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"Transforming challenges into opportunities: Vision for a new world"

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Message from the Conference Chair

Dr. Sampath Kannangara

Executive Dean & CEO – International College of Business and Technology

It is a great privilege to Chair the Annual International Research Symposium of ICBT, '**AIRS' 2021**' to be held online on 9th December 2021 at 2.00PM Sri Lanka Time (8.30AM GMT). This is the fourth International research symposium organized by the International College of Business and Technology. This will continue to move forward in the research arena under the ISSN-2659-2061.

The theme for this year is "Transforming Challenges into Opportunities: Vision for a New World" which has opened up in to a multidisciplinary approach consisting of four main session themes. They are Social Sciences, Engineering and Construction, Business Management and Information Technology. This year the paper acceptance rate has been 50% where a total of 24 local and international reviewers participated in the peer review process.

This research theme is a timely choice where the whole world is facing an unprecedented challenge due to the Covid-19 outbreak. Before the pandemic, the largest disruptions to work and workforce worldwide involved new technologies and growing trade links. However, Covid-19 introduced a new disruptor, which is physical proximity. In the post pandemic era, work arenas with higher levels of proximity are likely to see greater transformation.

The world will have to transform these challenges into opportunities by identifying and utilizing the trends that could persist after the pandemic such as shift to remote work and virtual interactions, the surge in use of e-commerce and other digital platforms and the deployment of automation and AI.

This conference will be a platform for academic and industrial researchers to publish their work in above-mentioned areas that would contribute to shaping the future of our civilization.

Message from the Editor-in-Chief

Dr Kalum Kathriarachchi

Head of Department/ Senior Lecturer- Engineering and Construction

International College of Business and Technology

Dear Colleagues,

Welcome to the Proceedings of the 4th ICBT Annual International Research Symposium- AIRS "Transforming Challenges into Opportunities: Vision for a New World". The global pandemic caused by COVID-19 has led to a major shakeup of how academic and society meetings are hosted. The traditional platform of in-person events is not currently an option, yet the appetite for information sharing and knowledge exchange remains. As a result, AIRS organizers are choosing to go virtual rather than cancel or postpone.

First, I would like to express my gratitude to authors, reviewers and participants of 4th AIRS. Secondly, I would like to express my deepest appreciation to the authors whose technical contributions are presented in these proceedings. It is because of their excellent contributions and hard work that we have been able to prepare these proceedings.

Education without innovative research and development is meaningless for the community. This is more so when we are intertwined globally and contribution to global knowledge is the call of the day. I feel highly motivated by the positive response from contributors and like-minded educational fraternities exhibiting their deep interest in bringing this 4th ICBT Annual International Research Symposium.

AIRS endeavours to provide a forum for academicians, researchers and practitioners who are fascinated in the discussion of data driven innovation sand are keen to promote, share and publish relevant high-quality research in the domains of Engineering, Health Science, Information Technology, Business Management and Social Science. Thus, AIRS aims to promote the data driven innovations in various fields and provides assistance in decision making in relevant areas.

On behalf of the editorial board, I am very obliged to our track chairs/ co-chairs for their great efforts in reviewing the papers in their tracks and organizing to assign other volunteer reviewers, the conference technical program committee members, and the designated reviewers.

I would like to hear from you as well as your valuable suggestions on improving our virtual symposium AIRS further. I sincerely extend my thanks to contributors, editorial board members and looking forward for continuous support in future.

I look forward to an exciting day of insightful presentations, discussions, and sharing of technical ideas with colleagues from around the world. I thank you for attending the conference and I hope that you enjoy your visit to virtual conference AIRS.

Profound Regards,

Editor-in-Chief

Dr Kalum Kathriarachchi (DSc, MSc, BSc)

KEYNOTE SPEAKERS

KEY NOTE SPEECH 01:

Professor John MacIntyre
Pro Vice Chancellor (International)
University of Sunderland

Title:
"Is big tech becoming the big tobacoo of AI; and why the future of AI must be ethical AI?"

- Professor John MacIntyre is Pro Vice Chancellor at the University of Sunderland.
- He did his doctorate in Applied Artificial Intelligence in the early 1990s, and went on to establish the Centre for Adaptive Systems which became recognised by the UK Government as a Centre of Excellence in Applied AI.
- He has published more than 150 papers and given numerous keynote presentations at events around the world.
- He is the Editor-in-Chief of Neural Computing & Applications, a role he has held since 1996. NC&A publishes peer-reviewed original research on applied AI.
- John is also Co Editor-in-Chief of a new journal, AI and Ethics, which he established with Professor Larry Medsker of George Washington University this year.
- The first original research and thought leadership pieces were published online in AI and Ethics in October 2020.

KEY NOTE SPEECH 02:

Professor Saman Seneweera
Former Director,
National Institute of Fundamental Studies,
Sri Lanka

Title:
"Fortification of cereals to combat zinc deficiency"

- Professor Saman Seneweera is a Professor of Plant Science at the University of Southern Queensland, Australia; Honorary Professor at the University of Melbourne, and former Director of the National Institute of Fundamental Studies (NIFS) Sri Lanka.
- He graduated from the University of Ruhuna with a Bachelor of Agricultural Science in 1990 and went on to pursue a PhD at the Western Sydney University.
- Professor Seneweera received his PhD in Plant Physiology in 1995 and has continued his academic career in the international arena. He has also worked at the University of Western Sydney, Australia, Tohoku University, Japan and the University of Illinois, Chicago, USA.
- Professor Seneweera's research focus is on understanding the impact of climate stress on the physiological processes of plants aiming to mitigate stress and improve quality and crop yield potential. His research also focuses on plant nutritional physiology aiming to improve grain quality such as protein, iron and zinc of cereal crops.
- In his work, Professor Seneweera uses cutting edge scientific techniques including genomics, proteomics, metabolomics and ionomic tools to identify new physiological traits to develop climate resilient crops.
- To date, Professor Seneweera has supervised over 30 PhD students internationally.
- He is on the editorial board of many journals and also reviews for a large number of journals like, Nature, Plant Physiology, Plant, Cell and Environment and New Phytologist.
- Professor Seneweera has published more than 200 research articles in top ranking journals including Nature and Science. He has a H index of 39 and over 5000 research citations.
- Professor Seneweera was ranked first in the area of Agriculture, Forestry, and Plant Science in a recent AD scientist rating in Sri Lanka; he was also ranked in the top 2% of global scientists by Stanford University in 2020.
- Professor Seneweera has been a keynote speaker at numerous international conferences. He has received numerous awards, including the 'Australian Prime Ministers Award-1997 for breakthrough in climate change research,' the University of Melbourne's MSLE Research Excellence Award – 2011, the Japan Society for the Promotion of Science Fellowship in 2001, and the Japan Science and Technology Fellow in 1999.

KEY NOTE SPEECH 03:

Dr (Mrs) H. M. Lalitha Kumari
Head of the Department**,**
Department of Social Science Education,
Faculty of Education,
University of Colombo, Sri Lanka

Title:
"Transforming Challenges in to Opportunities; Vision for a new world"

- She has obtained;
    - BA in Economics First Class (Honours) – 1999,
    - Postgraduate Diploma in Education with Distinction pass – 2002,
    - Certificate in Teaching in Higher Education (CTHE) 2003,
    - Masters of Educational Management – 2007 and
    - Master of Philosophy in Education – 2010 from University of Colombo, Sri Lanka.
- She completed her PhD in Education in 2018, from University of South Wales, United Kingdom.
- Her areas of research interests are Educational Leadership and Management, Classroom Management, School Based Management, Educational Supervision and Educational Policy and Planning.
- She received awards and scholarships for her research work by National Education Research and Evaluation Centre (NEREC, 2020), by National Centre for Advanced Studies in Sri Lanka (2012), by Assumption University, Bangkok, Thailand (2009), and South Asian Summer University, New Delhi, India (2005)
- She was the Chair, First International Research Symposium, (2021), Faculty of Education, University of Colombo, Sri Lanka
- She was the Acting Dean, Faculty of Education, University of Colombo, Sri Lanka from September 2020 to October 2021
- Member of the Senate, University of Colombo, Sri Lanka from 2017 to date
- Honorary Fellow of the Teaching and Education Research Association (TERA) Fellow Program in Education
- A member of the Review Panel of the Postgraduate Diploma in Educational Leadership and Management (PGDELM) Curriculum, Open University of Sri Lanka, 2021
- She was the Editor in Chief of the Symposium Proceedings of the First International Research Symposium, Faculty of Education University of Colombo, Sri Lanka 2021

KEY NOTE SPEECH 04:

Professor H. M. A. Herath
Head of Department of Business Management,
Faculty of Business Studies and Finance,
Wayamba University of Sri Lanka

Title:
"***Vision for future world of work***"

- Prof. HMA Herath is the Head of Department of Business Management, Faculty of Business Studies and Finance, Wayamba University of Sri Lanka.
- He obtained his Bachelor's degree in Management from University of Ruhuna, Sri Lanka. Master' degree in the same field from University of Sri Jayewardenepura, Sri Lanka. PhD in Management from Nothern University of Malaysia in 2014.
- Prof. Herath is a Member of Sri Lanka Forum of Economists and a Member of Institute of Management Sri Lanka.
- His research interests fall into the fields of Positive Psychology, Business Strategy, Human resource.
- Prof. Herath has book publications in Organizational Behaviour (Sinhala) and Strategic Management (Sinhala). He has several publications in International and local refereed journals & international conference proceedings.

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ENGINEERING AND CONSTRUCTION

BUSINESS MANAGEMENT

IMPACT OF REWARD SYSTEM ON RETENTION OF CONSTRUCTION PROFESSIONALS IN THE STATE OF QATAR

Dushmanthi K. Ratnayake [1], Omila Nisanka Kaluthanthrie[1]
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Abstract
Rewards are awards granted to workers for tasks performed, which meet or exceed the expectations. It motivates employees to retain in the jobs while enhancing their performance. Construction industry in Qatar exerts a significant economic impact while supporting to the welfare of the state. As per the preliminary investigation, many construction companies in Qatar strive to retain their professionals by giving different types of benefits. Hence, reward system plays a significant role in the sector. Therefore, this study aims to explore the impact of reward system on retention of construction professionals in Qatar. Primary data has been collected using the quantitative approach, with an online survey instrument, based on structured questionnaire. The Sample Size was 50 respondents. The findings suggested that non-financial rewards are the most persuasive reward system that impact employee retention in formwork field.

Keywords: Construction Sector, Employee Retention, Rewards System

Introduction

Reward systems can be described as the development, implementation, maintenance, communication and evaluation of compensation processes (Galanou et al., 2010). As per Terera and Ngirande (2014) rewards and job satisfaction are said to be the key factors in retaining employees. Hence, having a suitable rewards system is seen as a vital instrument in employee Retention. Rewards fall into two categories as extrinsic rewards and intrinsic rewards (Armstrong, 2012). Güngör (2011) determined that the extrinsic motivation of an employee can be explained by the variable of financial rewards while explaining intrinsic motivation by non-financial rewards. The state of Qatar is by far, the richest country in the world, with a Gross National Income (GNI) per capita of $116,799 (Trading Economy, 2020). The construction output in the country is expected to reach US$ 40912.5 million by 2025 (businesswire, 2021). It is assumed that the construction sector in Qatar is the largest employer in the country with about 37% of working population involved directly or indirectly and contribute 15% to country GDP (businesswire, 2021). Since the industry is man power intensive, employees are the main assets to the industry. The Qatari construction market is fragmented in nature with the presence of local and regional players.

This study focuses on Qatar construction industry in general which specialize in supplying formwork. While coronavirus pandemic has posted challenges to the sector, construction activities still continued in the country. Moreover, being the hosting country for 2022 FIFA World Cup, has given an immense provision to grow the construction sector in Qatar. With the expected visitors of over one million to FIFA, the country has started to build 47 new and exciting hotels on the horizon in Qatar (businesswire, 2021). According to an interview had with human resource manager, he has stated that there is around 3% to 5% of employee turnover and annual transfers between subsidiaries or completely going back to their home countries since 2018. Majority who transferred were skilled and well trained engineers. Further, he noted that there is a huge competition between companies to attract and remain highly skilled employees. There is a challenge for the most of the organizations to come up with an efficient reward strategy to retain their professional employees for the success (Frost, 2001). According to the Sri Lanka Bureau of Foreign Employment 2015, the number of requests for replacement of workers in Qatar has been rising steadily (Niyas & Siraji,2018). Due to lack of references to the field of formwork in construction industry in Qatar, there will be an empirical gap to this study as well. Therefore, the research question addressed in this study is "*How do reward system impact on retention of construction professionals in the field of formwork in Qatar?''*. This will be addressed using three research objectives. Those are,

- To study the impact of financial rewards on retention of construction professionals in the field of formwork relate in Qatar.
- To study the impact of non-financial rewards on retention of construction professionals in the field of formwork relate in Qatar.
- To identify the most important and suitable reward practice which impact the retention of construction professionals in the field of formwork relate in Qatar.

Methodology

Conceptual Framework

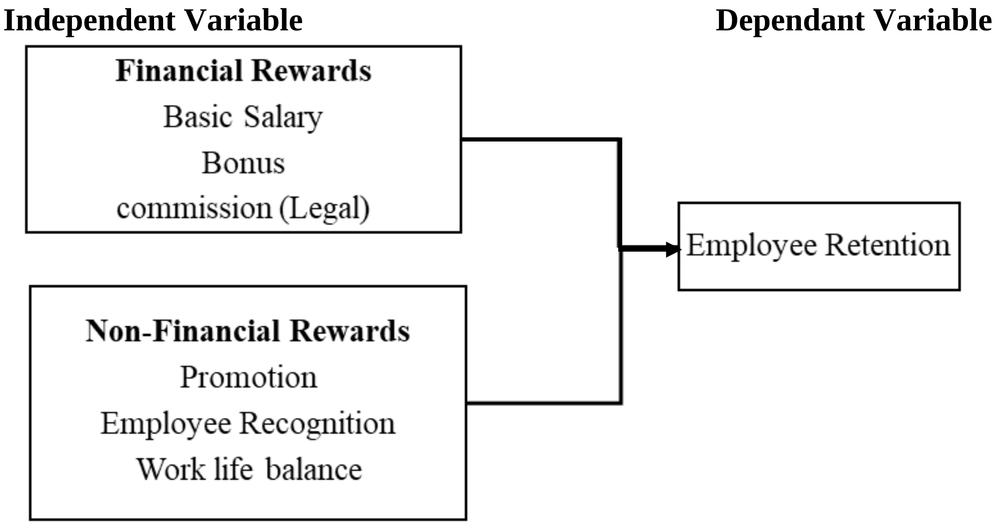

Figure 1: Conceptual Framework

Hypothesis

H_1: There is a significant impact of financial rewards on retention of construction professionals

H_2: There is a significant impact of non-financial rewards on retention of construction professionals

Study area and Data

This study has used the positivist philosophy with quantitative methodology. Moreover, deductive approach and survey strategy has also followed. As the research choice, multi-method has been used and data collection was done using a structured questionnaire. Questionnaire consist of three sections as demographic section, impact of financial rewards on retention and impact of non-financial rewards on retention. Three point, five point and six point Likert scale have been used. The level of measurement of the study consist with nominal, ordinal, ratio and interval. Both primary and secondary data were gathered for this study. Population consisted the both male and female professionals in formwork field related to the construction industry in Qatar. The sample of this study consisted of 50 representing the formwork field in general. The unit of analysis include professional employees in formwork field. From the non-probability sampling technique, convenience sampling and snowball sampling methods were used as the sampling methods. Time horizon is cross sectional. To reduce the effects of mono-method bias, respondents were informed that their responses would be anonymous (Podsakoff et al.,2003). SPSS 21 version was applied to present and analyze the data. Collected data has first screened and then analyzed using descriptive statistics, correlation and multiple regression analysis.

Results and Discussion

Descriptive statistics

Table1: Demographic Information

Demographic Factor	**Components**	**Frequency**	**Percentage (%)**
Gender	Male	38	76
	Female	12	24
	Total	50	100
Age	20-27years	04	08
	28-37 years	14	28
	38-47 years	23	46
	Above 47	09	18
	Total	50	100
Marital Status	Married	43	86
	Un Married	07	14
	Total	50	100
Profession	Engineer	25	50
	Manager	13	26
	Coordinator	08	16
	Accountant	04	08
	Total	50	100

Nationality	American	03	06
	Canadian	02	04
	Egyptian	04	08
	Europe	06	12
	Indian	09	18
	Lebanese	11	22
	Philippine	08	16
	Sri Lankan	05	10
	Other	02	04
	Total	50	100

Reliability and Validity

Table 2: Reliability Statistics

Variable	Cronbach's Alpha	N of items
Financial Rewards	0.701	8
Non-Financial Rewards	0.874	10
Employee Retention	0.712	5

All the constructs have more than 0.7 indicates the internal consistency of the study. To ensure high content validity, a comprehensive review of the literature in the area was conducted and all the items for measurement were taken from the existing literature.

Correlation Analysis

Table 3: Correlation between independent and dependent variable

Independent variable	Dependent Variable (Employee Retention)	p-value
Financial Rewards	**0.536****	**0.000**
Basic Salary	0.413**	0.003
Bonus	0.242**	0.001
Commission (Legal)	0.303**	0.033
Non-financial Rewards	**0.679****	**0.000**
Promotion	0.529**	0.000
Employee Recognition	0.530**	0.000
Work Life Balance	0.458**	0.001

**. Correlation is significant at the 0.01 level (2-tailed).

Table 3 demonstrates the results of correlation analysis for financial and non-financial reward on employee retention. According to the results of Pearson correlation, there is a moderate positive relationship between basic salary, commission and employee retention and all the selected non –financial rewards and employee retention. Bonus is having a weak positive relationship with employee retention. The relationship between independent variables and dependent variable are highly significant at 1% significance level. Out of the selected rewards types, Basic salary (Financial) and Employee Recognition (Non- financial) has found to be the most important reward practice.

Regression Analysis

Table 4: Model Summary

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.680[a]	.563	.440	.55811

a. Predictors: (Constant), TraFinance, TraNonFinance

Results of the regression analysis show that the R Square value is 0.563 and this reveal 56.3% of total variance in employee retention is explained by selected reward practices.

Table 5: ANOVA

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	12.615	2	6.308	20.250	.000[b]
	Residual	14.640	47	.311		
	Total	27.255	49			
a. Dependent Variable: TraRetention						
b. Predictors: (Constant), TraFinance, TraNonFinance						

ANOVA table shows that overall model is significant. Slope of the line is zero. Can reject the null hypothesis.

Table 6: Coefficient Table

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.647	.775		4.705	.000
	TraNonFinance	.300	.111	.171	2.702	.007
	TraFinance	.522	.219	.144	2.386	.018
a. Dependent Variable: TraRetention						

Hypotheses Testing

According to the results of Pearson correlations (Hypotheses testing Phase 1), Financial Rewards ($p=0.000<\alpha=0.01$) and Non-financial rewards ($p=0.000<\alpha=0.01$) are significant. In regression analysis (Hypotheses testing Phase 2) it was also got confirmed that financial rewards ($p=0.018<\alpha=0.05$) and non-financial rewards ($p=0.007<\alpha=0.05$) are statistically significant. This indicates strong evidence for rejecting the null hypothesis and accepting the alternative hypothesis. That is *H1: There is a significant impact of financial rewards on employee retention* is accepted and *H2: There is a significant impact of non-financial rewards on employee retention* is accepted.

Conclusions and Recommendations

This study has recognized the significance role of financial and non-financial rewards play at formwork field of construction industry in Qatar. The research highlighted that all financial rewards except bonuses and all non-financial rewards have a moderately positive relationship on retention of professionals. As per the discussion had with few heads and HR professionals, they have mentioned that majority of workers in the construction industry are expatriates. Especially in the formwork field majority are coming from Europe. There are 91.5% foreigners in the labour force (Statista,2019). Further, they have also highlighted that majority of European and American professionals have more interest on non-financial rewards while Asians prefer financial rewards. Moreover, they have also stated that in the modern society of formwork field in Qatar, there is a gradual trend for non-financial rewards compared to financial rewards. It has been further confirmed by this research. As recommendations, employers should concentrate more on providing a reasonable basic salary (to apply for a loan, visa arrangements, purchase assets), maintain a proper commission scale for all employees for profitable projects, maintain equal promotion system, provide training opportunities for employees and constantly appraise employee hard work and celebrate the success can be done.

References

Armstrong, M. (2009) 'Armstrong's Hand Book of Human Resource Management Practice'. 11th ed. London: Kogan Page, pp.735 - 750.

Businesswire. (2021). *Qatar Construction Industry Market Size & Forecast 2021, by Value and Volume Across 40+ Market Segments in Residential, Commercial, Industrial, Institutional and Infrastructure Construction - ResearchAndMarkets.com*. [online]. Available at: <https://www.businesswire.com/news/home/20210625005173/en/Qatar-Construction-Industry-Market-Size-Forecast-2021-by-Value-and-Volume-Across-40-Market-Segments-in-Residential-Commercial-Industrial-Institutional-and-Infrastructure-Construction---ResearchAndMarkets.com> [Accessed 05 August 2021].

Frost, L. (2001). Finding the top people. HR Future Magazine, 1(3).pp. 30-32.

Galanou, E., Georgakopoulos, G., Sotiropoulos, L., Dimitris, V. (2010) 'The effect of reward system on job satisfaction in an organizational chart of four hierarchical levels: a qualitative study''.*International Journal of Human Sciences*.8(1).pp.484-519.

Güngör,P. (2011) 'The Relationship between Reward Management System and Employee Performance with the Mediating Role of Motivation: A Quantitative Study on Global Banks'. *Procedia Social and Behavioral Sciences.* 24 (2011). pp. 1510–1520.

Niyas, P.T.M., Siraji, M. (2018) 'Factors Influencing Labor Turnover Intention: A Study on Qatar Based Sri Lankan Industrial Labors'. *International Journal of Scientific and Research Publications*, 8(9). pp.308-318.doi:10.29322/IJSRP.8.9. 2018.

Podsakoff, P. & MacKenzie, S. & Lee, J. & Podsakoff, N. (2003). Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies. *Journal of Applied Psychology,* [Online] 88, pp. 879-903. Available from: doi:10.1037/0021-9101.88.5.879 [Accessed 20th May 2019].

Statista. 2021. *Labor force participation rate in Qatar from 2009 to 2019, by nationality*. [online] Available at: https://www.statista.com/statistics/643459 [Accessed 21 May 2021].

Terera, S.R., Ngirande, H. (2014) 'The Impact of Rewards on Job Satisfaction and Employee Retention'. *Mediterranean Journal of Social Sciences*.5(1). pp.481-487.

Trading Economics. 2020. *Qatar Co-Operate Tax Rate*. [online] Available at: https://tradingeconomics.com/qatar/corporate-tax-rate [Accessed 03April 2021].

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THE EFFECTS OF PRODUCT QUALITY AND ITS IMPACT ON CUSTOMER SATISFACTION ON E-COMMERCE PLATFORMS

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Abstract

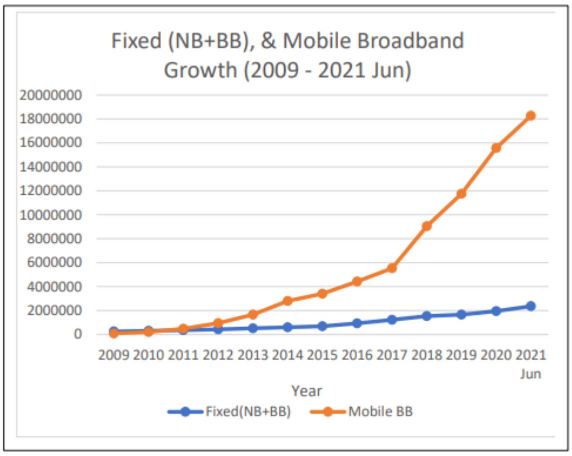
Electronic commerce is a business in which information technology is used to increase sales, business efficiency and provide a basis for new products and services (Miniotienė and Išoraitė, 2018). Even though majority (45%) are aware on E-commerce platforms, Sri Lankans prefer to purchase goods or services from physical stores (Fernando,2019). Therefore, this gap between awareness and use of E-commerce services is timely to be studied. Within this backdrop, this study aims to explore the impact of product quality on customer satisfaction of E-commerce platforms in Sri Lanka. This study involved data from 80 E-commerce uses around Sri Lanka. The primary data has been done using the quantitative approach, with an online survey instrument, based on structured questionnaire. The secondary data has been done through the review of previously established literature. The findings suggested that product performance is the most persuasive dimension that impact Consumer Satisfaction.

Key words: Customer Satisfaction, Electronic Commerce, E-Commerce Platforms, Product quality, Sri Lanka

Introduction

The emergence of Internet has made a significant impact on consumer behavior by converting many offline activities into online. Electronic commerce is generally defined as the buying and selling process of products and services over the internet in a virtual market space. According to recent comprehensive statistical overview report by The Telecommunications Regulatory Commission (TRCSL,2021) in Sri Lanka, it has shown a gradual increase on internet usage. With the presence of social media and E-commerce platforms, this made a great impact on the life of Sri Lankan consumers and their purchase behaviors. In this light online shopping has become more popular, especially with the COVID-19 pandemic. Since most consumers are attracted online purchase, online stores faced high competition (Sri Lanka Export Development Board,2021).

Year	Fixed (NB+BB)	Mobile BB
2009	249756	91359
2010	302000	200000
2011	359000	485000
2012	423194	942461
2013	507845	1664003
2014	606100	2790195
2015	682512	3408408
2016	929089	4429344
2017	1221960	5525194
2018	1530099	9032576
2019	1,654,237	11,754,166
2020	1,956,325*	15,567,665*
2021 Jun	2,359,507*	18,269,390*



Note: BB- Broadband,
NB - Narrow Band
* - Provisional

Figure 1 : TRCSL Broadband Growth (2009- June 2021)

Evidence signifies that E-commerce product quality is critical to online consumer satisfaction when it comes to adaption of the online facilities. Lin, Wu, and Chang (2011) found that product quality and delivery services have a positive significant effect on e-satisfaction. Kotler and Amstrong (2012) assumed that Product quality is the characteristic of a product or service that bear on its ability to satisfy stated or implied customer needs. The quality of the product consists of several indicators, namely performance, features, reliability, compliance, durability, service ability, aesthetics, and perceived quality (Garvin, 1987; Kotler and Keller, 2012). Among these, this study has taken four variables which suits to E-commerce platforms.

In today's context many organizations are highly investing on the new technologies to capitalize the market opportunities. Thus, many E-commerce platforms have failed to measure the exact benefits. According to LIRNEasia report in 2019, it has highlighted few facts. 70% of Sri Lanka's Internet users in the age group of 15-65 years were aware of E-commerce platforms, which put Sri Lanka ahead of Internet users in India, Pakistan, Bangladesh, Cambodia and Nepal. Despite the high awareness of E-commerce platforms, only 43% of those have engaged with E-commerce. This reluctance has occurred due to lack of trust (LIRNEaisa,2019). Therefore, to analyze E-commerce platforms product quality to increase customer satisfaction will be a timely matter. Hence, the research question addressed in this study is "*How does product quality effect on customer satisfaction of E-commerce platforms in Sri Lanka*?''

This will be addressed using three research objectives. Those are,

- To examine the impact of product quality on customer satisfaction of E-commerce platforms in Sri Lanka.
- To study the most significant dimension of product quality on customer satisfaction of E-commerce platforms in Sri Lanka.
- To identify present situation of customer satisfaction on E-commerce platforms in Sri Lanka and provide recommendations for improvements.

This study has selected leading three E-commerce giants in the world to study the product quality of customer satisfaction (Raul,2018). The main emphasis given to customers who use above E-commerce platforms in Sri Lanka.

Methodology

Conceptual Framework

Independent Variables **Dependent Variables**

Product Quality

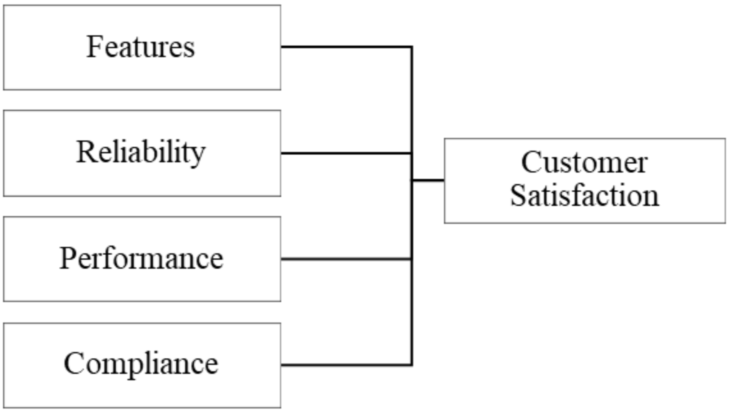


Figure 2: Conceptual Framework

Hypothesis

H_1- There is a significant impact of Features on Customer satisfaction
H_2- There is a significant impact of Reliability on Customer satisfaction
H_3- There is a significant impact of Performance on Customer satisfaction
H_4- There is a significant impact of Compliance on Customer satisfaction

Study area and Data

Based on the research objectives, this study can classify as an explanatory research, it examines the causal relationship between variables through hypothesis testing. Deductive approach and survey strategy has used with the online purchasing customers as the individual analysis unit. As the research choice, multi-method has been used and data collection has done using a structured questionnaire. Questionnaire consist of three sections as demographic section, product quality section and customer satisfaction section. Three point, five point and six point Likert scale have been used. The level of measurement of the study consist with nominal, ordinal, ratio and interval. Both primary and secondary data were gathered for this study. Population consisted of customers who purchase products from E-commerce platforms in Sri Lanka. By using the non-probability sampling technique, convenience sampling and snowball sampling methods were used as the sampling methods. The sample size is 80. Sample consist from Colombo, Gampaha, Kalutara, Polonnaruwa, Rathnapura, Kandy, Galle, Badulla and Anuradhapura. Time horizon is cross sectional. To reduce the effects of mono-method bias, respondents were informed that their responses would be anonymous (Podsakoff et al.,2003). SPSS 21 version was applied to present and analyze the data. Collected data has first screened and then analyzed using descriptive statistics, correlation and multiple regression analysis.

Results and Discussion

Descriptive statistics

Demographic Information

Majority of the respondents are found to be female respondents (61.3%) and most of the respondents are in the age category of 18-25 (76.3%). Majority are unemployed (53.8%) and have a basic degree (37.5%) as the highest educational qualification. When considering the living district, majority represent from Colombo district (68.8%).

Reliability

All the independent and dependent variables have more than 0.6 Cronbach value.

Correlation Analysis

Table 1: Correlation between independent and dependent variable

Independent variable (Product Quality)	Dependent Variable (Customer Satisfaction)	p-value
Reliability	0.815**	0.000
Performance	0.836**	0.000
Features	0.594**	0.000
Compliance	0.305**	0.006

**. Correlation is significant at the 0.01 level (2-tailed).

Source: Researcher's work ,2020

As shown by table 2, it demonstrates the results of correlation analysis for E-commerce product quality on Customer Satisfaction. According to the results of Pearson correlation, there is a strong positive relationship between reliability and performance on customer satisfaction and features and compliance have a moderately positive relationship on customer Satisfaction. The relationship between independent variables and dependent variable are highly significant at 1% significance level. Out of the selected product quality dimensions, performance has found to be the most influential product quality factor that affect customer satisfaction.

Regression Analysis

Table 2: Model Summary

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.874[a]	.764	.751	.28494
a. Predictors: (Constant), Tra_Features, Tra_Compliance, Tra_Reliability, Tra_Performance				

R value is 0.751 and this reveal that 75.1% of total variance in customer satisfaction is explained by selected product quality variables.

Table 3: ANOVA

ANOVA[a]					
Model	Sum of Squares	Df	Mean Square	F	Sig.

1	Regression	19.680	4	4.920	60.599	.000[b]
	Residual	6.089	75	.081		
	Total	25.769	79			
a. Dependent Variable: Tra_Satisfaction						
b. Predictors: (Constant), Tra_Features, Tra_Compliance, Tra_Reliability, Tra_Performance						

ANOVA table shows that overall model is significant. Slope of the line is zero. Can reject the null hypothesis.

Table 4: Coefficient Table

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.871	.290		3.004	.004
	Tra_Compliance	-.200	.105	-.110	-1.899	.061
	Tra_Reliability	.316	.095	.364	3.337	.001
	Tra_Performance	.402	.112	.411	3.586	.001
	Tra_Features	.123	.056	.151	2.196	.031
a. Dependent Variable: Tra_Satisfaction						

Hypotheses Testing

According to the results of Pearson correlations (Hypotheses testing Phase 1), all the variables are found to be significant. In regression analysis (Hypotheses testing Phase 2) of the findings, got confirmed that except the compliance dimension ($p=0.061>\alpha=0.05$) rest of the product quality dimensions are statistically significant. Therefore, it can conclude that *H_1- There is a significant impact of Features and Customer satisfaction* is accepted, *H_2- There is a significant impact of Reliability on Customer satisfaction* is accepted, *H_3- There is a significant impact of Performance on Customer satisfaction* is accepted and *H_4- There is a significant impact of Compliance on Customer satisfaction* is rejected.

Conclusions and Recommendations

First objective is to examine the impact of product quality on customer satisfaction of E-commerce platforms in Sri Lanka. All the variables except compliance was found to have a significance impact on customer satisfaction. Therefore, more attention should be given to performance, reliability and features to enhance the product quality in E-commerce platforms.

Second objective is to study the most significant dimension of product quality on customer satisfaction of E-commerce platforms in Sri Lanka. Performance has found to be the most significant dimension. However, Reliability has also found to have a high contribution. Hence, E-commerce businesses should concentrate more on enhancing performances and reliability of its products.

Last objective is identifying present situation of customer satisfaction on E-commerce platforms in Sri Lanka and provide recommendations for improvements. It has found through the preliminary investigations that Sri Lankan mindset is still into traditional bricks-and-mortar and they have some trustworthiness concerns regarding the platform. This may be why users tend to use cash or debit transactions after the delivery. Trustworthiness of the information displayed on the website plays a major role in the eyes of the customer (Flavian et al., 2009). Therefore, more solid product strategy with comprehensive details, trust in paying online should be created by the businesses.

Sri Lankans tend to have more fear and reluctance to accept it even getting children exposed to internet(LIRNEaisa,2019). Less educated, basic phone owners who don't have access to Internet have higher levels of concerns. Digital Infrastructure and Information Technology Former Minister Ajith P. Perera reasoned that the cultural aspects might have been a contributing factor for this(Fernando,2019). Even in this study, the majority of respondents represent from Colombo district indicates that E-commerce is an urban phenomenon. This may be happening due to lack of widespread online presence is other districts, limited access to personal devices and high data cost. In summary, more awareness programs specially on the use of online transactions, updating existing legal policies, introducing cyber security mechanisms and promoting more attitudinal change will enhance E-commerce usage.

References

Fernando, N. (2019). *Internet users reluctant to use e-commerce despite high awareness: survey.* [online] Available at:https://www.dailymirror.lk/business-news/Internet-users-reluctant-to-use-e-commerce-despite-high-awareness:-survey/273-167697#:~:text=Sri%20Lanka%20is%20estimated%20have%201.6%20million%20e-commerce,prices%20were%20among%20the%20main%20reasons%20for%20use [Accessed 23 May 2021].

Flavian, C., Gurrea, R., & Orus, C. (2009). The Impact of Online Product Presentation on Consumers' Perceptions: An Experimental Analysis. *International Journal of E-Services and Mobile Applications*. 1(3). pp. 17–37.

