of a new working place. Positive comments on self-esteem are significantly higher in case Mozy, where has an aggressive and highly competitive environment compared to the case Aura.

"We have to show them that we are strong, even if we are not; there are situations where we have to say 'No' [...] unless we cannot survive in corporate world."

Another finding appears with the comment of that being self-efficacy has helped the respondent not to be tricked by others, as new comers they can easily be the victim of extra works, long work hours, work place jokes etc. as thus from the beginning respondents had tried to give the impression of their self-efficacy to others. Further according to the Figure 4.1 elaborates that the respondents have gained the support of verbal & nonverbal communication and Physical appearance to make that impression (Refer 3.1.1&0) in their early days. Individuals who have high self-esteem are more concerned about enhancing their social self-presentation (Bolino & Turnley, 2016). Others can see it as rather "Too much" thus exists a risk of getting reject from the new culture.

Most interestingly study finds that (Figure 4.1) effect of self-efficacy for managing impression is two sided. Where self-efficacy acts as an IM and its outcomes or the positive feedback from that impression on others can in return act to increase the self-efficacy of females. A participant of Mozy in case Mozy narrated her previous experience in corporate sector where,

"Others have put a bet on me that I will leave within two weeks because I was so young and I had a harsh boss. But I cared of managing my impression and through that easily earned others/ my boss's confidence over me and that experience helped me to be confidence over myself as a young female worker."

Further when it comes to case Aura, the study finds that even though the respondents mentioned about importance of self-efficacy the relative importance of it's in a female dominant culture is considerably law compared to a male dominant culture. But it does not necessarily prove that self-efficacy is totally inefficient in a female dominant context.

7. Assiduity and Erudition

The key emerging theme of this study is assiduity and erudition (Figure 4.1). Even though it is not supported as a theme in IM literature, it is highly emphasized in respondents' comments. Considering the

characteristics of each term and its relatedness and impacts on each other; assiduity and erudition were treated under one theme in the study.

Assiduity refers for the hard work, care and attention to detail (Cambridge, 2018). Moreover, an assiduous person is closely and constantly giving attention to their work tasks. All except one, respondents express that being new employees the most important weapon in managing impression is hard working; most specifically doing perfect and clean jobs.

"Person who works hard get highlighted, what I believe is that being new employees; specially females we can easily raise our voice from hard and perfect work. And again, yes work talks."- A participant of Mozy

The study finds that despite of the organizational context (Male dominant Vs. Female dominant) assiduity is one of the most workable IM techniques. Moreover, a controversial comment appears as hard work itself does not count as a way of impression unless it is shown and promoted in front of others.

Furthermore, the study finds that assiduity is closely related with erudition and erudition itself is being used by three individuals to impress others. Erudite refers as having or containing a lot of knowledge that is known by very few people (Cambridge, 2018). Further most specifically tacit knowledge of the related subject is being used to impress. *"No one can defeat to your tacit knowledge."* Another forward step in erudition is dissemination of tacit knowledge; where individuals willingly share their knowledge with others to impress them. But a controversial raised as erudition caused as a barrier to learning, if the target impress as that the new comer has the knowledge then they won't attempt to teach the new comers what they have learned through experiences; which will be a disadvantage for new employees.

"I presented myself as zero in the first days. Because I wanted to learn what they were knew. Hence, I observed, gathered and possessed tacit knowledge."

Moreover, another aspect of erudition appears related with common knowledge. Where, individuals are able to attract the target by expressing the knowledge and interest towards common themes. It was observed that people who are conscious about trending topics, technological advancements and organizational related topics etc. have a higher possibility to being attracted by others / impress others. As thus despite of the organizational context new female employees is using erudition to impress the target.

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8. Conclusion

Newly hired female employees adapt different approaches to manage impression. The selected IM approach is considered to be effective when the behaviour has the intended influence on the target. As a main finding of this study success or failure of attempts of IM id depend on their fit with the organizational environment and culture. Particular IM approaches likely to be seen as more appropriate in some contacts than in others. As found women in male dominant organizations receive severe punishments for violating behavioral expectations specially based on their gender. Hence women need to clearly aware about balancing the boundaries of exploring and being authentic. This study provides new insight to individual/organizational behaviour.

Acknowledgements

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AN IMPROVED GENERIC ER SCHEMA FOR CONCEPTUAL MODELLING OF INFORMATION SYSTEMS

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Abstract

The Entity Relationship (ER) model is widely used for creating ER schemas for modelling application domains in the field of Information Systems development. However, when an ER schema is transformed to a Relational Database Schema (RDS), some important information on the ER schema may not be represented meaningfully on the RDS. This causes loss of information during the transformation process. Although, several previous researches have proposed solutions to remedy the situation, the problem still exists. Thus, in this on-going research we wish to improve the proposed solutions and maximize information preservation in the ER to relational transformation process. Cardinality ratio constraints, role names, composite attributes, and certain relationship types are among the information frequently lost in the transformation process. Deficiencies in the ER model and the transformation method seems causing this situation. We take the view that if the information lost is resolved; a one-to-one mapping should exist from the ER schema to its RDS. We modified the ER model and the transformation algorithm following a heuristic research method with a view to eliminating the deficiencies and thereby achieving a one-to-one mapping. We should show that the mapping exists for any real world application.

We create a generic ER schema - an ER schema that represents any phenomena in symbolic form - and use it to show that a one-to-one mapping exists for any real world application. In this paper, we explore our generic ER schema and its advantages over its predecessors in view of representing any real world application.

Keywords: Conceptual model, Database, ER model, Generic ER schema, Information System, Relational database schema

1. Introduction

When an Information Systems development work is undertaken a conceptual model is drawn in the form of an ER schema using the ER model[1, 2]to represent user requirements of the application domain concerned. An ER schema is a graphical diagram and represents phenomena in the real world, such a sentities, relationships, and attributes via graphical constructs, for instance, rectangles, diamonds, and ovals, etc. The constructs that are modelled on an ER schema are usually named by the corresponding real-world names (e.g., Employee, Designation, and Location, as in Figure 1) occurring in the application domain to which the ER schema is drawn.
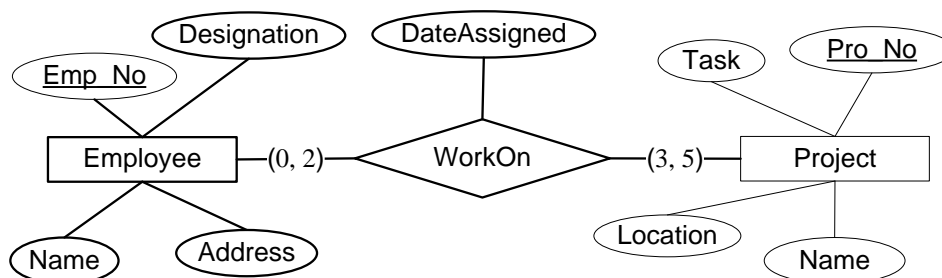

Figure 1: An ER schema that represents a real-world application domain

The ER notation using real-world names shown in Figure 1 (adapted from Elmasri & Navathe[3]) is known to be popular, natural, and understandable. Many other authors [4-6]often use the same or a similar version of it for ER schema modeling.

Even though the ER notations using real-world names are popular for representing real-world situations, they also pose limitations when they are used for automation of the ER to relational model[7, 8]transformation process. After an ER schema is created it is then transformed to the relational database schema (RDS). However, an information loss is occurred during this transformation process [9-11]. This information loss is difficult to understand and resolve unambiguously using real-world ER schemas. The information loss identified and the solution provided with regard to an ER schema representing one application domain (e.g. Company scenario, Figure 1) may not be relevant with regard to another ER schema representing a different application domain (e.g., Library database). Therefore, an ER schema expressed in a formal notation and that can represent any application domain, in general, is necessary for addressing the information loss. In other words, an ER schema independent of any real-world application domain is required.

Several researchers have proposed some generic ER schemas to address similar issues (e.g., [12], [13]). The proposed generic ER schemas never use real-world names, but instead alphanumeric symbols for naming their constructs. Nevertheless, proposed generic ER schemas also commit limitations. In the current study, we explore a generic ER schema that we have undertaken to develop for use in our main research.

Accordingly, in section 2, we discuss the generic ER schemas proposed by two researchers and the limitations of them. Section 3 presents the preliminaries of our method for developing a generic ER schema. Section 4 describes how relationship types and attributes are represented in the generic ER schema. Section 5 deals with how the structural constraints that are associated with relationship types can be represented. Finally, Section 6 presents the conclusion and future research that we plan to undertake using our generic ER schema that we will unfold.

2. Generic ER schemas proposed by some researchers

Storey [12]proposed a model for a generic ER schema, as follows:

"... Let $E = \{E_i\}$ be the set of all entity types and $A = \{A_{ij}\}$ the set of all attributes where A_{ij} is the jth attribute of the ith entity type." (p. 4)

This model specifies how several regular entity types and attributes attached to them can be represented. However, the author has not given any formal way of representing Primary Key(PK) attributes and relationship types in her work.

Atzeni, et al [13] shown that their proposed generic ER schema as given in Figure 2. This schema does not indicate how several relationship types can be represented between entity types and how they can be named, uniquely and consistently. For example, assume that a second relationship type exists between E_0 and E_1 and is named as R_2. Further, assume that another third relationship type exists between either E_0 and E_1 or E_0 and another entity type E_2. Then, it is not clear how this third relationship type can be named.

The ER schema indicates PK attributes and non-PK simple attributes using two separate visual constructs. For instance, A_{01} of E_0, and A_{11} of E_1 are closed circles and they indicate PK attributes of the respective entity types. The remaining simple attributes are represented as open circles. A PK given in a visual notation may not be able to understand if it is mentioned outside the ER schema. When the PK attributes are listed as: A_{01}, A_{11} the visual method is absent. However, still, they could sometimes be identified as PKs because of their second prefix being 1, always. If this is the case, it indicates a method redundancy. On the other hand, the numbers appear to have been assigned with multiple tasks: one is counting, and the other one is representing a semantic meaning - being a PK.

Further, the schema has not provided a method for representing attributes attached to relationship type
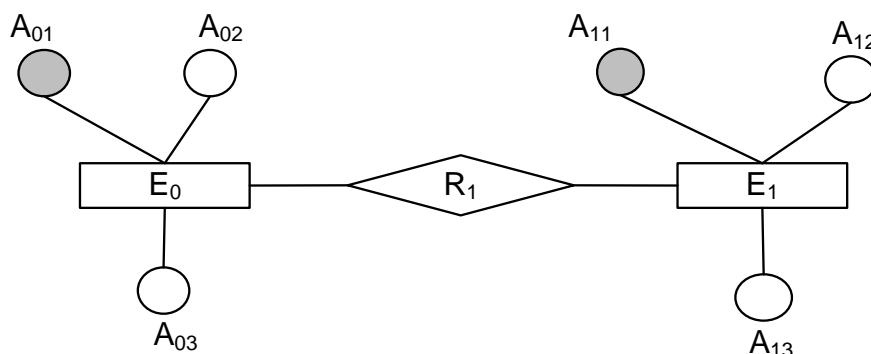
Figure 2: A generic ER schema that represents real-world phenomena in alphanumeric (symbolic) form
Source: Adapted from Atzeni, Ceri, Paraboschi, & Torlone [13]

In the current research, we propose a method for developing a generic ER schema that can overcome the above-mentioned issues.

3. Prefaces of a method for developing a Generic ER schema

In our proposed model, the letter "e" represents a regular entity type. Accordingly, e_i represents the ith regular entity type, where $i \in \mathbb{N}$ – Natural number set, i.e., $\mathbb{N} \equiv \{1, 2, 3 \dots\}$. Consider an entity type and an attribute belonging to it. An attribute belonging to its entity type is an association that exists between the attribute and its entity type. Therefore, we consider the attribute as a mapping s from the entity type. Then the simple attribute of the entity type e_i can be denoted as $s(e_i)$. In general, we denote the mapping as $s_j(e_i)$ such that s_j represents the jth simple attribute of the ith entity type, where $i, j \in \mathbb{N}$. Accordingly, the simple attributes of e_1 can be denoted as $s_1(e_1), s_2(e_1), s_3(e_1), \dots, s_n(e_1)$. Here, s_1, s_2, s_3, $\dots s_n$ are separate mappings. Each separate mapping s_i, is defined from the common set $\{e_1, e_2, e_3, \dots, e_n\}$ of all the regular entity types of the ER schema to the common set $\{ s_1(e_1), s_2(e_1), \dots, s_1(e_2), s_2(e_2), \dots, s_1(e_3), s_2(e_3), \dots, s_1(e_n), s_2(e_n)\}$ of all the simple attributes of it.

For example, consider the Employee entity type, and its simple attributes, Name, Address, and Designation, as given in Figure 1. According to our mapping the attributes are stated as s_1 (Employee) = Name, s_2 (Employee) = Address, and s_3 (Employee) = Designation.

In this research, we limit the PK to be a single attribute and not a composite attribute. We define a rule for setting the name of an entity type's PK attribute. The PK attribute's name should be related to the entity type's name. Accordingly, the PK name should be the name of the entity type or its first three letters or its first three letters with any identifiable string of the entity name concatenated with the underscore and any other suitable identifiable string. For example, the PK's name of the entity type Employee (Figure 1) can be set as either Employee_No or Emp_No or Empye_No, etc. In conclusion, whatever a name is chosen for a PK it should be related to the name of the entity type to which it belongs to and unique to the entire ER schema.

Consequently, we consider the PK of an entity type to be a mapping of it. Let this mapping to be k, and declare the PK of the entity type e_i as $k(e_i)$. For instance, if assume that the PK of the entity type Employee (Figure 1) is to be Emp_No. Then, k (Employee) = Emp_No. Figure 3, below, shows a generic ER schema that follows the rules described above. The schema contains a single regular entity type, e_i, and a set of n ($n \in \mathbb{N}$) number of simple attributes.
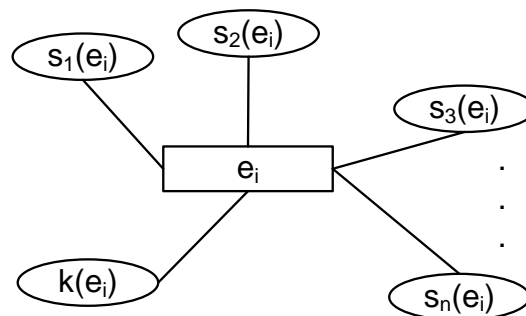
Figure 3: A generic ER schema created under the current research

4. Representation of relationship types and attributes attached to them

This section describes a method for representing binary relationship types existing between regular entity types and attributes attached to them. Let r be a binary relationship type that exists between two regular entity types: e_i and e_t. We denote this relationship type as $r(e_i.e_t)$. If more relationship types exist between e_i and e_t, they can be denoted as $r_v(e_i.e_t)$, where $v \in \mathbb{N}$. Accordingly, several relationship types, if they exist, between e_i and e_t can be represented as $r_1(e_i.e_t), r_2(e_i.e_t), \ldots$, and so on. An attribute attached to the relationship type, $r_v(e_i.e_t)$ can be denoted as $s_u(r_v(e_i.e_t))$, where $u, v, i, t \in \mathbb{N}$.

For example, a binary relationship type that exists between the entity types, e_1 and e_2 can be denoted as $r_1(e_1.e_2)$ while an attribute attached to the relationship type, $r_1(e_1.e_2)$ can be denoted as $s_1(r_1(e_1.e_2))$. A second attribute, if exists to the relationship type can be denoted as $s_2(r_1(e_1.e_2))$. The following Figure 4 shows these developments.
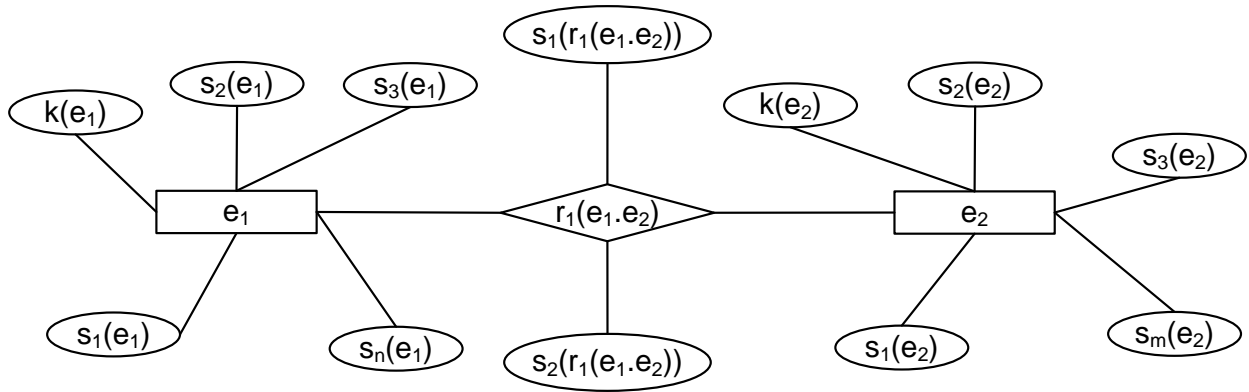
Figure 4: How a relationship type that exists between two regular entity types can be represented together with its attributes attached, in the proposed generic ER schema

5. Representation of structural constraints

The ER schema (Figure 1) shows structural constraints, such as (0, 2) and (3, 5) indicated at both sides of the relationship type, Works On.

Accordingly, two pairs of $(min, \max)$ structural constraints[3] often exist at both sides of the relationship type $r_1(e_1.e_2)$ in the ER schema, Figure 4. One of the two pairs exists at the side e_1 of the relationship type $r_1(e_1.e_2)$, while the other pair exists at the side e_2 of it. We denote the side of e_1 of the relationship type $r_1(e_1.e_2)$ as $e_1.r_1(e_1.e_2)$, uniquely and consistently. Similarly, the entity type e_2's side can be denoted as $e_2.r_1(e_1.e_2)$. Consequently, the structural constraint either min or max of each side can be defined as a mapping of that side. Let the min constraint be denoted by the letter m. Then the min constraint that exists at the $e_1.r_1(e_1.e_2)$ side of the relationship type can be defined as $m(e_1.r_1(e_1.e_2))$. Similarly, given that max constraint is denoted as x, then the max constraint at the same side can be denoted as $x(e_1.r_1(e_1.e_2))$. In the same way the $min - max$ constraints that exist at $e_2.r_1(e_1.e_2)$ side can be denoted as $m(e_2.r_1(e_1.e_2))$ and $x(e_2.r_1(e_1.e_2))$. The Figure 5 shows how the se structural constraints can be represented on the ER schema.
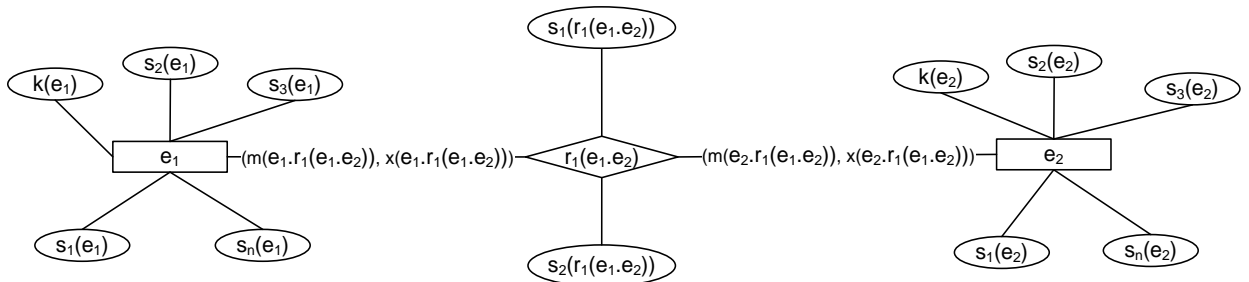
Figure 5: Representation of structural constraints in a proposed generic ER schema

6. Conclusion and future work

The generic ER schema proposed above has the ability to overcome most of the limitations appearing to exist in its predecessor ones. The proposed generic schema can represent regular entity types, relationship types and attributes attached to them, and structural constraints, uniquely and consistently. The uniqueness and consistency of them are retained even if they are represented only by their symbolic labels and outside the ER schema. For instance, consider the list of labels obtained from the ER schema in Figure 5, as follows: e_2, $r_1(e_1.e_2)$, $s_2(e_2)$, $x(e_2.r_1(e_1.e_2))$, $k(e_1)$, $s_2(r_1(e_1.e_2))$. We believe that a person with a clear understanding of the logic (sections: 3, 4, and 5) used to create the generic ER schema should be able to identify and determine the labels' corresponding ER constructs, uniquely and consistently.