Garvin, D.A. (1987). Competing on the Eight Dimensions of Quality. *Harvard Business Review*.87. pp.101-109

LIRNEasia,2019. *ICT access and use in Sri Lanka and the Global South* [pdf] Available at: https://lirneasia.net/wp-content/uploads/2019/05/LIRNEasia-AfterAccess-ICT-access-and-use-in-Sri-Lanka-and-the-Global-South.pdf [Accessed 20 June 2021].

Išoraitė, M., Miniotienė, N. (2018). Electronic Commerce: Theory and Practice. *Integrated Journal of Business and Economics*, 2(2). pp.73-79.

Kotler, P., Keller, K. L. (2012) *Marketing Management*.14th Ed. New Jersey: Prentice Hall.

Kotler, P. and Armstrong, G. (2012) Principles of Marketing. 14th Ed., Pearson Education Limited, Essex, England.

Lin, C. C., H. Y. Wu & Y. F. Chang. (2011). The Critical Factors Impact on Online Customer Satisfaction. *Procedia Computer Science*, [Online]pp.276-281. Available at:http://www.sciencedirect.com/science/article/pii/S1877050910004229 [Accessed 25 May 2021].

Podsakoff, P. & MacKenzie, S. & Lee, J. & Podsakoff, N. (2003). Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies. *Journal of Applied Psychology*, [Online] 88, pp. 879-903. Available from: doi:10.1037/0021-9101.88.5.879 [Accessed 20th May 2021].

Raul, 2018. *Visualizing the World's Tech Giants 2018.* [online] Available at: https://howmuch.net/articles/the-world-tech-giants[Accessed 20 May 2021].

Sri Lanka Export Development Board (TRC),2021. *Importance-of-e-commerce-during-covid-19*. [online] Available at:https://www.srilankabusiness.com/blog/importance-of-e-commerce-during-covid-19.html [Accessed 20 May 2021].

Telecommunications Regulatory Commission of Sri Lanka (TRC), 2021. Statistical Over View Report. [pdf] Available at: https://www.trc.gov.lk/images/pdf/StatisticalOverViewReportQ220212607.pdf [Accessed 20 May 2021].

IMPACT OF THE GREEN BRANDING ON CONSUMER PURCHASE BEHAVIOR OF KEELLS SUPER

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Abstract
Environmental awareness of the costumes have created changes of the business industries and the Keels Super can be identified as a company which recently moved for the green brand concept. Due to the lack of empirical studies on this context, this study aimed to identify the impact of green brand on consumer purchase behavior of Keels Super. 384 Keells Super customers were selected as the sample of the study and the quantitative data collected through a self-administrated questionnaire. Data was analyzed based on multiple linear regression analysis. The results indicate that there are significant influences of green brand awareness, trust, image, perceived value on consumer purchase behavior to use green products. A salient impact has occurred with the green perceive value. Findings suggested that it is needed to enhance the customer awareness on their environmentally friendly activities due to lack awareness.
Key words: Green brand awareness, Green brand trust, Green brand image, Green perceived value, Consumer purchase behavior

Introduction
Contemporary business world has created several changes within the marketing aspects. Due to the higher level of awareness of the society toward this sustainability concept, organizations have moved to use several strategies with the environmentally friendly perspectives (Hartmann, Ibáñez and Sainz, 2005). Due to the growing environmental concerns, the awareness of the consumer regarding green branding has led to a more environmentally friendly attitude. The attitude of consumers towards green products can be changed by the brands, as an efficient green position involves brands differentiation (Rathnayake, Siyambalapitiya and Perera, 2019). Further studies recognized that there is less commercial success for the products which do not reflect green attributes. In addition, researchers have argued that for the success of green branding strategies, green positioning is an important element. Numerous studies have addressed the significance and behavior of environmental products and their attributes from the perspective of Europe countries consumers have exhibited positive attitudes towards green branded products. (Shabbir et.al, 2020). Concern for the environment has become not only a significant common problem but also a critical topic in academic research over the past few decades. Since it is a trendy concept, the scholars have move to examine the different aspects in relation to the green branding as a marketing strategy. Previous authors have identified that, green banding can be influenced on the purchase intention of the customer. (Rathnayake, Siyambalapitiya and Perera, 2019). Yet the theory of reasoned action (Ajzen and Fishbein, 2000) indicate that, the intention can be different from the actual behavior. Thus, it is worth to identify the impact of the green branding usage in relation to the actual behavior of the customers. Keels super is a

sub brand which available in the portfolio of John Keels Holdings PLC. Further, it can be identified as a brand which has recently moved for the green branding concept. Thus, only a few empirical studies have focused on the green branding o the Keels super and its impact on the customer behavior. To address this empirical gap, the present study aimed to achieve the following objectives.

Primary Research Objective

- To investigate the effect of green brands on customer purchase behavior of Keells Super in Sri Lanka.

Secondary Research Objectives

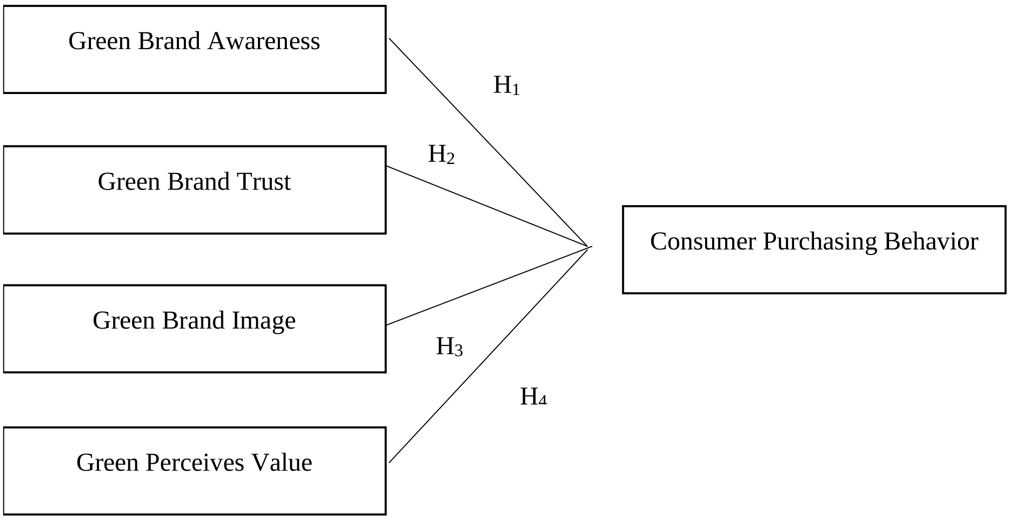
- To investigate the effect of green brand awareness on consumer purchase behavior of Keells Super
- To investigate the effect of green brand trust on consumer purchase behavior of Keells Super
- To investigate the effect of green brand image on consumer purchase behavior of Keells Super in
- To investigate the effect of green perceived value on consumer purchase behavior of Keells Super

Methodology

The main objective of this study was to study the impact of green branding on consumer purchasing behavior and the study was conducted as a quantitative study. There are various research methods that users can use. The study can also be identified as cross-sectional research. Deductive approach has implemented to address the identified research phenomena. Out of the customers of Keels Super, 384 customer selected as the sample of the study based on the 95% of confidence interval and confidence level 4. Due to the unavailability of specific sampling framework, convenience sampling technique has implemented. Self-administrated questionnaire used in order to collect quantitative data in relation to the four dimensions of green branding and the customer purchase behavior. Five point Likert scale related questions comprised in the distributed questionnaire.

Conceptual Framework

Figure 01: Conceptual framework



Source: Developed by researcher

Hypotheses

- H_1: There is a significant effect of green brand awareness on consumer purchasebehavior of Keells Super
- H_2: There is a significant effect of green brand trust on consumer purchase behavior of Keells Super
- H_3: There is a significant effect of green brand image on consumer purchase behavior of Keells Super
- H_4: There is a significant effect of green perceived value on consumer purchase behavior of Keells Super

Result

Table 1: Coefficient

Model	B	Std. Error	P-Value	Collinearity Tolerance	Statistics VIF
Constant	0.265	0.156	0.089		
GBA	**0.052**	**0.057**	**0.356**	**0.441**	**2.270**
GBT	**0.277**	**0.071**	**0.000**	**0.283**	**3.466**
GBI	**0.216**	**0.067**	**0.001**	**0.286**	**3.495**
GPV	**0.386**	**0.54**	**0.000**	**0.400**	**2.500**

Source: Analyzed statistical output from field survey

$$CPB = \mathbf{0.265} + \mathbf{0.052}GBA + \mathbf{0.277}GBT + \mathbf{0.216}GBI + \mathbf{0.386}GPV + s$$

Table 2: Model Summary Table

Figure	Value
R Square	0.591
Adjusted R Square	0.586
Std. Error of the Estimate	0.63945
Durbin Watson	1.784

Source: Analyzed statistical output from field survey

Table 3: ANOVA

Model	Sum of Squares	df	Mean Square	F-value	P-Value
Regression	223.580	4	55.895	136.696	0.000
Residual	154.973	379	0.409		
Total	378.553	383			

Source: Analyzed statistical output from field survey

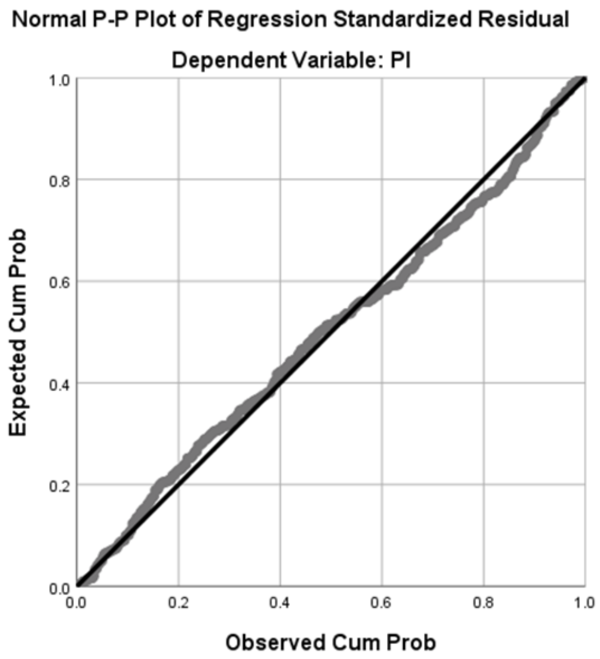


Figure 2: P-P Plot

Source: Statistical output of analysed field survey

Discussion

The consumer purchase behavior will be equal to 0.265, when the green brand related aspects are equal to zero. As per the regression model, there is a positive and significant impact of green brand and consumer purchase behavior in relation to the Keells Super in Sri Lanka. When the green brand awareness increases from average on unit while green brand of Keells Super equal to zero, the consumer purchase behavior will increase by 0.052. Further, if it is green brand trust, green brand image and green perceived value, the average change of the consumer purchase behavior will equal to 0.277, 0.216 and 0.386 respectively. Accordingly, impact of the green branding on consumer purchase behavior in Keells Super is considering more on the expertise of the purchase regarding the supermarket. Furthermore, the R square value of the model is illustrating that, 59.1% of the consumer purchase behavior of them green branding. As per the table 3, P-value of the model is 0.000. The model is significant at 95% of significant level and the hypotheses can be rejected (0.000<0.5). The result of the impact of green branding on consumer purchase behavior of Keells Super. These result are in line with the results obtained by various earlier researchers like (wahid, 2011; Rahman et.al, 2017). Rathnayake, Siyambalapitiya and Perera (2019) has found that, green brand can create positive impact on the purchase intention. The findings of present study is supporting to these finding and it has emphasized that the intention can be turned in t the actual behavior.

Conclusion and Recommendations

The study was aimed to identify the impact of green brand on consumer purchase behavior of Keells Super. Multiple linear regression implemented to achieve it and the findings suggested that, green brand awareness, green brand trust, green brand image, green perceived value and significant effects on the consumer purchase behavior. The first achievement is that consumers' awareness and understanding of green brand awareness has created a lower impact than the other aspects. This maybe since the consumers today are less aware of green brand of keels super since they have moved to it recently. Thus, the researcher suggest that organization needed to implement different campaign to enhance consumer awareness on the green brand concept and it is needed to implement different sales promotional campaigns to represent the environmentally friendly version of their service. Furthermore, environment related different functions can be added to their marketing communications plans for the upcoming years.

Reference

Ajzen, I. and Fishbein, M., 2000. Attitudes and the Attitude-Behavior Relation: Reasoned and Automatic Processes. *European Review of Social Psychology*, 11(1), pp.1–33.

Bukhari. (2011). Green Marketing and its impact on consumer behavior. *European Journal Of Business and Management, 3*(4).

Daniels. (2021, May 18). *Marketing Promotional Tools*. Retrieved from Business Study Notes: https://www.businessstudynotes.com/marketing/principle-of-marketing/marketing-promotional-tools/

Doszhanov and ahamad. (2015). Cunsumers' Intention to use Green products:The impact of green brand dimenssions and green perceived value. *SHS Web of Conferences*.

Hartmann, P., Apaolaza Ibáñez, V. and Forcada Sainz, F.J., 2005. Green branding effects on attitude: functional versus emotional positioning strategies. *Marketing Intelligence & Planning*, 23(1), pp.9–29.

Narges , Mohammad and Bahareh . (2013, August 2). *Effect of green marketing on consumer purchase behavior*. Retrieved from Qscience: https://www.qscience.com/content/journals/10.5339/connect.2014.5?crawler=true

Rahman et.al. (2017). Influence of green marketing on consumer behavior: A realistic study on bangladesh. *Global Journal of Management and Business Research: E, 17*(1).

Rathnayake, P.A., Siyambalapitiya, J. and Perera, K.J.T., (2019). Investigation of the Impact of Green Marketing Tools on Customer Purchase Intention of Fast Moving Consumer Goods : With special reference to the youth sector. In: *International Conference on Marketing Management*.

wahid. (2011). Investigation of green marketing. *Academia, 12*, 27-33.

IMPACT OF INFORMATION IN FINANCIAL STATEMENTS IN ASSESSING THE PERFORMANCE OF ABC PLC

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Abstract
Financial statements provide variety of valuable information which required to evaluate the financial position of a company. Literature has revealed that technical analysis of financial information has a significant impact on assessing the overall financial performance of a business entity within a particular period of time. According to the proposed research methodology this research was carried out to find the impact of profitability, investment decision and sustainable growth towards the financial performance of (ABC) PLC. This study was conducted totally based on the secondary data and facts revealed through financial statements have analysed according to the trend analysis method; growth percentages, ratios, correlations and regressions have presented under the analysis. Through evaluating the gathered information conclusions and recommendations have given for enhancing the future financial performance of the company.

Keywords
Profitability, Investment Decision, Sustainable growth

Introduction

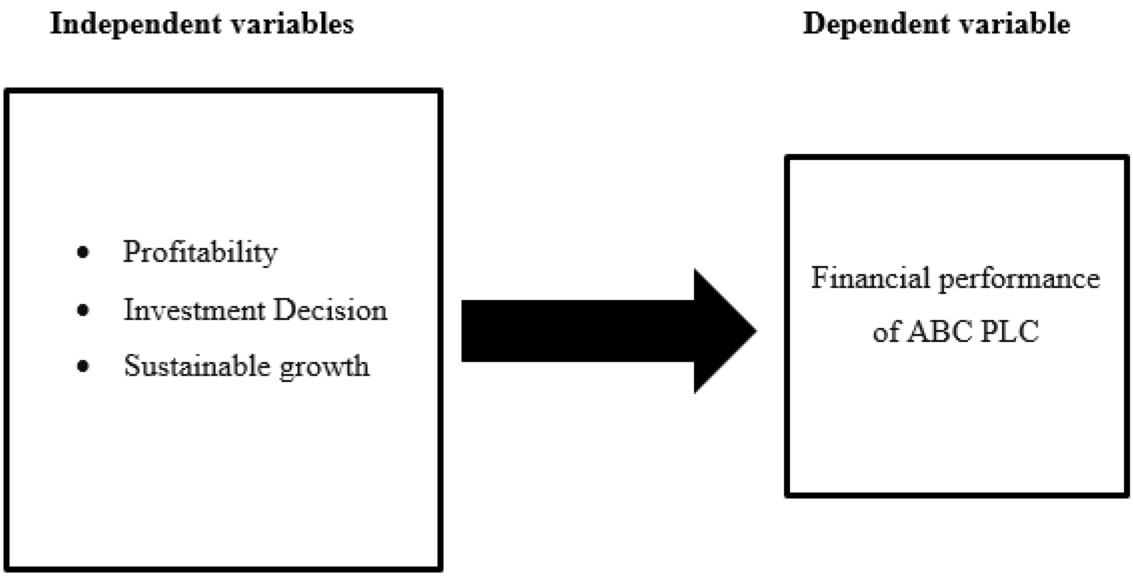
Financial statements evaluation is the procedure of analysing profitability, stability and viability to assess the financial position of a company. The primary objective of financial analysis is to identify changes in financial trends, to measure the progress a company has made, and to recognize a relationship in order to draw a logical conclusion about a company's performance. Financial performance can be defined as the measure of a company's policy and operation outcomes regarding its monetary terms. Financial statements are vital tools of operations for business entities and organizations. This study will be achieved following specific objectives throughout the study.

1. Evaluate the role of profitability in determining the financial performance of the company.
2. Assess the role of investment decisions in determining the financial performance of ABC PLC.
3. Examine the role of sustainable growth pattern in analysing the financial performance of ABC PLC.

Once Barker (2016) has said that “Vision without action is merely a dream. Action without vision just passes the time. Vision with action can change the world.” According to the above statement, at present in a data driven economy financial statements analysis is essential for businesses to make strategic and intelligent decisions regarding their future financial performance. This study will provide insight on how business organization rely on financial statements for decision making and further examination of the use of financial statements.

Methodology

Figure I – Conceptual Framework



Hypothesis

- H1: There is a significant relationship between profitability and financial performance of ABC PLC.
- H2: There is a significant relationship between investment decisions and financial performance of ABC PLC.
- H3: There is a significant relationship between sustainable growth and financial performance of ABC PLC.

Table 1 - Operationalisation

Variable	Indicators	Measurement
Profitability	Gross profit	Find the gross profit and net profit of 2017 to 2020 from income statement of ABC PLC and calculate the growth rate of each year. Then get the average growth rate of past three years and calculate the GP and NP for years 2021 to 2023 based on that average.
	Net profit	
	Gross margin	Divide gross profit from sales turnover.
	Net margin	Divide net profit from sales turnover.

Investment decisions	Cash flow from financing activities	Find the cash flow from financing activities of 2017 to 2020 from cash flows statement of ABC PLC and calculate the growth rate of each year. Then get the average growth rate of past three years and calculate the cash flow from financing activities for years 2021 to 2023 based on that average.
	Return on investment	Divide net income from total assets.
	Current ratio	Divide current assets from current liabilities.
	Quick ratio	Divide the difference between current assets and inventories from current liabilities.
Sustainable growth	Revenue	Find the revenue of 2017 to 2020 from income statement of ABC PLC and calculate the growth rate of each year. Then get the average growth rate of past three years and calculate the revenue for years 2021 to 2023 based on that average.
	Debt to Assets ratio	Divide total liabilities from total assets.
	Equity to Assets ratio	Divide total equity from total assets.
	Debt to equity ratio	Divide total liabilities from total equity.
Financial performance	Cash flow from the operation	Find the cash flow from the operation of 2017 to 2020 from cash flows statement of ABC PLC and calculate the growth rate of each year. Then get the average growth rate of past three years and calculate the cash flow from the operation for years 2021 to 2023 based on that average.

This research is totally based on secondary data, collected through the annual reports of ABC PLC as published in Colombo Stock Exchange website. Generally financial statements provide historical data and these historical data took into consideration to analyse the future financial performance of the company. For the evaluation relevant variables of financial statements for a period of four years (2017 to 2020) taken into consideration and the prediction has done for next three years (2021 to 2023) regarding financial performance of ABC PLC. Microsoft Excel 2016 has used for analyse growth percentages of each variable and reliability, correlation and regression analysis have calculated through SPSS software.

Results

Descriptive Statistics

Below tables show the difference percentages of considered variables under profitability, investment decision, sustainable growth and financial performance between each financial year (2017-2020) of ABC PLC. The average growth rate of past three years has applied for year 2021 to 2023.

Profitability

Table II – Gross profit

	2017	2018	2019	2020	2021	2022	2023
Gross profit	3,242,620	2,631,216	2,765,408	3,323,317	3,394,436	3,467,077	3,541,272
Growth%		-18.86%	5.10%	20.17%	2.14%	2.14%	2.14%

Table III – Net profit

	2017	2018	2019	2020	2021	2022	2023
Profit for the year (NP)	1,255,439	762,736	624,259	1,024,243	1,046,981	1,070,224	1,093,983
Growth %		-39.25%	-18.16%	64.07%	2.22%	2.22%	2.22%

Table IV – Gross profit vs Gross margin

	2017	2018	2019	2020	2021	2022	2023
Gross profit	3,242,620	2,631,216	2,765,408	3,323,317	3,394,436	3,467,077	3,541,272
Gross Margin	22.10%	16.19%	15.21%	17.79%	16.75%	15.77%	14.85%

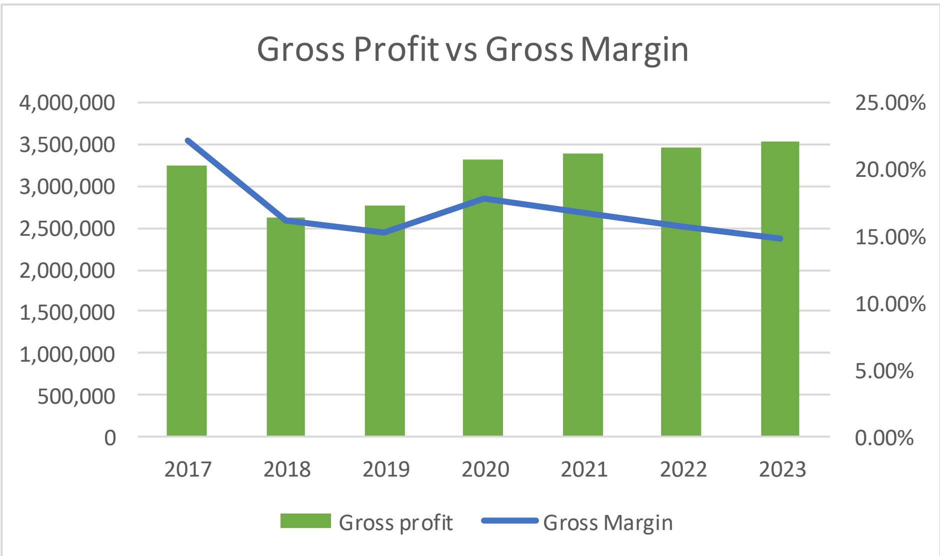


Figure II – Gross profit vs Gross margin

Table V – Net profit vs Net margin

	2017	2018	2019	2020	2021	2022	2023
Profit for the year (NP)	1,255,439	762,736	624,259	1,024,243	1,046,981	1,070,224	1,093,983
Net Margin	8.56%	4.69%	3.43%	5.48%	5.17%	4.87%	4.59%

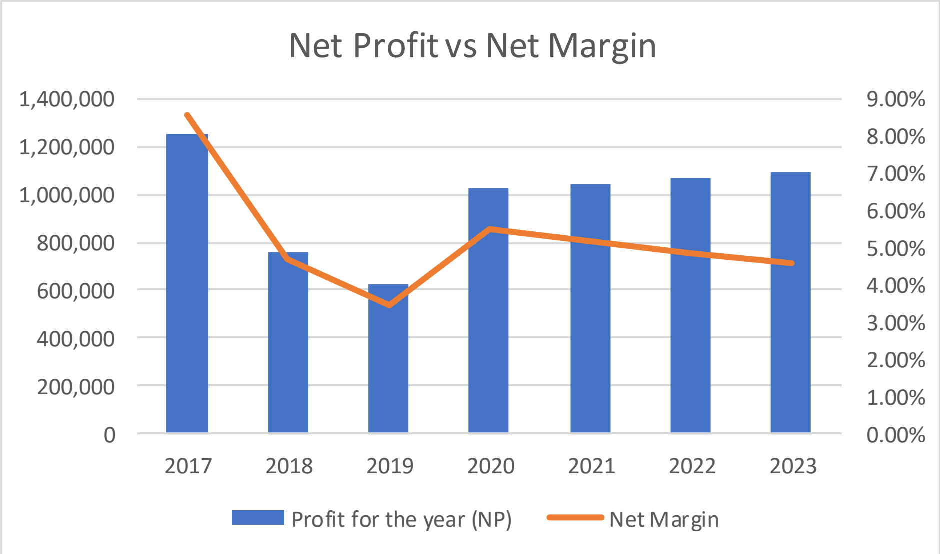


Figure III – Net profit vs Net margin

Investment Decision

Table VI – Cash flow from financing activities

	2017	2018	2019	2020	2021	2022	2023
Cash flow from financing activities	-168,678	247,288	2,913,838	-313,278	1,581,177	7,972,293	40,237,757
Growth %		246.60%	1078.32%	-110.75%	404.72%	404.72%	404.72%

Table VII – ROI Ratio

	2017	2018	2019	2020	2021	2022	2023
Return on investment	7.58%	3.98%	2.99%	4.36%	3.97%	3.61%	3.28%

Table VIII – Liquidity Ratios

	2017	2018	2019	2020	2021	2022	2023
Current ratio	229.07%	212.62%	188.95%	200.79%	191.78%	183.17%	174.95%
Quick ratio	147.98%	137.56%	117.56%	125.38%	118.28%	111.53%	105.13%

Sustainable Growth

Table IX – Revenue

	2017	2018	2019	2020	2021	2022	2023
Revenue	14,669,735	16,251,907	18,183,298	18,682,254	20,264,641	21,981,056	23,842,851
Growth %		10.79%	11.88%	2.74%	8.47%	8.47%	8.47%

Table X – Revenue vs Debt to assets ratio

	2017	2018	2019	2020	2021	2022	2023
Revenue	14,669,735	16,251,907	18,183,298	18,682,254	20,264,641	21,981,056	23,842,851
Debt to Assets ratio	36.82%	39.55%	43.39%	44.92%	48.01%	51.31%	54.83%

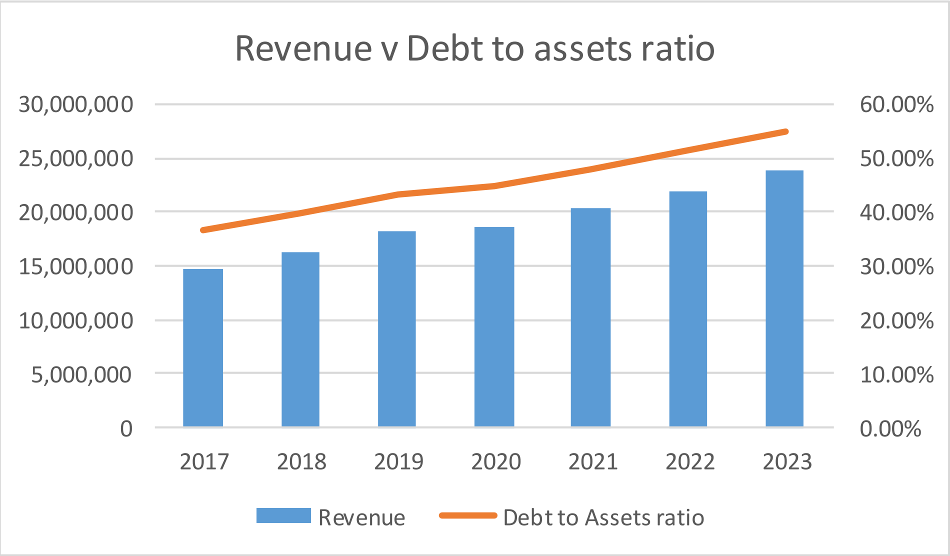


Figure IV – Revenue vs Debt to assets ratio

Table XI – Revenue vs Equity to assets ratio

	2017	2018	2019	2020	2021	2022	2023
Revenue	14,669,735	16,251,907	18,183,298	18,682,254	20,264,641	21,981,056	23,842,851
Equity to Assets ratio	63.18%	60.45%	56.61%	55.08%	52.63%	50.30%	48.06%

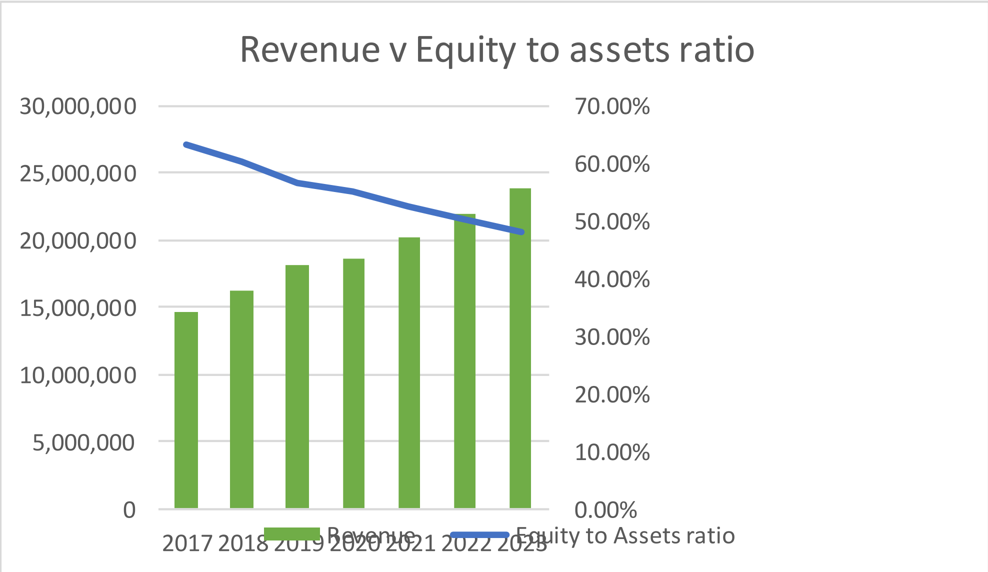


Figure V – Revenue vs Equity to assets ratio

Table XII – Debt to equity ratio

	2017	2018	2019	2020	2021	2022	2023
Debt to equity ratio	58.27%	65.43%	76.65%	81.55%	91.21%	102.01%	114.08%

Financial Performance

Table XIII – Cash flow from operating activities

	2017	2018	2019	2020	2021	2022	2023
Cash flow from the operation	-131,741	235,566	-2,221,380	197,924	(234,401)	(746,403)	(2,376,771)
Growth %		278.81%	-1043.00%	108.91%	-218.43%	-218.43%	-218.43%

Inferential Statistics

Table XIV - Reliability analysis

Variables	Cronbach's Alpha
Profitability	.061
Investment Decision	-18.541
Sustainable growth	- .014

According to above analysis Profitability variable is not a good scale item to produce constant results since; its Cronbach's Alpha value is less than 0.7 (not reliable). Since Investment decision and Sustainable growth both are negative values it reflects that those variables also don't satisfy the reliability measure.

Table XV – Correlation analysis

- Profitability

		Profitability	FINPER
Profitability	Pearson Correlation	1	.209
	Sig. (2-tailed)		.691
	N	6	6
FINPER	Pearson Correlation	.209	1
	Sig. (2-tailed)	.691	
	N	6	6

- Investment decision

		FINPER	Investmentdec
FINPER	Pearson Correlation	1	-.915*
	Sig. (2-tailed)		.011
	N	6	6
Investmentdec	Pearson Correlation	-.915*	1
	Sig. (2-tailed)	.011	
	N	6	6

There is a strong correlation and significant relationship between Investment Decision and Financial Performance since significant value of investment decision is less than 0.05.

- Sustainable growth

		FINPER	Sustainablegrow
FINPER	Pearson Correlation	1	-.493
	Sig. (2-tailed)		.320
	N	6	6
Sustainablegrow	Pearson Correlation	-.493	1
	Sig. (2-tailed)	.320	
	N	6	6

Regression Analysis

Table XVI – Profitability to financial performance:

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.209[a]	.044	-.195	4.97248

a. Predictors: (Constant), Profitability

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	-2.246	2.035		-1.103	.332
	Profitability	2.756	6.441	.209	.428	.691

a. Dependent Variable: FINPER

Table XVII – Investment decision to financial performance:

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.915[a]	.837	.796	2.05316

a. Predictors: (Constant), Investmentdec

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	2.180	1.277		1.708	.163
	Investmentdec	-1.078	.238	-.915	-4.532	.011

a. Dependent Variable: FINPER

Table XVIII – Sustainable growth to financial performance:

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.493a	.243	.054	4.42419

a. Predictors: (Constant), Sustainablegrow

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	3.834	5.609		.683	.532
	Sustainablegrow	-71.044	62.691	-.493	-1.133	.320

a. Dependent Variable: FINPER

Table XIX – Multiple regression

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.983a	.947	.894	1.07819

a. Predictors: (Constant), Sustainable growth, Investment decisions, Profitability

Model		Standardized Coefficients Beta	t	Sig.
1	(Constant)		-2946.522	.000
	Investment decisions	-1.458	-11316.495	.000
	Sustainable growth	.676	5251.709	.000
	Profitability	-.498	-9758.535	.000

a. Dependent Variable: Financial performance

Multiple linear regression model of this survey has 0.894 Adjusted R Square, explains that independent variables tested under this research have 89.4% explanatory power towards the dependent variable. Also the research fits to the model because ANOVA significant value is 0.000 which is less than 0.05.

Table XX – Hypothesis testing
Results can be concluded as below based on above table.

Independent variables	**Standardized coefficient Beta**	**Significant**
Profitability	-.498	.000
Investment Decision	-1.458	.000
Sustainable growth	.676	.000

- Profitability has a significant negative relationship towards financial performance of ABC PLC.
- Investment decision has a significant negative relationship towards financial performance of ABC PLC.
- Sustainable growth has a significant positive relationship towards financial performance of ABC PLC.

Discussion

A financial statement is a formal and detailed statement that describes the financial affairs of a business entity and provides information to the company as well as interested parties (Makarim and Noveria, 2014).

Profitability

Profitability is a relative measure used to determine the scope of a company's profits relative to the size of the business. Duru (2012) defines financial statement as a statement which conveys to management and to interested outsiders a concise picture of the profitability and financial position of a business. Profitability ratios calculates a company's income or operating success over a period of time. Theoretically the amount of profit depends on income and expenses figures, it is not limited to the data stated in the financial statements. Internal and external non-financial factors also influence the profitability. According to Weygandt (2009, cited in Sultan, 2014) profit margin is an important operating performance measure indicates the profitability generated from revenue.

Investment Decision

It is the responsibility of corporate entities to fully disclose the facts of their operations to assist investors in making investment decisions. In a research titled "Institutional investors perception on quality of financial statements in Kenya" conducted by Kariuki and Jagongo (2013) revealed that the information in financial statements such as income and expenses, total assets, cash flow from investing activities are very much important for investors. Sponsorship investments are essential for buildup strong brands. Therefore, sponsors also require financial information to make decisions whether invest or not in a specific brand. Financial statements analysis can be used by investors as a preliminary analysis to make an investment decision, because it reflects the current financial position of a company to predict the future and to establish investors' confidence on return on investments.