In future research, we will focus on how our generic ER schema can be transformed to an RDS. Subsequently, we will obtain a one-to-one mapping from the generic ER schema to the RDS. We will show that the information is retained and its loss is resolved and the proposed approach is valid for any real-world application domain.

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COMPARISON OF THE PERFORMANCES OF THE METHOD FOR COMPARING SEVERAL CORRELATED ROC CURVES TOGETHER WITH DIFFERENT ESTIMATION METHODS OF THE VARIANCE COVARIANCE MATRIX FOR ROC CURVES

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ABSTRACT –

ROC curve is identified as a graphical plot which illustrates the behavior of the sensitivity against the 1- specificity of a binary classification with it's threshold value is changed. It shows the performance of a binary classifier system. Further it is used as an effective approach of evaluating the performance of diagnostic tests in Medicine. The most important measurement of the ROC curve is the AUC value which is the area under the ROC curve. Diagnostic tests can be of two types such that the independent case and the paired or correlated case. This research aims to develop and compare a parametric approach for comparing more than two correlated ROC curves at the same time with different estimation methods of variance covariance matrix. Here the method developed for comparing several independent ROC curves by Sooriyarachchi and Senaratna (2015) is extended for comparing several correlated ROC curves. The major issue was that research was estimating the variance covariance matrix for several correlated ROC curves. Here two approaches; Obuchowski, Delong which are given under the cov() function in pROC library in R, are applied to estimate the variance covariance matrix of several correlated ROC curves and the performances of the extended test for each estimation are compared through a simulation study. In the end of the study, it concludes that although both the approaches behave similarly, the Obushowski's approach is much preferable for estimating.

Keywords: ROC, AUC, Correlated

1. Introduction

A Receiver Operating Characteristic curve is a graphical representation of the True Positive Rate versus the False Positive Rate of a binary classification. The AUC value is the most important measurement when considering a ROC curve which is the area under the ROC curve.

If the observations of two or more ROC curves are obtained through different regions, their ROC curves are independent. These ROC curves are defined as independent ROC curves. For an example, consider five medical diagnostic tests have been done for five different groups of patients. ROC curves which are obtained through those different groups are independent.

If the observations of ROC curves are obtained though the same region, their ROC curves are correlated. These ROC curves are defined as correlated ROC curves. For an example, in the above medical tests have been done for the same group of patients. ROC curves which are obtained through this group are correlated.

The literature shows several researches have been done for comparing two AUC values of independent and correlated ROC curves. There have been several methods developed to compare several independent ROC curves as well [2]. A very few researches have been done for comparing more than two AUC values of correlated ROC curves.

Sooriyarachchi, Meyen and Senaratna[5] have published a paper on this theme for comparing two AUC's of correlated ROC curves. However, they couldn't extended that for comparing several correlated ROC curves together, since there is no proper way to get the variance-covariance matrix of several AUC's taken.

The pROC package in R gives a function cov() and that gives three methods for obtaining covariance matrices for more than 2 AUCs of ROC curves. One is the Delong et al. [2]. Another method is also a non-parametric approach based on Bootstrap method. The third method available in R is the parametric method of Obuchowski and McClish [1]. The main objective is to use the Obuchowski's approach [1] and Delong's approach [2] for estimating the variance covariance matrix in the test developed by Senaratna and Sooriyarachchi [3] and discussing the performances of these approaches. Then the independent test can be extended for more than two AUC values of correlated ROC curves.

2. Test of Senaratna & Sooriyarachchi for several independent ROC curves

This test has been developed for any number of independent ROC curves by Sooriyarachchi & Senaratna [3].The test is explained below.

Let the AUC values of the ROC curves be,

$$\underline{AUC} = \begin{pmatrix} AUC_1 \\ AUC_2 \\ \vdots \\ AUC_p \end{pmatrix}$$

Consider the hypothesis test,

H_0 : All $\underline{AUC}$'s are same on average.
H_1 : At least one AUC_i is different where,
$i = 1,2,3,\ldots,$p

Alternatively this can be expressed as follows.

$H_0 : \underline{\mu} = \underline{K}$ Where $\underline{K}$ is a Constant vector.

$$H_1: \underline{\mu} \neq \underline{K}$$

Consider the Hotelling's T^2 statistic, T_G^2,

$$T_G^2 = (\overline{\underline{AUC}} - \overline{K})'\hat{\Sigma}^{-1}(\overline{\underline{AUC}} - \overline{K})$$

Notice that here $\overline{K} = \frac{\sum_{i=1}^p \overline{AUC}_i}{p}$ where p is the number of AUC values which are going to be compared and Σ is the variance covariance matrix for independent ROC curves. They have shown that the p has to be reduced by 1 for estimating $\underline{K}$. Therefore taking $q = p - 1$ instead of p, for large samples it can be shown that,

$$T_G^2 \frac{n}{(n-1)^2} \sim Beta\left(\frac{q}{2}, \frac{n-q-1}{2}\right)$$

Consider that here p is the number of AUC's and n is the number of independent quantities which have been used to calculate the AUC's. Here the AUC values of different ROC curves have been developed for the p different sets of individuals. Thus for the independent case Σ is a diagonal matrix with covariance terms equal to zero.

3. Methodology of the study

The variance covariance matrix can be obtained through the Obushowski's approach [1], Delong's approach [2] and Bootstrapping approach. Here the first two approaches are applied and compared the performances. For an example suppose a variance covariance matrix is needed for comparing 3 AUC values of 3 correlated ROC curves (Let $\hat{\theta}_1, \hat{\theta}_2, \hat{\theta}_3$).

Then that matrix can be obtained as,

$$\begin{bmatrix} v(\hat{\theta}_1) & cov(\hat{\theta}_1, \hat{\theta}_2) & cov(\hat{\theta}_1, \hat{\theta}_3) \\ cov(\hat{\theta}_1, \hat{\theta}_2) & v(\hat{\theta}_2) & cov(\hat{\theta}_2, \hat{\theta}_3) \\ cov(\hat{\theta}_1, \hat{\theta}_3) & cov(\hat{\theta}_2, \hat{\theta}_3) & v(\hat{\theta}_3) \end{bmatrix}$$

Consider that in the Obuchowski's method [1] for obtaining the covariance between two correlated ROC curves, makes the assumption that the data is binormal. So, the continuous predictor variables should be following the normal distribution in order to apply the Obuchowski's approach [1]. If the data is not following the normal distribution, first step is the normalization of the data.

Here the main approach is to do a simulation study and evaluate the Type I errors and Power values of the test for discussing the performances of each approach.

4. Simulation study

Here a simple method has been developed by Kang and Jung [4] is modified for generating binary response variable related to three continuous explanatory variables giving paired ROC curves.

Using the main function roc () which was given in the pROC library in R, three ROC objects are generated separately. These three ROC objects are generated for the three models which are fitted between,

- Binary categorical variable and X_1
- Binary categorical variable and X_2
- Binary categorical variable and X_3

Through the three ROC objects obtained, AUC values are calculated. Then the vector of AUC values is obtained.

Under the simulations for evaluating the Type I errors, 3 cases were considered for generating data as mentioned follows,

- Case 01 - The mean vector is changed.
- Case 02 - The variances are changed.
- Case 03 - The covariance's are changed.

Under each case, for each sample size the Type I errors are calculated and checked whether the values are lying within the probability interval [0.036, 0.064].

Under the simulations for evaluating the Power values, 2 cases were considered for generating data as mentioned follows,

- Case 01 – All the AUC's are mutually different.
- Case 02 – Only one AUC is different from the other two.

5. Results

Firstly, the results of the simulations have been done for evaluating the Type I errors are discussed for both approaches. Here the results for Case 1, Case 2 and Case 3 are mentioned as follows, for both approaches.

Let's consider the Case 1. Here the variance covariance matrix is constant for generating data and the variance and the covariance are 0.25 and 0.1 respectively. Here the red colour points are lying outside the probability interval, which is not good.

Table 1 - Type I errors for Case1 (Obuchowski's approach)

Sample Sizes	Mean Changes			
	1	1.25	1.5	1.75
50	0.181	0.098	0.097	0.127
100	0.072	0.072	0.066	0.059
250	0.058	0.052	0.058	0.057
500	0.05	0.058	0.046	0.064
750	0.055	0.054	0.05	0.052
1000	0.058	0.058	0.052	0.047
2500	0.043	0.053	0.034	0.042
5000	0.043	0.042	0.05	0.043
10000	0.052	0.045	0.053	0.04
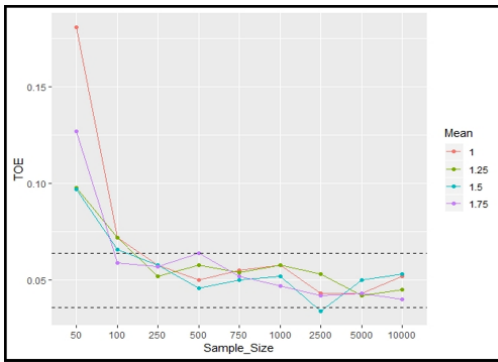
Figure 2 - Type I errors for Case1 (Obuchowski's approach)

Table 2 - Type I errors for Case1 (Delong's approach)

Sample Sizes	Mean Changes			
	1	1.25	1.5	1.75
50	0.165	0.09	0.068	0.141
100	0.089	0.072	0.068	0.077
250	0.053	0.069	0.056	0.066
500	0.052	0.061	0.058	0.05
750	0.054	0.051	0.043	0.051
1000	0.048	0.033	0.052	0.047
2500	0.041	0.045	0.043	0.036
5000	0.063	0.04	0.046	0.058
10000	0.044	0.04	0.04	0.048
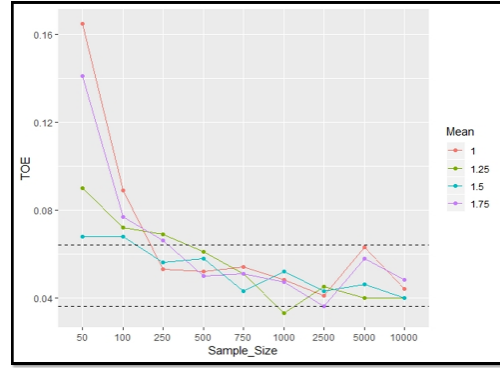
Figure 2 - Type I errors for Case1 (Delong's approach)

In both approaches the Type I errors are starting to behave within the probability interval when the sample size is increased. But in the Delong's approach [2] more points are in the outside of the probability interval than the Obushowski's approach [1].

Now let's consider the Case 2. Here the mean and the covariance values are constant while the variance is varied. The mean and the covariance value are 1.5 and 0.1 respectively.

Table 3 - Type I errors for Case2 (Obuchowski's approach)

Sample Sizes	Variance Changes			
	0.2	0.4	0.6	1
50	0.089	0.089	0.095	0.048
100	0.061	0.056	0.041	0.045
250	0.061	0.058	0.052	0.047
500	0.04	0.057	0.04	0.038
750	0.042	0.045	0.053	0.036
1000	0.052	0.042	0.039	0.04
2500	0.064	0.037	0.044	0.046
5000	0.045	0.033	0.037	0.034
10000	0.046	0.052	0.037	0.037
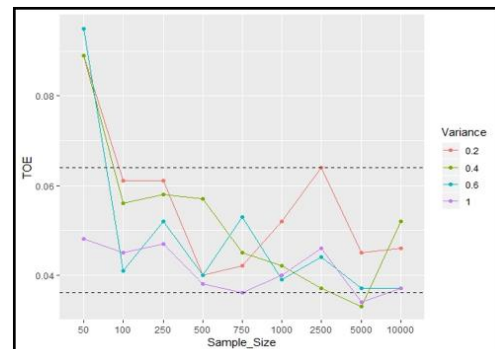
Figure 3 - Type I errors for Case2 (Obuchowski's approach)

Table 4 - Type I errors for Case2 (Delong's approach)

Sample Sizes	Variance Changes			
	0.2	0.4	0.6	1
50	0.091	0.076	0.078	0.091
100	0.078	0.063	0.066	0.06
250	0.049	0.057	0.05	0.048
500	0.051	0.049	0.052	0.039
750	0.068	0.041	0.048	0.037
1000	0.051	0.039	0.042	0.042
2500	0.057	0.045	0.042	0.042
5000	0.036	0.033	0.04	0.045
10000	0.041	0.051	0.048	0.039
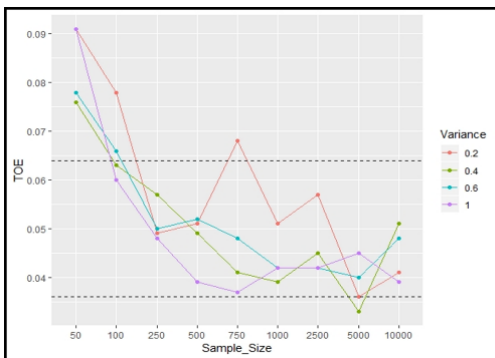
Figure 4 - Type I errors for Case2 (Delong's approach)

Here also, in both approaches the test is better when the sample size increases. In the Delong's approach [2] more points are in the outside of the probability interval than the Obushowski's approach [1].

Now let's consider the Case 3. Here the mean and the variance values are constant while the covariance is varied. The mean and the covariance value are 1.5 and 0.25 respectively.

Table 5 - Type I errors for Case3 (Obuchowski's approach)

| Sample Sizes	Co- Variance Changes			
	0.05	0.1	0.15	0.2
50	0.102	0.092	0.088	0.109
100	0.073	0.061	0.072	0.055
250	0.052	0.048	0.063	0.072
500	0.053	0.036	0.063	0.062
750	0.05	0.056	0.055	0.056
1000	0.037	0.062	0.054	0.049
2500	0.042	0.039	0.054	0.051
5000	0.053	0.052	0.04	0.049
10000	0.049	0.061	0.047	0.053
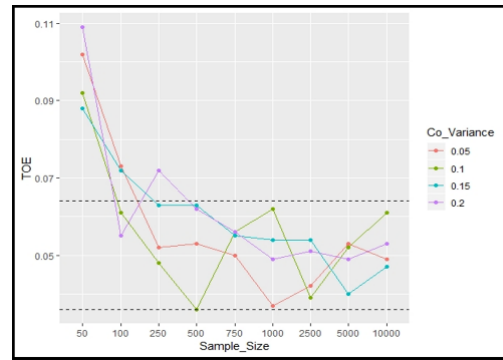
Figure 5 - Type I errors for Case3 (Obuchowski's approach)

Table 6 - Type I errors for Case3 (Delong's approach)

Sample Sizes	Co- Variance Changes			
	0.05	0.1	0.15	0.2
50	0.099	0.092	0.095	0.091
100	0.056	0.047	0.055	0.064
250	0.052	0.042	0.052	0.047
500	0.05	0.049	0.053	0.053
750	0.052	0.051	0.047	0.043
1000	0.04	0.056	0.056	0.039
2500	0.045	0.048	0.054	0.053
5000	0.038	0.04	0.051	0.059
10000	0.038	0.054	0.04	0.051
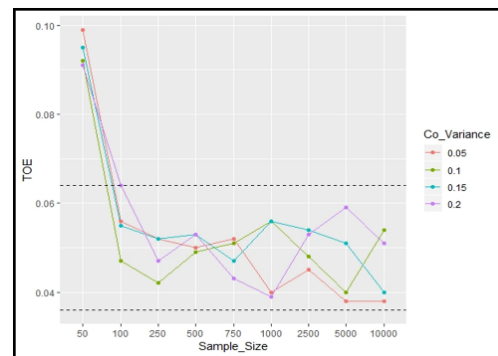
Figure 6 - Type I errors for Case3 (Delong's approach)

Here also, in both approaches the test is better when the sample size increases. In the Obuchowski's approach [1] more points are in the outside of the probability interval than the Delong's approach [2].

Now, the results of the simulations have been done for evaluating the Power I errors are discussed for both approaches. Here the results for Case 1 and Case 2 are mentioned as follows, for both approaches.

Let's consider the Case 1. Here the means, variances and covariance's are defined as follows,

Table 7 – Means, Variances & Covariances for Case 1

Mean		Variance		Co-Variance	
X1	1	X1	0.25	X1,X2	0.2
X2	2	X2	0.36	X1,X3	0.2
X3	2	X3	0.36	X2,X3	0.1

Let's consider the results,

Table 8 – Power values of Obuchowski's and Delong's approaches, left to right respectively for Case 1

Sample Size	Power		Sample Size	Power
50	0.202		50	0.178
100	0.291		100	0.266
250	0.602		250	0.574
500	0.939		500	0.9
750	0.99		750	0.975
1000	0.998		1000	0.999
2500	1		2500	1
5000	1		5000	1
10000	1		10000	1
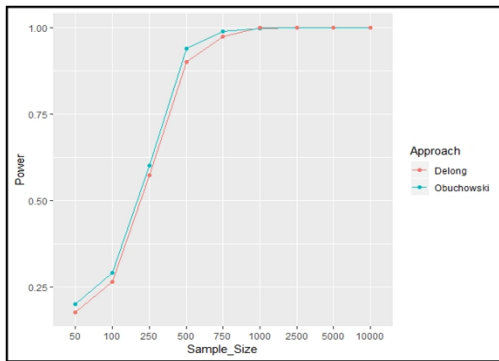
Figure 7 – Power values for Case 1

In Case 1, the Power values are increased with the sample size increases. Power values for the Obuchowski's approach [1] are always slightly larger than the Power values for the Delong's approach [2].

Let's consider the Case 2. Here the means, variances and covariance's are defined as follows,

Table 9 – Means, Variances & Covariances for Case 2

Mean		Variance		Co-Variance	
X1	1	X1	0.25	X1,X2	0.1
X2	2	X2	0.36	X1,X3	0.2
X3	3	X3	0.49	X2,X3	0.3

Let's consider the results,

Table 10 – Power values of Obuchowski's and Delong's approaches, left to right respectively for Case 2

Sample Size	Power		Sample Size	Power
50	0.172		50	0.084
100	0.244		100	0.273
250	0.484		250	0.48
500	0.794		500	0.808
750	0.936		750	0.954
1000	0.987		1000	0.988
2500	1		2500	1
5000	1		5000	1
10000	1		10000	1
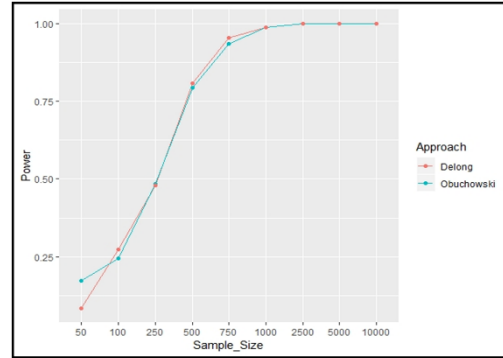
Figure 8 – Power values for Case 2

In Case 2 also, the Power values are increased with the sample size increases. Power values for the Obuchowski's approach [1] are always approximately similar to the Power values for the Delong's approach [2].

6. Conclusion

The main objective was to use the Obuchowski's [1] and Delong's [2] methods for estimating the variance co-variance matrix in the test developed by Senaratna and Sooriyarachchi [3] for comparing more than two AUC values of independent ROC curves. Then extending that test for comparing several AUC values of correlated ROC curves together. Obuchowski's approach [1] has to be considered under the bi-normal assumption. The simulation study was done for evaluating the behaviour of the Type I errors and Power values of both approaches. Generally, more points behave outside of the probability interval when the Delong's approach [2] is used than the Obuchowski's approach [1] & in all cases the Type I error behaves within the probability interval for both approaches when the sample size increases. When the sample size increases the Power values go to 1 in both approaches. But in the Case 1, Power values under the Obuchowski's approach [1] are slightly larger than under the Delong's [2] approach for all the sample sizes. As mentioned in earlier the Obuchowski's approach [1] is a parametric method. Literature has also shown few problems of estimating using the Delong's approach [2]. So as a final conclusion, the Obuchowski's approach [1] is much better method for estimating the variance co-variance matrix when comparing with the Delong's approach [2]

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THE CONTRIBUTION OF RABINDRANATH TAGORE IN SRI LANKAN DANCE TRADITION

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Abstract

Gurudev Rabindranath Tagore is the father of Asian Literature. He was the first Asian person who awarded the Nobel Prize in 1913 for his commendable poem "Geetanjalee". He showed his multifaceted talent not only the poetry but also in different branches of art, such as novels, short stories, articles, essays, dramas, dancing, music and paintings etc. Among his overseas travels, he had visited Sri Lanka three times in 1922, 1928 and 1934. During his last visit on May 1934 was the most significant visit by the invitation of Wilmot A.Perera and that made remarkable changes in Sri Lankan arts and culture. While his visit he carried a group of artists to perform in Sri Lanka to collect funds to his University of Shantiniketan. However, he presented many speeches and interviews in various cities on the island. While this visit Rabindranath Tagore laid the foundation for the new institution called "Sripalee" at Horana city which is to provide several courses for performing arts, fine arts and visual arts. In fact, this was based on the Rabindra Nath Tagore's concept of education and culture. Through this visit, some renowned dance artists in Sri Lanka obtain scholarships to study performing arts in various universities in India. In this aesthetic connection, Tagore truly believed in the mutually interactive relationship between the two cultures and often showed his regard for the glorious history and cultural traditions of India and Sri Lanka.

Sri Lankan art has been influenced by Rabindranath Tagore's tradition. By the impact of Tagore's vision Sri Lankan dance tradition was developed in numerous ways. The concept of Dance drama was introduced for the first time in Sri Lanka by Rabindranath Tagore. However, the visit of Rabindranath Tagore made significant destiny to Sri Lankan arts and his principles and thoughts still give great importance to Sri Lankan dance tradition and Sri Lankans ever grateful to great poet Rabindranath Tagore and his precious Contribution to developing Sri Lankan dance tradition with worldwide popularity.

Keywords- Rabindranath Tagore, Dance drama, Sripalee, Geetanjali, Shantiniketan

Introduction

This research study basically deals the development and new activities in Sri Lankan dance tradition through Gurudev Rabindranath Tagore's vision of art. He was the first Asian person who awarded the Nobel Prize in 1913 for his commendable poem "Geetanjalee". Besides poems, stories and short stories he composed a number of dance dramas and some of them popular till today. His own Rabindra Sangeet is also one of his excellent discoveries for the arts. In 1901 he established "Shantiniketan" a college of arts in the pattern of old Indian ashrama and later it became "Vishva Bharati Vishvavidyalaya" a university for visual and performing arts. As a great philosopher, he distributed his precious knowledge to the world by visiting many countries. Among his overseas travels, he had visited Sri Lanka three times in 1922, 1928 and 1934. Sri Lankan dance tradition had face dominant experience, by the arrival of Rabindra Nath Tagore, for the first time in the year 1922. His visit gave a great opportunity for Sri Lankan performers, artists and all art lovers. He has been patronized with Sinhalese dance introducing various concepts that helped to develop Sri Lankan dance, music and arts. His contribution also made to open new paths for Sri Lankan dance tradition. Once he appreciated Sri Lankan Kandyan dancers and has written a special poem about Kandyan dancers who performed in Sri Lankan traditional Perahera (procession). His last visit on May 1934 was a most significant visit by the invitation of Wilmot A. Perera and that visit was made remarkable changes in Sri Lankan arts and culture. While his visit he carried a group of 23 students including famous artists Smt. Pratima Tagore, Smt. Mira Devi and Sri. Nandalal Bose from his Shantiniketan to perform in Sri Lanka and for collect funds to his University. However, he presented many speeches and interviews in various cities on the island. Once he talks on Vishva-Bharati (Shantiniketan) under the titled "Ideals of an Indian University", and it was broadcasted over Radio Ceylon. His speeches always keep valuable thoughts. While his visit Tagore's famous dance drama called "Shapmochan" was performed at Regal Theater Colombo on 12th May 1934 and that was appreciated by one and all. Some great scholars, artists and dance lovers in Sri

Lanka have made several commentaries on his performance.

At the same period in 8th May 1934, Rabindranath Tagore had laid the foundation stone of "Sripalee" which is the Institute for learning dance, music and arts, at Horana by inviting Wilmot A. Perera who is the founder of Sripalee. This institute provides several courses for performing arts, fine arts and visual arts. At Sripalee institute, beginners can learn Sri Lankan traditional dance, music and craft as well as Indian classical dance, Rabindra Sangeet and visual arts by accomplished teachers like Shanti Deva Ghosh, Kiran De, Vidyadhar Vasalwar, jayanthilal Parak, Chimon Seth and Ananda Shivaraman. Among them Shanti Dev Ghosh is the one who produced first Dance drama in Sri Lanka called "Sitaharana" performed by the students of Sripalee institute and this production was also associated by several artists such as Kirande (who came from Shantiniketan), Vidhyadar Wazalwar (from Lucknow Bhatkhande Vidyapith) and Ananada Shivaram (from Kerala Kalamandalam). Later, in between 1936-1938, he produced three other dance dramas with the association of the students of Sripalee, such as, Urvasijayam, Manoharabandhanam and Chadanntadayam which were famous in Sri Lanka and many Sri Lankan dancers and musicians sprang up from these Dance dramas.

Methodology

This is qualitative research which observed data from important discussions, interlocution and studies from great scholars and experts. Data also collected by referring books, journals and magazines related to this study. Here I also analyse all details with comparing the ancient history of dance tradition and the creative dance tradition begins in the 20th century.

Results and Discussions

As a result of Rabindra Nath Tagore's visit, Sri Lankan dance, music and the entire arts had come forward with new artistic concepts. After few years of Rabindra Nath Tagore's visit several eminent scholars like Tara Chaudri, Uday Shankar, Devendra Shankar, Gopinath, Ragini Devi, and Menaka had come to perform in Sri Lanka and their compositions encouraged the development of Sri Lankan artistic thoughts. Furthermore, Sripalee Institute was the main gateway to enter the new creative dance world. The concept of performing arts in Sri Lanka also developed through the vision of Rabindra Nath Tagore.

Here I mentioned several areas which were influenced by the arrival of the great poet Rabindra Nath Tagore to Sri Lanka such as:

- ❖ Sri Lankan traditional dances became open to the world.

- ❖ Many artists who were interested in learning dance and music went to India and admitted to several Indian universities and institutes for their higher study in performing arts, among them Lionel Edirisinghe, Surya Shankar Molligoda, Devar Suriyasena, Edwin Samaradiwakara, W.A.Makuloluva, Dharmasena, Ganganatha, Panibharata, Chitrasena, Vasanta Kumara, Shanti Kumara Disanayaka, Prema Kumara Epitavela, Sheshapalihakkara were famous dancers and musicians who brought many Indian traditions to Sri Lanka.

- ❖ Sinhalese dance tradition became open to stage performance and various new concepts created in accordance with the theatre as dance items, costumes, instrumentation and decorations.

- ❖ By the introduction of Rabindra Nath Tagore's productions of "Dance drama", the Sri Lankan artists also produced Sri Lankan Dance drama called "Sitaharana" for the first time in the dance history. In early 1940-1950, many aesthetic compositions in Sri Lanka based on Indian stories, incidents or rituals. Some popular dance dramas as Rama and Seetha, Nala Damayanti, Chandalika, Ravana and Shiva ranga were based on famous Indian stories. But, the late 1950s the theme of dance dramas have been transformed into local historical stories.

- ❖ Furthermore, dancers who learnt from India produced many dance dramas in accordance with Sinhalese tradition and most of them were performed in association with the Kandyan dance form. First time in Sri Lanka, a dance drama festival was performed in 1948 for the Independence ceremony.

- ❖ First time in Sri Lanka a dance drama festival was performed in 1948 for the Independence ceremony and numerous Dance drama productions were performed in all over the Island by prominent scholars since 1948 onwards

- ❖ Indian famous dance forms like Kathakali, Bharata Natyam and Manipuri had their

- ❖ influence on this new dance drama tradition directly or indirectly.

- ❖ Most eminent dance teachers became famous.

- ❖ Both ladies and gents from high caste families started to learn dance and music.

- ❖ Dance dramas with Sinhala themes or Buddhist themes originated by the influence of Indian dance dramas.

All these references manifest that the arrival of Rabindra Nath Tagore gave considerable opportunity for the development of Sri Lankan Sinhalese dance with modern sophisticated and fascinating view since the early 20th century.

Conclusion

This research denotes that the visit of Rabindranath Tagore made significant destiny to Sri Lankan art tradition and his principles and thoughts still give great importance to Sri Lankan dance tradition and Sri Lankans ever grateful to great poet Gurudev Rabindranath Tagore and his precious contribution to developing Sri Lankan arts with worldwide popularity.

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IMPACT OF MICROFINANCE ON EMPOWERMENT OF WOMEN ENTREPRENEURS AT HOUSEHOLD LEVEL IN MINUWANGODA DIVISIONAL SECRETARIAT IN GAMPAHA DISTRICT

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ABSTRACT –

Microfinance is the tool that address to the people who live under the poverty line and who cannot entitle with the formal financial institutions and banks to fulfil the need that related to encourage them from the current position of low income. Empowerment of women entrepreneurs a greater value to do new creations from their birth. They are talented in managing resource with the problems that arising within manage. To overcome the problem of insufficient family income, the women also have to involve to the process of income generation via some appropriate activities like micro business. But into the real context most of women are lack of knowledge to start up and continue a business in successfully. Microfinance has a key role empowering rural women in developing countries such as Sri Lanka by accessing credit facilities for their income generating activities to improve rural women's entrepreneurship.

Keywords: Micro Finance, Women Entrepreneurs, Empowerment, Social services, Enterprise development

1. Introduction

Women are the key instrument in the sustainable development. They make a significant contribution not only to the family but also to society. Women have a greater value to do new creation from birth. As well as they are very talented in managing time and money. In present the income that generating by the husband is not enough for the basic needs. Therefore, they have been considered for several of soft jobs since they have more supportive than men.(Heter, 2008) Women face lot of barriers in achieving income generation. While, women handle a large part of the world's work, but they receive only a small part of the consequences for that work (Harper, 2003).The empowering women entrepreneurs is one of the vital situation in society that needs to establish in order to empower the women through economically, politically, household decision making, freedom of movement and ownership of property (Hassan & Saleem, 2017). According to (Drolet, 2010) Microfinance institutions (MFIs) have vital role among the low income people by providing financial and non-financial service to increase their living standard through the facilities for poverty alleviation. MFIs play an important role opposite the poverty by supporting low income people to increase their wealth (Haq, Hoque, & Pathan, 2008). Microfinance had arisen as a path of alleviating poverty and encourages self-employment. The term Microfinance extension small loans to for self-employment who

have no access to traditional banking services. Therefore, this study is examined the impact of microfinance program on empowerment of women entrepreneurs at Household Level in Minuwangoda Divisional Secretariat (MDS) in Gampaha District.

2. Research Problem

Empowering women entrepreneurs at household level is the most important factor country like Sri Lanka. Because Asian countries like Sri Lanka are of traditional culture and it always offers the second place to women rather than men (Yogendrarajah, 2015). They always try to protect their children and the spouse with beyond the tradition customs and norms. And always they try to depend on their husband's income. Therefore, most of the women lose their decision making power within the family. The most of rural areas women and children face a lot of irritable affections because of their husband involve drinking alcohol and smoking cigarettes. The main reason behind that is the women do not implicate income generation. The role of Microfinance always targets on the gradation of destitute as a small entrepreneur. In to that situation the achievement of women empowerment also affects to the alleviation of poverty by fulfilling the ultimate goal of social mission.

The empowerment of women entrepreneurs is far from the mind set of microfinance institutions. With that reason it is important to recognize whether the

microfinance institutions are making tools and techniques to build the empowerment of women entrepreneurs within the society and also need to identify whether those tools and techniques are working effectively toward the empowerment of women entrepreneurs by fulfilling the satisfaction of women too. Thus, the problem statement of this study is;

How the Microfinance influence on Empowerment of Women Entrepreneurs at Household Level in MDS in Gampaha District"

3. Research Objectives

The major objective of this study is to identify the impact of Microfinance on Empowerment of Women Entrepreneurs at Household Level in MDS in Gampaha district. And the secondary objectives are: to identify the microfinance factors that affect empowerment of women entrepreneurs at household level in MDS in Gampaha district. To find out the relationship between the financial services, social services and enterprise development services with empowerment of women at Household Level.

4. Literature Review

4.1 Micro Finance

Microfinance is a way to alleviate poverty, empowering low income people and giving social benefits on sustainable way of financing to low income for their business (Murray, 2002). Microfinance is not only Microcredit but also it includes insurance, transactional service and savings (Bakhtiari, 2006). At the present, microfinance has become more famous and important in, South America, Central America, Sub-Sahara Africa, Central Asia, Eastern Europe, South Asia and South East Asia (Development, 2013). Microfinance institutions aim low income people through different kind of channels like group lending, progressive lending, collateral substitute and regular repayment schedule. Not only that but also microfinance institutions are providing social services such as self-confidence development, group formation, training about financial literacy and management capabilities for the low income people in the society and it is a part of broad range of financial services such as loans, payment services, insurance to the low income, deposits and low income generating people and their micro enterprises (Mwenda & Muuka, 2004).

4.2 Women Entrepreneurs

Women Entrepreneurship explains an act of business ownership, design and controlling which empowers women economically increases their economic strength. Entrepreneurship is not just

limited to any one gender now rather due to multi-faceted economic pressures women have turned up and realized that the survival of their families and also their own potential lies only in working side by side with men (Sangolagi & Alagawadi, 2016). Women entrepreneur of 21st century is potentially encouraged for change in order to increase the living conditions of her family, deliver a sharing hand to her husband in income generation, deliver quality education to her children, contribute positively by making job opportunities, empowering other women and bringing out the society out of economic disparity and also unemployment (Sangolagi & Alagawadi, 2016).

4.3 Empowerment

Empowerment is a word that has been practiced widely that its explanation has become blurred (Yogendrarajah, 2015). Different definitions have been used to theorise empowerment. (Mayoux, 2006) Empowerment as ''a multidimensional and interlinked process of change in power relations''. In understanding women's empowerment, (Krishna, 2006) defines women's empowerment as ''the process of increasing the capacity of women to make choices and to transform these choices into desired actions and outcomes''. It means increasing the capability of individuals or groups to make effective development and life choices and to transform these choices into desired activities and outcomes.

Based on the empirical findings presented at literature review, following four hypothesis were developed to address the research question.

H1: There is a significant impact of Microfinance on Empowerment of Women Entrepreneurs at Household Level.

H2: There is a significant impact of Financial Services on Empowerment of Women Entrepreneurs at Household Level.

H3: There is a significant impact of Social Services on Empowerment of Women Entrepreneurs at Household Level.

H4: There is a significant impact of Enterprise Development Services on Empowerment of Women Entrepreneurs at Household Level.

5. Research Methodology

The study based on the extensive literature survey conceptual framework was developed as presented in figure 1. Accordingly, independent variables are financial services, social services and enterprise development services under the construct of Microfinance and dependent variable as Empowerment of Women Entrepreneurs at

Household Level. The population of this study was all the method that was exerted in selecting sample from the population was stratified sampling method. Microfinance beneficiaries in Minuwangoda Divisional Secretariat in Gampaha District in which the sample was selected as 150 women entrepreneurs from five Licensed Finance Companies. Data was collected through researched administered close ended structured Questionnaire consist three sections included researched administered closed ended questions to gather information on section one demographic characteristics, section two economic characteristics, Section three and section four consist of likert scale questions on variables.The questionnaire consist multiple questions, dichotomous questions and Likert Scale questions. Likert scale questions included one to five points, one represent lowest level of satisfaction and five represent highest level of satisfaction. The questionnaires were analysed through SPSS.v21.0 software and employed descriptive statistic, correlations and regression analysis according to the previous studies. The mean denotes score of the respondents for each variable:

1. If mean 1.00<M>2.33, then the level of agreement of the respondents for each variable is poor.

2. If mean 2.34<M>3.67, then, the level of agreement of the respondents for each variable is moderate.

3. If mean 3.68<M>5.00, then, the level of agreement of the respondents for each variable is high.

Figure 1: Conceptual Framework
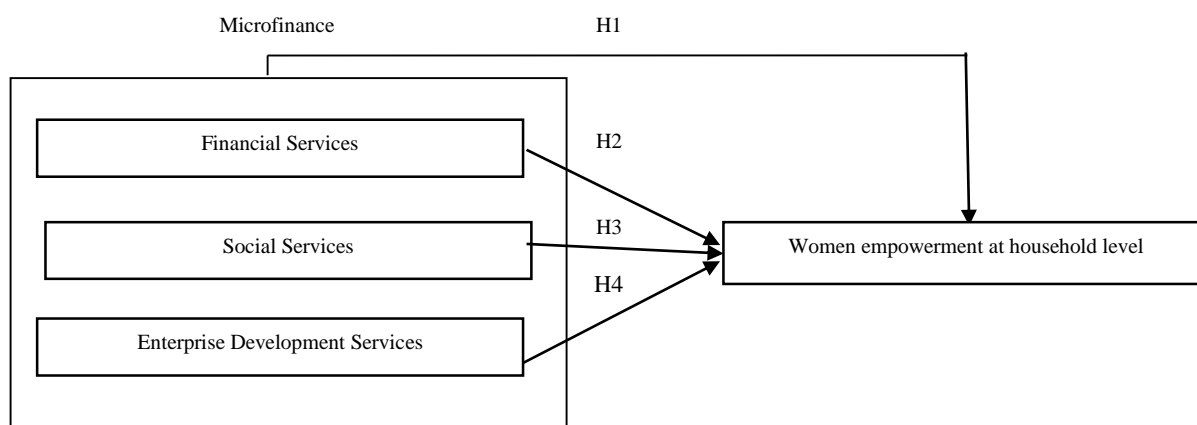
6. Results and Discussion

6.1 Test Adequacy of Sample

Researcher selected 150 respondents in the five licensed Financed Company in MDS in Gampaha district, Sri Lanka.

Kaiser-Meyer-Olkin(KMO) and Bartlett's test results are shown in Table 1.According, the KMO value is greater than 0.5 and the significance level for Bartlett's test value is 0.000 which shows that the value is significant at 1 per cent level of significance, therefore it is appropriate to apply factor analysis shown in Table 1.

6.2 Reliability

To found internal consistency, Cronbach's alpha value for reliability was calculated. All values were above 0.7, which may be considered as reliable. Value of Cronbach alpha is shown inTable 2.

6.3 Descriptive Statistic Analysis

As a present in table 3, the overall mean values for dependent and independent variables. Empowerment of women entrepreneurs has mean 2.16 and standard deviation 0.59 explaining women entrepreneurs had poor perceptions of empowerment at household level. The mean values of financial services 3.40 and standard deviation of financial services is 0.44. It defines licenced finance company has the ability to perform the financial services moderately. Social services have mean of 2.10 and standard deviation 0.72. It defines licenced finance company has the inability to perform the social services. Mean value of enterprise development services 2.27 and standard deviation 0.83. It means a licenced finance company has the ability to perform the financial services moderately.

6.4 Correlation Analysis

According to the table 4, the overall correlation coefficient of microfinance and enterprise development services with Empowerment of women entrepreneurs at household level is .606. And the correlation coefficient of financial services, social services and enterprise development services with Empowerment of women entrepreneurs at household level are -.284, .768 and .747 respectively. It is statistically significant at 0.05 percent level. It indicates that there is a negative relationship between financial services on women household. But social services and enterprise development services positively associate with dependent variable. The F-test indicates good model fit. Hence, the statistical properties are generally good and indicate that the estimation results are credible. The explanatory power of the model (R2) is 0.775, suggesting that the model explains 77 per cent of the variance in the Empowerment of women entrepreneurs. Accordingly, 77% variation of empowerment of women entrepreneurs is explained by financial services, social services and enterprise development services.

6.5 Regression Analysis

According to the table 5, regression coefficient of Microfinance is 1.355 and sig value is 0.000. It indicates that Microfinance has statistically significant positive impact on Empowerment of Women Entrepreneurs at household level in MDS in Gampaha District. Accordingly study accepts the hypothesis one that emphasizes the significant impact of microfinance on empowerment of women entrepreneurs at household level. Resulting, when increasing microfinance by one percent it will lead to increase level of empowerment of women entrepreneurs at house hold level by 1.355 percent.