Sustainable growth

The growth of business enterprises is used as an indicator of success, such as economic growth rate or revenue growth rate. There is no universal definition of organizational sustainability, but it can be defined as the ability of a company to directly or indirectly meet the needs of its stakeholders without compromising ability to meet their needs in the future (Dyllick and Hockerts, 2002 cited in Utami et al, 2018). Sustainable growth rate (SGR) is the maximum growth rate that a company or social enterprise can maintain without financing with additional debt or equity. This includes optimizing sales and revenue growth without increasing financial leverage. Assessing potential ratios plays an important role in achieving sustainable growth and analyzing its forecasts (Al-Muhairi & Nobanee, 2019). In recent studies financial statements have evaluated, for analyze and predict profitability, liquidity, solvency for the purpose of identify institutional bankruptcy and sustainable growth.

Conclusions and Recommendations

Under the profitability factor, from 2020 to 2023 though gross profit and net profit continuously increased gross margin and net margin has decreased during above period. High growth rate of sales turnover than the growth rate of gross and net profit will affect to decrease of gross and net margin. To increase gross margin and net margin company could increase their gross profit and net profit in a higher percentage than its sales turnover. For increase gross profit in a higher percentage company needs to reduce cost of sales and to increase net profit, administrative, distribution and finance costs have to be decreased.

There is a huge growth rate between each year in cash flow from financing activities which resulted the average growth rate as 404.72%. Due to inadequate earnings in 2019 company has decided to hugely increase its CFF for the particular year. Liquidity of ABC PLC will be decreased from 2020 to 2023 in other words a high increment rate of current liabilities than its current assets. Company could take necessary actions (such as increase earnings) to maintain their CFF in a considerable level avoiding high fluctuations for enhance their financial performance. Company has to use its current and non-current assets more effectively on generating profits in future also they have either to decrease liabilities or further increase current assets to maintain their liquidity position.

Company has been able to maintain an average, stable growth rate over the considered years. According to the financial definition of sustainable growth with the increase of revenue, increasing debt to assets ratio put negative effect on sustainable growth and decreasing equity to assets ratio can consider as a positive indication towards sustainable growth. Company has to reduce its liabilities by funding more internal cash (profits, earnings) to pay its obligations. It will further enhance the financial performance of ABC PLC in future.

Though individually only investment decision has significant explanatory power towards the dependent variable, but considering all the independent variables together (multiple regression) there is 89.4% explanatory power towards the dependent variable of this study.

References

Al Muhairi, M.M., and Nobanee, H., (2019). Sustainable Financial Management. *Social Science Research Network Electronic Journal*, [online] pp.1-15. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3472417 [Accessed 6 September 2021].

Barker, J.A., (2016), *Oxford Essential Quotations*, 4th edition, [online] Oxford University Press. Available at: https://www.oxfordreference.com/view/10.1093/acref/9780191826719.001.0001/acref-9780191826719 [Accessed 8 August 2021].

Duru, A. N., (2012), *Elements of Financial Accounting Made Easy*, Joglas Production Works Ltd, Enugu-Nigeria.

Kariuki, G., and Jagongo, A., (2013). Institutional investors' Perceptions on Quality of Financial reporting in Kenya. *International Journal of Humanities and Social Science,* 3 (21), pp. 144-54.

Makarim, R.F., and Noveria, A., (2014). Investment Decision based on Financial Performance Analysis and Market Approach Valuation of Indonesian Construction Sector. *Journal of Business and Management*, 3 (7), pp. 799-812.

Sultan, A.S., (2014). Financial Statements Analysis - Measurement of Performance and Profitability: Applied Study of Baghdad Soft-Drink Industry. *Research Journal of Finance and Accounting*, 5 (4), pp. 49-56.

Utami, D., Sulastri, Muthia, F., and Thamrin, K.M.H., (2018). Sustainable Growth: Grow and Broke Empirical Study on Manufacturing Sector Companies Listed on the Indonesia Stock Exchange. In: *The International Conference of Organizational Innovation*. Knowledge E, pp.820–834.

FACTORS DETERMINING CELEBRITY ENDORSEMENT AND IMPACT ON BRAND IMAGE: REFERENCE TO THE COSMETICS INDUSTRY IN SRI LANKA

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Abstract
The main purpose of this study is to analyze the impact of celebrity endorsement on brand image reference to the cosmetics industry in Sri Lanka. The paper reveals the impact of celebrities on brand image based on popularity, attractiveness, trustworthiness, celebrity multiplicity and celebrity activation. A survey is conducted based on 100 respondents and correlation, as well as regression analysis, were done to identify the relationship between the above said variables and the brand image. Also to find the significant impact of those variables on brand image. The results indicate that there is a positive relationship between popularity, attractiveness, trustworthiness, celebrity multiplicity and celebrity activation and brand image. Based on the results, it reveals that celebrity popularity, celebrity trustworthiness, celebrity activation and celebrity attractiveness have positive impact on brand image when endorsing a brand except for celebrity multiplicity.

Keywords: Attractiveness, Brand image, Celebrity activation, Celebrity multiplicity, Popularity and Trustworthiness

Introduction

The cosmetic customers in Sri Lanka have been exposed to many advertisements newspapers, magazines, billboards and websites of the cosmetic products. Nevertheless, competitors try to find different new ways to penetrate the cosmetic market while keeping the attention of customers with standstill. This is where, celebrity endorsement endorses the brand as a strategy. According to Armbruster (2006) the aim of each advertisement is to create awareness and to gain customer's attention towards their products and celebrity endorsement is one of the effective ways of attaining that.

Grant (1996) defines a celebrity endorser as "Any individual who enjoys public recognition and who uses this recognition on behalf of a consumer good by appearing with it in an advertisement" (McCracken, 1989). The choice of celebrity is very vital for brand marketing. Hence, it is essential to consider the image and personality of the celebrity endorsed the brands. Thus, it must be relevant and enhance the image of the brand. Moreover, creation of the brand image and increasing the number of customers are the crucial effect of the celebrity endorsement. Additionally, celebrity endorsement also form new market segments in which customers are without attitude and preferences to the brand previously (Byrne & Whitehead, 2003). Celebrity endorsement is frequently used in the promotion of cosmetic products and thus communicates the talent, beauty and perfection that are associated with them to the consumers. Then, the consumers try to find connection and similarities with endorsing celebrity.

Research Objectives

1. To identify the factors that determine celebrity endorsement in the cosmetics industry in Sri Lanka
2. To analyze the impact of the factors that determine celebrity endorsement on brand image in the cosmetic industry in Sri Lanka

Significance of the study

In most of the studies, with regards to celebrity endorsement on brand image, has been conducted in different countries where the findings and conclusions, may not apply to Sri Lankan consumers due to cultural, technological differences. Nevertheless, despite the fact that consumer behavior towards cosmetic items are positively determined by the celebrity endorsements (Hsu & McDonald, 2002), it is still questionable whether these celebrity endorsements influence on brand image of cosmetic advertisements in Sri Lanka. Therefore, this paper aims to identify the factors that determine celebrity endorsement and also to analyze the significate influence on brand image with reference to cosmetic advertisements in Sri Lanka.

Methodology

The primary data in this research consist of data retrieved from a questionnaire to gain information about the factors that determine celebrity endorsement. Therefore, the sample size of this study is 100 respondents in Colombo were selected. Convenience sampling was used for this study. Based on that 100 respondents were selected as the sample size as the sample can help to achieve accurate and reliable results as well as reducing the cost of research (Jamalzadeh, 2012) Further , an e-mail survey was conducted to test the hypothesis .

In Section – A, demographic data were collected which consisted of Gender, Age, Occupation in SPSS, and Ms. Excel is used to identify different cosmetic products and what different information sources they use. Section - B adopted five points Likert scale method from 1 = Strongly Dissatisfied to 5 = Strongly Satisfied agree to measure four independent variables which are popularity, attractiveness, trustworthiness, celebrity multiplicity and celebrity activation and a dependent variable which is brand image, respondents have indicated their agreement level based on five points Likert Scale and it is conducted from the statistical package for the social sciences [SPSS].

Hypothesis

The following alternative hypothesis can be formed as follow;

H1: There is a significant impact on the popularity of the endorser and the brand image.

H2: There is a significant impact on the attractiveness of the endorser and the brand image

H3: There is a significant impact on the trustworthiness of the endorser and the brand image

H6: There is a significant impact on celebrity multiplicity and brand image.

H7: There is a significant impact on celebrity activation and brand image.

Results

According to figure 01, the largest information source can be seen as the internet which shows a percentage of 30.88% out of every other channel and a decrease in traditional methods such as television and newspaper ads can also be seen in the below graph. The second largest used information source can be seen as recommendations by people who have a close relationship with the respondents.

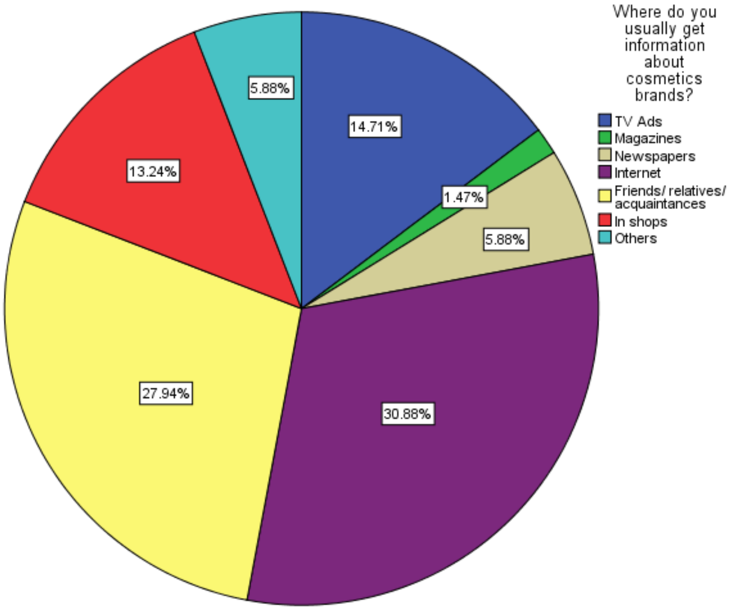

Figure 01 – Information Channel Chart

Correlations

		Popularity	Trustworthiness	Activation	Attractiveness	Multiplicity	Brand_Image
Popularit	Pearson Correlation	1	.372**	.174	.448**	.403**	.487**
	Sig. (2-tailed)		.002	.160	.000	.001	.000
	N	68	68	67	67	68	67
Trustworthiness	Pearson Correlation	.372**	1	.233	.369**	.149	.298*
	Sig. (2-tailed)	.002		.058	.002	.224	.014
	N	68	68	67	67	68	67
Activation	Pearson Correlation	.174	.233	1	.507**	.044	.280*
	Sig. (2-tailed)	.160	.058		.000	.723	.023
	N	67	67	67	66	67	66
Attractiveness	Pearson Correlation	.448**	.369**	.507**	1	.393**	.435**
	Sig. (2-tailed)	.000	.002	.000		.001	.000
	N	67	67	66	67	67	66

Multiplicity	Pearson Correlation	.403**	.149	.044	.393**	1	.205
	Sig. (2-tailed)	.001	.224	.723	.001		.096
	N	68	68	67	67	68	67
Brand_Image	Pearson Correlation	.487**	.298*	.280*	.435**	.205	1
	Sig. (2-tailed)	.000	.014	.023	.000	.096	
	N	67	67	66	66	67	67

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Table01: Correlation Between the determinants of Celebrity Endorsement and Brand Image

The correlation table given in above, reveals that there is a moderate positive relationship between celebrity popularity and brand image and celebrity attractiveness and brand image. A low positive relationship between celebrity trustworthiness and brand image and celebrity activation and brand image as the sig values are less than 0.05. But there is no significant relationship between celebrity multiplicity and brand image as the sig value is greater than0.05.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.573[a]	.329	.272	.13675

a. Predictors: (Constant), Multiplicity, Activation, Trustworthiness, Popularity, Attractiveness

According to model summary, adjusted R square value is 0.272, it implies that out of total variabilities, 27.2% of variabilities are explained by the regression model.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.540	5	.108	5.779	.000[b]
	Residual	1.103	59	.019		
	Total	1.644	64			

a. Dependent Variable: Brand_Image
b. Predictors: (Constant), Multiplicity, Activation, Trustworthiness, Popularity, Atractiveness

As per the ANOVA Table 8, the sig value is 0.000 which is less than 0.05 therefore there is enough evidence to reject the null hypothesis at a 5% level, it implies that the model is adequate.

$\mathbf{H_0}$ **:** The model is not adequate

$\boldsymbol{H_1}$ **:** The model is adequate

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.149	.095		1.570	.122
	Popularity	.438	.154	.366	2.840	.006
	Trustworthiness	.081	.099	.097	.814	.419
	Activation	.113	.125	.114	.902	.371
	Attractiveness	.136	.108	.184	1.254	.215
	Multiplicity	-.005	.072	-.009	-.076	.940

a. Dependent Variable: Brand_Image

According to the above table, most of the sig values of the independent variables are less than 0.05 except the popularity of the celebrity. Therefore, there is no significant impact of trustworthiness, celebrity activation, multiplicity, and attractiveness on celebrity endorsement except the popularity of the celebrity.

Conclusion

Compared to the research objectives mentioned earlier, the study can be concluded that popularity, attractiveness, trustworthiness, celebrity multiplicity and celebrity activation are the determinates of Celebrity endorsement. Further, the results revealed that there was a significant impact of those factors except for celebrity multiplicity on brand image but there was a positive relationship between the determinants and brand image .The cosmetic companies will have to be more careful on developing their advertising strategies thus the study has investigated five dimensions and even though all had a positive relationship towards brand image only celebrity popularity, celebrity trustworthiness, celebrity activation and celebrity attractiveness have a positive impact on brand image except celebrity multiplicity. Therefore, the Sri Lankan advertisers will have to give more focus on these attributes which are evidently seen in the Sri Lankan market.

Recommendations

As recommendations the researcher can suggest that when choosing a celebrity markets should make sure that they choose the celebrity who best matches the brand to create a solid identity. Moreover, the celebrity must have a positive background and is most likely to have a positive influence and future, since the relationship between the brand and the celebrity is a long term one. In addition to that, the main role of a celebrity in to create awareness about the product and to build the brand image via the awareness. However, if the quality is not as presented the credibility of the brand as well as the celebrity will be endangered. Therefore, it is very important for a marketer to make sure on quality and not to let that become a reason to tarnish the image of the brand as well as the image of the endorser.

References

Agrawal, J. & Wagner, A., 1995. The Conomic Worth of Celebrity Endorsers ;An event Study Analysis. *SAGE Journals* .

Armbruster , T., 2006. *The Economics and Sociology of Management Consulting.* Cambridge, Cambridge University Press .

Byrne, A. & Whitehead, M., 20013. The Naked Truth of Celibrity Endorsment. *British Food Journal* , 5(4).

Etikan, I., Musa , S. A. & Alkassim, R. S., 2016. *Comparison of Convenience Sampling and Purposive Sampling.* [Online]
Available at: http://article.sciencepublishinggroup.com/pdf/10.11648.j.ajtas.20160501.11.pdf
[Accessed 24 September 2020].

Halonen, E. K. & Hurmerinta, L., 2010. Who endorses whome? Meanings transfer in celebrity endorsement. *Journal of Product and Brand Managment* , 19(6), p. 12.

Hsu, C. & McDonald, D., 2002. An Examination on Multiple Celibrity Endorsers in Advertsing. *A Journal of Product and Brand Managment* , 11(01), p. 10.

Huu, S. M. et al., 2015. *Customer's Attitude Towards Mobile Advertising in Bangladesh.* [Online]
Available at: http://article.sciencepublishinggroup.com/pdf/10.11648.j.ijber.20150406.13.pdf
[Accessed 11 September 2020].

Jamalzadeh, M., Bechravan, N. & Masoudhi, R., 2012 . An Empirical Study of Email Based Advertisement and it's influence on consumers' attitude. *International Review of Management and Marketing* , 2(2146-4405), p. 132.

Lun, J. L. T. et al., 2014. *Consumer Attitude Towards Mobile Advertising in Malaysia.* [Online]
Available at: http://eprints.utar.edu.my/1445/1/BAC-2014-1106491.pdf
[Accessed 11 September 2020].

McCracken , G., 1989. Who is the Celibrity Endorser : Cultural Foundations of the endorsement process. *Journal of Consumer Research* , Volume 16, p. 11.

THE IMPORTANCE OF INFORMATION SYSTEMS FOR THE ACCOUNTING OF PUBLIC SECTOR ORGANIZATIONS IN COLOMBO DISTRICT

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Abstract

The usage of accounting systems in organizations is very essential in order to identify the financial stability and to prepare financial statements. The availability of information systems to do financial related activities leads to improve the performance of the organization as well as quick decision making. Majority of public sector organizations in Sri Lanka use outdated information technology and systems even though employees are effective in using information technology. Therefore, identifying the effect of usage of information systems on organizational performance would be an advantage for public sector organizations. Lack of publications available on this discipline leads to conduct this study to identify the relationship between usage of information system and the employees' perspective regarding the performance of the organization relating to the usage of information systems. Data were collected through structured questionnaire which contained five point Likert scale questions regarding the usage of Computerized Accounting System, Enterprise Resource Planning System, Supply Chain Management System, Material Requirement Planning System and perceived performance. Convenience sampling method was used to select ten public sector organizations. The result of the correlation analysis revealed that there is a significant relationship between the organization's performance and the usage of information systems. The study showed that the utilization of the latest Information Technological advancements in the public sector supports to increase the overall performance of the organization.

Keyword: - Usage of (IT) Information Technology, Accounting of Public Sector.

Introduction

Background of the study

The firms use accounting systems to identify its financial stability through the preparation of financial statements, cash budgets and ratios (Mahavidyalaya, 2015). The usage of accounting systems integrated with Information Technology (IT) would enable the firms to analyze the present business environment, through monitoring regularly firms could identify the changes in taxations and latest organizational practices (Talha, et al., 2010). Furthermore, Maziriri & Mapuranga, (2017) states that management accounting is utilized to increase the performance of the organizations through transmitting information among each department, making quick decision and quickly implying new decisions with the help of IT.

The centralization of information within the organization, most of the records were stored in the servers and data centers in an organized pattern. This stage enabled firms to communicate with different clients from different alternative locations, through the utilization of Enterprise Systems such as Customer Relationships Management Systems (CRM), Supply Chain Management System (SCM), Enterprise Resource Planning Systems (ERP), Material Requirement Planning Systems (MRP) and Human Resource Management Systems (HRM)

Accordingly, Information Technology is needed for the accounting of public sector organizations, in order to enhance the overall organizational productivity to compete with other organizations (Cascio & Montealegre, 2016).

However, the public sector organizations of Sri Lanka are utilizing the outdated (IT) for the integration of the accounting system, therefore most computer literate employees of the public sector organizations are ineffective in transferring budgets and other audited reports. Even though employees are effective in using (IT), through utilizing the outdated (IT) accuracy, time-management and various other variables could not be maintained productivity for the accounting system (Guah, 2012). Even though there are some studies on this theme in other countries, lack of studies have been conducted in Sri Lankan context. Therefore, identifying the relationship between the usage of information systems and organizational performance would be an advantage to public sector organizations in Sri Lanka

Research Questions

The main research questions are what is the relationship between usage of information system and the employees' perspective regarding the performance of the organization and what recommendations could be provided to improve the accounting activities.

Objectives

Therefore, the objective of this study was to identify the relationship between usage of information system and the employees' perspective regarding the performance of the organization relating to the usage of information systems.

Methodology

This study was done by selecting 6 managerial level employees who deal with the usage of those components of Information Technology from 10 public sector organizations in the Colombo district of Sri Lanka. The sample was selected using convenience sampling method. The limitation of this report is that the samples size is limited as it was not possible to collect more as per the restrictions in the country due to Covid 19.

Data were collected through a structured questionnaire which contained five point Likert scale questions regarding the usage of four information systems and perceived performance. The usage of Computerized Accounting System (CAS), Enterprise Resource Planning System (ERP), Supply Chain Management System (SCM), and Material Requirement Planning System (MRP) were considered as exploratory variables and perceived performance as the dependent variable in this study. Pearson correlation analysis was used to identify the relationship between above exploratory and dependent variables using SPSS version 20.

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Results

The results of descriptive analysis and correlation analysis of this study show below mentioned findings.

Table 1. Summary statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Years of Experience	60	3	25	9.70	5.283
Gender distribution					
Male	46.67%	Female		53.33%	

According to Table 1, there were 46.67% of male employees and 53.33% of female employees in this study. Moreover, average years of experience of these employees were 9.7 years.

Table 2. Correlation analysis

		Usage of CAS	Usage of ERP	Usage of SCM	Usage of MRP
Perceived performance	Pearson correlation	0.304	0.274	0.232	0.290
	Sig (2-tailed)	0.018*	0.034*	0.075	0.025*
	N	60	60	60	60

**Significant at 5% level of significance*

Table 2 shows the results of correlation analysis between exploratory variables and the dependent variables. According to results, it can be clearly observed that there are positive relationships between usage of information systems and perceived organizational performance as all correlation coefficients are positive. Moreover, sig-values of relationships between usage of CAS, usage of ERP, usage of MRP and perceived performance were 0.018, 0.034 and 0.025 respectively which were less than 0.05. It implies that relationships between usage of CAS and perceived performance, usage of ERP and perceived performance and the usage of MRP and perceived performance were significant at 5% level of significance. However, the relationship between usage of SCM systems and perceived performance was insignificant at 5% level because of its high sig-value.

Discussion

The findings of this study showed that there is a significant relationship between the organization's performance and the systems such as Computerized Accounting System, Enterprise Resources Planning System and Material Resources Planning System, but not Supply Chain Management System. This result is strengthening through a previous study conducted to identify the impact of information technology on accounting systems which pointed out that advancements in (IT) have helped the accounting systems of firms to boost the performance as well as the efficiency and effectiveness of information (C. Lim, 2013).

Further, a study conducted by Silva & Gunawardana, (2011) revealed that the usage of ERP systems is able to increase the performance within the five management accounting activities such as capital budgeting, forecasting, operation statement, reporting and activity-based costing. Therefore, the above findings also consistent with the findings of this current study.

Conclusion and Recommendation

The study revealed that the utilization of the latest Information Technological advancements such as Computerized Accounting System, Enterprise Resources Planning System and Material Resources Planning System, by the organizations in the public sector supports to increase the overall productivity of the organization and it helps to store large amounts of data with protection, reduce the errors during documentation, prepare financial reports, maintain time management effectively, motivates to perform more activities and etc.

Therefore, it shows that most of the employees have a good knowledge and understanding of the concept of Information Systems and IT. In practical terms, training and development programs would be more effective to enable them to be familiar with the utilization of the SCM system. Therefore, it would encourage an organization to gain new opportunities and finally, it would also allow it to establish itself at its present level.

References

C. Lim, F. P., 2013. Impact of Information Technology on Accounting Systems. Asia Pacific Journal of Multimedia Services Convergent with Art, Humanities and Sociology, 3(2), pp. 93- 106.

Cascio, W. F. & Montealegre, R., 2016. Research Gate. [Online] Available at: https://www.researchgate.net/publication/299400943 [Accessed 14 10 2020]

Guah, M., 2012. Research Gate. [Online] Available at: https://www.researchgate.net/publication/254356942_Public- 45 Sector_Accounting_and_E-Governance_in_Developing_Countries_Case_of_Sri_Lanka [Accessed 14 10 2020]

Mahavidyalaya, S. R. M., 2015. Comparative Study of Traditional Accounting System and Modern Accounting System. Prime International Research, 2(1), p. 31.

Maziriri, E. T. & Mapuranga, M., 2017. The Impact of Management Accounting Practices (Maps) on the Business Performance of Small and Medium Enterprises within the Gauteng Province of South Africa. Journal of Accounting and Management, 7(2), pp. 12-25.

Shiraj, M. M., 2015. Research Gate. South Eastern University of Sri Lanka , pp. 1-9.

Silva, N. & Gunawardana, K., 2011. Research Gate. [Online] Available at: https://www.researchgate.net/publication/228278969_The_Impact_of_Enterprise_Resource_Planning_Systems_on_Management_Accounting_in_Private_Companies_in_Sri_Lanka?enrichId=rgreq-d27cccbf5797354cde159fa14a2b7162-XXX&enrichSource=Y292ZXJQYWdlOzIyODI3ODk2OTtBU [Accessed 14 10 2020].

Talha, M., Raja, J. B. & A. S., 2010. A New Look At Management Accounting. The Journal of Applied Business Research, 26(4), pp. 83-96.

THE RELATIONSHIP BETWEEN JOB SATISFACTION AND LABOUR TURNOVER INTENTION OF KG FLEX PACKAGING PVT LTD

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Abstract
Employees play a critical role in organizational success and the achievement of employee retention in the long run have significant consequences for the organization. Identified problematic situation is that labour turnover intention and reduced job satisfaction work as predictors of actual turnover, resulted in detrimental situations. The purpose of the research is to assess the relationship between job satisfaction and labour turnover of employees in KG Flex Packaging Pvt Ltd. Quantitative research approach and deductive explanation was used. In the study primary data was collected through standardized survey questionnaire considering total population sampling technique. 50 responses from the target population considered as the sample for the analysis. The statistically analyzed results provide evidence that job satisfaction and labour turnover intention are significantly correlated and demonstrate a strong negative correlation. The results that signify the strong negative correlation could be effectively provided implications of turnover intention and job satisfaction that bridge the knowledge gap.

***Key Words*;**
Job satisfaction, Job satisfaction tools, Labour turnover intention

Introduction (Purpose/Aim & Background)

Research is focused on identifying the relationship between job satisfaction and labour turnover intention in KG Flex Packaging Pvt Ltd. Employee turnover intention have signified as a vital issue and a challenge for effective usage of human resource management strategies and organizational performance (Davidson, Timo and Wang, 2010). Labour turnover intention is considered as a strong indicator of organizational performance that have a negative observation towards the effectiveness and efficiency of organizational performance (Glebbeek and Redish, 2004). The labour turnover intention ratio is identified as high in industrial services particularly in factory workplaces that have a negative impact on organizational productivity, quality and profitability because of the loss of knowledge and technical skills. The high turnover intention of organizational structure will impact the organizational operation cost concerning the investment that organizations have to make for the recruitment and training procedure of new employee placement and further have a considerable impact on the organizational profit margins (Ramadhani, 2014). Because labour turnover intention is the prediction of actual labour turnover, organizations must invest in maintain a better awareness regarding the relationship between job satisfaction and labour turnover intention to deduct the ratio of actual turnover. Previous researchers have identified, labour turnover intention work as an influential matter that might drive the organization into the failure (Joshi and Ratnesh, 2013). The turnover intention has justified as a considerable organizational issue in human recourse management and provide insights and evidence about Labour turnover intention’s strong prediction towards the financial performance and effectiveness of organizations (Lambert, Hogan and Barton, 2001). It has been acknowledged by many researchers that turnover intention is the most influential predictor of actual turnover (Mobley,1977; Home and Griffeth, 1995). Employees need to achieve the satisfaction about job and organizational circumstances in order to capture a reduction of labour turnover intention (Ann Reukauf, 2017). James and Dorothy (2010) have discovered that a significant relationship between job satisfaction and turnover intention. The employee has signified a considerable chance to make decision about leaving the organization and job position when the employees are not satisfied (Kim and Park, 2014). Moureen (2004) found work itself is also one of the main causes for employee turnover intention. Parsons and Broadbridge (2006) have evaluated that salary satisfaction and turnover intention are negatively correlated. When negative behaviors of supervisors exist such as abusive behaviors and negative philosophies of supervision, negatively increases labour turnover intentions among employees (Richard, Boncoeur, Chen and Ford, 2018). Various researches (Mobley, 1977) have evaluated a positive relationship between growth opportunities and job satisfaction as well a negative relationship between growth opportunities and turnover intentions.

Primary Research Objective

- To investigate the relationship between job satisfaction and labour turnover intention in KG Flex Packaging Pvt Ltd.

Methodology

Deductive explanation research approach has been aligned with the Quantitative correlational research strategy. Quantitative data have been collected with the distribution of an administrative field questionnaire. The target population is 50 respondents who employed in KG Flex Packaging Pvt Ltd who have a direct involvement with the job satisfaction and labour turnover intention in KG Flex Packaging Pvt Ltd. Because of the manageable size of the employee population, total population sampling technique has been used to determine the sample size as 50 employees. In the present research study, job satisfaction tools have been identified as the independent variable and labour turnover intention is the dependent variable of the current research study. Job Satisfaction tools that are Salary, work itself, supervision, growth opportunities and advancement have been discussed as the dimensions under the independent variable. Data related to the variables were collected by using five point Likert scale. Job Satisfaction have determined as the independent variable and labour turnover intention as the dependent variable. In order to examine measurements of job satisfaction tools, four dimensions have been used that are Salary, work itself, supervision, growth opportunities and advancement. The dimensions have been identified by the scholar according to the previous literature (Ramadhani, 2014). Thus, twenty indicators have been used to measure the dimensions according to the previous questionnaire (Ramadhani, 2021).
By using 50 respondents the reliability of the present study has been calculated. The result of the reliability test shown in the table.

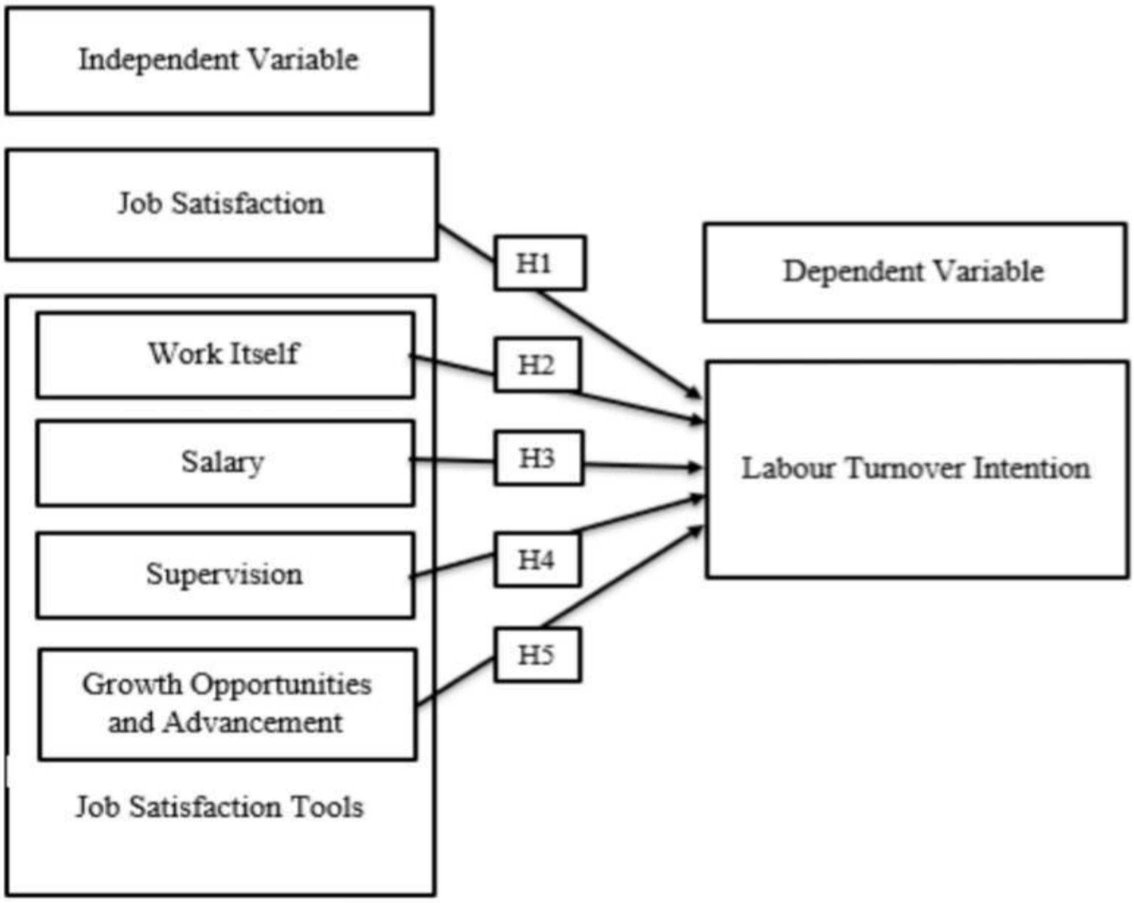
Construct	Cronbach's Alpha	Number of items
Work itself	0.818	6
Salary	0.842	4
Supervision	0.812	5
Growth opportunities and advancement	0.834	5
Labour turnover intention	0.864	5

Source: Analyzed statistical output from the field survey

According to the table, Alpha values of the constructs are higher than 0.8. In order to the value, internal consistency among the indicators which have been used by the researcher in the questionnaire are at a good level. Therefore, these items were combined to measure the particular variables.

Conceptual Framework

Figure 1; Conceptual Framework



Source; Developed by the researcher

- H1: There is a relationship between job satisfaction and labour turnover intention in KG Flex Packaging Pvt Ltd.
- H2: There is a relationship between work itself and labour turnover intention in KG Flex Packaging Pvt Ltd.
- H3: There is a relationship between salary and labour turnover intention in KG Flex Packaging Pvt Ltd.
- H4: There is a relationship between supervision and labour turnover intention in KG Flex Packaging Pvt Ltd.
- H5: There is a relationship between growth opportunities & advancement and labour turnover intention in KG Flex Packaging Pvt Ltd.

Finding/ Results

Table 1; Descriptive statistics

	N	Mean	Std. Deviation	Skewness	
	Statis	Statisti	Statistic	Statistic	Std. Error

	tic	c			
Work_itself	50	4.7000	1.21370	-1.752	.337
Salary	50	4.0300	1.07694	-1.616	.337
Supervision	50	4.0240	1.10778	-1.528	.337
Growth_oppotunities	50	4.0840	1.07064	-1.645	.337
Labour_turnover_intention	50	1.8480	1.06794	1.482	.337
Valid N (listwise)	50				

Source; Statistical output of analyzed field survey

Table 2; Correlation – Job satisfaction and Labour Turnover Intention

Correlations			
		Job_satisfaction	Labour_turnover_intention
Job_satisfaction	Pearson Correlation	1	-.922**
	Sig. (2-tailed)		.000
	N	50	50
Labour_turnover_intention	Pearson Correlation	-.922**	1
	Sig. (2-tailed)	.000	
	N	50	50
**. Correlation is significant at the 0.01 level (2-tailed).			

Source; Statistical output of analyzed field survey

Table 3; Correlation – Work itself and Labour turnover intention

Correlations			
		Work_itself	Labour_turnover_intention
Work_itself	Pearson Correlation	1	-.913**
	Sig. (2-tailed)		.000
	N	50	50
Labour_turnover_intention	Pearson Correlation	-.913**	1
	Sig. (2-tailed)	.000	
	N	50	50
**. Correlation is significant at the 0.01 level (2-tailed).			

Source; Statistical output of analyzed field survey

Table 4; Correlation - Salary and Labour turnover intention

Correlations			
		Salary	Labour_turnover_intention
Salary	Pearson Correlation	1	-.914**
	Sig. (2-tailed)		.000
	N	50	50
Labour_turnover_intention	Pearson Correlation	-.914**	1
	Sig. (2-tailed)	.000	
	N	50	50
**. Correlation is significant at the 0.01 level (2-tailed).			

Source; Statistical output of analyzed field survey

Table 5; Correlation – Supervision and Labour turnover intention

Correlations			
		Supervision	Labour_turnover_intention
Supervision	Pearson Correlation	1	-.890**
	Sig. (2-tailed)		.000
	N	50	50
Labour_turnover_intention	Pearson Correlation	-.890**	1
	Sig. (2-tailed)	.000	
	N	50	50
**. Correlation is significant at the 0.01 level (2-tailed).			

Source; Statistical output of analyzed field survey

Table 6; Correlation - Growth opportunities and Labour turnover intention

Correlation			
		Growth_oppotunities	Labour_turnover_intention
Growth_oppotunities	Pearson Correlation	1	-.903**
	Sig. (2-tailed)		.000
	N	50	50
Labour_turnover_intention	Pearson Correlation	-.903**	1
	Sig. (2-tailed)	.000	
	N	50	50
**. Correlation is significant at the 0.01 level (2-tailed).			

Source; Statistical output of analyzed field survey

The objective of the research has clarified to investigate the relationship between job satisfaction and labour turnover intention of employees in KG Flex Packaging Pvt Ltd. Based on the results of Pearson correlation analysis. The correlation coefficient value is -0.922 that determines strong negative correlation between job satisfaction and labour turnover intention in KG Flex Packaging Pvt Ltd. p value is 0.000 that is lower than 0.05 which have confirmed the statistically significant relationship by rejecting the null hypothesis. Secondary objectives were concentrated on investigating the relationship between each job satisfaction tool and labour turnover intention in KG Flex Packaging Pvt Ltd. Based on the results job satisfaction tools which are work itself, salary, supervision and growth opportunities & advancement, have shown a strong negative correlation with the labour turnover intention.

Discussion

Previous researchers have discussed the contradict results that stated the relationship between job satisfaction and labour turnover intention with the clarification of job satisfaction tools as work itself, salary, supervision and growth opportunities & advancement (Shukla and Sinha, 2013; Home and Griffeth, 1995; Spencer and Steers, 1981; Stovel and Bontis, 2002). Spencer and Steers (1981) discovered that there is a strong negative relationship between job satisfaction and turnover. Mowday, Porter and Steers (1982) also uncovered that job satisfaction is consistently and negatively associated with turnover. Batura et al. (2016) studied the relationship between employee job satisfaction and turnover intention in the healthcare industry.

Despite the relevance of the research, the study was conducted where geographical attributes, political inclination, socio- cultural values and industrial background shift from the domestic industries. Despite the fact that many studies were conducted to explore factors that influences employees' job satisfaction and turnover intention in different sectors of the economy, most of them were carried out in other countries. (Ramadhani, 2014).

Main findings of the research have signified that labour turnover intention have a significant relationship with job satisfaction and work as the predictor of actual labour turnover (Mobley,1977; Home and Griffeth, 1995). Considering the results, researcher have discovered that there is a strong negative relationship between job satisfaction and labour turnover intention.

Conclusion and Recommendations

Based on the Pearson correlation analysis of the research, there is a statistically significant relationship between job satisfaction and labour turnover intention that resulted in strong negative correlation between job satisfaction and labour turnover intention that is calculated as -0.922. Based on the Pearson correlation coefficient value of each job satisfaction tool have indicated that the variables have a strong negative correlation with labour turnover intention. The p value of each variable is 0.000 which is lower than the 0.05, have rejected the null hypotheses. The fulfilment of research gaps was accomplished. Correlation analysis assists to identify influential predictors about job satisfaction and labour turnover intention considering the analyzed patterns of information and calculated results. Adopting the predictors of calculated results in to the organizational practices. Strategy implementation would be beneficial to organization that would work as a solution for the increased labour turnover intention that inherently associate with a lot of benefits to increase organizational performance and productivity.

References

Davidson, M., Timo, N. and Wang, Y., 2010. How much does labour turnover costs? a case study of Australian four- and five- star hotels. International journal of contemporary hospitality management, 22 (4)

Glebbeek, S. and Redish, B., 2004. Turnover Intention and Organizational Effectiveness. Academy of Management Review.

Ramadhani, S., 2021. Factors Influencing Job Satisfaction and Turnover Intention in Commercial Banks. Tanzana: The Open University of Tanzania.

Joshi, A. and Ratnesh, K. 2013. Human resource budgeting and HRM strategies: A paradigm shift that increases job satisfaction, effectiveness of recruitment decisions of human assets. International Journal of Management Research and Reviews, 3(1).

Lambert, E.G., Hogan, N. L., Barton, S.M.,2001. The impact of job satisfaction on turnover intent: A test of a structural measurement model using a national sample of workers. The Social Science Journal, 38(04).

Mobley, W.H., 1977. Intermediate Linkages in the Relationship between Job Satisfaction and Employee Turnover. Journal of Applied Psychology.

Home, P.W., and Griffeth, R.W., 1995. Employee Turnover. OH. Cincinnati.: South-Western College.

Ann Reukauf, J., 2017. The Correlation Between Job Satisfaction and Turnover Intention in Small Business. Minnesota: Walden University.

James, S., and Dorothy, M., 2010. Designing Benefit Programs for Different Generations.

Kim, S. and Park, S. 2014. Determinants of job satisfaction and turnover intentions of public employees: Evidence from US federal agencies. International Review of Public Administration, 19(1).

Moureen, M., 2004. Human Resource Planning; First edition; Pearson Publishers. Parsons, E. and Broadbridge, A., 2006. Job motivation and satisfaction: Unpacking the key factors for charity shop managers. Journal of Retailing and Consumer Services, 13(2).

Shukla, S. and Sinha, A., (2013). Employee turnover in banking sector: Empirical evidence. IOSR Journal of Humanities and Social Science (IOSR –JHSS), vol. 11(5), pp. 57-61

Spencer, D. G., Steers, R. M., 1981. Performance as a moderator of the job satisfaction–turnover relationship. Journal of Applied Psychology, 66(4).

Stovel, M. and Bontis, N., 2002. Voluntary turnover: knowledge management-friend or foe? J. intellect. 3 (3).

IMPACT OF ELECTRONIC BANKING ON THE PROFITABILITY OF ABC BANKS IN MALDIVES

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Abstract
The research was conducted to examine the relationship between mobile banking service expenditure and the profitability, the relationship between Automated Teller Machine service expenditure and profitability, and the relationship between credit and debit card issued to customer service expenditure and profitability of ABC bank in Maldives.
This study is an investigative econometric research that aims to investigate and analyze the relationship between two variables. With the use of non-probability sampling technique and as the research is subjected to a qualitative approach and a deductive study, the researcher has utilized SPSS software to analyze the data to draw effective conclusions.
The research concluded there is a need for a further study, to determine the connection between internet banking and financial performance of the said bank. A positive relationship was found between e-banking and profitability though a full conclusion cannot be drawn due to the assumption that e-banking decision is the key factor in improving bank profitability.
Keywords: E-banking, Impact, Profitability, Relationship

Introduction

Internet banking, also referred to as electronic banking or e-banking changed the banks traditional service to knowledge service in the modern time. According to Choudhary (2013), e-banking is known as Electronic Fund Transfer (EFT), which also is a means of transferring money between accounts, which is easier than the physical visit to a bank. With regards to cost, e-banking is found to be cheaper by allowing the banks to use a fewer number of staff and also by cutting down expenses.
ABC Bank is one of the largest public limited companies within the Maldives. ABC Bank established to be the exclusive issuer and acquirer of American Express by expanding the business into card issuance and internet banking. ABC at present has a customer population using over 120,000 debit cards and 13,000 credit cards.
With the increase in number of banks offering internet banking service for customers, ABC Bank also has to rise up to the competitive standards. Hence, this study will reveal how internet banking contributes to increasing the profitability of ABC Bank in Maldives from 2011 to 2020.
The objectives of the study are to examine the relationship between:

- Mobile banking service expenditure and the profitability of ABC Bank;
- Automated Teller Machine (ATM) Service expenditure and the profitability of ABC Bank; and
- Credit and Debit Card issued to customer service expenditure and the profitability of ABC Bank.

The finding of the study will be in greater position to directors to ABC bank in Maldives as they will understand the impression of internet banking on profitability of ABC bank in

Maldives. This will contribute towards assisting the directors in making decision on whether to adopt internet banking or not and expected result of internet banking adoption to their bank's profitability.

HYPOTHESIS

Based on the above conceptual framework the following hypothesis will be tested. Researcher
adopted two hypotheses for this study. There is relationship between the internet banking as an
independent variable (Mobile Banking, ATM, Credit card) and the dependent variable
as a Profitability. However, the researcher adopted the following hypotheses for the study:

H0: There is no significant relationship between Mobile Banking Revenue and the profitability of
ABC banks
H1: There is significant relationship between Mobile Banking Revenue and the profitability of
ABC banks
H0: There is no significant relationship between ATM (Automate teller Machine) service Income
and the profitability of ABC banks
H1: There is significant relationship between ATM (Automate teller Machine) Service Income and
the profitability of ABC banks
H0: There is no significant relationship between Credit Card issued service Income and the
profitability of ABC banks
H1: There is significant relationship between Credit & Debit card issued service Income and the
profitability of ABC banks

Methodology

This being a study primarily focused to determine the impact of internet banking and
profitability on ABC bank in Maldives.
The most important part of any study is how the researcher chooses to fold, examines
and interpret the information. The strategy chapter will show the most vital part of the research area, research plan, investigating procedures, examining plan, sampling methods and the methods of information collection and translation.
SAMPLE SELECTION**:** The study is conducted assessing the qualitative factors in determining the impact of e-banking. It is descriptive and exploratory in nature. Survey is conducted by annual report and interviewing the managers of ABC banks in Maldives. The electronic services provided by the banks are ATM, Credit Cards, online banking from 2011 to 2020.
DATA COLLECTION**:** The design of this study is investigative econometric research as it is meant to investigate and analyze the relationship between two variables, namely, Internet

banking and profitability. The study identified four e-banking channels, including automated teller machines, electronic mobile banking, card operating, and internet banking transactions as indicators of electronic banking in Maldives; while, profit before tax (PBT) was used as the indicator of profitability. The study used yearly aggregated bank data for the period 2011 to 2020 for this study. The secondary data were collected from ABC bank annual reports and accounts.

Results

Correlation between Net profit and Card operations

Correlations

		Net_Profit	Card_operations
Net_Profit	Pearson Correlation	1	.777**
	Sig. (2-tailed)		.008
	N	10	10
Card_operations	Pearson Correlation	.777**	1
	Sig. (2-tailed)	.008	
	N	10	10

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 1 Correlation between net profit and Card operation

Correlation between Net profit and Card & Electronic Banking

Correlations

		Net_Profit	Card_Electronic_Banking
Net_Profit	Pearson Correlation	1	.536
	Sig. (2-tailed)		.110
	N	10	10
Card_Electronic_Banking	Pearson Correlation	.536	1
	Sig. (2-tailed)	.110	
	N	10	10

Figure 2 Correlation between net profit and Card & Electronic Bank

Correlation between Net profit and Card & Credit Card

Correlations

		Net_Profit	Credit_card
Net_Profit	Pearson Correlation	1	.594
	Sig. (2-tailed)		.070
	N	10	10
Credit_card	Pearson Correlation	.594	1
	Sig. (2-tailed)	.070	
	N	10	10

Figure 3 Correlation between net profit and Credit Card

Correlation between Net profit and three independent variances

Correlations

		Card_operations	Card_Electronic_Banking	Credit_card	Net_Profit
Card_operations	Pearson Correlation	1	.913**	.958**	.777**
	Sig. (2-tailed)		.000	.000	.008
	N	10	10	10	10
Card_Electronic_Banking	Pearson Correlation	.913**	1	.984**	.536
	Sig. (2-tailed)	.000		.000	.110
	N	10	10	10	10
Credit_card	Pearson Correlation	.958**	.984**	1	.594
	Sig. (2-tailed)	.000	.000		.070
	N	10	10	10	10
Net_Profit	Pearson Correlation	.777**	.536	.594	1
	Sig. (2-tailed)	.008	.110	.070	
	N	10	10	10	10

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 4 Correlation between 3 variances

Compared to the individual analysis of the variables, a positive relationship can be visible when all three correlations are combined together in a group. The three independent variables card and electronic banking, credit card and card operations will affect the net profit. According to the analysis, when all three variables are individually analyzed, only the first variable which is card operations will reject the null hypotheses indicating that particular variable does not have a relationship with the dependent variable, in this case the net profit. But electronic banking and credit card will not affect the net profit and therefore will not reject null hypothesis according to the p value. The P value will not indicate the rejection of null hypothesis but shows that there is a correlation between these three independent variables. Only card operations as an independent variable indicate that it can reject null hypothesis depending on answer that the researcher receives for p value. But the other two independent variables will not show the evidence to reject null hypothesis. This is indicative of a positive relationship with correlation.

Descriptive Statistics

	N	Mean	Std. Deviation	Variance
Credit card	10	268939.4000	112277.62705	12606265535.600
Net profit	10	682794.5000	362457.42228	131375382966.500
Card operating	10	452066.9000	156084.35016	24362324363.656
Card electronic banking	10	433012.4000	289478.69164	83797912911.822
Valid N (list wise)	10			

Figure 5 Descriptive statistics between three variables

Discussion and Recommendations

Following the analyzed inferences, the study made recommendations in two parts. First part (PART A) includes recommendations that should be taken into consideration by the ABC bank and relevant regulatory bodies. Second part (PART B) includes recommendations for future researchers.

PART A (BANK SPECIFIC RECOMMENDATIONS)

1) That, ABC banks should strengthen effort to deploy more ATM delivery opinions and also make them more actual and efficient.
2) That, ABC banks must attempt to answer to all declining ATMs in order to ease the tension experienced by customers in trying to get their services; and also, to safe the profit in terms of cost reduction
3) Just as clients have come to accept ATMs contacts, other e-banking channels like electronic mobile banking, POS, internet (WEB) banking container even develop more acceptable if to complaints since clients about failed dealings is achieved.
4) ABC Bank should examine issues that would make electronic banking networks more attractive to customers, noticing the drawbacks with a view to talking them, so that, Maldives will begin to get the full aids of internet banking as in other countries.
5) The regulatory establishments should also cooperate with the ABC bank to put in place an enabling operating environment and regulatory outline to bring out best arrangement of these services to clients. This is especially with respect to speaking the issue of failed dealings.

PART B (FUTURE RESEACHERS SPECIFIC RECOMMENDATION)

1) More dependent and independent variables can be taken into research considerations to further analyze the banking systems in the Maldives
2) More secondary data can be collected in order to enhance the literature review and the analysis of data collection in future research in the same area.

3) This research can be further analyzed by repeating it in another 3 to 4 years in order to investigate whether there is a positive change in the ABC Bank's profitability.
4) When conducting further research, consideration should be considered to include secondary data with a span of 10 to 20 years.

Conclusions

The study sought to determine the impact of internet banking and profitability of ABC banks in Maldives. There is a need for a study to be conducted to determine the connection between internet banking and financial performance of ABC banks in Maldives. There are many factors that affect financial organizations to adopt technology in the banking sector; there is need for a study to be complete to determine factors impacting internet banking and productivity acceptance of ABC banks in Maldives. The study was carried out in order to assess the relationship between electronic banking services and the profitability of ABC bank in Maldives. Many literatures and theoretical publications from unlike authors in electronic banking services were reviewed in the course of this work. Also, empirical data were gathered, analyzed and interpreted. The sign of the impact of the adoption of electronic banking (the internet) as a supply network of bank goods and services on bank profitability is mixed at both sides. However, the more recent studies, including this one, seem to find a positive relationship between e-banking and profitability; though even in the current study, it cannot be concluded that assuming e-banking decision is the key factor in improving bank profitability. Nevertheless, it can be claimed, that as the intensity and experience in the deployment and usage of internet services increases, the profitability, and by implication, the overall financial presentation of multichannel banks is likely to improve.

References

Maldives, B. o., 2020. *Annual report.* [Online]
Available at: https://www.bankofmaldives.com.mv/storage/document/371/2955/annual-report-2020-en.pdf
[Accessed 2021]

Auta, M. E. (2010). E-banking in Developing Economy: Empirical Evidence from Nigeria. Journal of Applied Quantitative Methods. 5(2), 23-56.

Maiyaki, A. U. and Mokhtar, S. S. U. (2010) Effects of electronic banking facilities, employment sector and age-group on customer's choice of banks in Nigeria. Journal of Internet Banking and Commerce,Vol. 15(1)

Singh, A.M (2004). Trends in South African Internet banking; Aslib Proceedings, New Information Perspectives, 56(3), 187-196.

THE RELATIONSHIP BETWEEN THE JOB RETENTION AND EMPLOYEE PERFORMANCE IN ABC COMPANY IN COLOMBO BRANCH.

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Abstract
This study is an attempt to study about the relationship between the job retention and employee performance in ABC company in Colombo branch. This strives to study reasons on what has led to inefficiency being demonstrated in the activities of the selected organization It has been used the independent variables of task performance, contextual performance, and counterproductive work behavior. The job retention is a major as well as a vital issue facing by the insurance company. It was noted that the company was experiencing low job retention levels thus the study is based on the primary data and the collected data has been evaluated through statistical Package for Social Science (SPSS). The results of the data analysis concluded that if an organizational employees performed well in their designation, it will impact to increase their retention towards the organization. The study identified that job performance and retention has relationship through finding relationship between the task performance, context performance and counterproductive performance.
Key words: Job retention, Employee performance, Task Performance, Contextual performance, counterproductive work performance.

Introduction
The role of human capital is considered as a source of success in the activities of a business organizations. Nowadays it can be identified a high percentage of voluntary and non-voluntary employees' turnover in any business in any industry (Yurchisin and Park, 2010). The insurance industry is confronting a very competitive job market with 1.7 percent unemployment rate moreover, the employee turnover rates vary by professional groups, however sales and marketing staff have the greatest turnover rate at 31% (Holliday, 2021) Furthermore, both newcomers to the insurance market and established firms are grappling with the increased staff retention rates. Therefore, it is revealed that the increasing employee turnover rate is a major challenge faced by the insurance companies.
The employees are valuable assets for the company since they have a direct impact on profitability and the reputation (Elnaga and Imran, 2013). As per the today's competitive economy, employee performance is critical to an organization's success. If a person performs well, the organization will succeed in the future but if they perform poorly the organization will fall (Nguyen and Duong, 2020). The majority of industrialized countries place a premium on employee job performance in order to achieve the organization success. The performance of the employees can he improved by enhancing the skills and the knowledge through training and development programs. Since the employee turnover rate is in the higher level of the insurance sector, the insurance organizations are battling in order to solve this issue rather than before. In order to be succeed the organization, the employee retention is essential. The performance of the insurance company is tied to the performance of the

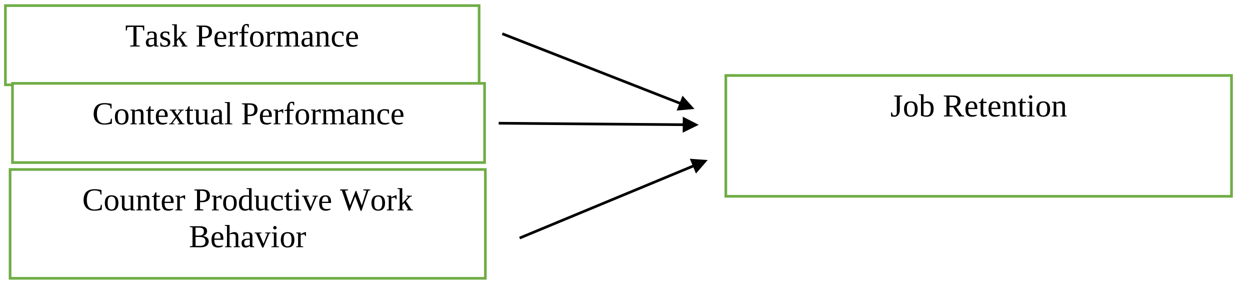
employees; the insurance company's survival is depended on the insurance agents (Luckmizankari, 2017). Thus, the most important thing for an organization is to keep its employees. This study mainly focused on the identify association between job performance and job retention of insurance agents of ABC company in Colombo branch.

Research Objectives

- To identify association between job performance and job retention of insurance agents of ABC company in Colombo branch.
- To identify the most influential job performance factor (task performance, contextual performance, counter productive work behaviour) towards the job retention.
- To identify policies of the ABC company should use to keep its employees and attract new employees in the future.

Conceptual Framework

The following conceptual framework has developed using the theories in order to use as a guidance for the subsequent works, it is tested using the collected data of the sample.



Hypotheses

With reference to the above research question and the research objectives the following hypothesis have been developed,

H1 – There is an association between task performance and job retention of insurance agents of ABC company in Colombo branch.

H2 – There is an association between contextual performance and job retention of insurance agents of ABC company in Colombo branch.

H3 – There is an association between counter productive work behavior and job retention of insurance agents of ABC company in Colombo branch.

Methodology

Research Study

In here the study employs a deductive approach survey research strategy as it is primarily concerned with identifying casual effects by creating and testing hypotheses based on the field data. This study employs a quantitative approach to evaluate the numerical data gathered.

Population

In this study the target population is defined as people who work on the project. It has identified the total of 275 insurance employees in ABC insurance company's Colombo branch were included in the study.

Sample And Sample Method

Using the simple random sampling approach, the data was collected. In here it is used a probability sampling methodology with strong and external validity. Rather than using the lottery, a random numbering mechanism is employed to select a sample from the population.

Data Collection

In this study, it is concentrated primarily on using the most widely utilized data collection method, the questionnaire methodology. In here, it is used various forms of surveys such as “internet mediated, intranet mediated, postal and delivery.” And also, it was utilized a self-administrated questionnaire.

Data Analysis Method

The numerical data must be analyzed as part of the quantitative study. As a result, the statistical software package SPSS is employed. The analysis employs a variety of data analysis techniques. Multiple regression analysis, correlation analysis, and ANOVA tables are used as data analysis procedures for demographic data, while multiple regression analysis, correlation analysis, and ANOVA tables are used as assessment techniques.

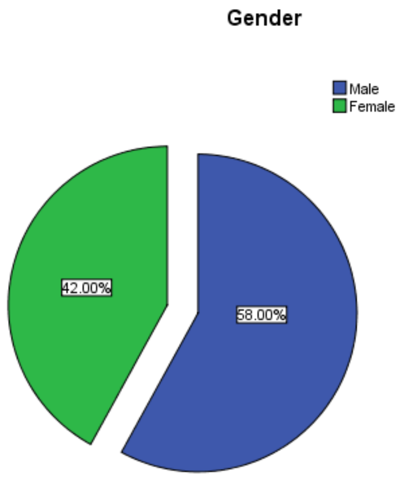
Results

The simple random sampling method is used to distribute the questionnaire among the selected sample. Thus, 55 questionnaires were distributed among the employees and it is collected 54 questionnaires but the 4 questionnaire were not in acceptable level because of missing data.

Distributed questionnaire	Usable questionnaires	Response Rate
55	50	90.9

Demographical Statistics

The study sample comprised with 50 employees while 29 male employees and 21 female employees. Further, the study included the 58 percent male employees and 42 percent female.



Marital Status of the ABC Insurance Company

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Single	31	62.0	62.0	62.0
	Married	16	32.0	32.0	94.0
	Divorced	3	6.0	6.0	100.0
	Total	50	100.0	100.0	

As per the above table, the results revealed that 62 percent employees are single, 32 percent employees are married and 6 percent indicated as the divorced employees. Thus, the results show that most of the single employees are working in the industry rather than married employees.

Education level of the employees in ABC insurance organization

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Ordinary Level	22	44.0	44.0	44.0
	Advanced Level	21	42.0	42.0	86.0
	Diploma Level	5	10.0	10.0	96.0
	Degree Level	2	4.0	4.0	100.0
	Total	50	100.0	100.0	

The education background of the employees, the majority (44 percent) stated that they are qualified up to ordinary level. Moreover, 42 percent have advanced level qualification, 10 percent have diploma level education, and 4 percent indicated that they have degree level qualification. Hence, most of the employees are come up with advanced level or below qualification.

The following table indicated that how the experience, married status, and age is differed from male employee to female employees.

Demographic Variable		Male	Female	Total
Age	Below 20 years	15	8	23
	21-25	5	12	17
	26-30	3	1	4
	31-35	2	0	2
	36-40	4	0	4
	Total	29	21	50

Civil Status	Single	17	14	31
	Married	11	5	16
	Divorced	1	2	3
	Total	29	21	50
Work Experience	<1 years	14	11	25
	1-3 years	5	9	14
	4-6 years	6	1	7
	7-9 years	2	0	2
	>9 years	2	0	2
	Total	29	21	50

Reliability Analysis

Variable	**Crobrach's Alpha**
Task performance	.718
Context performance	.747
Counterproductive Behavior	.834
Job retention	.777

The result demonstrated that all the values are more than 0.7; it means they are in acceptable level and has good internal consistency among questions. The highest level of internal consistency is demonstrated by the counterproductive behavior as the .834 cronbranch's alpha value. Moreover, the reliability values are changed from 0.747 to 0.834.

Correlation Analysis

The result of the correlation analysis range from -1 to +1 and it is demonstrated the correlation between the two variables.

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	.921	.170		5.413	.000
	Task	.392	.149	.318	2.628	.012
	Context Performance	-.228	.113	-.223	-2.026	.049
	Counterproductive	-.714	.111	-.851	-6.438	.000

a. Dependent Variable: Job Retention

As per the above table indicated the coefficient value related to particular study and it shows that task performance (B=.392, p=0.012, p<0.05) context performance (B=-.228, p=0.049, p<0.05) and counterproductive behavior (B=-.714, p=0.000, p<0.05) are influenced on the job retention of the employees in the ABC insurance organization at Colombo branch.

Discussions

The result discovered that task performance and job retention has strong positive correlation (r=.903, N=50) and regression analysis demonstrated that task performance is positively associated with the job retention (B=0.392, P=0.012, P<0.05). Hence, the second hypothesis of there is association between task performance and job retention of insurance agents of ABC Company in Colombo branch is accepted. The result discovered that contextual performance and job retention has strong positive correlation (r=.823, N=50) and regression analysis demonstrated that contextual performance is associated with the job retention (B=-0.228, P=0.049, P<0.05). Hence, the third hypothesis of there is association between contextual performance and job retention of insurance agents of ABC Company in Colombo branch is accepted. The counterproductive behavior and job retention has strong negative correlation (r=-.942, N=50) and regression analysis demonstrated that Counterproductive behavior is negatively associated with the job retention (B=-0.714, P=0.000, P<0.05). Hence, the hypothesis of there is association between counter productive work behavior and job retention of insurance agents of ABC Company in Colombo branch accepted.

Moreover, the results of the correlational and multiple regressions analysis can be concluded as follows respectively for the research hypothesis and objectives. The study identified that job performance and retention has relationship through finding relationship between the task performance, context performance and counterproductive performance. Thus, it is accepted three hypothesis of the study. Moreover, to answer the second research question it is found that counterproductive behavior is the most influential job performance factor towards the job retention. Hence, it can be concluded that if the organizations' employees are performed well in their designation, it will impact to increase their retention towards the organization.

It can be concluded that if the organizations' employees are performed well in their designation, it will impact to increase their retention towards the organization. Moreover, if insurance agents can plan and organizing their work properly, consider about their tasks, and doing work on right time will impact to enhance employee performance and it impact to retain employees with the organization. Further, descriptive analysis highlighted that most of the employees in insurance fields are fresher and there are limited experienced employees. Moreover, male employees are employed with the insurance organization rather than female. Further, there are limited married female employees within the insurance organization when compare to the male employees.

The following recommendations are made to achieve the third objective as 'RO3: To identify policies of the ABC insurance organization should use to keep its employees and attract new employees in the future' of the study;

1. Enhance employees planning and organizing skills through workshop and the training program
2. Consider about giving career development opportunities for the employees.

3. Offering extra payment or introduce salary increment technique to persons who are completed their tasks on time.

References

Abbas, Q. and Yaqoob, S. (2009) 'Effect of Leadership Development on Employee Performance in Pakistan', *Pakistan*.

Alshery, W. B. R. and Ahmad, F. Bin (2016) 'The impact of job satisfaction, training and leadership on performance of employees while taking role ambiguity as a moderating variable: Empirical study on public universities of Ksa', *International Business Management*.

Borman, W. C., & Motowidlo, S. J. (1993) *Expanding the criterion domain to include elements of contextual performance. In Schmitt, N. & Borman, W. C. (Eds.), Personnel selection in organisations,*.

Chew, J. and Chan, C. C. A. (2008) 'Human resource practices, organizational commitment and intention to stay', *International Journal of Manpower*. doi: 10.1108/01437720810904194.

Deckop, J. R. *et al.* (2006) 'The effect of human resource management practices on the job retention of former welfare clients', *Human Resource Management*. doi: 10.1002/hrm.20131.

Elnaga, A. and Imran, A. (2013) 'The effect of training on employee performance', *International Journal of Business and Management*.

Huang, I. C., Lin, H. C. and Chuang, C. H. (2006) 'Constructing factors related to worker retention', *International Journal of Manpower*. doi: 10.1108/01437720610683976.

Idowu, S. A. (2020) 'Role of Flexible Working Hours' Arrangement on Employee Job Performance and Retention in Manufacturing Industries in Agbara, Nigeria.', *Economic Insights - Trends & Challenges*

Viswesvaran, C. and Ones, D. S. (2000) 'Perspectives on Models of Job Performance', *International Journal of Selection and Assessment*. doi: 10.1111/1468-2389.00151.

Williams, C. R. and Livingstone, L. P. (1994) 'Another Look at The Relationship Between Performance and Voluntary Turnover', *Academy of Management Journal*. doi: 10.5465/256830.

INVESTIGATING THE FINANCIAL DISTRESS AND GOING CONCERN ABILITY OF ABC COMPANY

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Abstract

Corporate bankruptcies and financial distress are among the widely discussed topics nowadays in the corporate world. While bankruptcy puts the organisation to an end, financial distress indicates a risk of bankruptcy. Identifying financial distress is crucial because the firms can take corrective actions to overcome future defaults. Financial distress prediction helps the firms to quantify their risk of being bankrupted. The famous Altman's Z score model and the other models developed subsequently are helpful in this regard. ABC Company, a quoted company in Colombo Stock Exchange, shows some symptoms of financial distress and will be addressed in this research study. After examining the possible causes of the company's poor financial health, suggestions would be made to make the firm a financially healthy firm.

Key Words: Altman's Z Score Model, Financial Distress, Corporate Bankruptcy, Colombo Stock Exchange, Correlation, Regression

Introduction

Financial Distress says that the business has no money to pay or cover its liabilities and commitments as long as the company does not recognized. The best way to overcome this situation is to analysis the financial data, evaluate trends and set financial standards. In the modern business multiple analytical tools are there to predict the future risk and the bankruptcy. In Sri Lanka, evidence of financially distressed companies was found in previous researches indicate that around 30% - 35 % of the Sri Lankan listed firms are financially distressed. Out of these, a black tea manufacturer "ABC company" which is the subject of this research study indicates various characteristics of a financially distressed. As tea is a sector, which affect the Sri Lankan economy the most, it is really important to understand the possibility of financial distress while understanding what exact factors have led to the current situation.

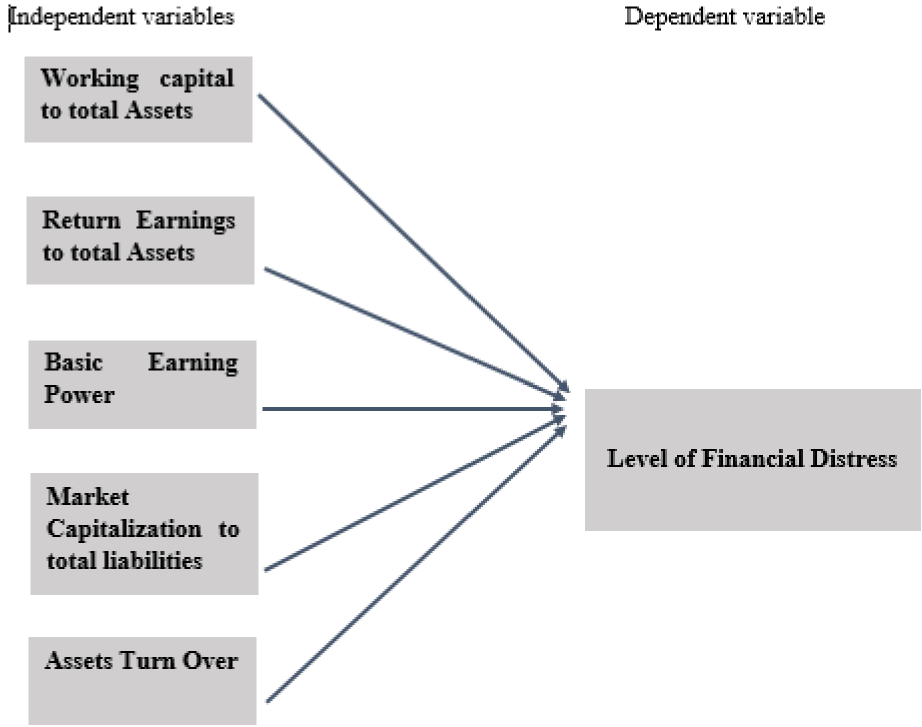
According to the above explanation, the main objective of this research is to discussed the potential and the possibilities of the bankruptcy of ABC and determine the ratios come in Altman Z score effects the financial distress.

Research Methodology

Data type and source

The research is based on the secondary quantitative data gathered from the annual reports (from FY2011 to FY2020) published on the Website of Colombo Stock Exchange by ABC manufacturing Company and the journal articles.