These is because, women can easily access to the microfinance institute and get loan within short duration when financial problems arise. As per the regression test result, regression co efficient of financial services are 0.277 and sig is 0.000. Resulting study accept hypothesis two: There is a significant impact of financial services on empowerment of women entrepreneurs at household level. Accordingly, when changing financial services by one percent it will lead to change level of empowerment of women entrepreneurs at house hold level by .277 percent. The relationship might be influenced the loans, savings and insurance. According to the regression table, regression coefficient of social services is 0.485 and sig value is 0.000. It indicates that social services have statistically significant positive impact on empowerment of women entrepreneurs at household level in MDS in Gampaha District. Accordingly study accepts the hypothesis three that: there is a significant impact of social services on empowerment of women entrepreneurs at household level. Resulting, when increasing social services by one percent it will lead increase women empowerment at household level by .485 percent. Micro finance institutes provide leadership, education and health services for women entrepreneurs. As per the regression test result, regression coefficient of enterprise development services are 0.367 and sig is 0.000. Resulting study accept hypothesis four: There is a significant impact of enterprise development services on empowerment of women entrepreneurs at household level. Accordingly, when changing enterprise development services by one percent it will lead to change level of empowerment of women entrepreneurs at house hold level by .367 percent. Micro finance institutes provides training programmes and marketing services for women entrepreneurs handle business activities smoothly under hyper competition

Table 1: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**.567**
Bartlett's Test of Sphericity	Approx. Chi-Square	314.261
	Df	6
	Sig.	.000

Normally, 0 < KMO < 1
If KMO > 0.5, the sample is adequacy
Here, KMO = 0.567 which indicates that the sample is adequate

Table 2: Results of Reliability Analysis

Variable	Cronbach's Alpha
Financial Services	.744
Social Services	.763
Enterprise Development Services	.710
Empowerment of Women Entrepreneurs at Household Level	.839

Table 03: Descriptive Statistic Analysis

Variable	Mean	Standard Deviation
Financial Services (FS)	3.405	0.444
Social Services (SS)	2.108	0.722
Enterprise Development Services (EDS)	2.278	0.838
Empowerment of Women Entrepreneurs at Household Level (EWEHL)	2.162	0.598

Table 04: Correlation Analysis

Results of correlation analysis for Microfinance on Empowerment of Women Entrepreneurs at Household Level

Result		EWEHL	MF
EWEHL	Pearson Correlation	1	0.606**
	Sig (2-tailed)		.000
Microfinance (MF)	Pearson Correlation	0.606**	1
	Sig (2-tailed)	.000	
**. Correlation is significant at the 0.01 level (2-tailed).			

Results of correlation analysis for variable of Microfinance and Empowerment of women entrepreneurs at Household Level

	FS	SS	EDS	EWEHL
Pearson Correlation	1	-0.471**	-0.471**	-0.284**
Sig (2-tailed)		.000	.000	.000
Pearson Correlation	-0.471**	1	0.544**	0.768**
Sig (2-tailed)	.000		.000	.000
Pearson Correlation	-0.471**	0.544**	1	0.747**
Sig (2-tailed)	.000	.000		.000
Pearson Correlation	-0.284**	0.768**	0.747**	1
Sig (2-tailed)	.000	.000	.000	
**. Correlation is significant at the 0.01 level (2-tailed).				

Table 5: Regression Analysis

Regression Coefficient Analysis between Microfinance and Empowerment of women entrepreneurs

Model	Regression Coefficient	T statistics	Sig Value
(Constant)	-1.769	-4.148	0.000
MF	1.355	9.256	0.000

R2: 0.775* Significant at .05 percent level
Dependent variable: Empowerment of Women Entrepreneurs at Household Level

Regression Coefficient Analysis between Variables of Microfinance and Empowerment of women entrepreneurs

Model	Regression Coefficient	T statistics	Sig Value
(Constant)	-0.638	-2.403	0.018
FS	0.277	4.513	0.000
SS	0.485	11.844	0.000
EDS	0.367	10.722	0.000

R2: 0.775* Significant at .05 percent level
Dependent variable: Empowerment of Women Entrepreneurs at Household Level

7. Conclusion

The study was examined the impact of microfinance on empowerment of women entrepreneurs at household level across three independent variables such as financial services, social services and enterprise development services. As per the descriptive statistics, financial services, social services and enterprise development services at acceptable level among respondent. Not only that but also correlation coefficients of all independent variables with the dependent variable were statistically significant at 0.05 percent level. Final regression analysis indicated that financial services, social services and enterprise development services have statistically significant impact on empowerment of women entrepreneurs at household level in MDS in Gampaha District. The findings match with many previous studies also. Accordingly, studies conducted by (Mayoux, 2006), (Yogendrarajah, 2015),(Hassan & Saleem, 2017), (Parvin, 2017)also indicated similar results in their studies.

8. Recommendations

Based on the findings study recommends Microfinance Institutes to increase the amount of loans to women entrepreneurs in MDS in Gampaha District and provide assistance to women for decide loan amount, repayment duration, loan instalment. Rural women expect continuous support from the institutions to handle business activities smoothly. The study has shown that although women face several problems in accessing poor enterprise development services such as marketing, business training and also production training. It is therefore recommended that the marketing and training on business increase to encourage existing women entrepreneurs and even attract new customers since the one of goal of most women entrepreneurs of MFIs is to have access to marketing and training for expand their business activities. And also the study also revealed that another problem women encounter in microfinance is their lack of business knowledge and leadership. Microfinance programs should therefore factor basic business education to train these women on basic business management and leadership skills.

9. Directions for Future Research

The empowerment of women entrepreneurs at household level may differ from geographical location to location, further studies can focus on impact of microfinance on Empowerment of Women Entrepreneurs at Household Level in licenced finance companies in Sri Lanka. The sample size of this study was limited to 150 women entrepreneurs in licenced finance companies in MDS in Gampaha district. The

futures researchers can conduct a research on the same topic of the impact on empowerment of women entrepreneurs at household level through increasing the sample by selecting more microfinance institutions and women entrepreneurs from different districts in the country. Further researchers can expand the view on empowerment of women entrepreneurs or the conceptual frame work by looking at more factors on empowerment of women entrepreneurs. With these entire can further examine the results on empowerment of women entrepreneurs and it will be really important to the Asian country like Sri Lanka.

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A COMPARATIVE STUDY ON ESTIMATION METHODS FOR GEOSPATIAL TEMPERATURE IN SRI LANKA

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ABSTRACT–

This paper examines the efficiency of widely used spatial techniques in estimating daily extreme temperatures (minimum and maximum temperatures) for locations in Sri Lanka where the distribution of temperature gauging stations is sparse and uneven to capture the entire spatial climatic diversities. Daily minimum and maximum temperatures from 2007 to 2012 gathered from 20 stations situated in various geographic locations over the country were involved in the study. Four deterministic techniques, Nearest Neighbour method (NN), Inverse Distance Weighting Method (IDW), Inverse Distance Weighting Method with optimized weighting power, and Thin Plate Splines (TPS) were experimented, where Ordinary Kriging (OK) was involved as a geo-statistical technique. Three test locations out of 20 stations were selected representatively from different climatic zones in Sri Lanka, based on a correlation analysis of temperatures. Readings from selected test days covering the entire study period were used to assess the performances of the techniques. Performances of the techniques were compared using statistical measures in terms of accuracy, biasness and percentage accuracy of estimates. Minimum geospatial temperatures were observed to be more volatile than maximum temperatures leading minimum temperature estimations to be more challenging. Results indicate that TPS performs the best and NN performs the poorest in estimating minimum temperatures for locations in Sri Lanka. Best maximum temperature estimates were obtained by IDW and NN was the poorest performing method for maximum temperatures. Moreover, results suggest that minimum temperature estimates entail larger errors than maximum temperature estimates, hence requiring more sophisticated methods to improve the estimations.

Keywords: Daily extreme temperatures, Geospatial temperature, Inverse distance weighting, Nearest Neighbour, Ordinary Kriging, Thin plate splines

1. Introduction

Temperature is considered one of the fundamental elements which support the existence of plant and animal life on earth. Earth is the only planet which upholds life as it provides healthy conditions, including desirable range of temperature for the life to prevail. Therefore, regular monitoring of spatial temperature can be utilized as insights to number of climatological phenomena and human activities.

Temperature data is utilized in several environmental and scientific disciplines such as hydrology, agriculture, resource management, research studies etc.However, temperature data are limited spatially as well as temporally. As management and maintenance of gauge stations established to monitor temperature is very expensive and complex, reliable data are often not available in Sri Lanka. As a lower middle income country, Sri Lanka cannot bear highly expensive apparatus or establishing meteorological stations everywhere it is necessary. There are only 22 principal meteorological stations in Sri Lanka to collect weather related observations, where it is much insufficient to cover the entire island. Therefore, identifying alternative methods that effectively estimate temperature where in the absence of gauging stations is of utmost interest.

2. Background

In most literature, all estimation techniques are regarded as weighting methods (Boke, 2017; Conti, Eccel, Noto, Piazza, and Viola, 2015; Turenne, 2016). Accordingly, the estimate for unmeasured site is approximated by the weighted average of temperature values of nearby sites. The only factor which differentiates each technique is the method used to calculate the weights. Moreover, as described by Turenne (2016) and Goodchild, Longley, and Smith (2018), the weights are calculated such that they are added up to the unity and prediction error variance is minimized.

As explained by Goodchild, Longley, and Smith (2018), Karagiannidis and Feidas (2014), and Bhowmik and Cabral (2007) interpolation techniques can be classified as deterministic methods and probabilistic methods. According to them deterministic methods include Nearest Neighbour method, Inverse Distance Weighting (IDW) and

Spline method. Kriging techniques are included in probabilistic methods.

Turenne, (2016), Wong, Yuan, and Perlin, (2004), Beurs, Hartkamp, Stein, and White, (1999) have employed Nearest Neighbour(NN) method in their studies, in which the desired estimate is the value of the nearest station to the missing location. Missing temperature entirely depends on one station in this method, giving that station to weight of 1. It is the simplest and easiest to implement among the interpolators.

As discussed by Conti, Eccel, Noto, Piazza, and Viola, (2015) and Boke, (2017) unknown temperature is estimated as a weighted average of neighbouring temperatures by Inverse Distance Weighting (IDW) method. Weights given to each station is inversely proportional to their distance. Boke, (2017) has discussed about a modified version of this method where, the impact of elevation is considered in calculating weights. The concern in the modified method is the possible influence comes about, when there is a large difference in elevation between the target location and its neighbours. The elevation correction that Boke, (2017) has suggested may be very much advantageous for temperature estimation work in Sri Lanka, where temperature varies drastically with the elevation.

Inverse Distance Weighting method is one of the most widely used methods due to its simplicity and ability to produce fairly good estimates. However, Inverse Distance Weighting assumes that distance from nearby weather stations is the most important factor in calculating estimates, where this may not be the case (Paulson and Hart, 2006 cited in Turenne, 2016). Another disadvantage is that the power-decay parameter must be applied uniformly in all directions when in reality it may vary based on direction and distance (Turenne, 2016). This method provides good results when there is sufficient number of neighbouring stations.

According to Conti, Eccel, Noto, Piazza, and Viola, (2015), TPS is the simplest variant of radial basis functions which can be viewed as an inverse weighted linear function of distance from target point to data point with a bias factor added to it. Study conducted by Conti, Eccel, Noto, Piazza, and Viola, (2015) reflected that TPS method performs better than IDW and OK, for temperature estimations in Sicily. As Bhowmik and Cabral, (2007) has pointed out, Thin Plate Splines can generate sufficiently accurate estimates from only a few sampled points and it retain small features. This property in TPS may be advantageous in the present study, where in Sri Lanka; station distribution is not much dense. The technique may produce estimates higher than the maximum and lower than the minimum input values,

which is considered as a drawback of the method (Bhowmik and Cabral, 2007).

Ordinary Kriging (OK) is a geo-statistical interpolation method, which considers spatial autocorrelation present in data in determining weights. What makes OK most outstanding of all interpolators is, as Turenne, (2016), argues it provides a best linear unbiased estimate (BLUE) for the temperature. Kriging approaches seem to give promising results compared with deterministic methods. In the study conducted by Bhowmik and Cabral, (2007) in which IDW, TPS and OK methods were applied to daily maximum and minimum temperature in Bangladesh, OK method generated better estimates than IDW and TPS for both daily minimum and maximum temperature. Kafatos, Kim, Kwak, Lee, Seo, and Shin, (2010) have compared IDW and OK methods in their study in Korea. Performances of IDW and OK are tested separately for mean temperature in summer and winter. It was evident from their study that Kriging performs better in interpolating temperature for both summer and winter.

However, in contrast Boke, (2017) showed that OKperforms poorest compared with IDW, TPS and even Nearest Neighbour method in his study which attempted to assess the performance of interpolation techniques in estimating mean temperature in Ethiopia.

3. Data and Methodology

3.1 Data

Sri Lanka is an island located in the Indian Ocean to the southwest of the Bay of Bengal and to the southeast of the Arabian Sea. Area of the country is 65 610 km^2. It is situated within 5^0 to 10^0 Northern latitudes and 79^0 to 82^0 Eastern longitudes approximately. The climate pattern of Sri Lanka can be characterized as tropical due to its location.

This study concerned daily minimum and maximum temperatures from 22 meteorological stations established over the island. Temperature data was collected for the period of 1st of January, 2007 to 31st of December, 2012. Data sets were collected from the Department of Meteorology, Sri Lanka.

3.2 Imputation of Missing Values

Inspection of the data involved in the study revealed the presence of numerous missing values in both minimum and maximum temperature series belonging to 22 gauging locations in Sri Lanka.

Missing temperature values are imputed under three conditions, considering the number of consecutive missing values in the series. However, two stations

were omitted from the analysis due to the abundant presence of missing values.

3.2.1 Only one value is missing in the temperature series

When one value is missing in the temperature series in a particular location, the value is imputed by the average of the immediate previous and the immediate following values of the temperature series of the same location as proposed by Oliver (as cited in Allen and Degaetano, 2001).

The method assumes that temperature value of a given day is highly influenced by the temperatures of the neighbouring previous and following days. The immediate previous and following temperature values are equally weighted in calculating the average.

3.2.2 Less than five consecutive values are missing in the temperature series

In the event of less than five values are missing consecutively in the temperature series in a particular location, missing temperature values are estimated based on a concept which suggests that the difference between daily temperatures at adjoining stations is equal to the difference between monthly average temperatures at those stations by Kemp et al. (as cited in Allen and Degaetano, 2001).

3.2.3 Five or more than five consecutive values are missing in the temperature series

When five or more values are missing consecutively in the temperature series in a particular location, Holt-Winters method is employed to estimate the missing temperatures. The method forecasts the values several time points ahead in the series, by making use of existing temperature values in a particular location.

Since the time series of minimum and maximum temperatures showed additive seasonality, additive variant of Holt-Winters method was employed (Chatfield & Yar, 1988).

After imputing missing values, temperatures of the test locations were estimated using methods discussed in following sections.

3.3 Nearest Neighbour Method

Nearest Neighbour method is the simplest method of interpolation techniques. In this method, temperature for an unmeasured location is assigned the temperature of the nearest measured location (Boke, 2017).Expression for estimated temperature at unmeasured location x_0 is,

$$\hat{T}(x_0) = T(x_i) \qquad (1)$$

3.4 Inverse Distance Weighting Method

In Inverse Distance Weighting method, temperature of the ungauged location is estimated as a weighted average of temperatures of neighbouring stations. The weight given to each neighbouring station is inversely proportional to their distance from the target location (Boke, (2017).Estimated temperature at an unmeasured location $\hat{T}(x_0)$ is given by,

$$\hat{T}(x_0) = \frac{\sum_{i=0}^{n} w_i T(x_i)}{\sum_{i=0}^{n} w_i} \qquad (2)$$

Where, $T(x_i)$ is the temperature measured at station x_i and w_i is the weight given to the temperature measured at station i. n is thenumber of stations contributed in the estimation. Weights w_i, are calculated as follows.

$$w_i = \frac{1}{d_i^p} \qquad (3)$$

Where, d_i is the distance between the target location and the station x_i and p is the power of weighting.

3.5 Inverse Distance Weighting Method with optimized weighting power

Estimates of temperature for a target location vary with the power that is used in weighting the distance (p). When p=0, all n temperatures are equally weighted in estimating the temperature for the target location. However, temperatures form closer stations are given more weight with increasing power.

In the current method, target temperature is estimated by optimizing the power of weighting. Leave-one-out cross validation (LOOCV) is employed in optimization process.

In leave-one-out cross validation technique, one station among available gauge stations is removed from the estimation process. Temperature of the left out station is estimated using temperatures from remaining stations. The mean squared estimation error for station $x_i$is calculated as, (Hastie, James, Tibshirani, and Witten, 2013),

$$MSE_i = \left(\hat{T}(x_i) - T(x_i)\right)^2 \qquad (4)$$

The procedure is repeated leaving out all stations one at a time. For every station the estimation error is calculated. As described by Hastie, James,

Tibshirani, and Witten (2013), the resultant measure of error calculated for leave-one-out cross validation with *n*gauge stations is,

$$CV_{(n)} = \frac{1}{n} \sum_{i=1}^{n} MSE_i \qquad (5)$$

The process is repeated for varying values for *p* to calculate $CV_{(n)}$ value for each. The value which minimizes $CV_{(n)}$is chosen as the optimal p value.

3.6 Thin Plate Splines

Thin plate spline is a variant of radial basis functions. Radial basis function is conceptually similar to fitting a rubber sheet that passes through measured sample values that are extruded to the height of their magnitude while minimizing the total curvature of the surface. The following two conditions should be satisfied in spline interpolation.

- The surface must pass exactly through the measured sample points.

- The cumulative sum of the squares of the second derivative terms of the surface taken over each point on the surface should be a minimum which indicate that the total curvature of the surface should be minimized.

Radial basis functions are used to build up function approximations considering the approximating function as a weighted sum of radial basis functions. Hence the temperature at unmeasured site $x_0$can be estimated by,(Conti, Eccel, Noto, Piazza, and Viola, 2015).

$$\hat{T}(x_0) = \sum_{i=1}^{n} w_i \phi(\|x_i - x_0\|) + \mu \qquad (6)$$

Where, $\phi(\rho)$ is the selected radial basis function,$\rho = \|x_i - x_0\|$ is the radial distance from x_0 to sample location x_i, w_i are the weights to be estimated, μ is the bias and *n* isthe number of contributing stations. Thin plate spline the radial basis function employed in temperature estimation, which isexpressed as, (Conti, Eccel, Noto, Piazza, and Viola, 2015).

$$\phi(\rho) = c^2 \rho^2 \ln(c\rho) \qquad (7)$$

Where, *c* is a constant.

3.7 Ordinary Kriging

Ordinary Kriging is a geo statistical approach that takes spatial dependencies between the locations into account, which is known as the spatial autocorrelation. Kriging assumes that the spatial relationships occur due to the distance between the points in space, can be utilized in explaining the variation of temperature across the surface. Kriging is most appropriate when it is known that there is a spatially correlated distance or directional bias in the data.

General formula of weighted average is also applied in Kriging. The method quantifies the spatial autocorrelation in order to utilize it in determining more sophisticated value for weights.

To uncover the spatial dependencies, the concept of semi variance is introduced which is a function of distance between two locations. Semi variance, is computed with the following expression for all pairs of locations separated by distance h, as described by Turenne (2016).

$$\gamma(h) = \frac{1}{2M(h)} \sum_{i,j \in M(h)} \left(T(x_i) - T(x_j)\right)^2 \qquad (8)$$

Where, $\gamma(h)$ is the semivariance for all pairs of locations that are separated by distance *h*, $M(h)$is the number of pairs of locations and $T(x_i)$, $T(x_j)$ are temperatures of locations x_i andx_j. Empirical semivariogram is then constructed by plotting the semivariance against the separation distance h.

Locations that are closer to each other (left on x-axis), should have similar temperatures (low on y-axis). Where the values become more dissimilar (high on y-axis), when the locations get far apart (right on x-axis), indicating the presence of spatial autocorrelation.
Value at which the semi variogram levels out is called the sil, the distance where the semi variogram first flattens is known as the range. Nugget is the intercept, where the partial sil is sil minus the nugget.
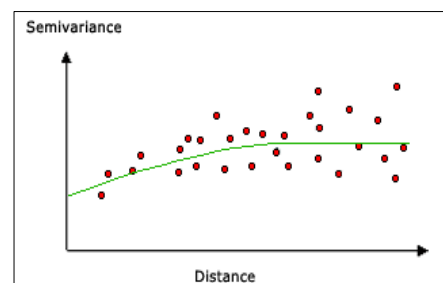

Figure 1 – Example semi variogram

Using the above parameters that describe it, a predefined model can be fitted to the semi variogram. The three most popular models are spherical, exponential, and Gaussian models.

Once the semi variogram model is defined, the vector of kriging weights for an unobserved location can be derived.

3.8 Measures of performance

Four measures of performances were used to assess the efficiency of the methods in estimating temperature. In the formulas, estimated value is denoted by $\hat{T}(x_i)$, actual value is denoted by $T(x_i)$ and number of test points is denoted by *n*.