Conceptual framework



Research Hypothesis

H_0: There is no relationship between Return on Working capital to total Assets andthe financial distress

H_1: There is a relationship between Working capital to total Assets and the financial distress

H_0: There is no relationship between Return Earnings to total Assets and the financial distress

H_1: There is a relationship between Return Earnings to total Assetsand the financial distress

H_0: There is no relationship between Basic Earning Power and the financial distress

H_1: There is a relationship between Basic Earning Power and the financial distress

H_0: There is no relationship between Market Capitalization to total liabilities and the financial distress

H_1: There is a relationship between Market Capitalization to total liabilities and the financial distress

H_0: There is no relationship between Assets Turn Over and the financial distress

H_1: There is a relationship between Assets Turn Over and the financial distress

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Data Analysis technique

Altman's Z score model has been used to evaluate the organisation's bankruptcy and financial distress level while

Data Analysis

$Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 1X_5$

X_1 = Working Capital / Total Assets

X_2 = Retained Earnings / Total Assets

X_3 = Earnings Before Interest & Tax (EBIT) / Total Assets

X_4 = Market Capitalisation / Total Liabilities

X_5 = Sales / Total Assets

Table 4: Altman's Z score (2020-2016)

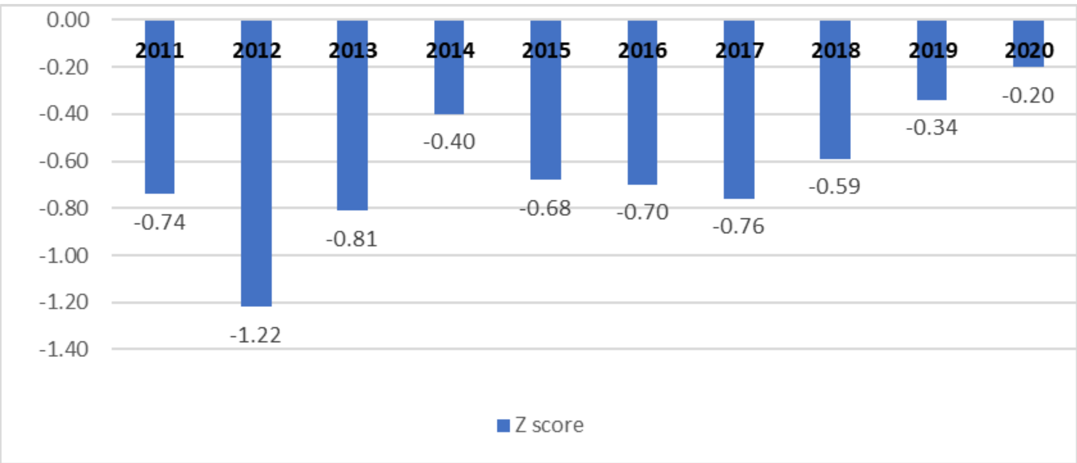
		2020	2019	2018	2017	2016
X1	Working capital	- 544,051	- 244,154	-178,948	- 941,507	-1,176,890
	Total assets	7,123,308	6,047,308	5,761,432	5,257,766	5,249,658
		- 0.08	**- 0.04**	**- 0.03**	**- 0.18**	**- 0.22**
X2	Retained earnings	- 5,077,361	- 4,693,769	- 3,740,607	- 2,900,407	- 2,817,538
	Total assets	7,123,308	6,047,308	5,761,432	5,257,766	7,123,308
		- 0.71	**- 0.78**	**- 0.65**	**- 0.55**	**- 0.40**
X3	EBIT	- 132,077	- 781,066	- 425,166	108,658	- 286,701
	Total assets	7,123,308	6,047,308	5,761,432	5,257,766	7,123,308
		- 0.02	**- 0.13**	**- 0.07**	**0.02**	**- 0.04**
X4	Market capitalization	110,354	75,041	69,523	82,736	72,281
	Total liabilities	5,682,028	5,099,398	3,957,361	2,659,238	2,621,738
		0.02	**0.01**	**0.02**	**0.03**	**0.03**
X5	Sales	2,832,067	2,006,977	2,144,945	2,605,104	1,842,069
	Total assets	7,123,308	6,047,308	5,761,432	5,257,766	7,123,318
		0.40	**0.33**	**0.37**	**0.50**	**0.26**
	Altman's Z-score	**- 0.74**	**- 1.22**	**- 0.81**	**- 0.40**	**- 0.68**

Table 5: Altman's Z score (2015-2011)

		2015	2014	2013	2012	2011
X1	Working capital	- 828,490	-1,790,467	-1,409,398	-1,006,784	- 810,790
	Total assets	5,093,811	4,866,222	4,343,950	4,071,358	3,782,277
		- 0.16	**- 0.37**	**- 0.32**	**- 0.25**	**- 0.21**
X2	Retained earnings	- 2,562,132	- 2,100,154	- 1,616,940	- 1,234,231	- 1,018,964
	Total assets	5,093,811	4,866,222	4,343,950	4,071,358	3,782,277
		- 0.50	**- 0.43**	**- 0.37**	**- 0.30**	**- 0.27**
X3	EBIT	- 281,872	- 270,042	- 216,009	- 63,130	-10,957
	Total assets	5,093,811	4,866,222	4,343,950	4,071,358	3,782,277
		- 0.06	**- 0.06**	**- 0.05**	**- 0.02**	**- 0.00**
X4	Market capitalization	62,782	63,920	64,362	60,982	67,818
	Total liabilities	2,430,239	3,137,346	2,626,908	2,125,927	1,812,149
		0.03	**0.02**	**0.02**	**0.03**	**0.04**
X5	Sales	1,870,384	2,207,885	2,056,721	1,693,075	1,580,214
	Total assets	5,093,811	4,866,222	4,343,950	4,071,358	3,782,277
		0.37	**0.45**	**0.47**	**0.42**	**0.42**
	Altman's Z-score	**- 0.70**	**- 0.76**	**- 0.59**	**- 0.34**	**- 0.20**

The value of Z score determines the current situation of the company considering the risk of bankruptcy, and it can be categorised as follows:
Z < - 0.05 = Risk and probability of bankruptcy risk is between 65% to 90%
0.04 < Z < 0.10 = Alert and probability of bankruptcy risk is between 30% to 65%
0.10 < Z < 0.16 = Good and probability of bankruptcy risk is between 10% to 30%
Z > 0.16 = Very good, and probability of bankruptcy risk is lower than 10

Figure 3: Findings of Altman Z score



When reviewing the above computations on Altman's Z score in ABC Company, it has a negative Z score, and most of the negative Z scores are lower to -0.05 throughout the last 10 years period. It implies that it is at a high risk of bankruptcy with more than 90% probability.

Descriptive analysis

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Working Capital to total assets	10	- 0.37	- 0.03	- 0.19	0.11
Return earnings to total assets	10	- 0.78	- 0.27	- 0.50	0.17
Basic Earning power	10	- 0.13	0.02	- 0.04	0.04
Market capitalization to total liabilities	10	0.01	0.04	0.02	0.01
Assets turn over	10	0.26	0.50	0.40	0.07
Financial Distress	10	- 1.22	- 0.20	- 0.64	0.29
Valid N (list wise)	10				

Correlations

		Working Capital to total assets	Return earnings to total assets	Basic Earning power	Market capitalization to total liabilities	Assets turn over	Financial Distress
Working Capital to total assets	Pearson Correlation	1	-.789**	-.332	-.423	-.426	-.464
	Sig. (2-tailed)		.007	.348	.223	.219	.176
	N	10	10	10	10	10	10
Return earnings to total assets	Pearson Correlation	-.789**	1	.508	.776**	.221	.782**
	Sig. (2-tailed)	.007		.134	.008	.540	.008
	N	10	10	10	10	10	10
Basic Earning power	Pearson Correlation	-.332	.508	1	.784**	.482	.888**
	Sig. (2-tailed)	.348	.134		.007	.158	.001
	N	10	10	10	10	10	10
Market capitalization to total liabilities	Pearson Correlation	-.423	.776**	.784**	1	.253	.914**
	Sig. (2-tailed)	.223	.008	.007		.480	.000
	N	10	10	10	10	10	10
Assets turn over	Pearson Correlation	-.426	.221	.482	.253	1	.468
	Sig. (2-tailed)	.219	.540	.158	.480		.173
	N	10	10	10	10	10	10
Financial Distress	Pearson Correlation	-.464	.782**	.888**	.914**	.468	1
	Sig. (2-tailed)	.176	.008	.001	.000	.173	
	N	10	10	10	10	10	10

**. Correlation is significant at the 0.01 level (2-tailed).

Discussion

Based on the descriptive analysis done above for 10 years period 2011 – 2020 Working Capital to total assets (X1) has a min value of -0.37, a max value of -0.03 a mean value of -0.19 also a std. deviation of 0.11. Return earnings to total assets (X2) has a min value of -0.78, a max value of -0.27 a mean value of -0.50 also a std. deviation of 0.17. Basic Earning power (X3) has a min value of -0.13, a max value of 0.02 a mean value of -0.04 also a std. deviation of 0.04. Market capitalization to total liabilities (X4) has a min value of 0.01, a max value of 0.04 a mean value of 0.02 also a std. deviation of 0.01. Assets turn over (X5) has a min value of 0.26, a max value of 0.50 a mean value of 0.40 also a std. deviation of 0.07. Financial Distress has a min value of -1.22, a max value -0.20 a mean value of -0.64 also a std. deviation of 0.29.

Working Capital to total assets (X1)

According to output, correlation between Working Capital to total assets (X1) and Financial Distress is -0.464. It implies that there is a moderate negative relationship between Working Capital to total assets (X1) and Financial Distress. Further, sig value is 0.176 which is greater than 0.05. Therefore, there is not enough evidence to reject H0 at 5% level of significance. It implies that there is no significant relationship Working capital to total assets (X1) and Financial Distress.

Return earnings to total assets (X2)

According to output, correlation between Return earnings to total assets (X2) relationship and Financial Distress is 0.782. It implies that there is a strong positive relationship between Return earnings to total assets (X2) and Financial Distress. Further, sig value is 0.008 which is less than 0.05. Therefore, there’s enough evidence to reject H0 at 5% level of significance. It implies that there is a significant relationship between Return earnings to total assets relationship and Financial Distress.

Basic Earning power (X3)

According to output, correlation between Basic Earning Power (X3) and Financial Distress is 0.888. It implies that there is a strong positive relationship between Basic Earning Power and Financial Distress. Further, sig value is 0.001 which is less than 0.05. Therefore, there is enough evidence to reject H0 at 5% level of significance. It implies that there is a significant relationship between Basic Earning Power and Financial Distress.

Market capitalization to total liabilities (X4)

According to output, correlation between Market Capitalization to total liabilities (X4) and Financial Distress is 0.914. It implies that there is a strong positive relationship between Market capitalization to total liabilities (X4) and job satisfaction. Further, sig value is 0.000 which is less than 0.05. Therefore, there is enough evidence to reject H0 at 5% level of significance. It implies that there is a significant relationship between Market capitalization to total liabilities (X4) and Financial Distress.

Assets turnover (X5)

According to output, correlation between Assets turn over (X5) and Financial Distress is 0.468. It implies that there is a moderate positive relationship between Assets turnover (X5) and Financial Distress. Further, sig value is 0.173 which is greater than 0.05. Therefore, there is not enough evidence to reject H0 at 5% level of significance. It implies that there is no significant relationship between assets turnover and Financial Distress.

Conclusion & Recommendation

5.1. Conclusion

In the ABC company context, the organisation does not have strong working capital management practices to ensure the health of the short term financial management process. However, ABC Company has negative assets turnover, which indicates that The Company does not have a proper mechanism to generate more cash inflows. It shows that ABC Company is not allocating finance for the investment activities, which help to increase the cash inflows. Operating loss position of has been increased significantly from the financial year 2011 to the financial year 2020.

5.2. Recommendations

To enhance the financial strength and reduce financial distress, the company should review the assets to identify the non-performing assets that are not able to generate the cash flows to the business. Further, it is recommended to take appropriate actions to replace those assets with well-performing ones to expand its cash-generating capacity. It is recommended to arrange the syndicated loan to manage the liquidity problems to strengthen the current assets position of ABC Company.

Further, it is recommended to review the cash conversion cycle elements of the company. At the same time, management should reduce the stock turnover period and the customer credit period to reduce the debt turnover period. And also review the operating expense portfolio of the company.

References

cdn.cse.lk. 2021. No page title. [ONLINE] Available at: HYPERLINK "https://cdn.cse.lk/cmt/upload_report_file/721_1370343410.pdf" https://cdn.cse.lk/cmt/upload_report_file/721_1370343410.pdf . [Accessed 06 August 2021]..

Corporate Finance Institute. 2021. Altman's Z-Score Model - Overview, Formula, Interpretation. [ONLINE] Available at: HYPERLINK "https://corporatefinanceinstitute.com/resources/knowledge/credit/altmans-z-score-model/" https://corporatefinanceinstitute.com/resources/knowledge/credit/altmans-z-score-model/ . [Accessed 20 August 2021].

THE EFFECT OF E-MARKETING MIX ON CONSUMER PURCHASE BEHAVIOR IN CARGILLS FOOD CITY

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Abstract
Technological enhancements have created a significant change in the contemporary Business world. Due to the rapid changes of technology E-marketing mix has become modern marketing strategies. Due to the lack of empirical studies, the purpose of this study was to examine the effect of the E-marketing mix on the buying behavior of consumers of Cargill's food city, a retail company in Sri Lanka. Taking Sri Lankan consumers as the population, 384 individuals were selected as the sample of this study and collected quantitative data used to conduct the multiple linear regression analysis. This research was quantitative in nature and also primary data was collected through self-administrated questionnaire. As per the findings of the study, E-marketing mix component has positive effect of E-marketing mix on consumer purchase behavior. Thus, the concept has suggested as a significant aspect in relation to the company potential within the online platform.
Key words: Consumer purchase behavior, E-place, E-price, E-product, E-promotion,

Introduction

The expansion of the internet has created a new market for product and service providers. It has been played an important role for almost two decades. The customers have become more aware on the changes of consumption pattern with the technological changes and the internet has been used as a marketing channel by organizations to introduce consumers to a new business model. A wide range of usage of internet as emerging marketing trends it has given more importance to the internet in modern times and it has become a part of society (Kumar, Francis and Ambily, 2017). E-marketing can be recognized as a modern tool which is using by the marketers to capture the global market place. In the 21st century, it is clear that the way companies do business is improving and the internet is moderating the consequences. The rate at which innovations in the 21st century evolved has increased exponentially due to the speed of technological advances compare to previous periods (Njuguna and Aniki, 2018).

This research examines the consumer purchase behavior with the influence of online platform. For many years, Cargills is one of the largest retailers in Sri Lanka which completed business activities through traditional methods. Due to the effect of Covid-19 pandemic, the organization considered E-marketing concept. Although online marketing has defined as one of the most considerable marketing aspects of the Cargills by its management at the current scenario, it is recognizable that, the consumers have low awareness on the E-marketing of Cargills brand when compared to the competitive brands within the oligopolistic market that they are performing (Senanayake, et al., 2020). Furthermore, related awareness on perceived usefulness of online grocery shopping also at a lower level with Sri Lankan customers (Piumali, 2020). There is a lack of empirical studies which have focused on this recognized phenomena. Thus, researcher identified that it is worth to identify the impact of the concept of E-marketing on Cargills customers' purchase behavior. Therefore, this study is an attempt to explore whether E-marketing mix in Cargill's food city will influence on consumer purchase behavior. This study will provide an understanding about effect of E-marketing strategies on the consumer purchase behavior in Cargill's food city. This is an attempt to a secretion the gaps in the empirical E-marketing literatures. The study is of a detailed and descriptive nature and leads to future studies relevant to this topic. From this study, marketers can understand the Sri Lankan market and the mindset of Sri Lankan customers. Customer buying behavior is changing and so a detailed and varied study covering different aspects of buying and selling was needed The proves that the study will helps to make decisions such as sales promotion, implementation of marketing concepts, rapid introduction of new products, penetration into the Sri Lankan market, pricing targeting, selection and advertising. With all this, this study shows the online marketing of all Sri Lankan consumers (Kaur et.al, 2021) Research findings will provide more insight to the future researchers, university students and educationalists to enhance the knowledge regarding E-marketing concepts.

An attempt was made to achieve the following research objectives

Research Objectives

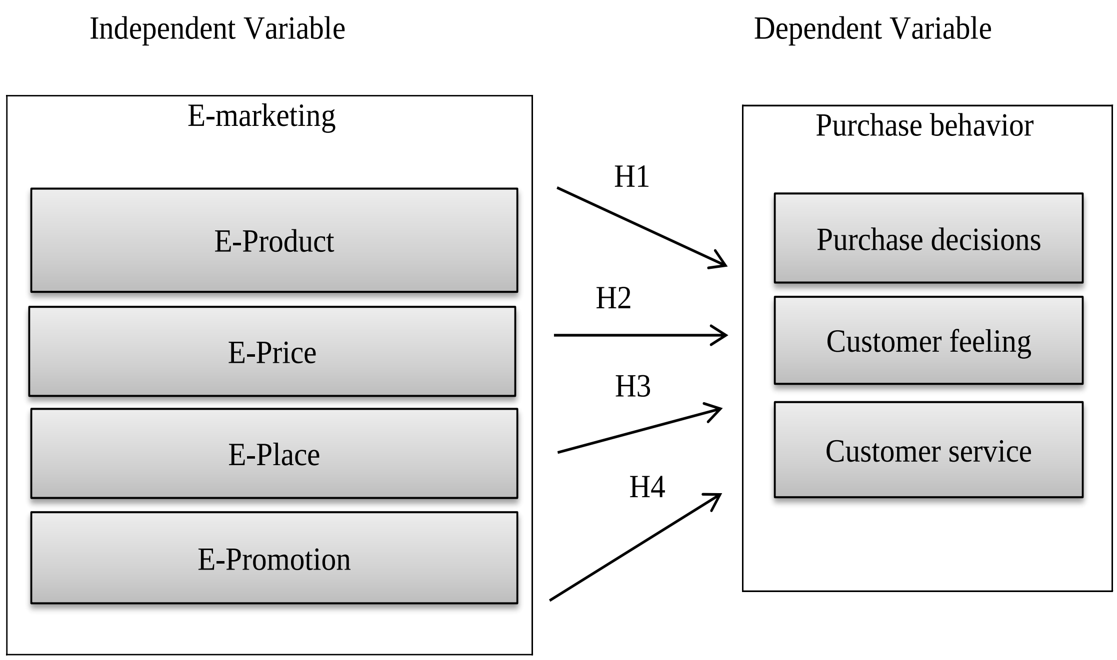
- To investigate the effect of E-marketing mix on consumer purchase behavior in Cargill's food city
- To investigate the effect of E-product on consumer purchase behavior in Cargill's food city
- To investigate the effect of E-price on consumer purchase behavior in Cargill's food city
- To investigate the effect of E-place on consumer purchase behavior in Cargill's food city
- To investigate the effect of E-promotion on consumer purchase behavior in Cargill's food city
- To investigate the most influential E-marketing mix element on consumer purchase behavior in Cargill's food city

Methodology

The purpose of the study is to find a possible solution regarding the online marketing mix and customer purchase behavior related aspects. Thus, the researcher applied the deductive approach and it can be identified as a cross sectional research. Quantitative methods have utilized and as an academic research, it was completed. Primary data collected through a self-administrative questionnaire. To measure the E-marketing mix, four dimensions (Mahendratmo and Ariyanti, 2019; Sam and Chatwin, 2013) and for Consumer behavior three dimensions have used (Sulaiman et.al, 2017). Five point Likert scale questions used to measure the variables (1 = Strongly Disagree, 2 = Disagree, 3 = Moderate, 4 = Agree, 5 = Strongly Agree). The population of the current study consists with consumers who are within the Sri Lanka which was accounted for 21,519,523 consumers (Department of census and statistics, 2021). The demographic profiles of 384 respondents selected as the study sample by using convenience sampling technique. The sample reliable level was calculated to be 95% and the confidence interval was 5.

Conceptual Framework

Figure 4: Conceptual framework



H1: There is a significant effect and positive effect of E-product on consumer purchase behavior of Cargill's food city

H2: There is s significance effect and positive effect of E-price on consumer purchase behavior of Cargill's food city

H3: There is a significant effect and positive effect of E-place on consumer purchase behavior of Cargill's food city

H4: There is a significant effect and positive effect of E-promotion on consumer purchase behavior of Cargill's food city

Results

Multiple Linear Regression Analysis

Table 6: Coefficients

Model	B	Std. Error	P-Value	Collinearity Statistics	
				Tolerance	VIF
Constant	0.602	0.140	0.000		
PD	0.198	0.035	0.000	0.709	1.411
PR	0.065	0.023	0.006	0.805	1.243
PL	0.238	0.038	0.000	0.569	1.757
PO	0.333	0.040	0.000	0.551	1.816

Source: Analyzed statistical output from field survey

$$\boldsymbol{CPB = 0.602 + 0.198PD + 0.065\mathrm{PR} + 0.238\mathrm{PL} + 0.333\mathrm{PO} + \varepsilon}$$

Table 7: Model Summary

Figure	Value
R Square	0.584
Adjusted R Square	0.579
Std. Error of the Estimate	0.39019
Durbin Watson	1.793

Source: Analyzed statistical output from field survey

Table 8: ANOVA Table

Model	Sum of Squares	df	Mean Square	F-value	P-Value
Regression	80.945	4	20.236	132.918	0.000
Residual	57.701	379	0.152		
Total	138.646	383			

Source: Analyzed statistical output from field survey

Discussion

The Consumer Purchase Behavior will be equal to 0.602, when E-marketing mix elements are equal to zero level. When the E-product increase form average one unit while E-price, E-place and E-promotion of E-marketing mix equal to zero, the consumer purchase behavior will increase by 0.198. Further, if it is E-price, E-place and E-promotion of E-marketing mix the average change of the purchase behavior of the customers will equal to 0.065, 0.238 and 0.333 respectively. According to the previous literature, e-product, e-price, e-place and e-promotion are four of the e- marketing mix which can use to enhance the customer decisions, customer feeling and customer service to consumer purchase behavior of the Cargill's food city. Most of the scholars and researchers have tried to identify the effect of the relationship of this marketing mix on the actual purchase behavior of customers (Njuguna and Aniki, 2018) According to the previous scholars, high income consumers have little time to go to market and face crowds to buy products from traditional shops. That is why they prefer to shop online (Chouhan, Khatter and Sharma, 2015). In here this results further shows that consumers prefer online shopping because of its convenience, time savings, money savings and no shopping costs, easy internet activation and 24*7 and 365 home purchases. (Chouhan, Khatter and Sharma, 2015)

Furthermore, the R square value of the model is illustrating that, 58.4% of the purchase behavior of them is collectively representing by the E-marketing mix. According to the table 03, P-value of the model is 0.000. The model is significant at 95% of significant level and the null hypotheses can be rejected (0.000<0.5). According to the researcher shows, Higher F-values supported to reject the null hypothesis and accept the four hypotheses of the study exists a low degree of correlation between the two variables. Out of the elements, E-Promotion has created the salient impact.

Conclusion and Recommendations

The findings of the study indicated that, E-marketing mix elements have created a significant impact on the consumer purchase behavior of the Cargills Food City customers with the salient impact of the E-promotions. Cargill's policy makers need to devise strategies to better adopt E-marketing. Policy makers need to improve their better use of social media to sell their products. Administrators need to set aside adequate budgets to embrace the technology of Cargill's food city. Policy makers need to ensure that staffs are employed.

This study was recommended that Cargill's food city use E-marketing mix for easy awareness. Cargill's food city should recognized E-marketing to design of the products and services offered, to save costs and raise awareness about products through E-marketing to provide an interactive customer feedback platform. Findings suggested that the E-marketing are more influential with purchase behavior. Therefore, organizations should focus more on electronic word of mouth marketing. The loyal customer data base can be used to deliver effective messages to the loyal customers regarding their E-marketing platform. Further, the study was recommended to launch social media related sales promotion campaign to attract customers to social media pages of Cargills. It can be proposed to develop online store through a mobile app or WhatsApp business version. This study focused on the impact of the marketing mix on the purchase behavior of consumers in Sri Lankan Cargill's food city. And also, as a retailer is still growing, a similar study is recommended to determine the effect of the marketing mix on the retail industry.

References

Baker, W.E. and Sinkula, J.M., 2005. Market orientation and the new product paradox. *Journal of Product Innovation Management*, *22*(6), pp.483-502.

Chouhan, B., Khatter, K. and Sharma, H.K., Impact of Demographic Factors on Online Shopping Behavior of Consumers in The Major Cities Of Rajasthan.Department of census and statistics, 2021. *GenderStatistics.* [Online] Available at: http://www.statistics.gov.lk/GenderStatistics/StaticalInformation/Population

Jenyo Gabriel, K. and Soyoye Kolapo, M., 2015. Online marketing and consumer purchase behaviour: a study of Nigerian firms. *British Journal of Marketing Studies*, *3*(7), pp.1-14.

Kumar, N., Francis, D. and Ambily, A.S., 2017. Consumer Behaviour towards E-Marketing. *Jour of Adv. Research in Dynamical and Control Systems, 9 (5)*, pp.11-18.

Leedy, P.D. and Ormrod, J.E., 2005. *Practical research* (Vol. 108). Saddle River, NJ: Pearson Custom.

Mahendratmo, B.P. and Ariyanti, M., 2019. Analysis of E-Marketing Mix to Consumer Purchase Decisions Traveloka. *Asian Journal of Management Sciences & Education*, *8*(1), pp.72-82.

Njuguna, J.M., 2018. *Influence Of E-Marketing on Consumer Buyer Behavior in Supermarkets in Nairobi County* (Doctoral dissertation, University of Nairobi).

Piumali, P., 2020. *Customer adoption of online grocery shopping in colombo district, Sri lanka.*. s.l., s.n.

Meng, S.K. and Chatwin, C., 2012. Measuring e-marketing mix elements for online business. *International Journal of E-Entrepreneurship and Innovation (IJEEI)*, *3*(3), pp.13-26.

Senanayake, J. et al., 2020. *Consumer Preference Towards Own Brands with Special Reference to Own Brands of Cargills & Keells Supermarkets.* s.l., General Sir John Kotelawala Defence University.

Sulaiman, Y., Bakar, N.N.A.A., Ismail, M.Y.S., Mat, N.K.N. and Musa, R., 2017. The Function of Marketing Mix and Consumer Preferences on Healthy Food Consumption among UUM Students. *International Journal of Economic Research*, *14*(19), pp.103-122.

ENGINEERING AND CONSTRUCTION

ANALYSING THE IMPACT OF ASSOCIATED COST INCURRED IN COMPETITIVE TENDERING ON SRI LANKAN CONSTRUCTION INDUSTRY'S ECONOMY

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Abstract
Lost bids within the increased number of projects are adding significant cost to the construction industry, thus prompting this research to comprehend the cost of tendering within the Sri Lankan construction industry. Investigation was carried out to gather cost of tendering data to analyze the impact on the Sri Lankan construction industry's economy. In-depth research was carried out to study the process and associated cost of competitive tendering followed by semi-structured interviews to identify the impact of the cost and attain reliable suggestions to mitigate identified impacts. Subsequently, the nature of the accumulated cost of lost bids was identified from the results and the mitigation measure and were validated through semi-structured professional interviews. The main finding of this research is the stakeholders' lack of awareness on the cost of bidding and the wasted money caused by lost bids burdening the national economy. Additionally, this research provides recommends to clients, contractors and the government.

Keywords
Accumulated Cost of Lost Bids, Construction Industry, Contractor Selection, Cost of Tendering

Introduction

The tendering process covers a huge cost due to multiple parties' involvement and long contractor selection progression in construction procedures. Selecting a suitable bidder as a contractor is vital and a complex part of the pre-contract stage (Holt, et al., 2007). To select the contractor, the client should identify the tendering method to be adopted for a project based on different parameters. Therefore, selecting the appropriate method of tendering is crucial to meet the clients' requirement (Palaneeswaran and Kumaraswamy, 2000). Competition for work means that only one contractor among many tendered bids will be awarded with the contract. The remaining will have expended resources with no return. Therefore, it could be argued that a competitive tendering system increases the total cost of tendering to the construction industry (Oo, et al., 2010).

In Sri Lanka, the most common type of selecting a bidder for a project is by following an open tendering method. Since the contractors are expecting to obtain the project with favorable contractual terms the expected profit margin is achieved (Enshassi, et al., 2008). According to Marsh (2000) bidders are planning to provide attractive price while minimizing the project risk and liabilities as a dual objective of the bid.

Semaan and Salem (2017) argues that bidders need to spend money on every project, which is non-refundable, which could be reduced when the contractor selection process is well-structured. Therefore, the usual practice of all the losing builders to recover the cost of tendering for those projects is eventually through those tenders that are successful (Adedokun, et al., 2013). More precisely, bidders recover the lost cost of the bid by including in the overheads as a practice, which will reduce their competence of competition in the market (Enshassi, et al., 2008).

This research aims to develop strategies to manage the associated cost of open tendering systems and its impact on the Sri Lankan Construction Industry's Economy. Accordingly, the following objectives shall be achieved to fulfil the aim of the research; to review the Open tendering process in the construction industry, to identify the associated costs in the competitive tendering system and its impact on the economy of the Sri Lankan Construction Industry, to analyses the associated cost of the opening tendering system and its impact to the economy of the Sri Lankan construction industry, to develop strategies to manage associated cost in competitive tendering. This research has limited to review and analyzing the process of open tendering in the Sri Lankan construction industry. The research will be analyzing the degree of impact to the economy of the construction industry due to the lost bids caused by competitive tendering.

Methodology

Qualitative research approach follows an in-depth analysis providing distinct advantages while, quantitative research approach assesses the evidences with numerical findings (Creswell, 2013). Thomas and Brubaker (2008) elaborated that five distinct types of procedures are available for data collection and accordingly semi-structured interviews were elected for data collection. The main objective of using semi-structured interviews in this research was to validate and achieve the research objectives successfully. However, the literature survey led to the identification of facts needed to achieve the objectives, there were no enough details related to the Sri Lankan context.

Experienced quantity surveyors were identified and experts' interviews were conducted as the area of accumulated cost of lost tenders weren't covered much in the Sri Lankan context; examining the importance of the cost of tender concerning the level of importance on a contracting firm in Sri Lanka. Convenient sampling method was used to obtain the primary data from industry experts. A sample of 13 experts participated for the interview. According to the compilation and the collection of the data manual content analysis method is utilized for this research to analyses the collected data from secondary and primary sources. For achieving the objectives of the research, a qualitative approach was referred.

Results and discussion

The following table provides an introduction to the profile of responds who participated for the interviews.

Table 1: Profile of respondent's in Semi-Structured interviews

Respondents code	Designation	Years of Experience	Organisation Category	Organisation Type
R01	Chief Quantity Surveyor	34	Contractor	Private
R02	Charted Quantity Surveyor	14	Contractor	Public
R03	Charted Quantity Surveyor	13	Contractor	Private
R04	Procurement Specialist	31	Consultancy	Private
R05	Procurement Engineer	17	Contractor	Private
R06	Senior Quantity Surveyor	15	Client	Private
R07	Senior Quantity Surveyor	15	Consultancy	Government
R08	Project Quantity Surveyor	14	Client	Private
R09	Project Quantity Surveyor	14	Contractor	Private
R10	Project Coordinator	16	Contractor	Private
R11	Senior Quantity Surveyor	12	Consultancy	Private
R12	Senior Quantity Surveyor	12	Consultancy	Government
R13	Finance Manager	14	Consultancy	Private

Through the results of this research six areas were derived progressively. The results will be further elaborated and organised in the figure below:

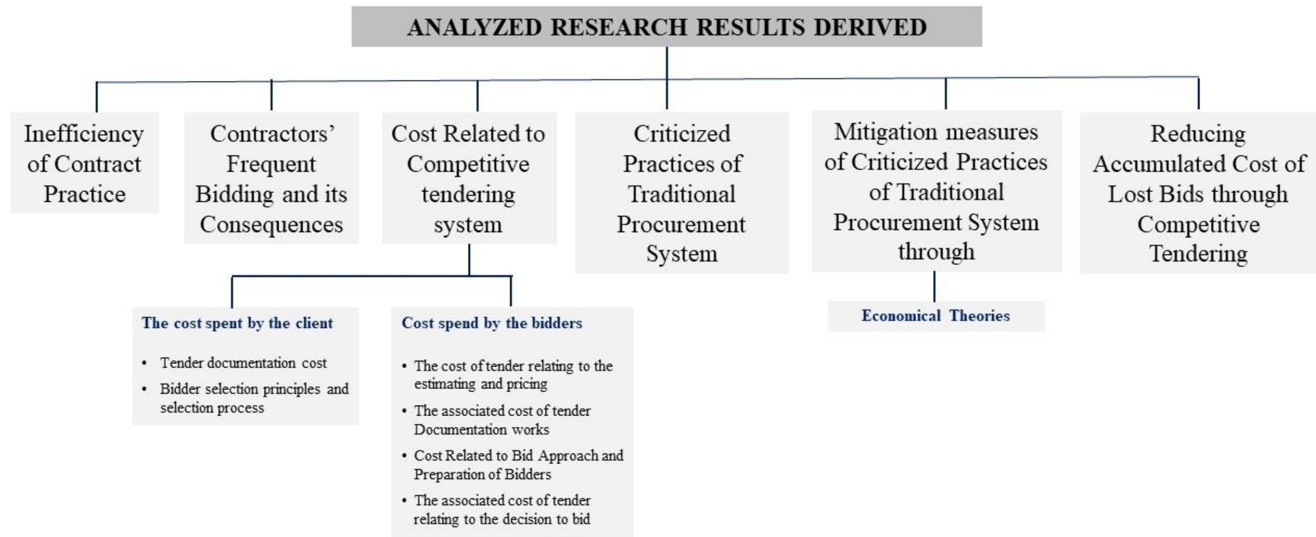

Figure 5 - Research results

INEFFICIENCY OF CONTRACT PRACTICE

Most of the respondents except R01 and R03 stated that they don't have any framework to select the tendering method indicating lack of measures taken on the decision of selecting a project to bid. According to R01 R03, they have a specific checklist for tender selection. Furthermore, R03 said, *"After getting the tender notice we conduct a special meeting with the participating of our management and there we consider what are the advantages and disadvantages of participating that tender"*.

According to the above analysis, the cost of tender prices might increase accumulating tendering cost which would impact the national economy. Moreover, these practices lead to affect the overall GDP and GNP (Valence, 2011).

CONTRACTORS' FREQUENT BIDDING AND ITS CONSEQUENCES

Most of the respondents agreed that approaching different projects within a frequent time could only help in winning projects. Seven respondents stated some risks were observed when tendering for many projects listing it as follows: Increase stress of employees can spoil the office environment, mistakes in the submitted bid documents can be increased, future upcoming feasible projects cannot be taken due to the current workload, projects can be dropped after the take over the work due to improper decisions.

COST RELATED TO COMPETITIVE TENDERING SYSTEM

THE COST SPENT BY THE CLIENT

In considering the client side, according to respondent R06 and R08, identified some cost items cannot be exactly quantified due to the varied range requiring decision-making.

Tender Documentation – All the respondents identified tender documentation as a common cost. Responsively, RO4 quotes:

"*…tender documentation should be done with expertise in the industry, particularly in the conditions and specification preparation. Since those might include a large amount of money when it comes to claims in the construction and post-construction stage, they might be prepared well, and conditions should be fit to purpose*".

Bidder selection principles and process – two respondents further proved that if the selection process is done by two enveloped method principles then the cost and time spent by the bidders would double. Accordingly, respondent R04 said, "*Unfortunately, in Sri Lanka, the clients had the poor awareness of the cost of tender or they haven't worry about the cost spend by the bidders which are highly connected with the economy of the country".*

COST SPENT BY THE BIDDERS

The respondents signified their reviews as below;

Table 2: Severity ranking of the cost of bidders

	Severity															
	R01	**R02**	**R03**	**R04**	**R05**	**R06**	**R07**	**R08**	**R09**	**R10**	**R11**	**R12**	**R13**	**Σ(v)**	**Σ(v)/i**	**Rank**
Provide the significant value based on the monetary allocation for the below-mentioned cost items																
(Cost, Time, Number of employees involved in)																
Bidding Strategy (Decision make to collect the Tender)	10	10	10	15	15			15	15	15	15			120	10	**2**
Intelligence and Relationship Building:	5	10	10	10	5			5	10	10	15			80	6.7	**4**
Bid Management	10	15	15	10	10			10	15	10	15			110	9.2	**3**
Estimation and Pricing	15	15	15	15	15			15	15	10	15			130	10.8	**1**
Proposal Writing: (Documentation works)	15	15	10	15	15	**N/A**	**N/A**	15	10	15	10	**N/A**	**N/A**	120	10	**2**
Interview and Negotiation: (Suppliers, Sub Contractors)	10	5	10	10	10			10	10	5	5			75	6.3	**5**
Review and Learning: (After Bid submission)	10	15	5	5	10			10	5	10	5			75	6.3	**5**

1. High value = 15
2. Moderately value = 10
3. Low value = 5

v= value of severity
i= Nr. Of Respondents

The cost of tender relating to the estimating and pricing – All the respondents agreed on having a cost resultant of the estimation and pricing. According to the expert respondents the cost of tendering and estimating deviate from 0.1% -2.5% of the tender sum according to the size of the project.

The associated cost of tender documentation works – Six respondents gave their priority to this cost item and further said that this is the most significant cost item due to several reasons.
Cost related to bid approach and preparation of bidders –The respondents of contracting organisation quoted that determining the exact amount of cost for tender is challenging.
The associated cost of tender relating to the decision to bid – The decision to tender is considered as crucial (Wanous , Boussabaine, and Lewis, 2003). Some decision models to take effective decisions to increase the win percentage/success rate of the contracting organisation were available (Wood, 1971).

CRITICIZED PRACTICES OF TRADITIONAL PROCUREMENT SYSTEM

Except for one respondent (R02) other all of the respondents accepted that though they have favour regarding the open tendering system. R02 stated, "We *are more prefer to the selective tendering system due to there is a good chance to go high markup levels*".
As per the expert interviews, the below table summarises the criticized practices ranked based on its severity.

Table 3: Ranking of criticizing practices of the open tendering system

	R01	**R02**	**R03**	**R04**	**R05**	**R06**	**R07**	**R08**	**R09**	**R10**	**R11**	**R12**	**R13**	**∑(v)**	**∑(v)/i**	**Rank**
Select the severity of the below mentioned criticized practices in the open tendering system																
Does not have open and transparent communication	2	1	1	2	1	1	5	3	4	2	5	5		32	2.6	**3**
Excessively lengthy tender list	5	5	4	5	5	4	4	5	5	4	2	4		52	4.3	**1**
Irresponsible lowest bidding culture	4	4	5	4	4	3	3	4	3	5	3	3	**N/A**	45	3.7	**2**
Late and poor quality documentation	3	3	2	1	3	2	2	1	1	3	1	1		23	1.9	**5**
Leading bidders are not considered	1	2	3	3	2	5	1	2	2	1	4	2		28	2.3	**4**

v= value of range scale
i= Nr. Of Respondents

Commonly respondents said that they find too many irresponsible low bids and by selecting such bidders, the investment of other bidders tends to be wasted while the accumulated lost bids cost can be a burden to the national economy.
The most wasteful practices, which is considered by six out of twelve respondents, is an excessively lengthy tender list. Every respondent agrees that the cost of tendering can be reimbursed only through winning bids and earning profits.

MITIGATION MEASURES OF CRITICIZED PRACTICES OF TRADITIONAL PROCUREMENT SYSTEM THROUGH ECONOMICAL THEORIES

The respondent R13 stated "*Sri Lanka is a developing country. So still, they are going through the traditional systems. Accordingly loss of bids wastes directly for the significant impact to Sri Lankan Construction Industry's economy. "*. Furthermore, he explained, if it was possible to apply the Modernization theories to the traditional procurement system it will be a reason for the development of GDP and GNP. Similarly, respondent R04 opinions stated to adopt technological changes to the system suggesting e-tendering that would reduce significant documentation and stationary cost.

REDUCING ACCUMULATED COST OF LOST BIDS THROUGH COMPETITIVE TENDERING

All the respondents of the contracting organisation held that the selection of the contractor shall not depend on the tender sum. Respondent R03 quotes, "*We have lost projects immediately after when clients have seen the tender sum and have also won them immediately after for the same reason*". Moreover, R03 suggested that this price tag purchasing method can be solved by procuring bidders through outcomes and performance.

Findings

While the analysis the data collected regarding the traditional procurement system in the Sri Lankan construction industry criticized practice of competitive tendering are also discussed. On the other hand, mitigation measures of criticized practices are identified from the experts. After that, cost of bidding of competitive tendering is identified through bidders as well from the clients. Finally, analyse the mitigation measures in order to reduce the accumulated cost of lost bids from the collected data from the experts.

Conclusion and Recommendations

The wrongful approaches of making decisions to select the tenders were identified as might cause a higher cost of tendering through the interviews. Due to this Inefficiency of Contract practice most of the bidders were motivated to adjust frequent bidding culture to increase the winning of the bids with addressing the high risk of associated cost bids.

The lowest bidding culture and the excessively long tender list were found to be the most critical issues in the traditional procurement method while professionals' opinion complements these issues as a threat to the sustainability of the procurement system in terms of tendering cost.
When a bidder spends considerable money and the cost for the decision to bid is high, their winning ratio is intended to be increased. However, the experts' opinion in Sri Lanka is that even-though Sri Lankan contractors knew that the decision is vital for winning, they do not put an effort to take that decision strategically.

The research analysis further concluded that intelligence and relationship building were the most expensive cost incurred by contracting organizations. Additionally, conclusion defines that the practitioners of the tendering system should consider the social cost; unfortunately, Sri Lankan contractors and consultants don't have the awareness of this accumulated cost of lost bids.

Overall, the literature found there is a significant impact on the accumulated cost of the competitive tendering system than the other procurement systems and it will decrease the value of the GDP and GNP of the national economy.

RECOMMENDATIONS TO CONTRACTOR

Sri Lankan contracting organizations should increase the effort on deciding to tender collaborating with the tender division who are more knowledgeable on the area. Even-though, contractors are highly capable of preparing quality bids they would fail to obtain the job by poor selection/less effort in the decision to bid.

RECOMMENDATIONS TO CLIENT

Clients are required to consider the accumulated cost of the construction, which was mentioned as social cost before. The cost of construction has a direct connection with the contractor selection method.

RECOMMENDATIONS TO GOVERNMENT

The Sri Lankan government should be aware of the lost bids and its cost. In terms of reducing the cost of tendering, the government should encourage other procurement methods as well.
By reducing the undesirable accumulated cost of lost bids, the contribution by the construction industry to the national economy would increase resulting in a high GDP and GNV. Hence, the stakeholders of the construction industry shall consider the recommendations made.

References

Adedokun, O. A., Ibironke, O. T. and Babatunde, S. O., 2013. Assessment of competitive tendering methods of procuring educational building projects in Nigeria. Journal of Facilities Management, 11(1), pp. 81 -94.

Creswell, J.W., 2013. Steps in conducting a scholarly mixed methods study.

Enshassi, A., Aziz, A. R. and Karriri, . A. . E., 2008. Investigating the overhead costs in construction projects in Palestine. Journal of Financial Management of Property and Construction, 13(1), pp. 35-47.

Holt, G., Olomolaiye, P. and Harris, F., 2007. A conceptual alternative to current tendering. Building Research and Information, 8 May. pp. 167-171.

Marsh, P. D., 2000. Contracting for Engineering and Construction Projects. 2nd ed. Farnham: Gower Publishing.

Oo, B. L., Drew, D. S. and Runeson, G., 2010. Competitor analysis in construction bidding. Construction Management and Economics, 28(12), pp. 1321-1329.

Palaneeswaran, E. and Kumaraswamy, M. M., 2000. Contractor selection for design/build projects. ASCE Journal of Construction, Engineering and Management, Volume 5, pp. 331-339.

Semaan, N. and Salem, M., 2017. A deterministic contractor selection decision support system for competitive bidding. Engineering, Construction and Architectural Management, 24(1), pp. 61-77.

Thomas, R.M. and Brubaker, D.L., 2007. *Theses and dissertations: A guide to planning, research, and writing*. Corwin Press.

Valence, G. D. ed., 2011. Modern Construction Economics: Theory and Application. London and New York: Spon Press.

Wanous , M., Boussabaine, H. and Lewis, J., 2003. A neural network bid/no bid model: the case for contractors in Syria. construction management and Economics, Volume 21, pp. 737-744.

Wood, D. (1971). A decision system for competitive bidding. European Journal of Marketing, 5.

WASTE VEHICLE TIRE BEAD STEEL WIRES AS FIBER REINFORCEMENT MATERIAL IN CONCRETE

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Abstract
This research paper presents a study on use of waste vehicle tire bead steel wires as fiber reinforcement material in concrete, which provides a solution for the material of fiber reinforced concrete. This is mainly focuses on the properties of substituted materials. These substitute materials are disposed as the vehicles waste tires, which can be found from vehicle repairing centers. Research was mainly focused on varying aspect ratio (Aspect Ratio = Length / Diameter) of vehicle waste steel tire beads to get the optimum aspect ratio. The experimental process was mainly focused on compressive strength test and slump test to analyze the variation in strength of vehicle waste steel tire beads fiber reinforcement concrete, at varying aspect ratio and to compare with the normal concrete cube. Each sample has been tested after 7 days and 28 days. The findings revealed that, Aspect Ratio 40 as the Optimum Aspect Ratio for Grade 25 concrete (C25) using vehicle waste steel tire beads as fiber. Workability was reduced when aspect ratio was increased.
Key Words : Vehicle Waste Steel Tire Beads, Aspect Ratio, Fiber Reinforced Concrete, Compressive Strength, Workability

Introduction

The amount of vehicle waste is a huge environmental issue. Therefore using vehicle waste steel beads as fiber reinforcement is a response for that and adding to waste the various constructions works. Until 2017 vehicle populace in Sri Lanka is 7,247,122. Brake link, gear link, grip link is changed to the new link in 2-5 years (The Ceylon Chamber of Commerce Motor Vehicle Industry, 2017) Furthermore consistently there is an impressive amount of waste beads in Sri Lanka. When considering the vehicle disposed of waste material as steel fiber support it is a less expensive answer for the financial issue. Furthermore on the other hand it's developing a waste organization structure for the waste steel cables which are harmed and unusable.

Appropriately it needed to test that vehicle waste steel cables materials as fiber reinforcement concrete. Concrete is a weak composite material. If the durability could increment in the solid that can apply to produce the substantial structures with a high proportion weight bearing breaking point a tolerable response for the weak concrete manufacture its strength. Fiber reinforced concretes are of various types and properties with numerous favorable circumstances. Consistent cross sections, woven textures and long wires or poles are not viewed as discrete filaments. Fiber reinforcement is a basic material in the construction industry. It has various widespread investigates along the previous two decades.

Designers are in combined with the steel fiber reinforcement as indicated by it benefits. High strain limit, vitality ingestion level and sturdiness are some of primary gainful parameters of fiber strengthened cement (Johnston S. 1994) Fundamentally FRC is improving the properties of solid components. Those are flexural quality, compressive quality and elasticity. In any situation in a country like Sri Lanka it is extremely uncommon to find steel strands. And furthermore It is an over the top expensive material to utilize. Fiber Reinforcement Concrete has been generally utilized in common foundations. Those are steel fiber concrete, building extension deck and low thickness foundations are a portion of the normal uses of fiber reinforce concrete. (Lee, 2015)

Aim and Objectives

Aim

The main aim of this research is to compare the variation in strength of vehicle waste steel wire bead cable fiber reinforcement concrete and normal concrete.

Objective

- To study the materials properties and usages of waste vehicle tire beads,
- To get the optimum aspect ratio for grade 25 concrete by using waste vehicle tire bead wires as fiber and
- To find the workability of concrete with different ratios.

Methodology

In this experimental process mainly two tests were precede, compressive strength test and slump test. These tests were conducted for prepared waste steel bead cables. Fiber was added to the separate mixture according to the, fiber content 1% by weight of concrete with Aspect Ratio 30, fiber content 1% by weight of concrete with Aspect Ratio 40, fiber content 1% by weight of concrete with Aspect Ratio 50 and fiber content 0% by weight of concrete Plain concrete (Aspect Ratio = Length / Diameter). Fibers were removed from the tires by using the Tire Bead Separator Machine and it manufactured by Qingdao Ouli Machine Co, LTD. Waste steel beads were gathered from vehicle repair center at Kaluthara. Steel tire beads wires diameter (thickness) is 2mm. Fibers were cut with grinders maintaining an average length from 60 mm to 100 mm. Those lengths 60 mm, 80 mm and 100 mm were used for aspect ratio 30, 40 and 50 respectively. The coarse aggregate below 20mm particle size was used and river sand was used as fine aggregates. These were mixed the concrete according to the ASTM Standard.

Figure I : Vehicle Waste Tire Steel Bead Wires

Weight of fiber rate should 0.5 % - 1.5 % because the expansion of fiber amount may decrease the features of the mixture. Compressive quality and the workability of steel fiber concrete by an extension in steel fiber rate up to the ideal worth. The length of fiber extended should be 20mm to 100mm because the length proportion of steel fiber more essential than 100mm isn't recommend it will cause lacking features (Milind V. Mohomod, 2012)

Table I : Mixed proportion

Concrete Grade = C25				
Fiber Content 1% by weight of concrete				
Constituents	Sample 01 Aspect Ratio 30	Sample 02 Aspect Ratio 40	Sample 03 Aspect Ratio 50	sample 04 Plain Concrete
Cement	16.152 kg	16.152 kg	16.152 kg	16.152 kg
Coarse aggregate	32.554 kg	32.554 kg	32.554 kg	32.554 kg
Fine aggregate	16.152 kg	16.152 kg	16.152 kg	16.152 kg
Water	8.61 kg	8.61 kg	8.61 kg	8.61 kg
1% Fiber content	0.648 kg	0.648 kg	0.648 kg	
Fiber Diameter	2 mm	2 mm	2 mm	
Fiber length	60 mm	80 mm	100 mm	
Aspect ratio (L/D)	30	40	50	

Crushed metals, river sand water were mixed together until the mix is uniform. After that fiber was added into the mixture until the mixture is uniform.

Figure II : Fiber Concrete Mixture

To find the optimum aspect ratio Compressive Test was conducted for 7 days and 28 days. Numbers of 12 sample cubes were casted for 7 days and 12 sample cubes were casted for 28 days. Total numbers of cubes are 24 cubes. Make concrete cubs and curing was done according to ASTM C31/31 Standards.

Table II : Number of Cubes for 7 and 28 Days

Cube Size	Aspect Ratio	Number of Cubes
150mm X 150mm	30	3
150mm X 150mm	40	3
150mm X 150mm	50	3
150mm X 150mm	Plain Concrete	3

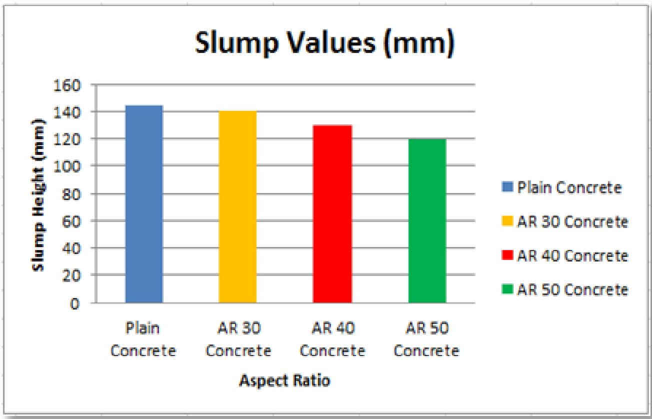
To find the workability of concrete for different aspect ratio Slump Test was conducted. According to the Nagoc Kien, Tomoaki Satomi, Bleen Thomas, Ayesha Siddika, and Alejandro Meza in 2018, 2015, 2019 and 2006 was sated compressive quality of cement is most important parameter in concrete similarly as the concretes are assessing as indicated by the compressive quality.

Results and Discussion

Slump test results are as follows.

Table III : Results of Slump Test

Sample Name	Slump (mm)
Plain concrete	145
AR 30 concrete	140
AR 40 concrete	130
AR 50 concrete	120



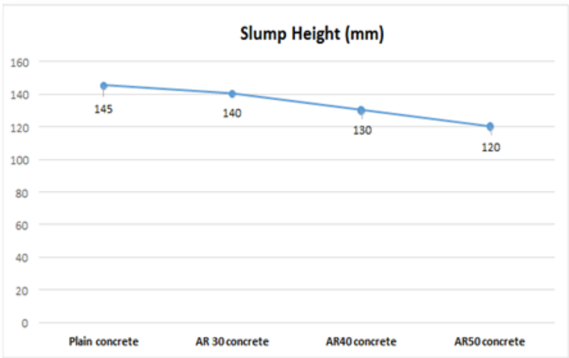


Figure V : The Variation of Slump Value

Design slump value is 125 $\pm$ 25 mm. It is shown that the slump value was decreased with the increased of aspect ratio. It happens because that the added fibers length obstructs the flow and hence affects the workability of concrete. Slump values are also between the design slump 100 mm -150 mm and slump results are acceptable.

According to the Ayesha Siddika in 2019 was stated when increased the scraped tire rubber size slump values were gradually decreased.

According to the Figueiredoa A.D, 2015 was stated when increased the fiber length slump values were decreased.

According to the the Nagoc Kien and Tomoaki Satomi in 2018 was stated when increased the amount of recycled PET bottles waste and recycled woven plastic sack waste as fiber the workability of concrete was decreased.

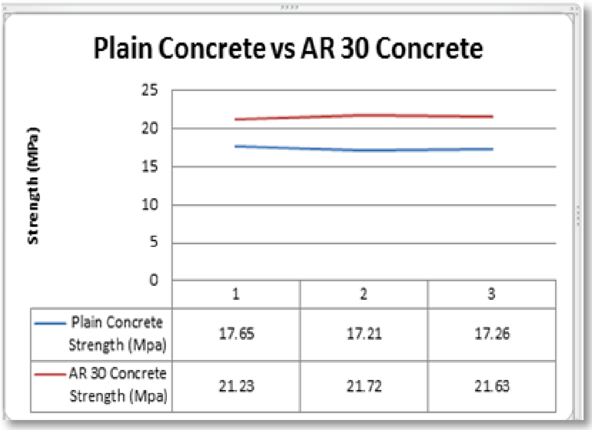
The compressive strength of concrete at 7 days and 28 days was measured by Meakawa ACA-200A-F1 machine with ASTM standard.

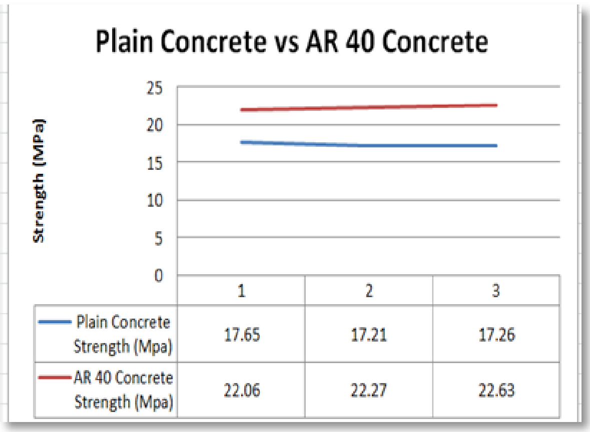
The test results of compressive strength for 7 days and 28 days are shown in table IV and table V.

Table IV : Test Results of Compressive Strength for 7 Days

Sample	First Compressive Strength (MPa)	Second Compressive Strength (MPa)	Third Compressive Strength (MPa)	Average Compressive Strength (MPa)
Plain Concrete	17.65	17.21	17.26	17.71
AR 30 Concrete	21.23	21.72	21.63	21.53
AR 40 Concrete	22.06	22.27	22.63	22.32
AR 50 Concrete	19.36	19.88	19.36	19.43

The variation of plain concrete compressive strength with vehicle tire steel beads added concrete compressive strength is shown in figure 7 and figure 9. Compressive strength results variation of 7 and 28 days are shown in figure 8 and 10.





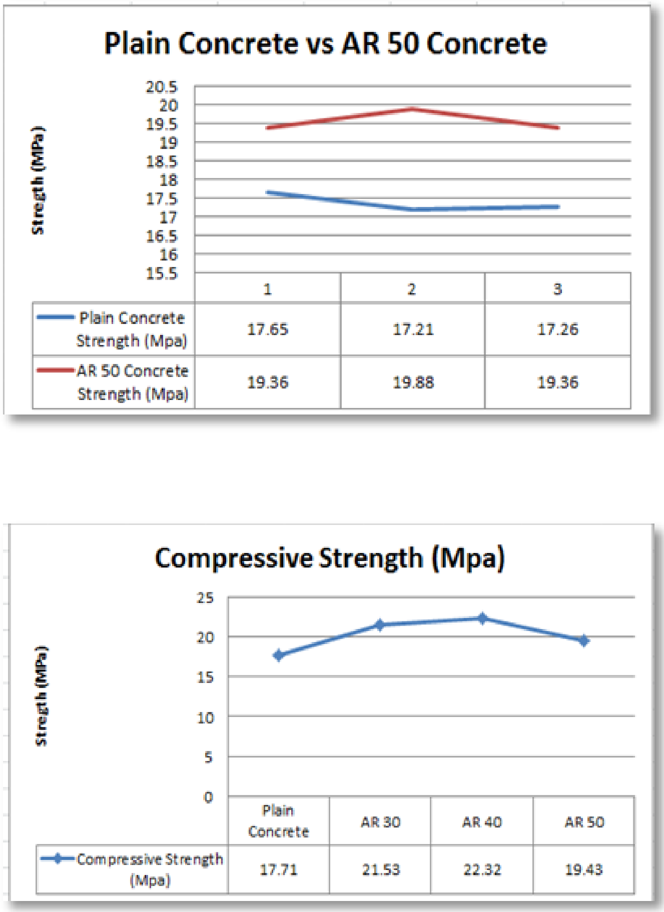


Figure VII – Variation of Compressive Strength

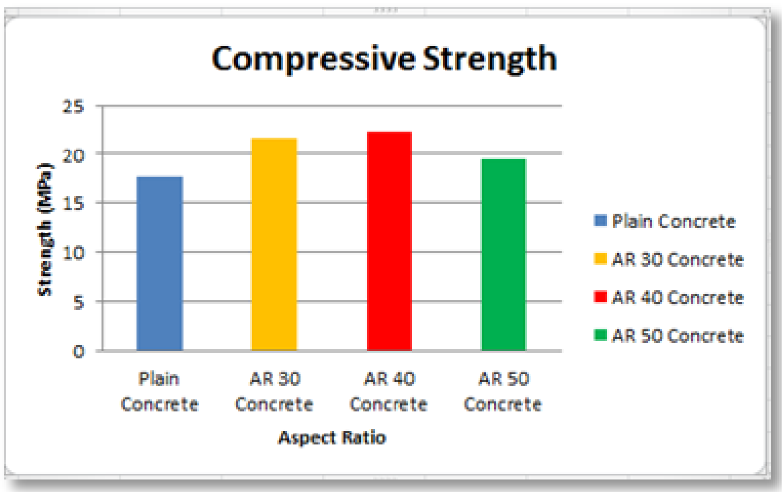


Figure VIII : Compressive Strength Test Results for 7 Days

Sample	First Compressive Strength (MPa)	Second Compressive Strength (MPa)	Third Compressive Strength (MPa)	Average Compressive Strength (MPa)
Plain Concrete	25.88	25.14	25.62	25.55
AR 30 Concrete	29.57	29.36	29.43	29.45
AR 40 Concrete	30.29	30.79	30.11	30.40
AR 50 Concrete	27.59	27.81	27.72	27.71

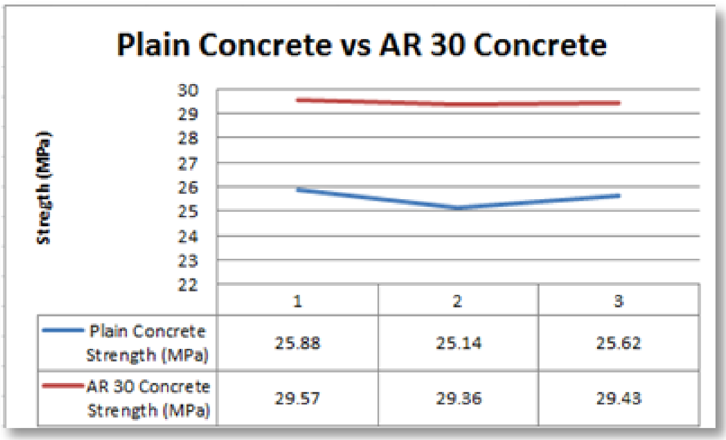
Table V : The Results of Compressive Strength for 28 Days

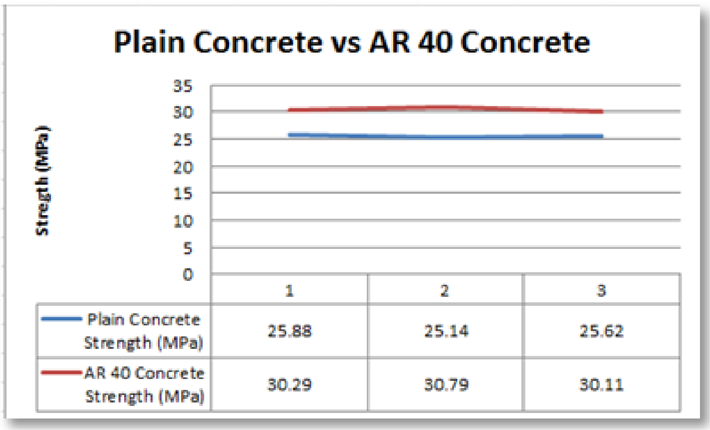
When considered the figure 7 and figure 9 it presented the compressive strength of aspect ratio 30 concrete and aspect ratio 40 concrete was variant parallel with the plain concrete. In addition the aspect ratio 40 concrete was variant most parallel with plain concrete strength more than aspect the ratio 30 concert. Furthermore the strength gap between plain concrete and fiber added concrete, the aspect ratio 40 concrete strength gap was increased considerably more than aspect ratio 30 and aspect ratio 50 concrete. But the compressive strength of plain concrete and aspect ratio 50 concrete wasn't increased parallel it was considerably fluctuated. In compressive strength results were observed that the strength of concrete is slightly increasing when added fiber.

This can be interpreted by the vehicle tire beads addition increasing of the compressive strength of plain concrete, which was line with the results from the research by Mazen Hilles and M. Ziara in 2019.

When considered the figure 8 and figure 10 presented the for 7 days compressive strength was gradually increased from 21.53 Mpa to 22.32 Mpa and after aspect ratio 40 concrete the strength was decreased from 19.43 Mpa. Furthermore compressive strength after 28 days was gradualy increased from 29.45 Mpa and 30.40 Mpa and after aspect ratio 40 concrete the strength was decreased from 27.71 Mpa. Considered the all above results and information, the strength was remarkably decreased when the increase of fiber length.
According to the Ngoc Kien and Tomoki Satomi in 2018 was stated when increase the size of woven plastic sack waste and PET bottles as fiber in concrete, the strength of concede was decreased.

When expanding perspective proportion, Aspect proportion 40 is invigorated the most extreme compressive. After analysing the above results, it is proved that waste vehicle steel tire bead as fiber was increased on the compressive strength of concrete and the Optimum Aspect Ratio for compressive strength improvement is Aspect Ratio 40. Further fiber length is another most considerable factor on the compressive strength of fiber reinforced concrete.





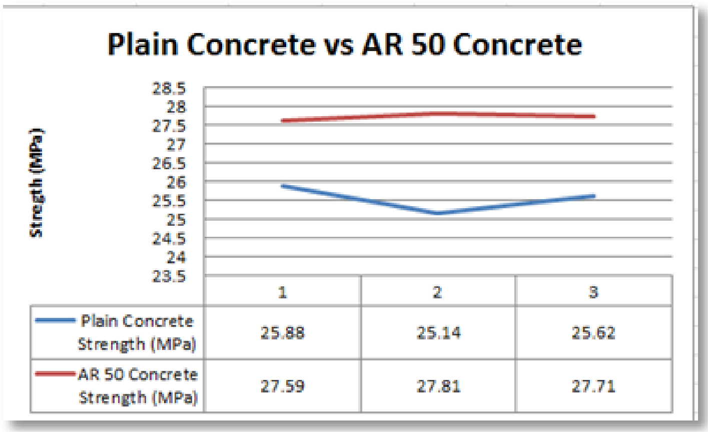
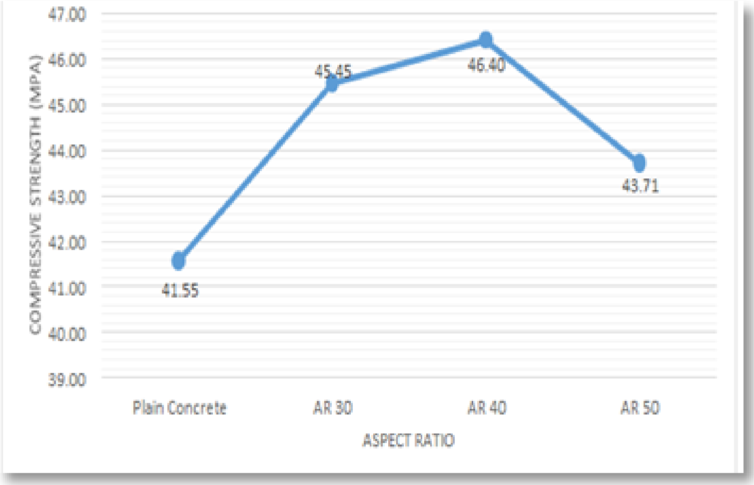


Figure IX – Variation of Compressive Strength



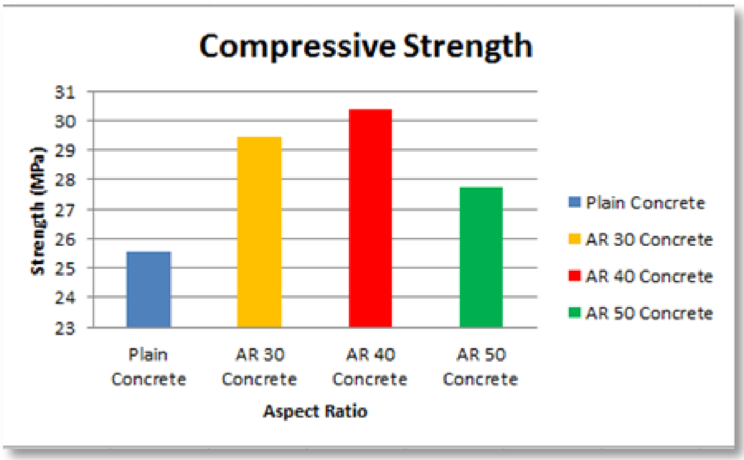


Figure X – Compressive Strength Results for 28 Days

Conclusion

The application of waste tire steel wire beads in concrete construction is an effective and sustainable process. The effect of waste vehicle steel wire bead is shown a good improvement in the compressive strength. The findings of experimental investigations obvious that Aspect Ratio 40 is the Optimum Aspect Ratio for grade 25 concrete (C25) using vehicle waste steel wire beads as fiber to improve performance of cement concrete. Slump value was decreased with the increased of Aspect Ratio. After get optimum Aspect Ratio 40, limit the samples because the compressive strength was decreased after Aspect Ratio 40.

As a recommendations for future work, a proper study on the considered with varying the fiber percentage 0.5% - 1.5% according to aspect ratio 40 and get the optimum fiber content. Steel fibers can be tested according to aspect ratio 30, 40, 50 along with vehicle waste steel cables and compared them. For this research only did compressive strength test and slump test but in future works hope to do flexure test on Aspect Ratio 30, 40, 50 and the crack pattern can be studied using fracture mechanics.

References

Agrawal, A., 2014. Compressive Strength Testing of Steel Fiber Reinforced Concrete in Different Curing Regimes. *International Journal of Engineering Research & Technology (IJERT),* Vol. 3 (Issue 10). [Accessed 7 March. 2020].

Alam, M., 2015. Experimental study on properties of glass fiber reinforced concrete. *International Journal of Enginering trends and technology,* Volume Volume 24. [Accessed 7 March. 2020].

Behbahani, H., 2011. *Steel Fiber Reinforced Concrete.* Kandy-SriLanka, ICSECM. [Accessed 7 March. 2020].

Hensher, D., 2016. Fiber-reinforced-plastic (FRP) reinforcement for concrete structures: properties and applications. Volume Vol. 42. [Accessed 7 March. 2020].

Kandasamy, R., 2011. fiber reinforced concrete using domestic waste plastic as fibers. *ARPN journal of Engineering and Applied sciences,* Volume vol. 6. [Accessed 7 March. 2020].

Katzer, J., 2006. Steel fibers and steel fiber reinforced concrete in civil engineering. *Researchgate.* [Accessed 7 March. 2020].

Lee, S.-C., 2015 . Compressive Behavior of Fiber-Reinforced Concrete with End-Hooked Steel Fibers. *Materials* , Issue ISSN 1996-1944 [Accessed 7 March. 2020].

M., A. F. K., 2014. Behavioural study of steel fiber and polypropylene fiber reinforced concrete. *Impact : international journal of research in Engineering & technology* , vol. 2(Issue 10), pp. pp 17- 24. [Accessed 7 March. 2020].

Mohod, M.V., 2012. Performance of Steel Fiber Reinforced Concrete. International Journal of Engineering and Science. VOl 1, 4. [Accessed 7 March. 2020].

Serdar, M., 2015. Shrinkage behavior of fiber reinforced concrete with recycled tyre polymer fibers. *International journal of polymer science* , p. 9 pages. [Accessed 7 March. 2020].

TANOLI, W. A., 2014. Effect of Steel Fibers on Compressive and Tensile Strength of Concrete. *International Journal of Advanced Structures and Geotechnical Engineering,* Volume Vol. 03. . [Accessed 7 March. 2020].

Figueiredoa, A.D., 2015. Workability Analysis of Steel Fiber Reinforced Concrete Using Slump and Ve-Be Test. International Journal of Engineering and Science. VOl 1, 7. [Accessed 7 March. 2020].

INVESTIGATING THE FACTORS RESTRAINING THE IMPLEMENTATION OF WATER EFFICIENCY IN GREEN BUILDINGS - SRI LANKA

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Abstract

With the increasing potable water demand, it has recognized from literature that adoption of water efficiency (WE) will reduce the heavy demand whereas the constructions will be environmentally friendly. Despite its importance, the implementation of WE has not received much attention in Sri Lanka. The research aims at finding the factors restraining the implementation of WE and to identify strategies to overcome the barriers. A total of 100 questionnaires were distributed among the green professionals and 82 responded. The study revealed that lack of legislation enforcement and monitoring, lack of client's understanding and resistance to change from convectional technology are core factors restraining the implementation. Further, the study found that enhancing public and construction professional's awareness might help to overcome the barriers. The study recommends that there is a need to enhance the public awareness by television advertisements and social media and arrange Continuous Professional Development (CPD) sessions for the construction professionals.

Keywords: Restraining Factors, Strategies, Sustainability, Water efficiency

Introduction

The world today is experiencing scarcity of water due to the ever-increasing demand and the overuse (Young & Loomis, 2014). Sudden climatic changes, droughts and the increasing industrial demands are draining the available freshwater ((Chanan, White, Howe, & Jha 2003; Economist, 2008; Goodrum, 2008; Johnston, 2003; Russell & Fielding 2010). Thus the rising demand for water, forces the people to be more efficient in their water consumption (Rodgers, De Silva, & Bhatia, 2002). It is stated in the Organizational for Economic Cooperation and Development (OECD) reports that over 47% of the world's population will live under a severe water stress by 2030. The gap between the water availability and the increasing demand for water has transformed into water scarcity (Joyce, 2012). Sri Lanka is a country with a current water availability of 2492m^3/capita/year (Environmental Indicators: Inland Water Resources- last update March 2011). Yet it's gradually heading towards 1500 m^3/capita/year by 2050 which means "water stressed".