3.8.1 Root Mean Square Error (RMSE)

$$RMSE = \sqrt{\frac{1}{n}\sum_{i=1}^{n}\left(\hat{T}(x_i) - T(x_i)\right)^2} \qquad (9)$$

3.8.2 Mean Bias Error (MBE)

$$MAE = \frac{1}{n}\sum_{i=1}^{n}\left|\hat{T}(x_i) - T(x_i)\right| \qquad (10)$$

3.8.3 Mean Absolute Error (MAE)

$$MAE = \frac{1}{n}\sum_{i=1}^{n}\left|\hat{T}(x_i) - T(x_i)\right| \qquad (11)$$

3.8.4 Mean Absolute Percentage Error (MAPE)

$$MAPE = \frac{1}{n}\sum_{i=1}^{n}\frac{\left|\hat{T}(x_i) - T(x_i)\right|}{T(x_i)} \times 100\% \qquad (12)$$

4. Results

In this study, NN, IDW, IDW with optimal power, TPS and OK methods were experimented to estimate minimum and maximum temperatures. Three test locations were selected to evaluate the efficiency of the methods.

Correlations of temperature series from one location with every other location were considered. Results showed clearly differentiating two groups of temperatures, which were identified to be from dry zone locations and wet zone locations. It was noticed that dry zone temperatures are more correlated with each other than wet zone temperatures. Therefore, representativeness of dry and wet zones, ratio of area between dry and wet zones and geographical distribution of stations were considered in selecting test locations.

Dry zone is approximately double the area of wet zone. Therefore, two stations from dry zone and one from wet zone were selected as test locations.

Set of test days was selected systematically including days from every month in the study period. Minimum and maximum temperature for test stations on selected days are considered unmeasured. They are estimated using the techniques discussed and estimated temperature values for test stations on selected test days are studied to evaluate performances in different methods employed in estimation process.

IDW, IDW with optimized power, TPS and OK methods were performed considering temperatures from 2 and 3 neighbouring locations. Utilizing more than 3 neighbours was avoided as very distant and locations with very dissimilar temperatures will be captured hence making estimations highly erroneous.

In IDW method, power varied discretely from 0 to 5 with 2 neighbours and 3 neighbours. The approaches which gave best performances from each method were compared.

4.1 Minimum Temperature

Location wise minimum temperatures in Sri Lanka are highly volatile, making minimum temperature estimations more challenging. Minimum temperatures at mountainous areas are very low in comparison to lowlands. Comparative illustration of efficiency of estimation methods for minimum temperature estimates is shown in Figure 2.

It can be noticed that NN method performs poorest in estimating minimum temperature with highest RMSE, MBE and MAE values. Best performing method for minimum temperature is TPS method according to lowest values for error measures. Methods other than NN and OK underestimated real temperatures at test sites according to negative MBE.
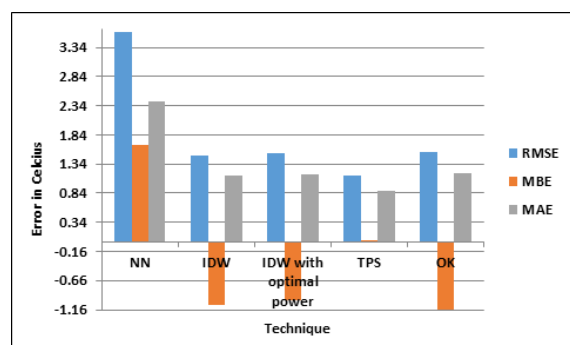

Figure 2 –Comparison of efficiency of methods for minimum temperature

In terms of percentage error also, NN is the worst performing method while TPS is the best performing as shown in Figure 3. NN estimates entail much larger error of more than 12%, where TPS estimates entail approximately 3% error.
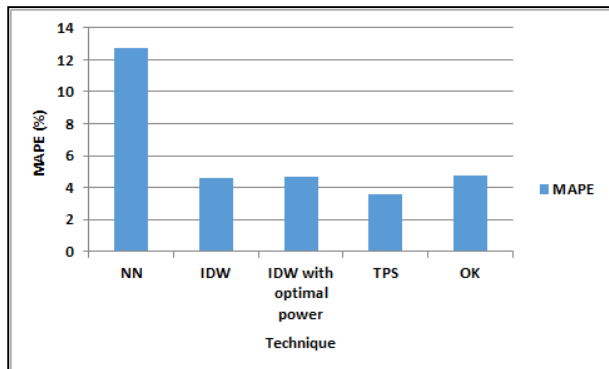

Figure 3 –Comparison of MAPE for minimum temperature

4.2 Maximum Temperature

Though the maximum temperature does not show drastic variations among the locations, considerable volatility is present in maximum temperatures in Sri Lanka. Figure 4 gives a comparative illustration of efficiency of estimation methods for maximum temperature estimates.

It can be decided that the best performing method for maximum temperature estimations is IDW method with lowest RMSE and MAE values. NN method has the lowest MBE value. However, MBE for IDW is lower than remaining three methods. Similarly as in minimum temperature, NN is the poorest performing method. Negative MBE suggests that all methods underestimated real temperatures at test sites.
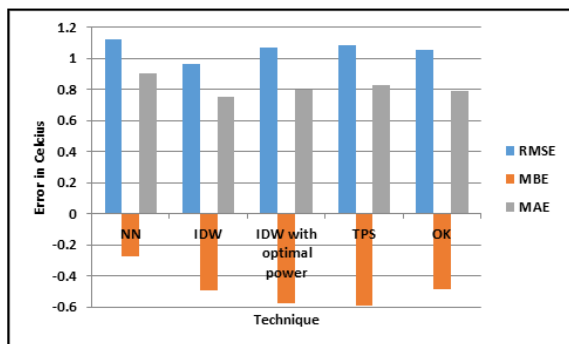
Figure 4 - Comparison of efficiency of methods for maximum temperature

MAPE of IDW is the lowest of all methods according to Figure 5. Highest MAPE is recorded for NN, for maximum temperature estimations.
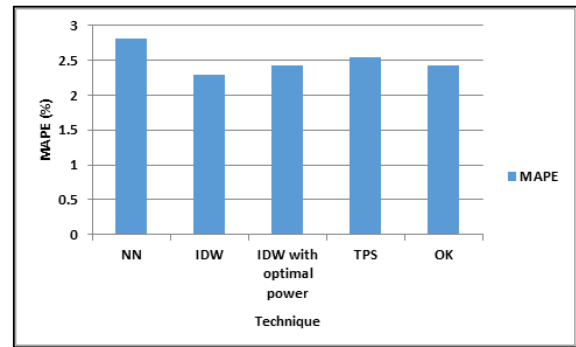
Figure 5 – Comparison of MAPE for maximum temperature

Unlike in minimum temperature estimations, drastic differences in error measures between estimation methods cannot be seen in maximum temperature estimations.

5. Discussion

Experimented spatial methods assumes that, attribute data (temperature in this context), are continuous over space and attribute values are spatially dependant indicating that values closer together are more likely to be similar(Bhowmik and Cabral, 2007). The methods were formulated based on these two assumptions. Four deterministic interpolation techniques, NN, IDW, IDW with optimal power, TPS and OK as a geo statistical interpolation method were tested in this analysis.

As seen in the study, performances of IDW method got better with increasing weighting power, which implies that IDW estimates get better when near observations, were more weighted than distant observations. It can be noted that this relationship establish the basic assumptions described.

It was learnt that, TPS technique performs best in estimating minimum temperatures where NN technique perform the worst. Somewhat agreeing performances were noticed in OK and IDW with optimal power methods, where slight improvement was seen in IDW with optimal power. When the weighting power was 4, better performances were resulted from IDW method, than IDW with optimal power.

In estimating maximum temperature NN method performed worst as well as seen in minimum temperature estimation. Moderate performances were noticed for OK technique and IDW with optimal power, where OK performed slightly better. TPS estimates were little worse than OK technique and IDW with optimal power. For maximum temperature estimations, IDW technique was identified to be the best method.

Performances of methods seemed to be getting better when the number of neighbouring locations was set to 3 in both minimum temperature estimation as well as in maximum temperature estimation.

IDW works well when the stations are evenly distributed. Clustered data may result in errors in IDW method (Bhowmik and Cabral, 2007). In Sri Lanka, stations are somewhat evenly distributed, though the density is sparse. May be for that reason, IDW was found to be performing moderately well at estimating minimum temperature and performing best at estimating maximum temperature. Further, IDW is sensitive to outliers.

Similarly as IDW, TPS is also sensitive to outliers. TPS can generate sufficiently accurate estimates with fewer sampled points and it can retain small features (Bhowmik and Cabral, 2007). However, TPS estimates may be higher than the maximum and lower than the minimum sampled data values. TPS is sensitive to outliers as well.

NN method was employed mainly because of its simplicity and ability to provide fairly good estimates. As temperature variations are not very much severe in Sri Lanka except for mountainous areas, it was supposed that NN method may perform moderately. However, NN resulted in largest errors than any other technique for both minimum and temperature estimation.

Since NN method take the value at the nearest measured location to the target location as the estimate of the target location, the method may require fairly dense distribution of gauging stations to provide good estimates.

However, there are few limitations in the study. Since the temperature varies drastically with the elevation, large differences in temperature can be noticed within a short distance. This variation is difficult to capture as the stations are located far apart. The study considered only three test locations, which is very insufficient in generalizing results to the entire study area. Since the distribution of station is uneven and sparse, it is difficult to select a representative test station set to test the efficiency of methods. High elevation locations were not included in test set, as temperatures at those locations are comparatively highly outlying. As Sri Lanka lacks high elevation stations, it was not able to evaluate how these methods would estimate temperature at high elevations.

6. Conclusions

The availability of spatially and temporally continuous temperature data is a key requirement for agriculture, hydrology and environmental management, many research areas and as well as in day-to-day living. The main goal of the study was to find a method that successfully estimates temperatures at unmeasured sites in Sri Lanka, where the gauging station density is quite sparse and uneven.

This study compared five different methods to identify the method which best estimates minimum and maximum temperatures at an unmeasured site. Four deterministic methods and a geo-statistical approach were tested.

The best performance in terms of accuracy and unbiasedness was obtained with TPS for minimum temperature, with very low RMSE of 1.14^0C, MBE of 0.04^0C and MAE of 0.08^0C approximately. It yielded MAPE of 3.6% approximately.

Best performance for maximum temperature was obtained by IDW method. It yielded RMSE of 0.96^0C, MBE of -0.49^0C and MAE of 0.79^0C approximately. Percentage error of the method was 2.2% approximately.

Moreover, minimum temperature estimates resulted in much larger errors than maximum temperature estimates. High volatility that can be seen in minimum temperatures among locations which occur mainly due to the elevation difference can be identified as the main factor which makes minimum temperature estimates to be more erroneous.

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REAL TIME BUS TRACKING PASSENGER INFORMATION SYSTEM

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ABSTRACT

Uncertainty of arrival times of public transport occurs due to number of conditions. Because of this uncertainty, most of passengers are dissatisfied about the public transport. At present, the real-time bus tracking information systems for passengers are famous in the world and spreading across the countries rapidly. The objective of this research is to develop user friendly android application with a real time bus tracking information system to be used by the passenger and the bus conductor. This research is based on predicting bus arrival time at bus stops on a certain root. A study of each bus route should be done separately because especially in Colombo the direction of destination-to-source and source-to-destination is not same in the route network. To predict the arrival time information of every stop on the route, delay at each bus stop and delay at traffic lights must be collected and analyze. The accuracy of the location detection, distance calculation and delay are high. When the bus is stop at somewhere, the application displays a message "Bus is stuck in the traffic or stop at a bus stop", in the information window instead of displaying the arrival time. In conclusion, the Real-Time Bus Tracking Passenger Information System provides cost effective, user-friendly, flexible and effective passenger information system.

Keywords: Passenger Information, Real-time Tracking, Mobile application

1. Introduction

One of the most prominent and inexpensive way to provide reliable public transport, reduce passenger waiting time, improve passenger experience and satisfaction is a Real Time Passenger Information System. Real Time Passenger Information Systems uses various technologies such as AVL and most of these systems use GPS tracking devices to track the current location of the vehicle and generate predictions of the bus arrival time. The arrival time is displayed using rolling display on bus stops, web based interfaces, mobile applications and sending messages to mobile phones. A majority of these systems come with significant cost and the accuracy of GPS data depends on many factors such as GPS satellites, surroundings and weather. Availability of such system is another issue associated with this field. And also there are Real Time Passenger Information Systems based on bus passenger's participatory sensing. Data integrity is the major issue of this kind of systems since anyone can register as a shared user and they can share wrong locations.

A real-time bus arrival information system with integrity and availability will overcome the problems with the existing systems. In the proposed system, I tried to address those issues using a real-time database and android applications as android phones are available for most of population in Sri Lanka.

2. Methodology

To predict the arrival time information of every bus stop on the route, delay at each bus stop and delay at traffic lights must be collected and analyzed.

2.1 Firebase Rea-Time Database

In firebase, data is stored as JSON and synchronized in real time to every connected client. Firebase gives these functionalities to the application.

> Real-Time Functionality
> Firebase Authentication
> Read and Write Data on Firebase Database

2.2 Google Maps

To build a map into the android application Google Maps API is used. An API is a set of methods and tools that can be used for building software applications. This allows to display maps on your websites and provide many features to the map. We can customize markers, cluster markers, and get more granular geo data using heat maps. Another useful feature of Maps API is that it is camera animated.

2.3 Track the Location of a Device

To detect the location, the system used two methods. The Location determined by,

1. Using NETWORK_PROVIDER
2. Using GPS_PROVIDER

3. System Architecture

The whole system is divided into three main models: The bus conductor application, real-time database and the passenger application. According to the system authorized users upload information to real time database and passenger can access that information through the database.
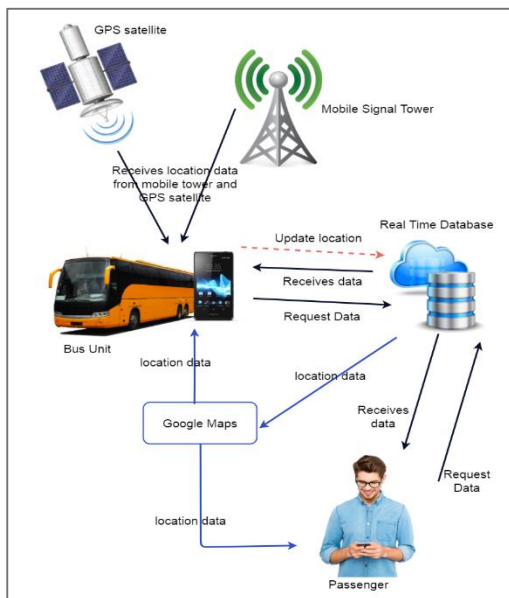
Figure 1. Architecture of the System

4. Analysis and Design

To maintain the data integrity, the system should restrict unauthorized users to update the database. Therefore, the conductor's app requires username and password authentication and the following activity diagram, Figure 2 shows this method.
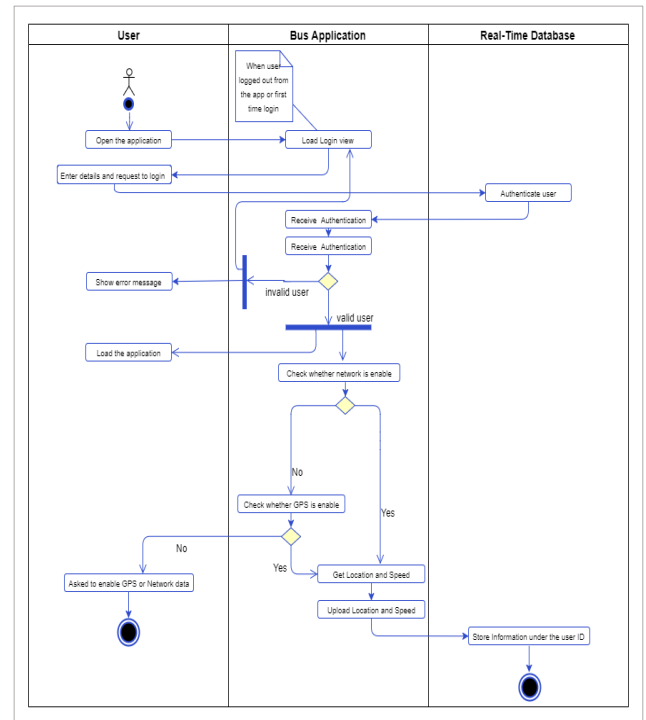
Figure 2. Activity Diagram of Upload in location to the database

5. Results and Discussion

Location and the speed of the phone with the conductor app are updated in the real time database in every 2 minutes, without any interference of the user. This update was automatically done by the application by calling the method on Location Changed () in every 2 minutes. And every time when data changes, app update the database within few seconds and passenger can receive these information of updates in few seconds. It was observed that the speed of the bus changes in every update. Location detection of the system is also very accurate and the application displays the estimated arrival time of a given bus in average of 40 seconds. And also the app displays the message "The bus is stuck in a traffic or stop at a bus stop" in the information window instead of the arrival time when the bus is stopped at anywhere.
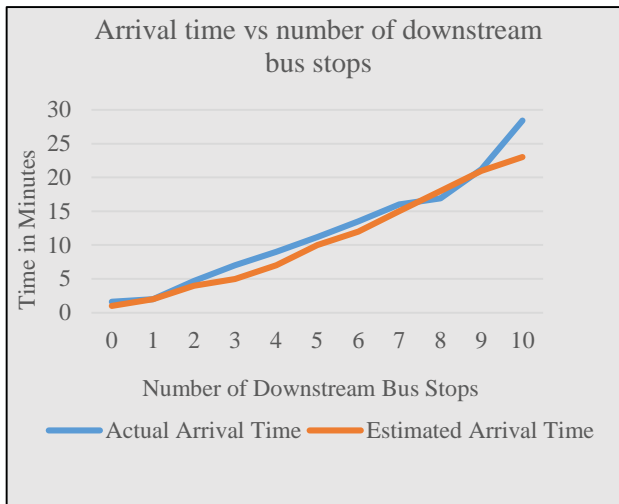
Figure 3. Line Chart of Actual Arrival Time vs Estimated Arrival Time
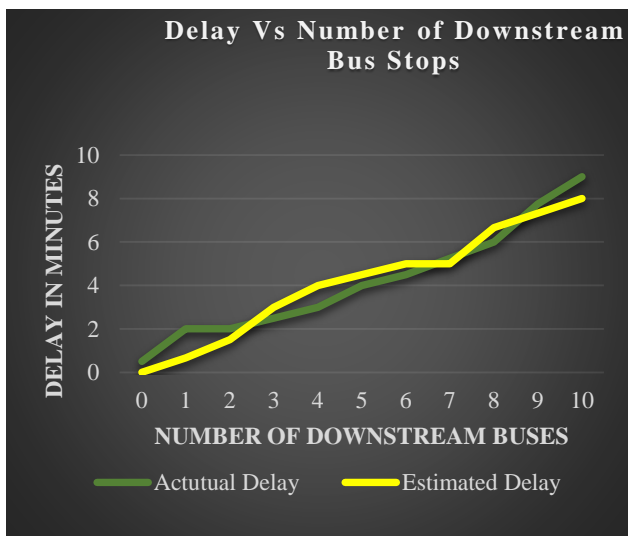
Figure 4. Line Chart of Actual Arrival Delay Vs Estimated Delay

6. Conclusion

The proposed system serves the needs of the passenger and bus drivers and conductors using GPS and cellular network to track the buses' current location and Google Maps API to display the buses' current location. Since this system is free of time table and interference of bus companies, it is very easy to implement the system for any route. This system gives accurate location of the buses on the route and inform the passenger when the bus is stuck in somewhere. The proposed system is using cost efficient android application that uses firebase cloud services as backend server and share location of each buses at real time. This bus tracking system provides flexible, customizable and accurate information to the passenger and ensure passenger satisfaction and safe journey.

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A CORPUS-BASED STUDY OF LANGUAGE USED IN THODUWAWA REGION

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ABSTRACT

Sri Lanka is a multilingual country and Sinhala, the main language has consisted of several regional dialects. The differences are based on the language use including vocabulary, tone, and structure of sentences. Thoduwawa is an area which is situated in the border of Chilaw and Puttalam districts in the north-western province. The main career of the people is fishing and going abroad as employers. The language used by the speakers at Thoduwawa region is having differences with the comparison of standard language which is used in the western province. The difference can be mainly seen in the vocabulary and phonological variations such as stress and sound variation. Accordingly, this research addresses the language used in Thoduwawa region as a comparison with the standard language used in the Sinhala language. A speech corpus of 10 hours is collected from the natural conversations of the speakers and transcribed the data. Additionally, the data are analyzed with the speech analysis tools in order to identify the phonological variations. The language used by the speakers at Thoduwawa consists of different vocabulary than the standard language. Additionally, the phonological differences are included in the speakers' speech pattern. The speakers use a high tone in the speech with the influence of their career than the normal language speakers. The language used by the speakers at Thoduwa has consisted of a different vocabulary and the phonological differences can be identified with the analysis.

Keywords: Dialects, Standard language, Vocabulary, Phonology, Stress, Variation

1.   Introduction

Sri Lanka is a multilingual country and Sinhala, the main language has consisted of several regional dialects while Tamil and English are considered as the second language and the linking language respectively. A regional dialect is identified based on the differences including vocabulary, tone, and grammatical structure of sentences. Content of a language differs based on the factors including region, culture, occupations, gender, and caste. A regional dialect is a language which is specified based on the geographical factor and possessed from generation to generation (Dharmadasa, 1972:47). Sinhala language consists with 7 regional dialects. To consider a language as a regional dialect, it should be consisted of a phonological, grammatical and morphological differentiation (Dharmadasa, 1949:49).

Thoduwawa is an area which is situated in the border of Chilaw and Puttalam districts in the north-western province.
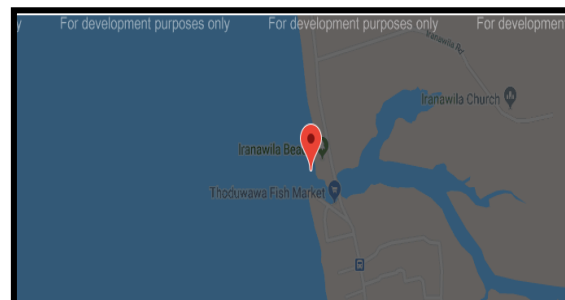
Figure 1
Location of Thoduwawa region

The main occupations of the citizen are fishing and going abroad as employers especially to Italy. The main religion is Christianity and the culture is depending on the Christian religion. Additionally, the region is consisted of Christian people mainly and additionally, some Buddhist Tamil people as migrants. The following figure explains some of the details such as climate, situation and the population.
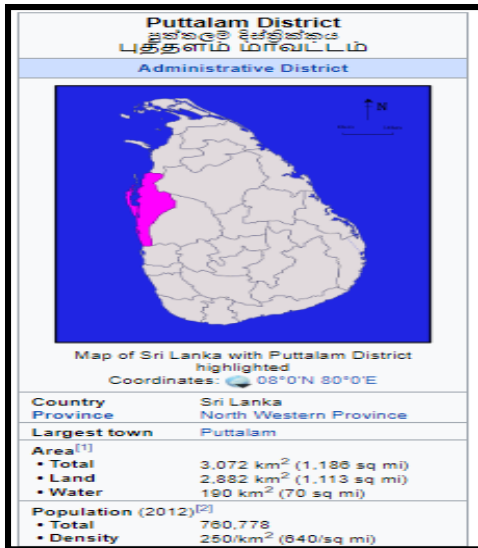
Figure 2
General information of the region
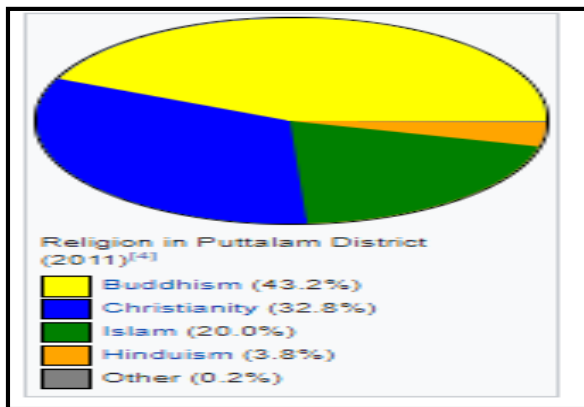
Figure 3
The population of the region

The language used by the speakers at Thoduwawa region is having differences with the comparison of standard language which is used in the western province. The difference can be mainly seen in the vocabulary and phonological variations such as stress and sound variation. Accordingly, this research addresses the language used in Thoduwawa region as a comparison with the standard language use in Sinhala language with the analysis of phonological, morphological and grammatical distinctions of the language. The main aim of the research is to address the following research problems.

- Does the language used in Thoduwawa region differ from the standard language in Sinhala language?
- Does the language in Thoduwawa contain a different vocabulary?
- Does it consider as a regional dialect?
- What are the specific features of the language used in Thoduwawa region?

2. Method and Materials

This research addresses the language used in Thoduwawa region as a comparison with the standard language use in the Sinhala language. A speech corpus of 10 hours is collected from the natural conversations of the speakers at Thoduwawa region in Sri Lanka and transcribed the data using the transcription tools in order to analyze the data. Additionally, the data are analyzed with the speech analysis tools in order to identify the phonological variations. Additionally, the collected data were analyzed manually to identify the other differences including morphological, syntactic and grammatical differences.

3. Results

With the analysis of the data, the following findings were identified. The language used in Thoduwawa region is consisted with differences related to a regional dialect as,

- Phonological variation
- Use of a high tone
- Use of long syllables
- Morphological variation

The vocabulary is the main factor which changes easily based on the social features (Dharmadasa,1972:59). The vocabulary of this dialect consists with words taken from the religion as well as the careers such as fishing.

word	relation
මුදු යනවා	career
වාරකං	career
සුරුවම	career
වාඩි	career
පසේකා	religion
මහයියා	religion

Table 1
Words based on religion and career

Except from the vocabulary related to the religion and carrers, the speakers use different words for the general words used.

Standard language	Language at Thoduwawa region
පොලොස්- baby jak	පැහිය
වමත- left	සොත්ති
එක්කගෙන යනවා- go with some one	කැන්දන් යනවා
නියම වැඩේ- amazing incident	ජාති වැඩේ
නියම - good	ජාති
වැලිතලප- welithalapa	සවි දොදොල්

සීනි මුරුක්කු - sugar murukku	කාජ
ඇතුළට - to the inside	අස්සට
රැකියාවට යනවා - going to the job	රස්සාවේ යනවා

Table 2
Vocabulary of language used in Thoduwawa region

Accordingly, the results prove that the above language includes a separate vocabulary compared to the standard Sinhala language.

With the analysis, it was identified that the language used in Thoduwawa region was consisted with some phonological variations. The speakers used long syllables instead of long syllables.

eg: හෙට එන්න **ඕනෙ**, හරිද?
හෙට එන්න **ඕනා**, හරිද?
[You **should come** tomorrow, oky?]

In the above example, the 'a:' syllable is used instead of 'e' syllable. And the following long vowels were substituted instead of short vowels.

Short sound	**Long sound**
අ	ආ
එ	ආ
ඉ	ඊ
එ	ඒ
ඔ	ඕ

Table 3
Substitution of syllables

Another specific feature of the language is use of high tone in the conversations. The following figures show the use of high tones in the speech. The figures compare the speech tone of two speakers who use the standard language and language at Thoduwawa.
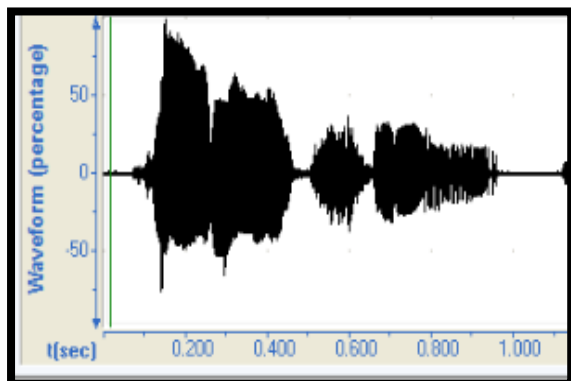
Speaker 1
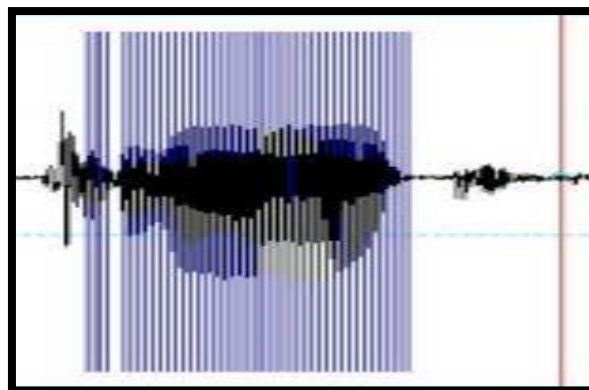
Speaker 2

මම එහෙ යන්නයි හිතන් ඉන්නෙ.
[I am planning to go there]

Additionally, the speakers at Thoduwawa region use some specific features in the conversations. They are denoted as follows.

- Use of word 'අයියෝ' within the conversations
- Use of word 'අඩා' within the conversations

The above features are related to the phonological difference of the language used in Thoduwawa region.

With the consideration of grammatical features of the language used in Thoduwawa region, it was revealed that changes are not in the sentence structure among the standard language and the language used in Thoduwawa region.

Eg: මම එහෙ යනවා
මම එහෙ යනවා
I go there

මම එහෙ යනවා
S   O   V

Accordingly, it is clear that the morphological ad phonological differences are existed among the standard Sinhala language and the language used in Thoduwawa region while no changes are existed related to the grammatical structure of the languages.

With the analysis of the data, it can be concluded that the language used in Thoduwawa region is consisted with some dialectal variation features. Such variations are mainly based on phonology and morphology. And no changes can be seen related to the grammatical structure of the language.

Additionally, language contact, careers and cultural differences cause for the language variation.

4. Conclusions and Future Recommendations

The language should be further analyzed in order to identify the differences further. Additionally, the syntactic as well as contextual differences should be further analyzed in order to identify the all differences in the language.

5. Acknowledgements

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ARE ENTREPRENEURIAL TRAITS OF FEMALE ENTREPRENEURS' AFFECTING ON THEIR VENTURE SUCCESS IN SMALL AND MEDIUM ENTERPRISES (SMES) OF SRI LANKA?

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ABSTRACT

There are several approaches to describing the entrepreneur and determining the venture success. One of the approaches is based on the psychological perceptive, which argues that entrepreneurs often exhibit a typical characteristic profile. Olakitan and Ayobami (2011) argue that among many factors of venture success, entrepreneur him/herself is most important determinant. Scholars of the female entrepreneurship literature have pointed out that personality characteristics identified by the psychological perceptions as entrepreneurial are typically masculine characteristics. Female entrepreneurs' characteristics are also found to be more associated with behaviors identified with masculine than with feminine traits (Buttner and Moore 1997; Hisrich and Brush 1986). Hence, it is needed to identify whether Sri Lankan female entrepreneurs' have these Entrepreneurial Traits (Ent-Tra) to become success in their ventures. The population consists with female entrepreneurs in Small and Medium Enterprises (SMEs) of Sri Lanka. Sample of 250 women entrepreneurs who engaged in five sectors of Western Province of Sri Lanka were selected on the basis of non-probability purposive sampling methods of convenience sampling and snow-balling sampling methods. Data was collected through a structured survey questionnaire. Three specific Entrepreneurial traits of Need for achievement (NFA), Locus of control (LOC) and Risk taking propensity (RTP) were selected on the base of previous quality literature. A moderate correlation was identified among N-Ach, LOC and Venture Success (VS) of female entrepreneurs. Multiple linear regressions were used to test the three hypotheses developed. It was found that NFA and LOC have significant and moderate positive relationship with VS. Nevertheless, RTP has no any significant relationship with VS of femal entrepreneurs'. The study concludes that Ent-Tra of female entrepreneurs' is moderately impact on their VS in SMEs of Sri Lanka.

Keywords: Entrepreneurial Traits (Ent-Tra), Need For Achievement (NFA), Locus of Control (LOC), Risk Taking Propensity (RTP), Venture Success (VS)

1. Introduction

Female entrepreneurship has increased over the past decade as the percentage of female in business has increased. The growth of female entrepreneurs is part of the societal changes that have occurred and are occurring all over the world in the late twentieth and early twenty-first century. Increased independence for females, later marriage, decreased child bearing, increased education levels, and the increased desire for financial independence all contribute to the growth of females-owned businesses (Fielden and Davidson 2005). Significantly, substantial evidence in literature shows that female entrepreneurs' businesses are predominantly in the small and medium enterprises sector. Research in female entrepreneurship, mostly in developed countries, highlights the growth in the number of females in small and medium enterprises. These studies show that female entrepreneurs in all OECD countries and other developed countries are contributing significantly to the socio-economic development of their countries (OECD 2004).

There are several approaches to describing the entrepreneur and determining venture success. One of the approaches is based on the psychological perceptive, which argues that entrepreneurs often exhibit a typical characteristic profile. Numerous studies on female entrepreneurs have therefore endeavored to develop a profile of female entrepreneurs and establish whether a 'typical' profile of female entrepreneurs existed, and if so, whether people matching this profile were more likely to make successful entrepreneurs (Bennet and Dann 2000; Hisrich and Brush 1985).

Olakitan and Ayobami (2011) argue that among many factors of venture success, entrepreneur him/herself is most important determinant. Majority of scholars argue that entrepreneurs have a certain characteristics which differentiate them from

general public and they are small in numbers (Marcua, Lordanescua, Iordanescua, 2012).

Scholars of the female entrepreneurship literature have pointed out that personality characteristics identified by the psychological perceptions as entrepreneurial are typically masculine characteristics. Taylor and Newcomer (2005) observed that the tendency worldwide has been to identify entrepreneurs in terms of masculine characteristics. Though, female entrepreneurs' characteristics are also found to be more associated with behaviors identified with masculine than with feminine traits (Butter and Moore 1997; Hisrich and Brush 1986). Therefore, it is needed to identify whether Sri Lankan female entrepreneurs' have these entrepreneurial traits to become success in their businesses. To fill this gap the researcher investigated the venture success of female entrepreneurs' in SMEs of Sri Lanka. Hence, the primary objective of this study was to investigate the relationship between entrepreneurial traits and venture success of female entrepreneurs' in SMEs of Sri Lanka.

2. Literature Review

Li and Jia (2015) said entrepreneurship has becoming a popular term currently, he add not all of entrepreneurs can succeed in entrepreneurial business. They need specific characteristics to enable them to success. In this study, the researcher will capitalize on the most important entrepreneurs' characteristics that have been used by many researchers as will be showed in the coming subsections.

2.1 Entrepreneurial Traits (Ent-Tra)

Rauch and Frese (2000) point out that personality trait of entrepreneurs' predict his/her behavior. Major character of entrepreneurship is entrepreneur him/herself, so it is important to study individual entrepreneur, in order to understand the process of entrepreneurship (Poon et al., 2006). McClelland's (1961) work was pioneering in entrepreneur's personality trait including Need for achievement, Locus of control and Risk taking propensity. There are many characteristics of personality which grab attention of scholars. Substantial evidence in literature supports the perception that entrepreneurial traits such as Need for achievement, Risk taking propensity and internal Locus of control make a fundamental contribution to the emergency of an enterprise, and are strong determinants in entrepreneurial venture success. In view of these findings, the researcher might expect that Sri Lankan female entrepreneurs possess these specified entrepreneurial traits.

2.1.1 Need for Achievement (NFA)

Concept of Need For Achievement was first presented by David C McClelland (1961) and argue that since beginning human being have desire to accomplish, need to excel, succeed or achieve. To satisfy this need an individual tend to be an entrepreneur. Although there are not many research evidence which support personality traits, but still there exist evidence which proved relationship between NFA and entrepreneurship (Johnson, 1990). According to Elliot (2006) NFA consisting two parts one is hope for success and second is fear of failure.

Among all personality traits which are researched, NFA grabs most attention of the scholars. David Clarence McClelland (1953) defines NFA as behavior of individual towards competing with excellence. According to David C McClelland (1961) preferences for challenge, innovativeness and personal responsibility are building blocks of NFA. These are not only motivation factor for startup of entrepreneurial venture, but also contribute for the success of it (Hornaday & Aboud, 1971). Shaver and Scott (1991) argue that NFA has longest history among all psychological characters associated with entrepreneurs. David C McClelland (1961) ranked high NFA as a key trait for entrepreneurs, recognized leadership characteristic (Lumpkin & Dess, 1996). Individual with high NFA are more self-confidence, having high RTP (David C McClelland, 1965).

David C McClelland (1961) argues that some qualities related to NFA have their contribution in success of venture. Brockhaus found that higher NFA is one of the most important entrepreneurial traits which play significant role in success of new start-up (R. H. Brockhaus, 1982). In the light of these evidences from literature author hypothesized that;

H1: Higher Need for Achievement (NFA) positively and significantly related to Venture Success (VS) of female entrepreneurs'.

2.1.2 Locus of Control (LOC)

Locus of control is one of the most studied personality traits of entrepreneur. Rotter (1966) defines LOC as perception of individual that what is the cause of events which took place in his/her life? In other words, belief of one person about the events which took place in one's life is due to his/her own actions (Internal LOC) or he/she has no control on those events (External LOC).

Concept of LOC is first introduced by Rotter (1966) and Rotter (1966) expands this concept further. Internality and Externality are two dimensions of

LOC (Rotter, 1975). Internality refers to believe about outcome is due to one's own actions, whereas externality is view that outcome is due to luck, chance, fate etc. (Fagbohungbe & Jayeoba, 2012) defined LOC as perception of individual about punishment and reward in his/her life. It is perceived control over life events (Rotter, 1966).

R. H. Brockhaus (1982) ranked internal LOC as an important success factor along with higher achievement need and higher propensity to take risk. Caliendo et al. (2014) provide evidence that there is positive relationship between internal LOC and entrepreneurship status. It was highlighted in number of previous studies that positive relationship exists between LOC and success of entrepreneurial venture (Begley & Boyd, 1987; Evans & Leighton, 1989; Thomas & Mueller, 2000). So this leads author to develop second hypothesis;

H2: Internal Locus of Control (LOC) positively and significantly related to Venture Success (VS) of female entrepreneurs'.

2.1.3 Risk Taking Propensity (RTP)

Modern era of this concept starts in late 1970s and early 1980s when different models were developed in order to make distinguished between entrepreneurs and employees in grounds of risk. It was suggested by Palmer (1971) that we can test entrepreneur psychologically by measuring individual's attitude, perception and management of risk. It is already stated that there are many definitions of entrepreneurship. According to Noah (1961), entrepreneur is a person who organize an economic venture, particularly one who is organizer, owner, manager and risk taker accompanied with business. It is also stated in Standard Dictionary of Funk and Wagnairs (1958) that entrepreneur is a person who start a business and having full control over its functions and take risk to operate its daily process (R. H. Brockhaus, 1980). Schumpeter (1954) argues that J. S. Mill was first economist who use term entrepreneur in field of economics. In his study, Mill (1848) describes functions of entrepreneur as direction giver, controller, superintendent and risk-taker. He further argues that RTP is the quality which distinguished entrepreneurs from managers.

There is positive relationship between RTP and intention to start and stay in business (Zhao, Seibert, & Lumpkin, 2010). Caliendo, Fossen, and Kritikos (2010); (2009) found that risk aversion has impact on entry to self-employment and individual having less risk aversion attitude are most probably to enter in self-employment. He also point out that self-employees have higher RTP than employees. Further highlighted by same Author, those

individuals with medium RTP have more probability to stay in self- employment when he compared them with those who have low or very high RTP. To investigate RTP and VS author hypothesized that;

H3: Higher Risk Taking Propensity (RTP) positively and significantly related to Venture Success (VS) of female entrepreneurs'.

2.2 Venture Success (VS)

Traditional economics and entrepreneurship theories interpret the success of a venture based on its financial performance and profitability (Djik, 1996). Small business success defined in various ways by different scholars, In simplest way, small business success may be defined as the firm ability to survive or sustain in business (Lussier and Pfeifer, 2001). However, some researchers have used criteria based on financial measures to estimate venture success even though these criteria may not fully appropriate to small business entities such as profitability, sales growth, market share and cash flow to define success (Chaganti and Chaganti, 1983; Hornaday and Wheatley, 1986; Storey et al; 1987; Thorpe, 1989; Kelmar, 1990). Masuo et al (2001), in their studies defined venture success in terms of economic or financial analysis which includes return on assets, sales, profits, employees and survival rates. Jennings and Beaver (1997) stress that determinants of small firms success or failure is a complex, dynamic and problematic issues.

These entrepreneurial traits are considered to be crucial in distinguishing successful entrepreneurs from unsuccessful ones (Brockhaus 1982). Sri Lankan female entrepreneurs will therefore be investigated within this framework to find out whether they possess these unique traits, and whether their entrepreneurial traits relate to their venture success.