The reason behind this is the growth of population, socio-economic development and changing of consumption patterns of people. Although Sri Lankans believe that the country is blessed with an unlimited supply of water, the recent studies reveals that there will be a water shortage due to the increasing demand and unsustainable practice of water (Samad, 2005; Dharmaratna & Parasnis, 2012). Even though, there's an urge to implement water efficiency (WE) in buildings making them more sustainable, yet there're identified factors which restrain this implementation. However, with all these facts still it has been a significant issue to adapt water efficiency due to the lack of awareness of general public and the attitude of people is essential to implement water efficiency (Samaraweera & Gunawardhana,2019). A few studies have been done on water efficiency during the operational stage of a building, while others have looked at water efficiency (WE) during the construction stage of a building (Carragher et al., 2012). Accordingly, the implementation of water efficiency has been given a low priority.

This research aims to identify them and to investigate the measures to overcome these barriers

Research objectives

The factors restraining the implementation of water efficiency by construction organizations were the aim of this research. The general objective was to identify the factors restraining the implementation of water efficiency and rank them. The specific objectives were to identify the importance of water efficiency in the Sri Lankan context and to examine the measures to overcome the identified factors.

Research methodology

The research adopts a quantitative approach using a structured questionnaire among a focus group to rank the factors restraining the implementation of WE and the strategies to overcome the identified barriers. A robust questionnaire survey was conducted based on the factors identified in the literature review and administered among the green professionals who have experience in the construction industry. Convenience sampling technique was adopted because there is no list of professionals in the sampling frame. Five point Likert scale questions were given in order to identify the factors restraining the implementation and the strategies to overcome the identified barriers. Scales were given as 1 = Strongly Agree, 2 =Agree, 3 = Moderate, 4 = Disagree and 5 = Strongly Disagree. A total of 100 questionnaires were distributed and the questionnaire comprises of four sections. The first section of the questionnaire includes the general demographic factors including the basic personal information such as designation, work experience etc. Next their idea on WE and the opinion on current implementations were inquired. Whereas the second section includes about the importance of WE and third section of the questionnaire includes about the factors restraining the implementation of WE with the barriers to overcome those in the fourth section. The respondents were asked to rate them according to their level of awareness in each section.

Data for the study was processed and analyzed with the aid of the Statistical Packages for Social Science (SPSS) and Microsoft Excel. The demographic factors were analyzed using frequency distribution. The respondents' idea on WE, current implementation of WE and the importance of implementing the WE were analyzed using Arithmetic mean score values and the Standard deviation. The factor analysis was to reveal the possible common factors restraining the implementation of green buildings and 10 common barriers and 8 common strategies to overcome the barriers was identified by studying the existing literature.

Table 4 – Barriers for implementing water efficiency

Barriers	Key reference
Lack of legislation, enforcement and monitoring	Ren, 2007; Zhou and Zhang, 2007; Rohracher, H. 2001.
Lack of client's understanding	Hakkinen and Belloni, 2011
Resistance to change from conventional technology	Ametepey et al., 2015
Lack of reliable information on cost saving	Hakkinen and Belloni, 2011
Higher costs than conventional buildings	Wang, 2010; Luo, 2011;Kats G, 2009; William and Dair, 2007; Griffin et al., 2010.
Lack of WE product suppliers and service providers	Hakkinen and Belloni, 2011
Negative attitudes of general public	AlSanad, 2015
Limited knowledge of construction professionals	Li and Miao, 2009; Zhang, 2010.
Long payback period	Williams and Dair , 2007
Insufficient criteria in GREENSL rating tool	GREENSL rating tool

Table 2 – Strategies to overcome barriers

Strategies to overcome barriers
Enhancing public awareness
Enhancing the knowledge of the construction professionals
Introducing a star rating system for the plumbing fixtures
Encouraging innovative solutions by rewarding
Imposing strict building laws on implementing WE
Tax concessions on water efficient plumbing fixtures
Assessment tax concessions on WE buildings
Improvements for the GREENSL rating tool

The ranking of the restraining factors and the strategies were based on the Relative Importance Index.

$$RII = \sum \frac{W}{A\ x\ N}$$

W=Weightage given by each respondent on a scale of 5 to 1. (5 implies to Strongly agree and one implies to Strongly disagree)
A=The highest weight (5)
N= Total number of samples
A higher RII value indicated a higher influence.

Data Analysis and Discussion.

Demographic information of respondents

The first section of the questionnaire was to ask few of personal information from the respondents such as the type of profession, years of experience in the construction industry and their green projects' involvement. Below tables present the results.

Table 3 - Descriptive results of respondents' profession

Characteristic		Frequency	Percent
Profession	Project Manager	8	9.8
	Engineer	51	62.2
	Architect	3	3.7
	Assistant Engineer	1	1.2
	Quantity surveyor	7	8.5
	Assistant Quantity surveyor	1	1.2
	Other	11	13.4
	Total	82	100

Table 4 - Descriptive results of respondents' industry experience

Characteristic		Frequency	Percent
Industry Experience	1 - 5 years	45	54.9
	6 - 10 years	19	23.2
	11–15 years	6	7.3
	16 –20 years	8	9.8
	21–25 years	3	3.7
	26 –30 years	1	1.2
	Total	82	100

Table 5 - Descriptive results' of respondents' involvement in green projects

Characteristic		Frequency	Percent	Valid Percent
Number of Green Projects Involved in	None	30	36.6	40.0
	1-2 projects	28	34.1	37.3
	3-4 projects	12	14.6	16.0
	5-6 projects	3	3.7	4.0
	More than 6 projects	2	2.4	2.7
	Total	75	91.5	100.0
	Missing system	7	8.5	
Total		82	100	

Based on the 82 responds collected, highest number of respondents (62.2%) were engineers and the rest of the respondents are also professionals such as Project managers, Quantity Surveyors, Architects, Sustainability Consultants etc. Moreover, all the respondents have at least 1-year experience in the construction industry. Among them, 60% of the respondents have at-least one green project involvement. The results prove the involvement of industry professionals with adequate experience in responding the structured questionnaire.

Then the idea of the respondents regarding the statement, "water efficiency focus on achieving same results with minimum water requirement" were inquired. 56.3% of the respondents were agreed with it while 22.5% were strongly agreed. Accordingly, majority of the respondents agree with the fact.

Further, out of all respondents, 42% opinion on the current implementations of WE in the buildings projects were moderate, 23.5% stated as good and 25.9% as low. Hence the arithmetic mean value was 2.95.

Mean	Median	Mode	Std. Deviation
2.95	3.00	3	0.921

Reliability check of the responds

Table 6 - Reliability check

	Cronbach's Alpha	N of items
Importance of WE	0.657	5
Restraining factors	0.557	10
Strategies to overcome the barriers	0.752	8

As per the findings the Cronbach's Alpha value was calculated for the sections 2, 3 and 4 in the questionnaire to find the internal consistency of the responds. Accordingly, 0.657 was the Cronbach's Alpha value for the questions of finding the importance of WE and it is acceptable whereas the Cronbach's alpha value for the restraining factors was 0.557. However, it is also in the acceptable range. The Cronbach's Alpha value of strategies to overcome the barriers was 0.752 showing that there is a good internal consistency within the responds.

Analyzing the importance of Implementing WE in buildings

Table 7 - Importance of implementing WE

Importance factor	**Mean**	**Median**	**Mode**	**Std. Deviation**
Reduction of heavy demand for potable water	1.8	2.00	2	0.749
Improves the Environmental wellbeing	1.68	2.00	2	0.668
Reduction of utility bills for the building occupants	1.73	2.00	2	0.613
Provides higher property value for building developers	2.02	2.00	2	0.774
Reduction of the cost on purifying water for the government	1.83	2.00	2	0.771

The section 2 of the questionnaire intends to find the importance of implementing WE in buildings and accordingly the responses analyzed through arithmetic mean value scores. As per the responds, the highest mean value score of 2.02 which stated that WE provides a higher property value for building developers whereas the second highest for the reduction of cost on purifying water with a less mean value of 1.68 which stated that WE improves the environmental wellbeing.

Analyzing the factors restraining the implementation of WE

Table 8 - Analyzing the factors restraining the implementation of WE

Factors restraining the implementation of WE	**RII**	**Rank**
Lack of legislation, enforcement and monitoring	0.838	1
Lack of clients' Understanding	0.815	2
Resistance to change from convectional technology	0.800	3
Lack of reliable information on cost saving	0.780	4

High cost than convectional buildings	0.773	5
Lack of WE product suppliers and service providers	0.763	6
Negative attitudes of general public	0.760	7
Limited knowledge of construction professionals	0.741	8
Long payback period	0.731	9
Insufficient criteria in GREENSL® rating tool	0.677	10

The survey results indicate that the highest ranking restraining factor of implementation of WE having 0.838 RII is the lack of legislation, enforcement and monitoring. Next, lack of clients' understanding (RII 0.815) and Resistance to change from convectional technology (RII 0.800) ranks second and third respectively. Insufficient criteria in GREENSL® rating tool having RII of 0.677 is the least restraining factor.

Analyzing the strategies to overcome the barriers for implementation of WE

Table 9 - ***Analyzing the strategies to overcome the barriers for implementation of WE***

Strategies to overcome the barriers	**RII**	**Rank**
Enhancing public awareness	0.900	1
Enhancing the knowledge of the construction professionals	0.896	2
Introducing a star rating system for the plumbing fixtures	0.865	3
Encouraging innovative solutions by rewarding	0.865	3
Imposing strict building laws on implementing WE	0.845	5
Tax concessions on water efficient plumbing fixtures	0.825	6
Assessment tax concessions on WE buildings	0.823	7
Improvements for the GREENSL rating tool	0.787	8

According to the table, most important strategy to overcome the above identified barriers is enhancing public awareness (RII 0.9). Enhancing the knowledge of the construction professionals on WE implementations (RII 0.896) and Introducing a star rating system for plumbing fixtures to identify their performances (RII 0.865), ranks second and third respectively. Improvements for the GREENSL® rating tool ranks the lowest obtaining RII 0.787.

Conclusion

The purpose of the study is to find the factors restraining the implementation of WE in buildings and to find strategies to overcome. As per the second section in the questionnaire the importance of implementing WE was analyzed and the survey results indicates that implementing WE will provide a higher property value for the developers and it will also minimize the purification cost for the government. Further the study found that lack of legislation enforcement and monitoring, lack of client's understanding and resistance to change from convectional technology are the core factors restraining the implementation of WE, also the respondents have agreed with the factors such as lack of reliable information on cost savings, higher costs than convectional buildings, lack of WE product suppliers and service providers and negative attitudes of general public. Among the factors provided in the structured questionnaire, the respondents disagreed with the fact that there are insufficient criteria in the green rating tool, Sri Lanka. Hence some professionals believe that the criteria are sufficient.

The survey results indicate that the most effective way to overcome these barriers is to enhance the public awareness as well as the awareness of the construction professionals on the importance of WE. The respondents also believe that introducing a star rating system for plumbing fixtures and encouraging innovative solutions by rewarding will also help to overcome these restraining factors. The study concludes that implementing WE will provide higher property values and also will save the cost of the government on purification. Moreover, public awareness can be enhanced by social media advertisements and discussions whereas the construction professional's awareness can be enhanced by conducting Continuous Professional Development (CPD) sessions. Additionally, the general public and construction professionals will get motivated if the government could make it compulsory for every project to get green certified by the Green Building Council of Sri Lanka (GBCSL) and provide tax concessions for WE buildings. The study couldn't approach for the total population due to the pandemic situation in the country. Further studies can be done to find the awareness of the general public and construction professionals on water efficiency and regarding the effectiveness of the strategies implemented in the green buildings in Sri Lanka.

References

Chanan, V., White, S., Howe, C. & Jha, M. (2003). sustainable water management in commercial office buildings, Pert, Institute for sustainable futures. Retrieved from http://www.isf.uts.edu.au/publications [Accessed on 09/09/2021]

Daniel, E I, Oshineye, O and Oshodi, O (2018) Barriers to Sustainable Construction Practice in Nigeria In: Gorse, C and Neilson, C J (Eds) Proceeding of the 34th Annual ARCOM Conference, 3-5 September 2018, Belfast, UK, Association of Researchers in Construction Management, 149-158.

Johnston, D.J (2003). water for sustainable development, OECD Observer No. 236, Retrieved from http://www.oecdobserver.org/news/fullstory.php/aid/933/Water_for_Sustainable_Development.html [Accessed on 10/09/2021]

Rogers, P., De Silva, R. & Bhatia, R. (2002). Water is an economic good:How to use prices to promote equity, efficiency and sustainability, Water policy, 4, p.17

Russell, S. & Fielding, K. (2010), Water demand management research: A psychological perspective, Journal of water resources research, 46, 1-12.

Waidyasekara, K., 2016. *SUSTAINABLE USE OF WATER IN CONSTRUCTION PROJECTS: THE CASE OF SRI LANKA*. Doctor of Philosophy. University of Moratuwa. Available at : http://dl.lib.uom.lk/bitstream/handle/123/12320/full-text.pdf?sequence=2&isAllowed=n [Accessed on 17/09/2021]

Young, R. A., & Loomis, J. B. (2014). Determining the economic value of water: concepts and methods. Routledge.

IDENTIFY THE IMPACT OF MANAGEMENT RELATED RISKS IN FOREIGN CONTRACTORS' INVOLVEMENT IN SRI LANKAN CONSTRUCTION SECTOR.

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Abstract

Construction industry is a vast area where the economy of the country relies. In Sri Lanka construction industry is developed after the time of 2009. The projects by the foreign firms are of 40% of the projects in Sri Lanka. But it may be local company doing or the foreign company doing projects, the risks associated with the industry is always high. This research talks about the risks involved in the construction management of the foreign company doing projects North in Sri Lanka. And out of so many risks in the construction management, this research clearly talks about the risks by communication issues, decentralized administration. Shortage of resources and about employee empowerment. The research is based on quantitative way of collecting data. This research will give out the risk management practices for the above-mentioned construction management risks, and will help all the foreign firms in their upcoming projects.

Keywords: Construction Industry, Foreign Contractors, Project Management, Sustainable Projects

Introduction

Project management is one of the disciplines in any field. If it's come to construction, the management will be the backbone of it. Proper and effective management is needed to carry out the project in a successful way. The word management contains a lot in its self. The period of the project, the success of the project will be decided by how they manage the project from the start to its end. Mainly this includes uncertain productivity of resources means before starting the project it is a must to assign the adequate number of skilled staff clearly defined about their roles and responsibilities, improper handling of staff, labours and contractors, impossible deadlines, etc. The company ABC (Pvt) Ltd is a South Asian company, and KLM (Pvt) Ltd is an East Asian company. The research is based on how the management related risks influenced the massive delay of the project handled by that company.

Objective

- To identify the key challenges and risks within the construction management of foreign firms doing construction projects in Sri Lanka.
- To study and, check the suitable risk management practices practicability in North Province.
- To analyse the impact of risk management practices in the project life cycle of construction projects done by foreign companies.
- To recommend the best planes for foreign companies to deal with the risks in doing the project in Sri Lanka.

Methodology

In this research Deductive research method used for the research method. In deductive inference, when the premises are true, the conclusion must also be true and the generalizing from the general to the specific Data collection is used to evaluate propositions. This research follows the Primary data collecting method. Here qualitative data used because it provides depth and detailed information Questioner survey done using google forms to collect basic data, target sample of the questioner survey staffs of construction companies which situated in North Province and ideas and the interviews with selected handpick experts (Engineers, Project managers). Responses obtain from the questioner survey analysed using the data analysis plane with the use of Statistical Package for the Social Science by the graphs and the pie charts and it's used by various kinds of researchers for complex statistical data analysis. Content analysis will be used to analyses the data which will be gathered by interviews. The main advantage of content analysis is that it helps in data collected being reduced and simplify.

Results

Language /Communication barriers.

The correlation value for the variable one is 0.637, which means that there is a perfect relationship, and the p-value is o which is less than 0.05. Thus, the signature is accepted. Therefor language and communication barriers have a significant impact on minimising risks in construction management.

Empowerment of employees.

The correlation value for variable 2, is 0.564, which means there is a relation between the empowerment of employees, and minimising risks in construction management. Also, the P-value is 0.001, which is less than 0.05. Thus, the signature is accepted. Therefore, empowerment of employees has a significant impact on minimising risks in construction management.

Shortage/inadequate resources.

The correlated value for the third variable is 0.651, which means there is a relationship between the shortage of resources and minimising risks in construction management. Also, the P-value is 0.000, which is less than 0.05, that the significance is accepted. Therefore, there is a significant impact of shortage/inadequate construction resources in minimising construction management risks.

Decentralization of the administration

The correlation value is 0.685, which means there is a good relationship between decentralisation of the administration and minimising construction management risks. Also, the P-value I 0.000, which id less than 0.05, so the significance is accepted. Therefore, there is a significant impact of decentralisation of the administration, in minimising risks in construction management

Discussion

This Data analysis includes different sections, all based on the data that was collected from the questionnaires distributed. The first section showed the demographic data of the sample including Position, qualification, area of specialisation, age and experience, afterwards results for each question in the questionnaire were presented with a discussion about the obtained answers and how it contributes to the research objectives. Then independent variables testing was performed, including a reliability test that concludes whether the questionnaire utilised was reliable or not—moreover, descriptive statistical analysis showing the mean and standard deviations of each independent variable. Finally, correlation analysis that was performed to test the significance of the 4 independent variables with the dependent variables by the P-value, which is results showed that language barriers, empowerment of employees, shortage of resources and decentralisation have acceptable r value. All of them had a P- value less than 0.05, meaning they all affected minimising construction management risks in the foreign company doing projects in Sri Lanka. The next chapter will have an overview of the complete research, with recommendations, limitations and future area of research.

Conclusion and Recommendations

Language /communication barriers.

It is noticed that 85% of the population agree that a huge focus must be given to effective communication and training where the bilingual workforce is involved. States that the following can be implemented in the site and within the employees to overcome the language barriers in the construction site

- Basic language training for the employees – they can be teaching with the important and the basic words used for the construction.
- Training for showing method.
- Using an interpreter when giving instructions.
- Translate all the relevant documents to both languages.
- Teaming them with a co-worker who can speak both languages.

Empowerment of employees.

The foreign firms should implement this employee empowerment in the projects in Sri Lanka. The empowerment of employees increases productivity and savings in the project.

- Increase in the productivity
- Cost and time savings
- Increase inefficiency
- Improved relationship between managers and workers

Shortage/inadequate construction resources.

Use of types of machinery instead of the skilled labours is proffered for this labour shortages, to overcome the material/construction resource issues.

- Training about efficient use of materials
- Perfect tracking of materials
- Efficient material management
- Recycling of the materials

Decentralization.

Decentralization of the administration is also another important aspect of successful construction management.

- Saves time and cost
- Sharing of knowledge and information with the subordinates and the managers
- Increase effectiveness and motivation

Summary

Implementing the above recommendations can benefit the ABC and KLM companies and all the foreign firms when doing projects in Sri Lanka. First, the employees would feel more motivated and secure, reflecting on their performance as individuals, which would improve works, processes, and procedures in ABC and KLM. This would improve ABC's and KLM's companies' organizational performance without a doubt and can help them get more contracts in the future. Current customers of ABC and KLM would also benefit since their operations would be hindered less often, and a higher quality of service would be given to them. Finally, this would increase the effectiveness by reducing the risks in the construction management of ABC and KLM companies, easing their jobs and help them to run successfully.

References

Available at: https://www.educba.com/construction-project-management-careers/

CMAA, 2010. *Construction Management - Standards of Practise.* s.l.:s.n.

Zhi, 1995. *Risk Management for overseas Construction Project.* s.l.:s.n.

A STUDY OF IMPACTS OCCURRED DUE TO THE COVID19 PANDEMIC IN THE SRI LANKAN CONSTRUCTION SECTOR

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Abstract
COVID19 has become a bottleneck on almost every day-to-day human endeavors where the construction industry isn't an exception. To comprehend the depth of impact due to COVID19 in the Sri Lankan construction sector a questionnaire survey was distributed among the construction experts, analyzed using the SPSS v22 Software and cross-checked with two proficient project managers. The literature review part of this research has covered the brief global catastrophe and major contractual provisions were discussed related to dodge claims against parties. The result suggests that impacts of COVID19 range from labor and supply shortages, suspension of works, time overrun, interruption in planning and scheduling, interruption in logistic movements, sudden price fluctuations, to contractual discrepancies. Certain challenges were experienced during the research such as lack of resources for literature review and restriction towards meeting people personally due to health measures.
Keywords: COVID19, Sri Lanka, Pandemic, Impact, Construction sector.

Introduction

COVID19 pandemic has affected most of the industries in Sri Lanka apart from the construction sector such as tourism, textiles, clothing, banking, finance, import, export, and small businesses however those impacts could evolve, if the impacts and scale of the impacts are not identified promptly, especially in the construction sector. Professional bodies such as CIDA (Construction Industry Development Authority) strive their level best to handle this situation and overcome smoothly as possible. (CIDA , 2020)
Nissankna Wijerathne, Secretary of the Sri Lankan Chamber of construction industry stated on the "EconomyNext" website that according to the forecast prepared by the loaning agencies, the economy of Sri Lanka will be predicted to contract up to a 3% slowdown. Mainly the Construction industry will be affected along with other industries if the economy goes down in the same manner, he states on the website. Furthermore, most of the companies are struggling with delayed payments however certain big companies managed to pay 50% of the wages during the pandemic this is also a reason for a large number of people not to go to work and some chose to work in different fields. Mr Nissanka has mentioned further that, out of 650,000 people in the industry even at least 200,000 people wouldn't have returned to the work yet.
The largest Contractors of Sri Lanka holds 600 Billion worth of projects which includes Chinese funded projects, Shangri- La apartments project and Port city projects. Nearly 50% are not yet started since the outstanding payments. Foreign workers who have returned to their home country for the New Year aren't able to return since the imposed travel ban. Health guidelines given by the ministry such as social distancing are making it more

complicated in the construction sector Wijerathne further mentioned to EconomyNext (JAYASINGHE, 2020)

Aim and objectives

The research aim is to identify the impacts of COVID19 in the construction sector of Sri Lanka and the following are identified as objectives to attain the aim successfully:

- To identify & discuss briefly the current status and overall impacts that occurred due to COVID19 globally.
- To analyze the range of impact of COVID19 in the Sri Lankan construction industry.
- To identify the clauses related to dodge claims under the standard forms of contract by CIDA (SBD – Standard Bidding document by Construction Industry Development Authority).

Methodology

To achieve the objectives, a desk review of literature review and field study with the collection of primary data from the construction professionals have been used. As a field review, the questionnaire survey method has been chosen as the quantitative method and have made 15 - 20 questions using the Likert scale, and multiple selective questions. Since it was complicated to collect data from all around Sri Lanka simple random sampling method was chosen for this particular purpose. Two to three companies were chosen randomly from the three different selected cities which were Colombo, Kandy, and Galle and requested the selected professionals to participate in the survey. Moreover, for this particular purpose, Google Form was used and 30-35 participants were expected to take part in the survey from each city.

Furthermore, to get a clear picture of the situation two industry experts were interviewed for the qualitative data. The questions were sent to those project managers prior a week to the appointment. Those questions were mostly based on the results received from the open survey and to cross-check the received answers. The expertise was chosen from known contacts. Moreover, the conversation was recorded on mobile phones with their consent. Since the lockdown around the country and strict health measures continued throughout the research period telephonic conversations and WhatsApp was used for communications. Furthermore, the data were analyzed via SPSS V22 data analysis software.

Secondary data was obtained for the literature review from various elements such as published researches and articles. Furthermore, contractual obligations were identified in the Standard forms of contracts by CIDA (Construction Industry Development Authority) to dodge claims and to avoid further disputes. Finally, the statistic from different websites such as WHO (World Health Organization) and the Health promotion bureau has been taken to provide the exact numbers of death rates, confirmed cases around Sri Lanka as well as globally.

Results

The data attained from the survey is expected to have 30-35 participants from each selected city with a total of 90 – 105 participants. However, at end of the survey total of 97 participants were responded. The following diagram shows the distribution of respondents.

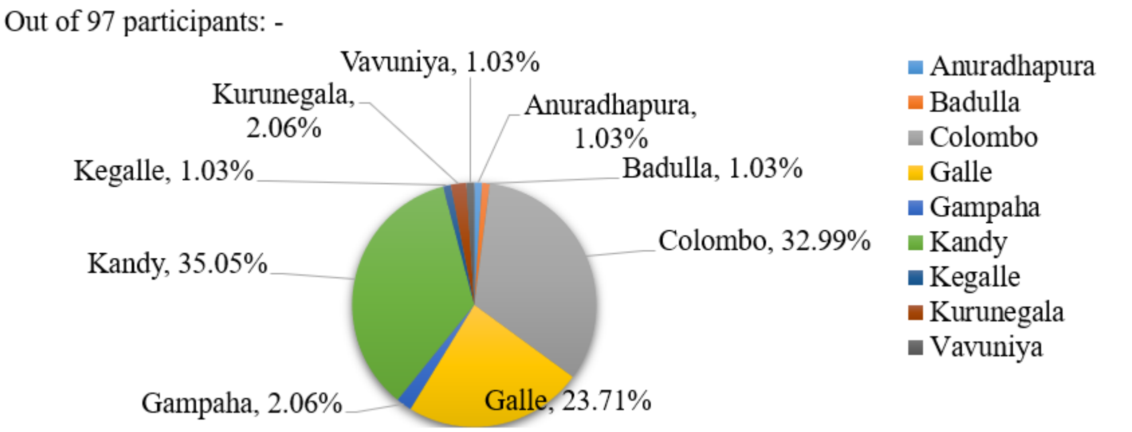

Figure 1 – Distribution of Participants

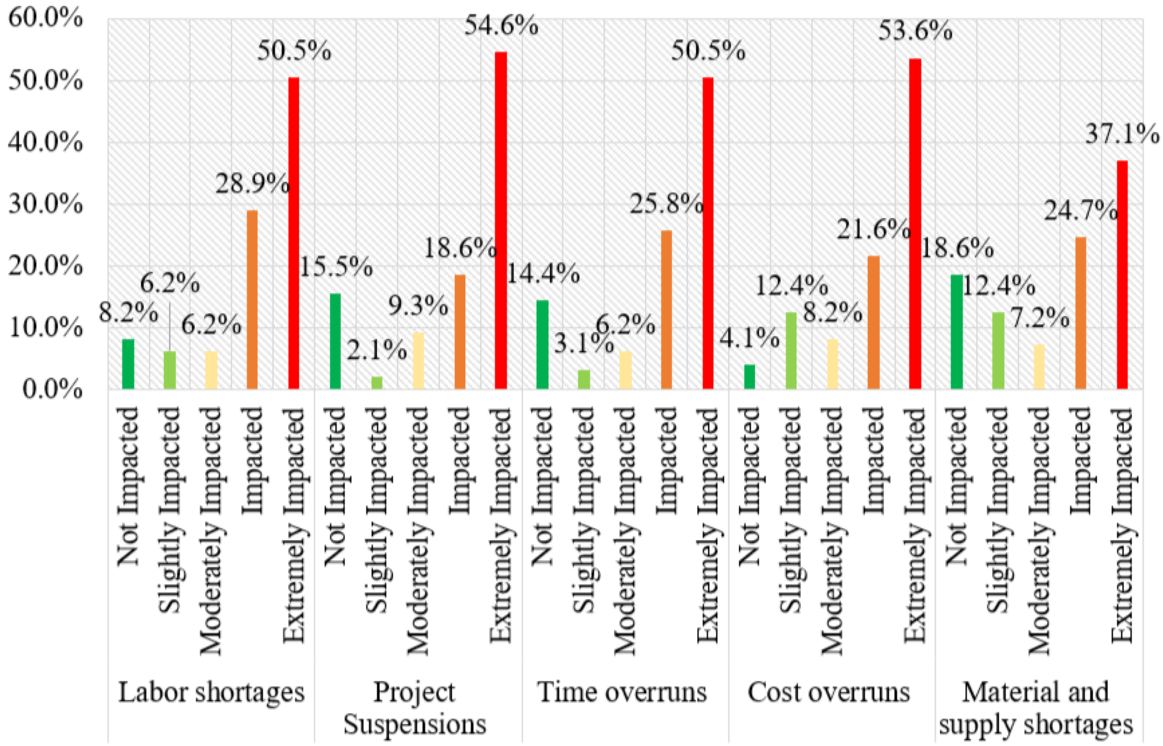

Figure 2 – Range of Impacts 1/2

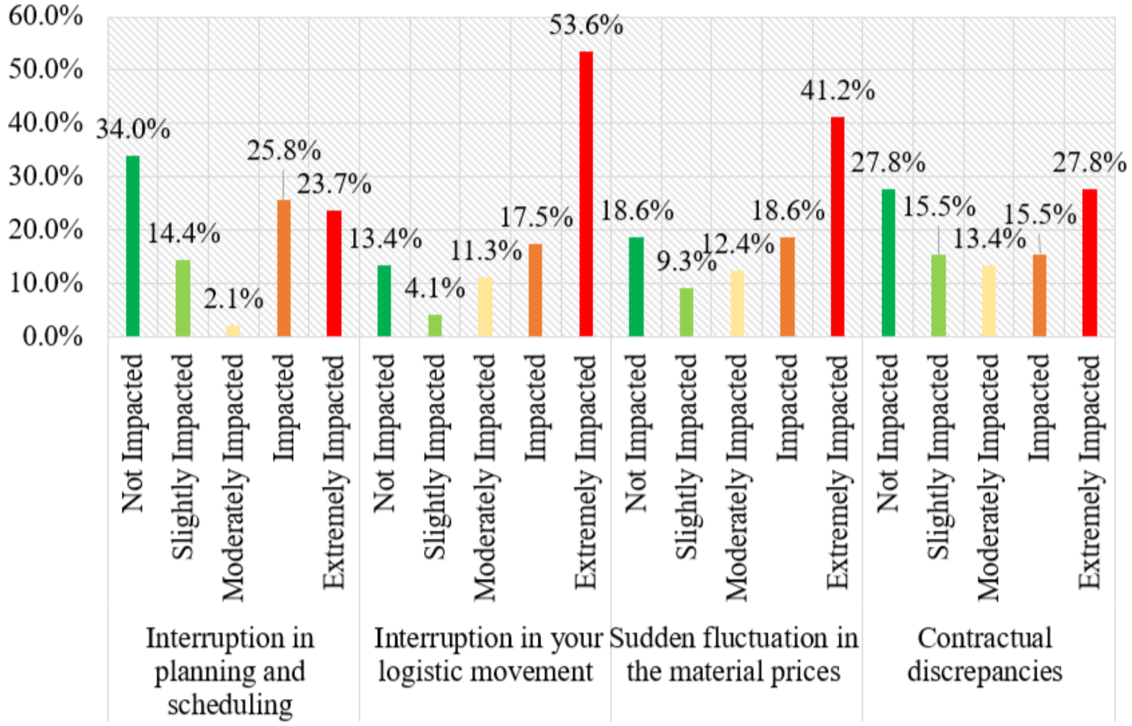

Figure 3 – Range of Impacts 2/2

A substantial amount of participants has responded that their projects were extremely impacted due to COVID19. Below table – 05 elaborates on the response towards the impact by the parties

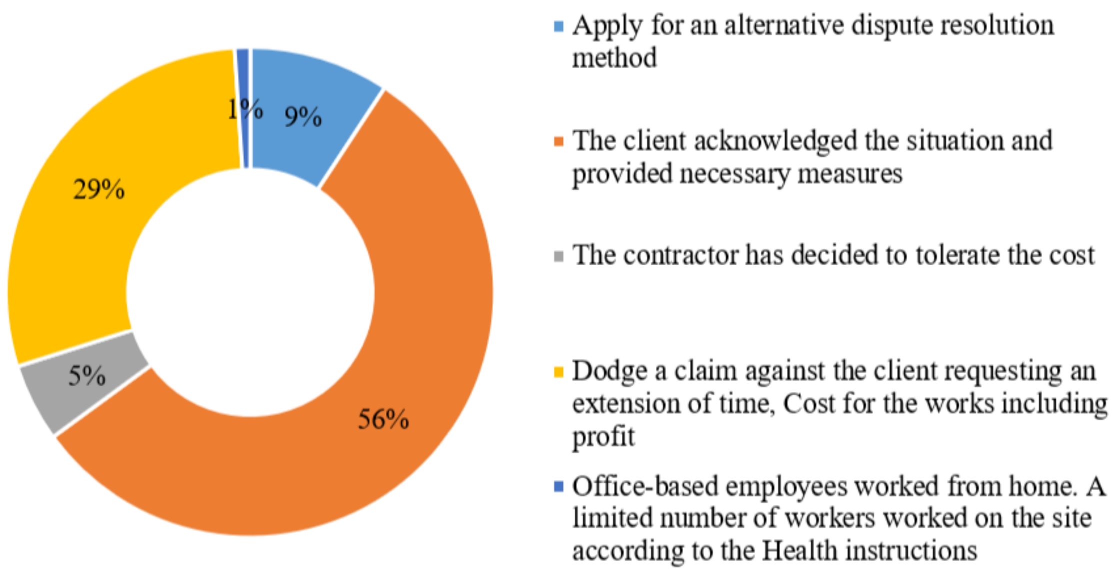

Figure 4 – Remedial actions to overcome the impact

Using the contractual obligations 44.3% of the respondents have stated that they received an extension of time in the project, 42.2% of them received the cost of the work including profit as well as an extension of time to complete the project and 7.2% of them have stated that they have received only the cost of the work out of 97 respondents. Furthermore, the respondents have complied with different standard forms of contract in their project which has presented in figure – 6. Wherein 78% of the respondents have stated that they complied with the Standard Bidding documents by CIDA.

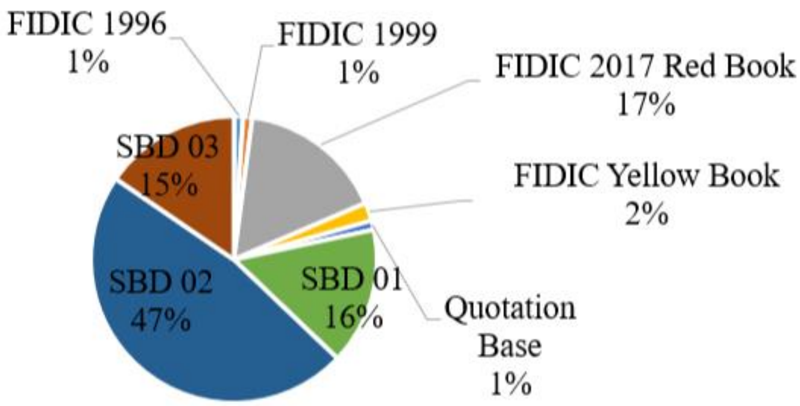

Figure 5 – Standard forms of contract respondent's project complied on

Conclusion and Recommendation

The overall impact of the COVID19 can be elaborated further in below pie chart using the collected data from each perspective:

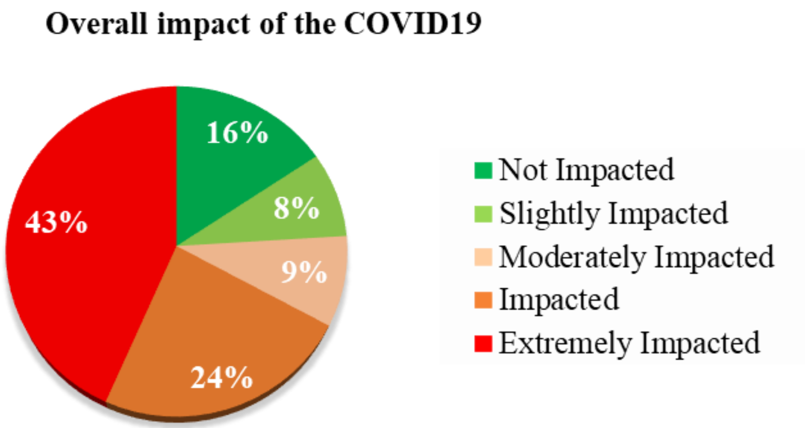

Figure 6 Overall impact of the COVID19

Examining the acquired data it's evident that some factors have largely impacted than the others. And some factors have minimal impacts such as Interruption in planning and scheduling as well as in contractual discrepancies. Moreover, data shows that overall 43% of extreme impact with respect to all the responses received. Which conclude the depth of impact that occurred due to COVID19 in the construction sector of Sri Lanka was mostly influenced by Labor, material and supply shortages, project suspensions, time and cost overruns, Interruption in logistic movements, and sudden price fluctuation.