3. Methods

This is a descriptive study. As the study was examined the entrepreneurial traits affecting venture success in natural working environment of small and medium enterprises it is non - contrived setting. The study was cross – sectional in nature. The unit of analysis of the study is female entrepreneurs of SMEs in Sri Lanka. Primary data was collected by means of mail survey questionnaire which was mailed out to 250 Sri Lankan female entrepreneurs in Western province of Sri Lanka. Out of that 250, only 215 questionnaires were identified as usable data for this study purpose. Non probability [purposive] sampling methods of convenience

sampling and snow-balling sampling methods were used as sampling methods of the study.

Multiple diverse instruments were used for data collection in this research study which is related to three independent and dependent variable. NFA was measured by a 9-item scale for the purpose of the present study by using Ray's (1979) measure of need for achievement motivation. Levenson's (1973, 1974) 3 scales, IPC-scale was used to measure LOC. RTP was measured by a 5-item scale created based on Groves and Paunescu (2008). Entrepreneurial VS was measured by previous years' development in sales and employments respectively by using 5-point Likert scale.

Data was analyzed using SPSS-21 software. The survey questionnaire was piloted to ensure its reliability and validity for the study. Descriptive statistics were used to make raw data into a meaningful form and Pearson correlation was used to investigate the relationship between the variables. Multiple regression analysis technique was applied to determine the simultaneous impact of entrepreneurial traits on venture success of female entrepreneurs'.

4. Findings of the Study

215 fully completed questionnaires received from respondents which show a satisfactory response rate of approximately 87% from five sectors of businesses (trading 42.1%, production 12.4%, service 24.8%, education 11.7%, textile and fabric 9%)

Variables	N	Mean	SD
VS	215	3.3724	0.9526
NFA	215	4.0345	0.9175
LOC	215	3.1724	1.5223
RTP	215	2.3614	1.2249

Table 1. Descriptive Analysis

Table 1 depicts the means and standard deviation of the variables of the study. A high value of mean shows the more agreeableness of the responds, whereas lower value of mean shows disagreement. Means of three variables NFA, LOC and VS are high and which show availability of these qualities in female entrepreneurs of Sri Lanka. Though, RTP of female entrepreneurs is low.

Cronbach's alpha coefficient is above the significant level of 0.7 for all scales within the sample of this study. It indicates that inter item consistency reliability of each instrument is satisfactory.

Pearson correlation test results which applied to check the relationship between different

entrepreneurial traits and VS. Relationship between NFA and VS and LOC and VS were moderate positive with value of 0.517 and 0.438 at confidence level of 99%. Correlation between RTP and VS was positive and close to zero with value of 0.054. Though, it is not significant at confidence level of 95%.

Multiple linear regression analysis was conducted in order to examine hypothesized relationship between three independent variables and VS. The results of the multiple linear regression analysis are presented in Table 2.

Co-Variables	β	S.E.	T	Sig
NFA	0.232	0.125	2.573	0.011
LOC	0.185	0.060	2.251	0.026
RTP	0.046	0.068	0.572	0.568

a. Dependent variable :VS

Table 2. Multiple Regression Analysis

As shown in Table 2, NFA has the strongest significant effect on VS ($p<0.05$) with standardized beta of 0.232. LOC has significant effect on VS with a standard beta of 0.185. RTP does not have significant effect on VS.

Hypothesis 1 proposed a positive and significant relationship between NFA and VS. A significant regression coefficient beta 0.232, t(215) = 2.573 at 0.011 ($p<0.05$) is showing support for hypothesized relationship which mean female entrepreneurs having higher NFA achieve higher VS. This finding is in line with a Goksel and Aydintan (2011) and Tongan Loy (2011) studies.

Hypothesis 2 proposed that there is a positive and significant relationship between internal LOC and VS. Value of regression coefficient beta was 0.185, t (215) = 2.251 at 0.026 ($p<0.05$) is showing support for hypothesized relationship. Although relationship was not as strong as in case of NFA, still there is significance positive relationship which shows that female entrepreneurs with internal LOC has positive relationship with VS.

It was proposed in Hypothesis 3, that there is a positive and significant relationship between RTP and VS. Beta coefficient value of 0.046 and t value of 0.572 were not significance with p= 0.568 which is p>0.05. Thus, hypothesized relationship is not proved. That is female entrepreneurs with high RTP may not achieve higher VS.

A stepwise regression was done in order to find out the extent of contribution of each co-variable to adjusted R square value or the total explanatory power of the regression model.

Co-Variables	Adjusted R square	β	F	Sig
NFA	0.050	0.264	8.567	0.004
LOC	0.087	0.209	7.852	0.001

Table 3. Stepwise Multiple Regression Analysis

As shown in Table 3, the results of stepwise regression indicate that there were two predictor co-variables that could significantly contribute to the adjusted R square value.

The results indicates that NFA has highest value of 0.264 and contributed 5% to the variance of VS. LOC contributed 3.7% to the variance in VS with beta value of 0.209. RTP was not found contributing to the total explanatory power suggesting that NFA and LOC explained about 8.7% of variance in VS.

5. Discussion and Recommendations

Results show that positive and significance relationship between NFA and VS which provide support to hypothesis 1. This means that entrepreneurs having high NFA are more succeed on their ventures. This result is supported by most of the previous studies, such as; Baum and Locke (2004) and Sola (2013).

Hypothesize 2 proposed positive and significance relationship between internal LOC and VS. Empirical analysis also confirmed the hypothesized relationship that entrepreneurs who having internal LOC are more succeed on their ventures. The results of internal LOC is similar to previous studies of Makbul and Hasun (2010), Baum and Locke (2004) and Adenbite et.al. (2006).

A positive and significance relationship between RTP and VS was hypothesized in hypothesis 3 which is not supported by empirical evidence. Hence, there is no relationship between RTP and VS of female entrepreneurs in Sri Lanka.

RTP was not found contributing to the total explanatory power suggesting that NFA and LOC explained about 8.7% of variance in VS.

6. Conclusion

Entrepreneurial traits and Venture success was tested using three entrepreneurial traits i.e. Need for achievement, Locus of control and Risk taking propensity. Using multiple regression-analyses it was found that two out of three entrepreneurial traits which are NFA and internal LOC are predictors of VS of female entrepreneurs'. Hence RTP is not predicting VS.

This study is a pioneering work which provides a detailed picture of traits of Sri Lankan female entrepreneurs. Although, VS is not only determined by entrepreneurial personality traits, there are many more other factors which should be investigated such as Skills, competencies and demographic characteristics and so on. This study will provide initial thought for further research. It is crucial to conduct a comparative longitudinal study with a larger sample to see the significant differences of male and female entrepreneurs in Sri Lanka. Moreover, this study provides information about female entrepreneurs of one of the nine provinces of Sri Lanka which may not be applicable to whole country because of difference of sub-cultures in Sri Lanka.

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GAME EDUCATION TO AVOID PHISHING ATTACKS

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ABSTRACT –

Internet technology is unescapable today that it has become the backbone for modern lifestyle. As people's dependency on Internet technology grows more, the possibility of security breaches increases. It is revealed that human factor is still weak and susceptible for security vulnerabilities because of their lack of security awareness and quick, sensitive trust decisions during online activities. This research focused on developing a game design to protect computer users against phishing attacks. The literature review was conducted to understand the research background and support the proposed research work. Research investigates the key elements that should be addressed in the game design framework to avoid phishing attacks. The proposed game design was aimed to enhance the user avoidance behavior through motivation to prevent phishing attack. By playing the game, user get a good confidence to face attack and take the necessary avoidance behavior in the real-world scenarios. The one of many ways of identifying a phishing attack is by paying attention to the website address (URL). Proposed game design aim to teach users how to identify legitimate and phishing website addresses. A game prototype was developed based on design. First survey checks for the awareness about the attack of target group and in the second survey, game design was evaluated. In conclusion, the research found that the game has a good effect in enhancing the user's phishing attack awareness. The participants who played the game were better able to identify fake URLs compared to the participants without any training.

Keywords: Security awareness, Phishing attack

1. Introduction

The Internet brings enormous opportunities and benefits modern lifestyle enabling ordinary people to shop, socialize and be entertained all by using their home computers/laptops and smart phones. Besides, nowadays, companies, organizations are increasingly shifting to 'virtual' concepts where they shift from office work to the home environment. Employees are free to work out of company/organization, and moreover, BYOD like concepts are also being introduced.

As people's dependency on Internet technology grows more and more, the possibility of hacking and other security breaches increases. As a result, it increases the opportunity for individual users to open themselves to vulnerabilities. Popular security activities can include viruses, spams, spyware, malware, personal information hacking through social engineering, Identity theft and many more. These attacks are prepared to target either financial or social gain.

As mentioned above, users are often the weakest link in a software system. If security controls embedded in software systems delay users' ability to accomplish their tasks, users will ignore or try to bypass such controls, which is a common occurrence in today's systems. So, because of that, building usable security functions is a significant component of building secure systems.

Many studies have reported end-user education as a frequently recommended approach to countering attacks. Due to lack of security awareness and quick and sensitive trust decisions that make during online activities in our day-to-day life, researches have revealed that the human factor is still infancy and a significant threat in the field of information security and Computer users are susceptible for security vulnerabilities. To protect individual users against these IT threats, education is the best solution. Always prevention is more suitable for detecting an issue.

Concerning the ordinary people, one of the main reasons why application security violations continue to rise is the fact that many deployed security mechanisms are not user-friendly, and specialized knowledge is needed.

The focus of this research was to see the possibility of how education of computer users against security vulnerabilities they face; which has become a great issue with their unawareness, with focus on game-based learning.

1.1 Phishing Attack

Phishing is one of the major problems faced by cyber-world and leads to financial losses for both industries and individuals. Phishing is a crime in which a culprit sends the fake e-mail, which appears to come from popular and trusted party, asking to input personal credentials, The fake e-mails often look amazingly legitimate, and even the website where the Internet user is asked to input personal information also looks similar to legitimate one. [13]

Detection of phishing attack with high accuracy has always been a challenging issue. Phishing website looks very similar in appearance to its corresponding legitimate website to deceive users into believing that they are browsing the correct website.

Phishing messages propagate over e-mail, SMS, instant messengers, social networking sites, VoIP etc. But e-mail is the most popular and common way to accomplish this attack and 65% of the total phishing attack is achieved by visiting the hyperlink attached to the e-mail.

The phishing mechanism is shown in Figure 1. The fake website is the clone of targeted genuine website. When the user submits his/her personal data, the information is transferred to the attacker.
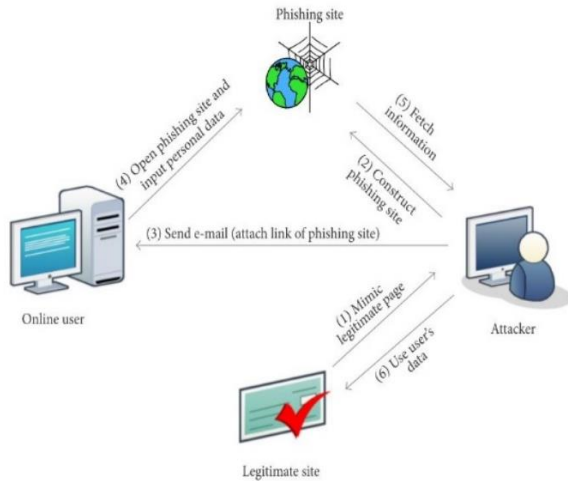

Figure 1.1

1.2 Human aspect of security

Internet provides media enabling ordinary people to engage with online activities such as online shopping, banking and entertaining much easily. Unfortunately, most computer users are unaware of this technique and will open a back door for hackers. This is one major reason to raise the possibility of hacking and other security breaks. Therefore, it is worth considering human aspects of security within their regular computer use.

Researches show that human aspect of security in the computer use can be concerned as the most stimulating and challenging area in Information Security because general users are not equipped with a certain degree of computer literacy.

This poor security behavior in computer use exposes computer users to vulnerable malicious IT attacks or security breaches. Computer users should realize that they are responsible for their own personal computer's security as the same way that they are responsible for their own goods or having insurance when they buy a house or vehicle. However, knowledge about the human aspect of performing computer security is yet far from complete.

1.3 Concept of educational games

Educational games and simulations have become increasingly acknowledged as an enormous and powerful. The main reason is that game based education allows users to learn through experience and the use of virtual environment while leading them to approach problem solving through critical thinking.

To protect individual users against these IT threats, education is the best solution. Always prevention is more suitable that detecting an issue. Therefore, this research work effort is to see the effectiveness and possibility of a game prototype as a tool, achieving the user friendliness to educate computer users to avoid and protect themselves against phishing attack.

2. Methodology

2.1 Research Approaches

There are several research methodology approaches exist in the Information Systems literature for example, the qualitative approach, the quantitative approach and the mixed method approach.

In this research in order to find the possibility and feasibility of this topic, first a theoretical literature study was done and then a survey was conducted using mixed method with both quantitative and qualitative methods which were felt the best method considering all. Several tools were used to gather necessary data for the research. The data were collected using questionnaires, interviews and by observations.

Two questionnaires were designed, one before the game to check their awareness in finding legitimate websites and participants security background. Second survey aimed to check the improvements after using proposed game tool. Observations were carried out the second data gathering tool. Observation session was conducted to follow user behavior in

facing real online situation. For the interviews; the third data gathering tool, adopted a informal approach, letting the interviewee speak freely about an issue or asking specific pre-determined questions.

IBM SPSS, which is a statistical software package for data analysis; was used to analyze the information gathered through above methods.

The questionnaire survey was conducted in-person. First, participants were informed about the research and background information. Then the individual participants were asked whether they knew what the term "Phishing Attack" means. Those who gave a positive response were asked to give a short verbal description to confirm their understanding, while those who responded in negative way were asked to read a brief definition of phishing attack and given a short verbal description. Then participants were asked to complete the questionnaire items. They were informed that they are of course welcome to clarify them any questions when difficulty of understanding.

There faced few difficulties regarding the language. For those participants who didn't familiar with the language, language assistance was given in Sinhala. Observation was done throughout the entire activity. Points were given for the marked statuses were achieved. That way was able to observe the behavior in how cautions participants are entering confidential and sensitive information.

2.2 Story and Mechanism

Storytelling techniques are used to grab attention, which also the interesting aspect of reality. Stories can be based on personal experiences or famous tales or it could also be aimed to build a storyline that associates content units, inspire or reinforce.

When it comes to the concept of phishing, it is metaphorically like fishing in the water, but instead of trying to catch a fish, attackers try to steal consumer's personal information.

The more appropriate, realistic and content relevant the story, the better the chances that it will trigger users. The game design is based on a story of a small fish who live in the sea. The game player role-plays as the small fish, who is hungry and finding foods to eat to grow up. There are both bad and good food in the sea. However, it should be careful of phishers those who try to trick him and make him eat bad foods. Each food is associated with a website address, so called Unified Resource Locator (URL). The small fish's job is to eat food without catching to the traps. In other words, small fish has to eat which associate legitimate website addresses and reject fake foods which associate with fake website addresses before the time is up.

There is a helping hand for the fish. If the food associated with the URL is suspicious and if it is difficult to identify, the small fish can request help. The help will give the small fish some tips on how to identify bad foods. For example, "website addresses associate with numbers in the front are generally scams," or "a company name followed by a hyphen in a URL is generally a scam". Whenever the small fish requests help from the teacher, the time points will be reduced by certain 50.

The game prototype design consists of URLs to randomly display foods including good food (associated with legitimate URLs) and bad food (associated with phishing URLs).

Table 2.1

Real or Phishing	Example	Hint messages
Real	http://www.dailymirror.lk/	"URLs with well-known domain and correctly spelled are legitimate"
Phishing	http://187.44.286.55/PayPal/login.html	"Don't trust URLs with all numbers in the front"
Phishing	www.paypa1.com	"Don't trust URLs with misspelled known websites"
Real	https://www.mcdelivery.lk	"URLs with well-known domain and correctly spelled are legitimate

2.3 Game Design

The game scenario and design principles (a set of guidelines) were combined to focus on designing an educational game for computer users to prevent phishing attacks. Therefore, the current study attempts to design a storyboard based on the game scenario and design principles as the initial step for the game.

This research study implemented a game prototype for computer users to thwart phishing attacks based on the above-mentioned storyboard design. To explore the feasibility of using a game to prevent from phishing attacks, a working prototype model was developed using game maker studios.

3. Evaluation and Discussion

3.1 Pre-Survey

The survey results yielded a total of 20 participants and their data from each of the targeted sectors of the research. There were a total of 11 male and 9 female

participants. Out of 20 participants all are daily internet users mainly engaging with the purpose of social media, entertainment and online buying's.

From those Internet users, 30% percent have heard of phishing, although only 25% percent have a slight idea of what phishing is and there were 40% of no answers which says they haven't heard of phishing.

Also found that 75% of the participant's check-out the promotions and various advertisements come to their mail and out of 20, 60% said that they might open such email or attachment even they don't know the sender.

65% of the users think that their e-mail service provides necessary options to secure e-mail that they don't have to concern it.

Analyzing the observation results, it was found that 76% of the participant never checked the URL or the validity of the link which was given to them to do a transaction. While paying online 62% of them directly entered numbers without checking for online website's security.

More than half of participants ignored all cues in the web browser address bar and status bar as well as all security indicators. Participant's avoidance behavior was 25% at this state.

After analyzing all, came to conclusion that most of the emerging youth who have curiosity over the new online culture doesn't have much worry about their information.

Participants were given few website URLs to identify whether legitimate or not. Surprisingly only 31% suspected malicious URLs while others just clicked on the link

3.2 Post-Survey

The participants scored 48% in the before the game design finding legitimate URLs task and 86% in the post-test after playing the game. The overall score had been increased by 38% percent which is a huge achievement. Three participants scored full marks during their post-test identifying all correctly, while five participants scored above 80 percent. It is interesting to note that participants' avoidance behavior has increased in the post-test, after playing the game. It is also revealed that the time taken to identify a URL is much lesser compared to pre-test. Additionally, participants did notice warning signals

3.3 Evaluation

The findings of post-survey study aim to determine whether the participant avoidance behavior enhances

through motivation to protect themselves from phishing attacks through the game prototype. This time the accuracy of the identifying URLs correctly has been increased compared to the pre-test and participants had a middle level knowledge on the subject, which makes the research a true and successful one.

Moreover, participants demonstrated they had higher confidence after using the game prototype. Participants were also able to learn the game quickly and they stated they are quite interested in using the game frequently. The comments from the users were mostly positive. There were few comments regarding the user friendliness and colors, sound in the game.

In addition, all participants talked about their opinions about phishing threat awareness after using the mobile. All of them believed that the game was somewhat effective to enhance their avoidance behavior through motivation to protect themselves against phishing attacks.
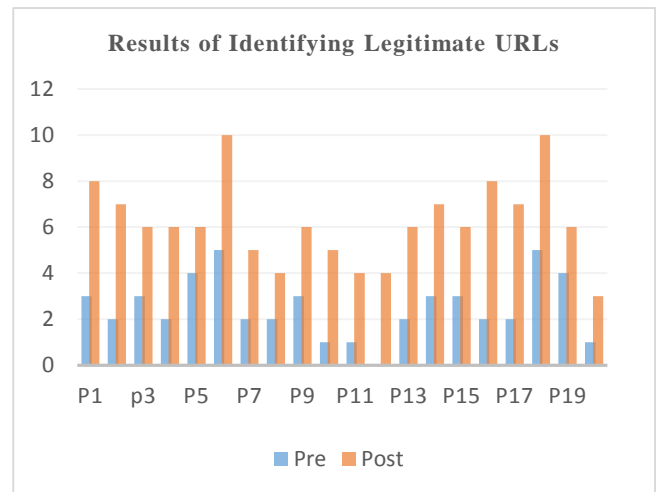
Figure 3.1

4. Conclusion

The main purpose of this research to find whether a game can be designed to protects users against phishing attacks. The study reported a game prototype as an educational tool to teach computer users how to protect themselves against phishing threats. The elements from the game design frameworks were used to address those game design issues and the game design principles were used as a set of guidelines for structuring and presenting information in the game design context. The objective of the anti-phishing game prototype was to teach the user how to identify phishing URLs. The overall game design was focused to enhance avoidance behavior through motivation of computer users to prevent phishing threats. Then to evaluate a study was done included total 20-10 participants, the age range between 18 and

25. The pre- and post-tests were based on questionnaires observations and interviews. The study results found that the game prototype teaches personal computer users to protect themselves from phishing attacks.

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FUTURE VISION: ACCEPTABILITY OF ARTIFICIAL INTELLIGENCE PERSONALIZED SERVICES IN WINERY ACCOMMODATION

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ABSTRACT:

India is one of the countries in the New World Wine region and is emerging into the wine market. The growth of the industry has been growing at the rate of 30% annually in the last ten years [1][2]. According to [3] wine tourism would play a vital role in changing the trends in wine marketing in India in the near future. In addition, the habit of customers in exploring about a product or service in the websites before deciding on the purchase [4] urges the business to develop a website. The study was done in the context to wineries in Karnataka, the southern state, which is one of the wine producing regions in the country. This study is an attempt to analyse the acceptability of Artificial Intelligence Personalized Services in the customer perspective and the customer's expectations toward winery website components as the winery's website can be an important tool used for promotion [6]. The data was collected with the help of the questionnaire and results analysed with suitable statistical tools. The results prove that consumers are interested in wine tourism and more excited to experience Artificial Intelligence Personalized Services and expect a Virtual Tour component in the winery website as it eases the consumer's decision making on planning a winery visit. This study suggests the wineries of Karnataka to move on to the next level of innovation by adapting web 4.0 components in their respective wineries in order to be in the spotlight of innovation and develop brand awareness.

Keywords: Artificial Intelligence, Karnataka Wineries, Virtual Tour, Wine Tourism, Wine 4.0 components, Winery Accommodation

1. Introduction

Customers expect the products or services to be better in every future purchases. This gives more pressure on the company, irrespective of the sector, on delivering the best product or services to the customers compared to their competitors. This causes the need for the companies to incorporate customer's ideas as that would be easily accepted by the consumers [7]. Social media, gives a helping hand to these companies to primarily understand what the customer needs. This helps them to develop the product or services accordingly. Though competition among the company persists in delivering the best to their consumers, still it minimizes the risk of non-acceptance of the product or service by the customers as the companies have understood the customer's need clearly. The same applies for hospitality and tourism industry too. Wine tourism is a concept which is familiar in Old World Wine producing countries and many wineries have adopted wine tourism as a marketing tool to spread brand awareness. The study of wine industry is given an emphasis because wine industry would contribute in developing rural tourism [8] and creates opportunities for the rural communities [9]. There are countries like Bulgaria which follows international trends in providing accommodation and Spa for the wine tourists, still finding it difficult in attracting customers [10]. Wine tourism is a unique way of transforming tangible wine products to intangible tourism experience[11]. Touring a winery involves tasting of wine and food and participating in nature based and lifestyle activities (Hall et al., 2000). Karnataka, the state in the southern part of India is one of the best wine producing regions in the country which has 16 wineries in operation and the wine consumption has increased from 13.71 lakh litre in 2007 to 178 lakh litre in 2015 but still struggling to compete at the international wine market. The people of Karnataka mostly prefer beer or other spirits and wine is the least consumed beverage [12]. The only way to create awareness about the wine region and the wine products of Karnataka, wine tourism would be the best way to attract more customers. In addition, the wine regions which implement wine tourism fail to take steps in attracting visitors [10]. On the other hand, innovation in technology is power enough to change the way in delivering customer service. Innovation is one of the vital elements which becomes essential in the current competitive market scenario. The customer in recent days' likes to go hand in hand with the technological development. In this case, strategic innovation is required to be adapted by the wineries which is conversion of idea into product or practice which in turn creates a great impact on market evolution [13]. Also as internet gains more popularity among consumers it could be an advantage for winery business[14] Therefore, this paper aims to understand the level of acceptability of virtual tours and Artificial Intelligence Personalized Services from a customer perspective.

The study is based on the customers expectation as the organizations in order to be innovative has to incorporate ideas into products or services that will be accepted by customers [7]. This is done to give suggestions to the wineries and wine authorities of Karnataka to adapt web 4.0 components which would match the customer perceptions and the technology innovation would attract customers.

2. Objectives

- To analyse the level of awareness among consumers about wineries in Karnataka
- To understand the expectations of customers in regards to visiting a winery
- To examine the importance of website information for customers about accommodation facilities in a winery
- To understand the expectation of customers in regards to virtual tour content in a winery's website
- To analyse the level of liking of customers to interact with Robots (Artificial Intelligence Personalized Services)

3. Methodology

The study involved a preliminary work to identifying the contents of 16 winery websites of Karnataka to understand the level of information provided for visitors who are willing to visit a winery and avail accommodation at the winery. According to the preliminary observation of the website contents of all wineries in Karnataka state that the websites has to be enhanced in order to attract and influence customers to visit the winery and take part in wine related activities. In order to enhance the website and tourist

activities the expectation of the customers have to be understood in order to find out whether the customers like to stay in a winery and what would be there expectations before and after reaching the destination. The data for the same was collected through a questionnaire from 50 respondents of Karnataka and the same was tested for its validity and the Cronbach's alpha value of the questionnaire is 0.7. The results of the study were run statistically using Minitab 17, VassarStats and Microsoft Excel worksheet. The statistical tools used for the study were Cronbach's Alpha, paired t – test, Pearson's correlation, one – way Anova and Tukey's test

4. Findings

The study involved 50 respondents of all age group. 54% of the respondents were in the age group of 18 – 25 years.

4.1 Awareness about Wineries in Karnataka:

In the perspective of wine tourism, it is important for a customer or visitor to possess an awareness on wine destination. Therefore, the study attempted to understand the level of awareness among the respondents in regards to wineries in Karnataka. The result is stated in Table 1.

Hypothesis:
H0 – There is no significant difference in the consumer's level of awareness about wineries in Karnataka
H1 - There is a significant difference in the consumer's level of awareness about wineries in Karnataka

Anova: Single Factor

SUMMARY

Groups	Count	Sum	Average	Variance	Std. Error
Not at all aware	50	11	0.22	0.175102	0.059178
Slightly aware	50	14	0.28	0.205714	0.064143
Somewhat aware	50	13	0.26	0.196327	0.062662
Moderately aware	50	9	0.18	0.150612	0.054884
Extremely aware	50	3	0.06	0.057551	0.033927

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	1.52	4	0.38	2.419439	0.05	2.408488
Within Groups	38.48	245	0.157061			
Total	40	249				

Table 1: Awareness among Consumers in Regards to Wineries in Karnataka

According to Table 1, the null hypothesis is rejected and there is a significant difference among the respondents as the p value is equal to the alpha value (p = 0.05) and the data states that 28% of the respondents are slightly aware and 26% are somewhat aware about the wineries in Karnataka. The state being a wine producing region in the country the awareness among the people is lesser and that would definitely affect the future wine market and wine tourism cannot be expected to grow as the visitors are not aware about the destination.

4.2 Customer's Interest in Visiting Wineries:

The increase or development of wine tourism can be initiated if there is interest among the consumers in visiting the wineries as the interest will influence the customer's to become perspective wine tourist. The study tested the hypothesis to understand the level of interest among consumers in visiting the wineries and the results are depicted in Table 2.

Hypothesis:
H_0 – There is no significant difference in consumer's interest in visiting the wineries
H_1 - There is a significant difference in consumer's interest in visiting the wineries

Anova: Single Factor

SUMMARY

Groups	Count	Sum	Average	Variance		
Not Interested	50	12	0.24	0.186122		
Interested	50	38	0.76	0.186122		

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	6.76	1	6.76	36.32018	0.00	3.938111
Within Groups	18.24	98	0.186122			
Total	25	99				

Table 2: Consumer's Interest in Visiting Wineries

According to Table 2 the null hypothesis is rejected as the p value is lesser than the alpha value (p value = 0.00 < 0.05). This proves the significant difference among the consumers in terms of interest in visiting wineries. The results prove 76% of the respondents showing interest in wine tourism.

4.3 Level of Interest among Customers in Staying at a Winery Accommodation:

The revenue in tourism grows when the tourist visits happens and more revenue would earn when the tourists stay at the destination. In regard to winery visits not only the revenue in tourism increases but the wineries get to show case their

wines and educate the visitors on their brands which turns to be a marketing tool in the country where alcohol advertisement is banned. When a visitor stays and spends few days at the winery accommodation the winery gets more time to creating brand awareness. In this regard, the study analysed the interest level among respondents in staying at a winery accommodation. The results are depicted in Table 3.

Hypothesis:
H_0 – There is no significant difference in consumer's level of interest in staying at a winery accommodation
H_1 - There is a significant difference in consumer's level of interest in staying at a winery accommodation

Anova: Single Factor
SUMMARY

Groups	Count	Sum	Average	Variance	Std Error
Extremely unlikely	50	4	0.08	0.075102	0.038756
Unlikely	50	5	0.1	0.091837	0.042857
Neutral	50	14	0.28	0.205714	0.064143
Likely	50	23	0.46	0.253469	0.0712
Extremely likely	50	4	0.08	0.075102	0.038756

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	5.64	4	1.41	10.05384	0.00	2.408488
Within Groups	34.36	245	0.140245			
Total	40	249				

Table 3: Level of Interest among Customers in Staying at a Winery Accommodation

As per the statistical date in Table 3, it proves a significant difference in the level of interest among respondents in staying at a winery accommodation as the p value is lesser than 0.05 (p value = 0.00). This proves that 46% are likely to stay at a winery accommodation.

4.4 Factors Combined along with Winery Accommodation – Customer's Expectation:

To make the stay at the winery worth for the customers in order to learn about wines and enjoy the stay, an attempt was done to understand the expectations of the customers in regards to other factors which they would prefer to be combined with the winery accommodation. The results are statistically analysed in Table 4.

Hypothesis:
H_0 – There is no significant difference in consumer's expectation from a winery accommodation
H_1 - There is a significant difference in consumer's expectation from a winery accommodation

Anova: Single Factor
SUMMARY

Groups	Count	Sum	Average	Variance
Wine Events	50	16	0.32	0.222041
Wine Education	50	24	0.48	0.254694
Wine Purchases	50	10	0.2	0.163265

ANOVA

Source of Variation	SS	Df	MS	F	P-value	F crit
Between Groups	1.973333	2	0.986667	4.625	0.011273	3.057621
Within Groups	31.36	147	0.213333			
Total	33.33333	149				

Table 4: Factors Expected by Customers Along with Winery Accommodation

As per Table 4, the p value is lesser than the alpha value (0.01<0.05) and hence proves a significant difference among the groups. The analysis proves the interest in customers to learn about wines as 48% of the respondents have chosen wine education as an expected factor to be combined with wine accommodation.

4.5 Level of Importance of Website Information:
In recent days, all the information is available online and it eases customers to educate them before purchasing a product. An analysis was done to understand the importance given by customers to the website information as the website is also a marketing tool. The results are depicted in Table 5.

Hypothesis:

H_0 – There is no significant difference in the level of importance to website information among consumers
H_1 - There is a significant difference in the level of importance to website information among consumers

Anova: Single Factor
SUMMARY

Groups	Count	Sum	Average	Variance
Not at all important	50	5	0.1	0.091837
Slightly important	50	5	0.1	0.091837
Neutral	50	3	0.06	0.057551
Important	50	16	0.32	0.222041
Very Important	50	21	0.42	0.248571

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	5.12	4	1.28	8.990826	0.00	2.408488
Within Groups	34.88	245	0.142367			
Total	40	249				

Table 5: Level of Importance given to Winery Website Information

The results in Table 5, states a significant difference among the group (p value = 0.00 < 0.05). The statistics prove that for 42% of the respondent is the website information is very important and 32% state it to be important.

4.6 Virtual Tour:

The web goes several steps ahead and a virtual tour is a part of it which gives an experience for a customer to view a place from their home virtually. This finding was to understand the expectation of the customers towards virtual tour of the winery or vineyard to decide their visit. The results are statistically analysed and depicted in Table 6.

Hypothesis:

H_0 – *There is no significant difference in customer's expectation towards virtual tour in the winery website*
H_1 - *There is a significant difference in customer's expectation towards virtual tour in the winery website*

Anova: Single Factor
SUMMARY

Groups	Count	Sum	Average	Variance
Never	50	3	0.06	0.057551
Rarely	50	6	0.12	0.107755
Sometimes	50	16	0.32	0.222041
Often	50	16	0.32	0.222041
Always	50	9	0.18	0.150612

ANOVA

Source of Variation	SS	Df	MS	F	P-value	F crit
Between Groups	2.76	4	0.69	4.539474	0.001486	2.408488
Within Groups	37.24	245	0.152			
Total	40	249				

Table 6: Expectation towards Virtual Tour

As per the results in Table 6, the p value is 0.001 which is lesser than the alpha value of 0.05 and hence proves a significant difference among the groups. The results prove 32% of the respondents expect a virtual tour in the website sometimes and other 32% expect it often. This proves the importance given by customers for a virtual tour.

4.7 Excitement towards Artificial Intelligence Personalized Services:
To move a step forward from virtual tour and to create a wow experience for the visitors the Hotel Hilton in Virginia along with IBM has created Connie who handles the concierge desk on artificial intelligence platform. In order to attract more visitors, the study analysed how excited the customers would be if an Artificial Intelligence Personalized platform is set up in a winery. The results are depicted in Table 7

Hypothesis:
H0 – There is no significant difference in customer's level of excitement towards Artificial Intelligence Personalized Services
H1 - There is a significant difference in customer's level of excitement towards Artificial Intelligence Personalized Services

Anova: Single Factor

SUMMARY

Groups	Count	Sum	Average	Variance
No	50	25	0.5	0.255102
Yes	50	25	0.5	0.255102

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0	1	0	0	1	3.938111
Within Groups	25	98	0.255102			
Total	25	99				

Table 7: Excitement towards Artificial Intelligence Personalized Service

According to the data in Table 7, there is no significant difference among the groups (p value = 1) and the results prove that 50% of the respondents state they are excited to experience the services of artificial intelligence platform but other 50% respondent state they are not excited about it.

4.8 Interacting with Artificial Intelligence Personalized Services:

The study also analysed the level of liking among customers in interacting with Artificial Intelligence personalized Services. The results of the same is stated in Table 8.

Hypothesis:

H_0 – *There is no significant difference in customer's liking in interacting with Artificial Intelligence Personalized Services*

H_1 - *There is a significant difference in customer's liking in interacting with Artificial Intelligence Personalized Services*

Anova: Single Factor

SUMMARY

Groups	Count	Sum	Average	Variance
Extremely Unlikely	50	7	0.14	0.122857
Unlikely	50	2	0.04	0.039184
Neutral	50	12	0.24	0.186122
Likely	50	14	0.28	0.205714
Extremely Likely	50	8	0.16	0.137143

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	1.744	4	0.436	3.154755	0.0149	2.408488
Within Groups	33.86	245	0.138204			
Total	35.604	249				

Table 8: Level of Liking among Customers in Interacting with Artificial Intelligence Personalized Services at a Winery Accommodation

According to the data analysed in Table 8, there is a significant difference among customers (p value = 0.01). Hence the results prove that 32% of the respondent's state 'likely' in regards to interacting with Artificial Intelligence Personalized Services.

4.9 Correlation between Variables:

For further in-depth understanding of the analysis a Pearson's correlation was done among variables and the same is stated in Table 9.

Independent Variable	Dependent Variable	r value	p value	Remarks
Level of Excitement toward AIPS	Level of Interest in Interacting with AIPS	0.7	0.00	Strong, positive and a significant correlation
Interest in Visiting the Wineries	Expectation on Virtual Tour of the Winery Facilities	0.3	0.00	Strong, positive and a significant correlation
Importance on Website Information	Expectation on Virtual Tour	0.5	0.02	Strong, positive and a significant correlation
Interest in Staying at a Winery Accommodation	Level of Interest in Interacting with AIPS	0.4	0.3	Strong, positive and a significant correlation

Table 9: Pearson's Correlation

According to Table 9, the results state that as there is an increase in the level of excitement toward Artificial Intelligence Personalized Services (AIPS) there is an increase in the level of interest among customers in interacting with AIPS. This proves the interest among customers in terms of technological development and suggests the wineries to be in the trend to match the customer's expectation.

The customers interested in visiting wineries expect a virtual tour aspect in the winery website (r = 0.3). This proves how keen the customers are in knowing about the facilities of a winery and its accommodation before they visit the winery destination. Also, the more the importance given by the customers to website information the more is the level of expectation for a virtual tour aspect in the website (r = 0.5). Also, the level of interest in enjoying a stay at the winery accommodation found to have a strong and significant correlation (r = 0.4) with level of interest in interacting with AIPS and this proves that AIPS can be used as a marketing tool to attract visitors and to promote wine tourism.

5. Conclusion and Contribution

More than half of the respondents (54%, p value = 0.00) were Millennials who were between 18 – 25 years. The study proves the necessity of spreading awareness among consumers of Karnataka in regards to the wineries in Karnataka and that the state is a wine producing region in India because the respondents seem to be just slightly aware (p value = 0.05, Table 1) about his fact. The wine authorities of Karnataka, namely the Wine Board of Karnataka and the different wineries has to take efforts in spreading awareness either by conducting wine fairs or events to inform customers about their presence in the state as the non-awareness would affect wine tourism and further affects brand awareness. The expectations of the customers prove that most of them show interest in visiting wineries (76%, p value = 0.00, Table 2), staying at the winery (46%, p value = 0.00, Table 3)

and more interested towards learning about wines (48%, p value = 0.01, Table 4) and purchasing wines. This is a positive point from the perspective of wine tourism as this proves the interest among consumers who are less aware about Karnataka wineries in taking part in wine tourism. Most of the respondents (42%, p value = 0.00, Table 5) explore the winery website and the contents are considered to be most important in deciding the visit to a winery. This finding gives an understanding to the wineries to upgrade their website contents in order to facilitate consumers search online. The customers expect a virtual tour of the accommodation and other facilities of the winery in the website which eases their decision making on winery visit (32%, p value = 0.001, Table 6). Half of the respondents were excited about Artificial Intelligence Personalized Services and other half weren't excited about the same (Table 8). In addition, many respondents showed more interest towards interacting with Artificial Intelligence Personalized Services (32%, p value = 0.01, Table 9). The study identified a strong and significant correlation between these variables (r= 0.7, p value = 0.00), that is the more excited the customers are towards AIPS they were more interested in interacting with AIPS.

The study proves that the customers show interest in visiting and staying at the winery and keen on learning about wines. The website information and a virtual tour element plays a vital role in customer decision making towards winery visit as this study has identified a positive, strong and significant correlation (r = 0.5, p value = 0.00) and in addition the respondents who were interested in visiting wineries expect a virtual tour aspect in the website (r = 0.3). The wineries of Karnataka which are open to wine tourism should plan accordingly to include accommodation facilities and emphasis on wine education as this would in turn enable more wine purchases and brand awareness. Among 16 wineries in Karnataka only 8 own their winery websites. It is time for the wineries to set up a website move to the next level of innovation, that is, Web 4.0

which enables to implement virtual tour element in the websites and the wineries should take effort in planning to implement Artificial Intelligence Personalized Services where the guest will get an opportunity in interacting with robots for any assistance during their stay at the winery as the study also identified a moderate and significant correlation between interest in interacting with robots and stay at winery (r = 0.4, p value = 0.03) and this may be the high level of expectation of consumers from advanced technological development. The wineries in Karnataka concentrate on quality wine making and it is time for them to create brand awareness and become popular in the international wine market. As today's customers are more technologically oriented, the wineries therefore, should step ahead in developing the infrastructure, enhance the website content as the customer's develops the belief about the product and company by the way it is portrayed

on the websites [15] and implement new innovations like Artificial Intelligence Personalized Services to match up with the star hotel standards as this would further help in attracting international visitors as well as it would arouse the fun and curiosity which would further enhance the promotion of service robots [5].These recommendation may help to overcome the situation where India stands nowhere in the wine map of the world [16]. The winery contents are given emphasis in this study as they would help in easily getting connected with the consumers [17] and a virtual tour component would turn to be a powerful tool. As the study recommends website components, virtual tour facility in the website and Artificial Intelligence Platform, Table 10, gives a rough idea for the wineries to develop a website and to decide on various components of the website.

Web Domain	Web 1.0	Web 2.0	Web 3.0	Web 4.0
	Customers to view the contents only	Customers can communicate or register	Virtual Tour/Smart Advertising/ Virtual Shopping	Smart Personal Assistant (Robot)
Go Daddy	Rs. 4788/ year	Rs. 7,188/ year	Rs. 11,988/ year	
Word Press or Joomla	Rs. 4256/-			
Freelance Web Designer		Rs. 7000/ - Rs. 15000/-		
Google			Rs. 21,300 – Rs. Rs. 1,64,000 (based on the business size)	
IBM				Rs. 6,74,000

Table 10: Pricing of Website Components

6. Limitation & Future Research:

The study had a smaller sample size and it concentrated only one state in the country, that is, Karnataka. The results may not be generalized for the entire population and the results may vary if a study is done with larger sample size. As the findings of the study shows the positive acceptance level of Artificial Intelligence Personalized Services among customers and expectation of a virtual tour component in the website, a future study may be done on implementation of the same.

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