Below mentioned are general clauses that can be used for the current situation. However, depending on the situation the clauses can be varied.

Table 5 – Major clauses related to dodge claims

	SBD 01: Section – 03, Conditions of Contract	**SBD 02: Section – 03, Conditions of Contract**	**SBD 03: Section – 03, Conditions of Contract**
Extension of the intended completion date	Clause 28 (Extension of Intended completion date)	Clause 8.4 (Extension of time for completion)	Clause 6.3 (Extension of Time)
Variation	Clause 39 (Variation)	Clause 13 (Variation and adjustment)	Clause 9 (Variation and Claims)
Force Majeure/ Exceptional event/ Compensation event	Clause 44 (Compensation Event)	Clause 20 (Force Majeure)	Clause 12.2 (Force Majeure)
Notifying the parties	Clause 32 (Early Warning)	Clause 20.2 (Notice of Force Majeure	Clause 9.3 (Early Warning)
Changes in legislation	Clause 45 (Change in law)	Clause 13.6 (Adjustment for Changes in legislation)	10.11 (Subsequent Legislation)
Suspension of works	Clause 64 (Suspension of Work)	Clause 8.8 and 8.9 (Suspension of Work and consequences of Suspension)	Clause 5.1 (Employer's liabilities/ Risks – Suspension unless it is attributable contractor's failure)
Price adjustments	Clause 47 (Price adjustment)	Clause 13.7 (Adjustments for changes in cost)	Clause 10.10 (Price adjustments)
Dispute resolution adjudication & arbitration	Clause 24, 25, 26 (Dispute Resolution, Procedure for adjudication and Arbitration)	Clause 19.2, 19.3,19.4 & 19.5	Clause 14 (Resolution of disputes)
Claims	No specific clause	Clause 19.1 (Contractor's claim)	No specific clause

(ICTAD/CIDA, 2007), (ICTAD/CIDA, 2007), (ICTAD/CIDA, 2007).

COVID19 has created a chaotic situation in the construction sector of Sri Lanka. This paper has explored the scale of impact from each perspective from the questionnaire and interview with the experts in the industry. Most of the construction companies adopt "Work from home" strategies that have positive and negative influences in the construction sector. 34% of the respondents have shared that the planning and scheduling works are not interrupted during the pandemic which is due to work from home strategies the project managers added further in the interview progress. However, not all the works can be done from home in the construction sector especially the site related works.

Moreover, Outbreak of the COVID19 has taught greater lessons and remarkable events ranging from digitalization, remote working strategies, more awareness on hygienic approaches in the construction sector, awareness on labor welfare and health safety procedures, the importance of procurement planning, scheduling, contingency planning, better understanding on contractual provisions and rights to claim.

Some limitations have been encountered while conducting the research especially the lack of resources for literature review and the restriction towards meeting the interviewees personally due to safety protocols. Moreover, this research can be further developed on adaptation to the situation since the COVID19 has not either come to an end or is likely to end anytime sooner, or Contingency plans to overcome the situations as well as to get prepared for any future outbreaks.

Reference

CIDA , 2020. *Health and Safety guildines for Sri Lankan Construction Sites to be adopted during COVID19 outbreak.* [Online] Available at: https://www.cida.gov.lk/newsevents/CIDA%20COVID%20and%20DEGUE%20Guidelines%20for%20Construction%20Industry%20Version%203(Revised).pdf
[Accessed 2 01 2021].

CIDA, 2020. *Health and Safety guildlines for Sri Lankan Construction Sites to be adopted during COVID19 outbreak.* [Online] Available at: https://www.cida.gov.lk/newsevents/CIDA%20COVID%20and%20DEGUE%20Guidelines%20for%20Construction%20Industry%20Version%203(Revised).pdf
[Accessed 2 01 2021].

Florence Yean Yng Ling,Evelyn Ai Lin Teo,Kok Min Tang, 2003. Effect of severe acute respiratory syndrome on the construction industry. *Fraunhofer,* pp. 73-84.

ICTAD/CIDA, 2007. *STANDARD BIDDING DOCUMENT - Procurement of Works - Minor Contract - 03.* Second ed. Colombo: ICTAD/CIDA.

ICTAD/CIDA, 2007. *Standard bidding document (Procurement works) - 01.* second ed. Colombo: ICTAD (CIDA).

ICTAD/CIDA, 2007. *Standard Bidding document- Procurement of works (Major Contracts) - 02.* Second ed. Colombo: ICTAD/CIDA.

JAYASINGHE, C., 2020. *Sri Lanka construction industry fears 100,000 jobs losses after Covid-19 crisis, stalled payments.* [Online] Available at: https://economynext.com/sri-lanka-construction-industry-fears-100000-jobs-losses-after-covid-19-crisis-stalled-payments-71098/
[Accessed 20 10 2020].

Ji Chou, Nai-Fong Kuo, Su-Ling Peng, 2004. Potential Impacts of the SARS Outbreak on Taiwan’s Economy. *Asian economic paper,* pp. 84-99.

Ministery of Health and Indigenous Medical Services, 2020. *No. 2168/6 - WEDNESDAY, MARCH 25, 2020.* s.l., The gazette of the democratic socialist republic of Sri Lanka.

Ministry of health and indigenous medical services, 2020. *No. 2167/18 - FRIDAY, MARCH 20, 2020.* s.l., The Gazette of the Democratic Socialist Republic of Sri Lanka.

Ministry of health and Indigenous medical services, 2020. *No. 2170/8 - SATURDAY, APRIL 11, 2020.* s.l., The Gazette of the Democratic Socialist Republic of Sri Lanka.

The Democratic Socialist Republic Of Sri Lanka, 1897. Quarantine and prevention of diseases. *Quarantine and prevention of diseases ordinance*, 9 February, pp. 215-218.

The World Bank, 2020. *The Global Economic Outlook During the COVID-19 Pandemic: A Changed World.* [Online]
Available at: https://www.worldbank.org/en/news/feature/2020/06/08/the-global-economic-outlook-during-the-covid-19-pandemic-a-changed-world
[Accessed 7 January 2021].

BIONIC ARM: EMG CONTROLLED PROSTHETICS

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Abstract
Electromyography (EMG) is a method used to measure the electrical response of muscles due to the stimulations by nerves on muscles. A potential difference can be detected due to the electrical activity. Therefore EMG plays a vital role in medical field for diagnostics and research in muscle activity. The detected electrical activity can be used for different purpose after capturing, amplifying and filtering processes. One of the major uses of the detected EMG signal is, it can be used to control bionics or artificial limbs. We made an EMG sensor which is able to capture and utilize the EMG signals and then control the actuator in it according to the requirement as programmed in the microcontroller. By implementing the system of EMG sensors and prosthetics with actuator we were able to produce a lowcost prosthetic which could be affordable by all people.
Keywords : Bionics, Electromyography, Prosthetics, Amputee, Amelia

Introduction

Electroencephalography (EEG) is one of the best options to control a prosthetic as its directly working with brain waves, however the affordability of the patients to get prosthetics controlled using EEG taken in to consideration, the second option scientists and researches uses is the electromyography signals (Raj *et al.,* 2018). EMG is used to measure the electrical activity in response to nerve stimulation of the muscles in human body. This is usually used to detect the abnormalities in muscle activities. Muscle tissues produce an electrical signal when the nerves are stimulated when we contract muscles. It usually does not produce any signals if not stimulated. (Johns Hopkins Medicine, n.d.). The detected electrical signal is used in controlling the prosthetics.

Background

A prosthetic is not only a medical support device but also a emotional comfort for the person who faces the difficulty. It has been used throughout the history of mankind. With the new advances in medicine and technology in the 21st century, the user can take more control over the prosthetics (Clements, n.d.).The engineering disciplines and biological solutions together have formed a great combination in providing advanced prosthetics these days. When an amputation is done, a person's nerve endings still remain and they can be used to determine the signals transferred through the nerves and those signals can be utilized for the purpose of controlling prosthetics (Alayon, 2018).

Problem Identification and Solution

It was noticed that people with limb difficulties are struggling to get their day to day work done by themselves. They need to always rely on someone for support. Thus, a solution was required. A prosthetic usually is a passive part of the body and does not help in continuing the daily task. A functional prosthetic which can be controlled with EMG signals would be an ideal solution and it gives a level of freedom to the user in his day to day life. The designed prosthetic should be affordable by everyone as well.

Methodology

According to the system design in figure 1, an electrical energy source is used for actuation and energy is given to the measurand whereas, the measurand in the system is the human body. An EMG sensor has to be used to acquire EMG signals from the human body. The sensor is calibrated according to the user's threshold values and the signal goes through a few stages inside the EMG sensor. The signal is processed within the EMG sensor and the signal is sent to a microcontroller which is programmed to carry out a few processes according to the signal received and the microcontroller provides the signal to actuate the prosthetic.

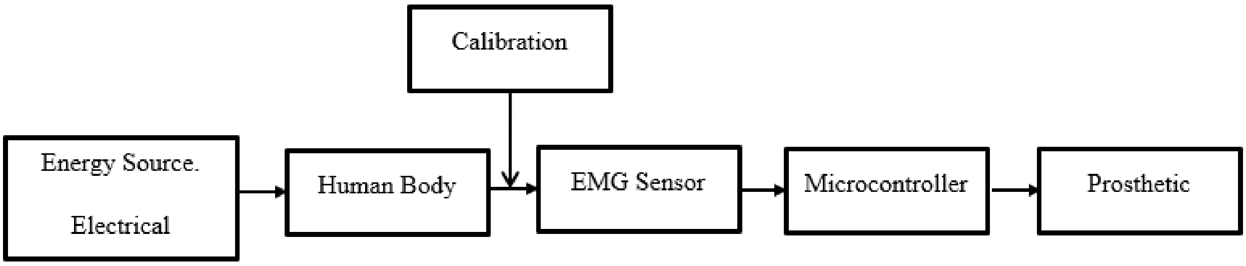

Figure 1: System design for the EMG controlled prosthetic

The major components required for the EMG controlled prosthetic are;EMG sensor, microcontroller, actuators, and prosthetic arm. There are different options are available for the sensors, which areMyoWare EMG sensor, custom build an EMG sensor and EEG sensor.
Out of them, making the EMG sensor from scratch would be the best option due to the unavailability of theready made sensors in the market and not being able to get it ordered due to the pandemic as well. The cost of the products are high during the pandemic. Thus, EEG sensors are too costly and the goal of this project is to build a low cost prosthetic which is affordable for everyone. The bionic arm was 3D printed for the purpose.

Figure 2: 3D printed bionic arm

EMG Signal Acquisiotion

1) EMG electrodes and placement: Electrodes or bio-electrodes are conductors that are used to interface between the electronic systems and the biological measurand which has to be measured. It is used to sense and measure the electrical activity within the biological structure or at times it induces impulses externally to the biological structure (Khandpur, 2020).Non-invasive surface electrodes would be the best option for prosthetics as it can be easy for the user to wear and remove.

EMG extracted from surface electrodes also known as Surface EMG can have artifacts associated with it. According to Jamal (2012) and Luca (2002),in order to get the best output signals, the EMG electrodes should be placed at ideal places on the muscle and its orientation across the muscle is vital. Placing the electrodes on the middle of the muscle is much appreciated as the muscle fiber density is highest at the middle of the muscle (Figure 3). This gives an improved superimposed EMG signals.

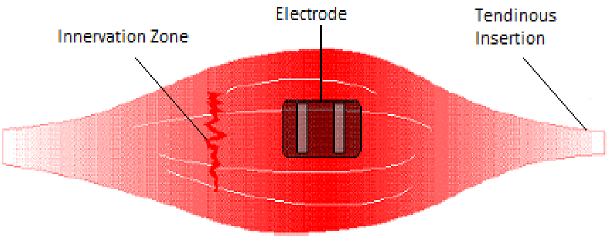

Figure 3: Ideal position for electrode placement
Source: (Jamal, 2012)

Two electrodes are placed to capture the electrical potential between the two points in the muscle and a third electrode is placed elsewhere which is used as the reference electrode. The EMG signal detected by the other two electrodes is detected with respect to the reference electrode. This reference electrode acts as a ground for the signals detected (Luca, 2002).

2) Acquisition: Bio signals are very weak and the major purpose of a bio-potential amplifier is to amplify and filter the bio-signals. It should be able to capture or extract the bio-signals from the body and amplify them. According to Luca (2002), The amplitude of EMG signal is between 1mV to 10 mV and its frequency is dominant in the range 50Hz to 150Hz .

High gain and the high input impedance are required for biomedical applications and it can be achieved using an instrumentation amplifier (Muthukrishnan, 2021). The output is ideally proportional to the difference between the two input voltages (Electrical4U, 2021).

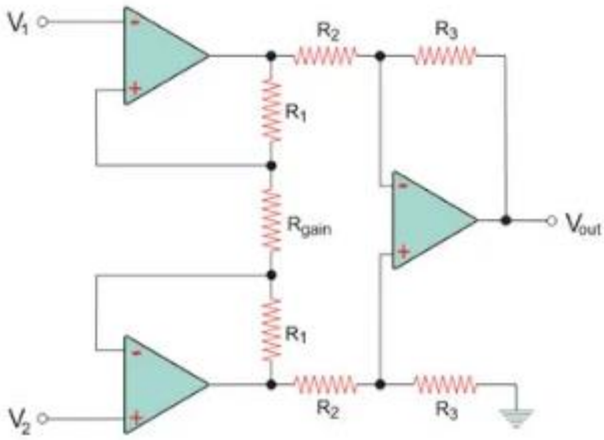

Figure 4: Classic instrumentation amplifier
Source: (Muthukrishnan, 2021)

3) Electrical design: Initially, the signal has to be acquired from the body by an instrumentation amplifier.. Instead of using the classic three Op-Amp design in figure 3 an INA 106 single IC package is used.

INA 106is a differential amplifier with a precision gain of 10. It can be used as an instrumentation amplifier. It has an accurate gain of ±0.25% (Texas Instruments, 2003). According to Muthukrishnan (2021), a bio-signal amplifier should have a common mode rejection ratio larger than 80dB; in that case the INA 106 IC has a high common mode rejection ratio of 86dB minimum (Texas Instruments, 2003).
TL072is used for the amplification, rectification and filtering stages as it uses low power for execution and has a wide common mode and differential voltage range. Its specialty is that it gains very less noise to the signals. As discussed under EMG acquisition, the Op-Amps should have high input impedance and likewise the TL072 Op-Amp has high input impedance (Texas Instruments, 2020).

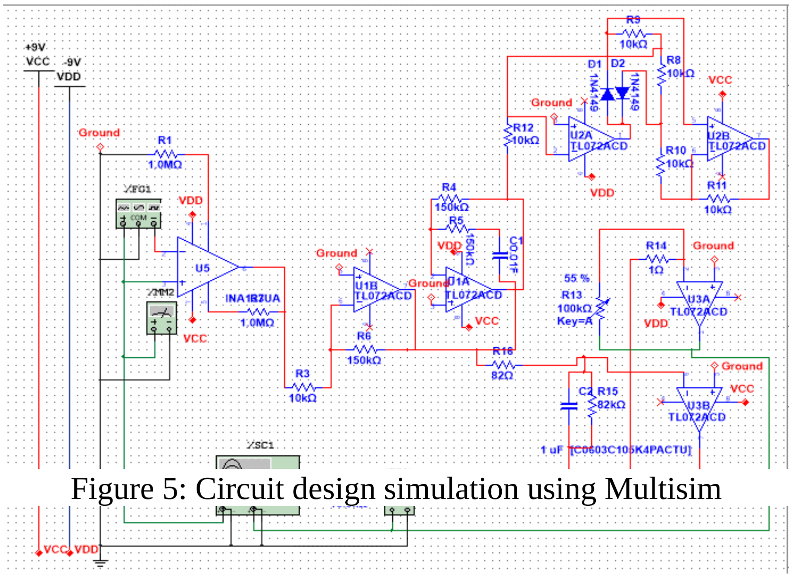

Figure 5: Circuit design simulation using Multisim

4)Microcontroller program: Once the signal is acquired and processed, the signal has to be fed into the microcontroller which is programmed to control the actuators by the signals detected through the EMG acquisition circuit as shown in figure 6.

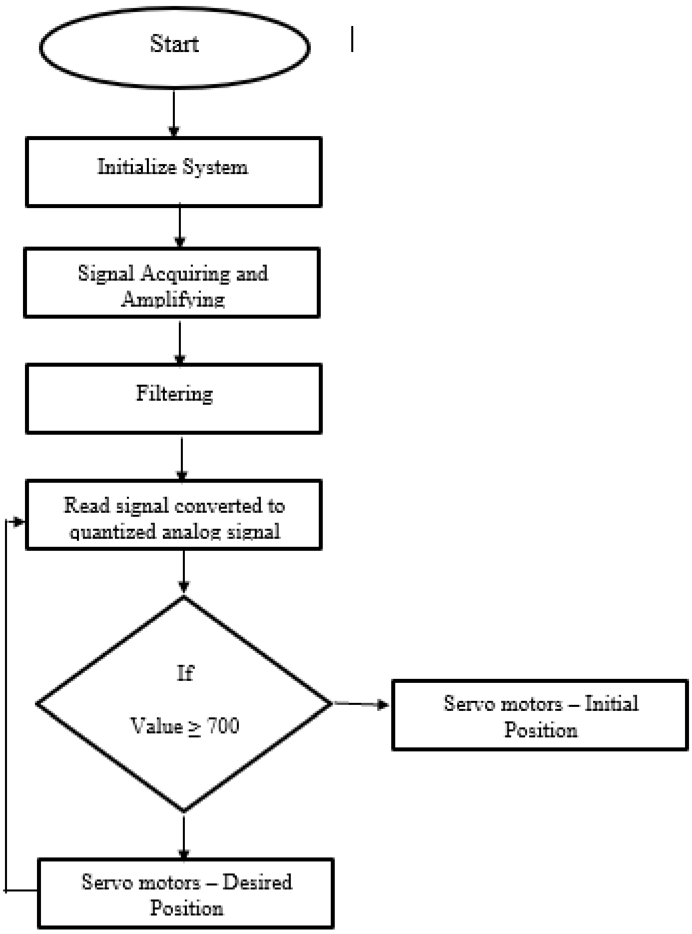

Figure 6: System Flowchart

Results and Discussions

As the first stage, simulation of the design took place using the Multisim software. Two small signals of 50 mV / 100 Hz and 150 mV / 75 Hz inputs were given to the system (Figure 7). It was noticed that the difference of the two inputs were amplified by the instrumentation amplifier (Figure 8).

When the output of the whole system was considered (Figure 9). It has a gain of 100. The input signals were in the mV and the outputs were in the V scale and it is visible that the signals have been amplified well. The output signal has been filtered and only the required frequency is given out. A variable resistor is available at the point where the signal is given out to the oscilloscope or the microcontroller. By varying the resistance, the gain can be changed as per the requirement.

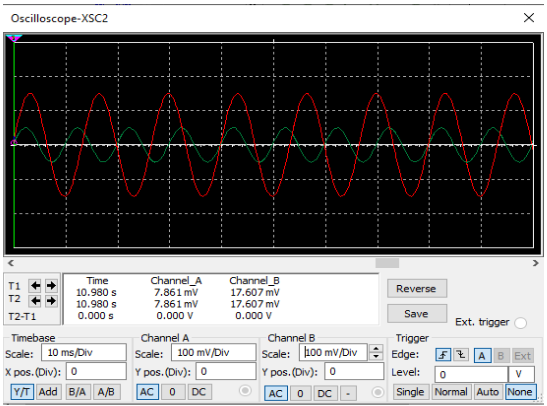

Figure 7: Input signals

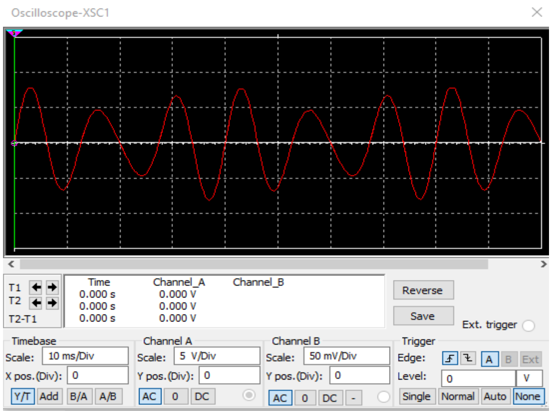

Figure 8: Output from the instrumentation amplifier

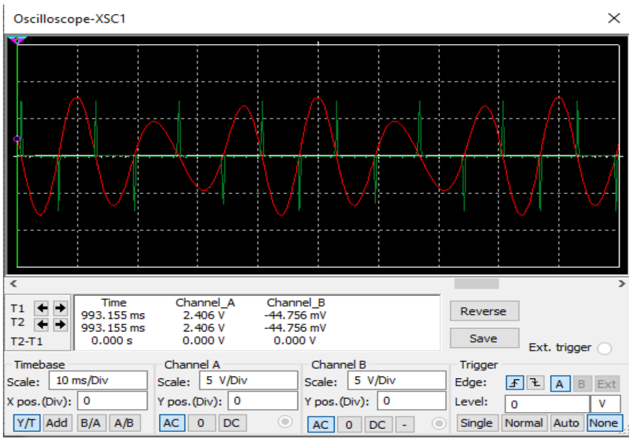

Figure 9: Initial and final signals

The EMG sensor prototype was developed after it was tested using multisim. Once the prototype was successful, the EMG sensor was developed. The captured EMG signal can be seen in figure 11. It is visible that we get a high voltage difference when the muscles are contracted and the voltage difference is low when the muscles are relaxed.

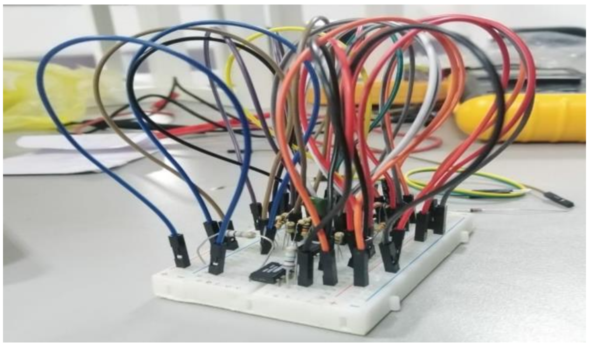

Figure 10: EMG Sensor Prototype

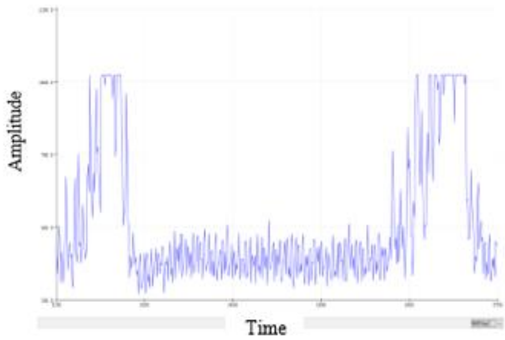

Figure 11: Captured EMG signals

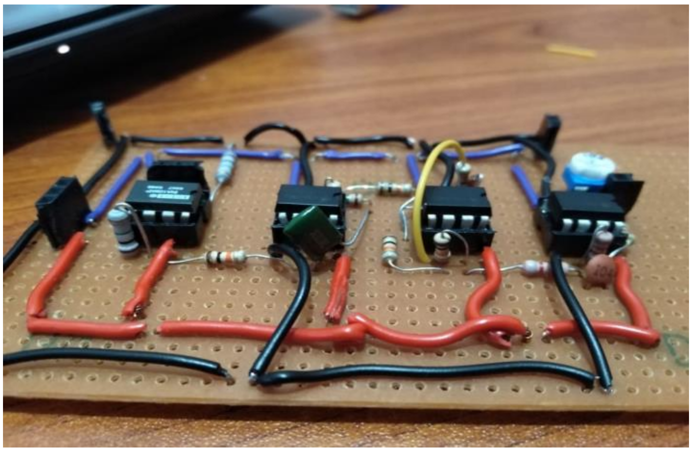

Figure 12: Developed EMG sensor

The arm was prototyped to check its design compatibility with the sg90 servo motor. Sg90 servo motors were used as it consumes less power compared with all other servo motors and also it is easily available in the market.The prosthetic was 3D printed after the compatibility test. Then the system was implemented by interfacing with the microcontroller (Arduino Uno) which was programmed to do the required task.

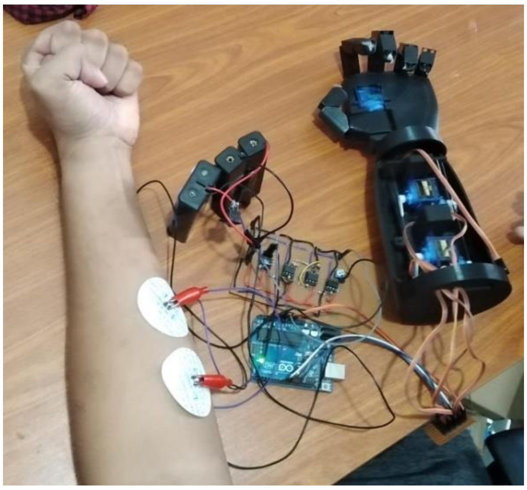

Figure 13: Implemented prosthetic system

A system of switches was introduced to the system, whereas when a certain switch is pressed and the EMG signal is detected, a specific grip is exhibited. This switch system has reduced the cost drastically.
During the testing phase an issue was encountered. When the user touches the ground barefooted the whole system gets grounded and does not work.When the system was powered with two different sources for the prosthetic and microcontroller, the subject to which the sensor and the microcontroller is connected becomes the common ground and when it comes in contact with the external ground barefooted the whole system goes haywire. This issue was resolved by powering the microcontroller and the sensor using the same battery source.

Conclusion

The advances in technologies are giving more ability to the differently-able people to overcome their barriers and face the world with new confidence. The advances have made the prosthetics to work as a part of the body rather than being a passive piece in the body. With the time, this would get more advanced as well and there can be a time where the people with bionics are stronger than the people with natural limbs. We as engineers and researches have to work to the betterment of the society and try to solve issues faced by people in the society by looking it in different perspectives and overcome issues together as a society.

Acknowledgement

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References

Alayon, D. (2018). *Future Today*. Retrieved March 24, 2021, from https://medium.com/future-today/beyond-bionics-how-the-future-of-prosthetics-is-redefining-humanity-b12b4489c381

Clements, I. P. (n.d.). *howstuffworks*. Retrieved March 24, 2021, from https://science.howstuffworks.com/prosthetic-limb2.htm

Electrical4U. (2021). *Electrical4U*. Retrieved April 08, 2021, from https://www.electrical4u.com/differential-amplifier/

Jamal, M. Z. (2012). Signal Acquisition Using Surface EMG and Circuit Design Considerations for Robotic Prosthesis. In G. R. Naik (Ed.), *Computational Intelligence in Electromyography Analysis - A Perspective on Current Applications and Future Challenges.*

Johns Hopkins Medicine. (n.d.). *Johns Hopkins Medicine*. Retrieved March 22, 2021, from https://www.hopkinsmedicine.org/health/treatment-tests-and-therapies/electromyography-emg

Khandpur, R. S. (2020). Bioelectrodes. In *Compendium of Biomedical Instrumentation* (pp. 177-182).

Luca, C. J. (2002). *Surface Electromyography: Detection and Recording.* Delsys Incorporated.

Muthukrishnan, V. (2021). *electrica4u*. Retrieved April 8, 2021, from https://www.electrical4u.com/biological-amplifiers/

Raj, R., Deb, S., & Bhattacharya, a. P. (2018). Brain Computer Interfaced Single Key Omni Directional Pointing and Command System: a Screen Poiunting Interface for Differently-abled Person. *Procedia Computer Science* (pp. 161-168). ScienceDirect.

Texas Instruments. (2003). *Texas Instruments.* Retrieved January 15, 2021, from Texas Instruments: https://www.ti.com/lit/ds/symlink/ina106.pdf

Texas Instruments. (2020). *Texas Instruments.* Retrieved January 15, 2021, from Texas Instruments:
https://www.ti.com/lit/ds/symlink/tl072.pdf?ts=1618624378038&ref_url=https%253A%252F%252Fwww.ti.com%252Fproduct%252FTL072

INVESTIGATION OF RISK AND ISSUES INHERENT IN SOCIAL HOUSING SCHEMES PROCURED THROUGH USP IN MALDIVES

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Abstract

There is an unembellished shortage in mid-range social houses compared to its demand in the Maldives. Unsolicited proposal policy has been enacted to the public finance initiatives by the Maldivian government enabling private investors to engage with social housing schemes to carter this problem. Social housing projects have been experiencing various issues since the adoption of the Unsolicited Proposal policy (USP) because the root causes of these issues are hidden. Core objective of this research is to reveal the relationship between the categorized risk and the existing issues and identify the risk factors that hinder the successful completion of social housing projects procured through USP. Inferential analysis is used to evaluate the severity of risk factors and analyze the relationship between the issues and the risk factors. As per the research data analysis, pre-construction and construction stage risk factors have the major impact against the success of social housing schemes. Six risk factors out of ten most critical risk factors that impact negatively to the success of the Social Housing schemes are related to the pre-construction and construction stage risk.

Keywords : Public-private partnerships, Risk Analysis, Risk Management, Social housing schemes, Unsolicited proposals

Introduction

The annual growth of the population in the Maldives is 2.9% (IBRD.IDA Data, 2020) and the housing necessity of the community is rising at an alarming rate with this population growth. The government face severe consequences due to the inability of providing affordable housing for this increasing population and opt to adopt unsolicited proposal policy to ensure private sector participation to develop public housing schemes (HDC, 2017). The survey done by the HDC with the collaboration of the National University of Maldives exposed the key issues in social housing schemes and rated mid-range housing projects as below standard (HDC, 2017; Maldives Partnership Forum, 2019). These issues in the mid-range housing schemes procured through USP have created economic and social distress in the Maldives. Pertaining literature relevant to this study area has not been explored the relationship between issues and the risk factors, which impact on the mid-range housing schemes. Hence, the major objectives of this research are to identify the critical risk factors that negatively influence the success of the mid-range social housing schemes procured through USP and identify the root causes for the issues in the mid-range housing sector by analyzing the relationship between the issues and the identified risk factors.

Existing literature has revealed many risk factors that are associated with Public-Private Partnership (PPP) projects, which include both solicited and unsolicited procurement routes. No researches are conducted in the Maldives context to reveal the risk factors identical to the unsolicited procurement path (Castelblanco, et al., 2020). This research has been designed to address this knowledge gap. Through extensive research on pertaining literature, the critical risk factors that influence the success of social housing schemes have been identified under three categories namely, political, and economic risk, pre-construction and construction stage risk, and life cycle stage risk. Similarly, issues in the social housing sector and risk response methods have been identified referring to the locally published literature, and conducting semi-structured interviews.

Methodology

The research process needs to be selected based on their ability to address the research purpose and to help test the hypothesis or answer the research question (Leavy, 2017). The research problem related to this study aims to analyze the impact of categorized risk factors on social and affordable housing schemes and find the critical risk factors that influence project success. Hence, analyzing the impact of the three risk categories is essential to identify the root causes of the existing issues in the housing schemes and to plan proper risk response methods based on the criticality of the risk factors. Hypotheses can be developed to evaluate the impact of the risk categories using an existing theory.

H01 – Political and economic risk factors will have no positive impact on issues related to social housing schemes procured through USP

Ha1 Political and economic risk factors will have a positive impact on issues related to social housing schemes procured through USP.

H02 - Pre-construction and construction stage risk factors will have no positive impact on issues related to social housing schemes procured through USP

Ha2 – Pre-construction and construction stage risk factors will have a positive impact on issues related to social housing schemes procured through USP

H03 – Life Cycle stage risk factors will have no positive impact on issues related to social housing schemes procured through USP

Ha3 - Life Cycle stage risk factors will have a positive impact on issues related to social housing schemes procured through USP

The above hypothetical explanations can be tested and confirmed through inferential analysis. Accordingly, an objective research approach has been adopted to establish law-like generalizations applied to the same phenomenon in different contexts. Considering this perspective that honors objectivity, the positivism research philosophy has been chosen for this specific research. The deductive approach tests the validity of theories and hypotheses (Bryman & Bell, 2015). Since this research has been designed to test the hypotheses, a deductive approach has been chosen. An inferential analysis must be chosen to fulfil the objectives of this research. Therefore, a quantitative methodology has been chosen for this research. Literature review, pilot survey, and questionnaire survey methods have been chosen as data collection techniques.

The sample frame should constitute a representative subset of the population from which the sample is drawn. This is the most critical element of the sampling procedure, and the sample frame must adequately represent the unit of analysis (Pinsonneault & Kraemer, 1993). Hence population has been identified as professionals working in government organizations who actively engage with USP projects in the Maldives. Since the population is pre-determined and known, Cluster sampling technique has been adopted under the probability sampling. The selected size of the sample is 247 professionals working under the different clusters.

Regression model has been chosen to analyze the impact of risk factors on issues. Spearman correlation was adopted to identify the relationship between the independent and dependent variables while relative important index is chosen to identify most critical risk factors.

Results and Discussions

Kolmogorov-Smirnov and Shapiro-Wilk tests have been conducted to check the normality of the collected data set.

Table 6 - Kolmogorov-Smirnov and Shapiro-Wilk tests for data normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Housing_issues	0.205	103	0.000	0.805	103	0.000
Political_Economic_risk	0.204	103	0.000	0.833	103	0.000
Pre_and_construction_risk	0.234	103	0.000	0.805	103	0.000
Life_cycle_stage_risk	0.217	103	0.000	0.774	103	0.000

a. Lilliefors Significance Correction

According to the outcome, the sig value is 0.000, which is less than 0.05. Therefore, the null hypothesis cannot be rejected, which implies the data set is deviated from normal distribution. Hence, Spearman’s correlation coefficient is utilized to identify the relationship between the variables.

Table 7 - Spearman's correlations between variables

Correlations

			Housing_issues	Political_Economic_risk	Pre_and_construction_risk	Life_cycle_stage_risk
Spearman's rho	Housing_issues	Correlation Coefficient	1.000	.715**	.792**	.645**
		Sig. (2-tailed)		0.000	0.000	0.000
		N	103	103	103	103
	Political_Economic_risk	Correlation Coefficient	.715**	1.000	.747**	.649**
		Sig. (2-tailed)	0.000		0.000	0.000
		N	103	103	103	103
	Pre_and_construction_risk	Correlation Coefficient	.792**	.747**	1.000	.630**
		Sig. (2-tailed)	0.000	0.000		0.000
		N	103	103	103	103
	Life_cycle_stage_risk	Correlation Coefficient	.645**	.649**	.630**	1.000
		Sig. (2-tailed)	0.000	0.000	0.000	
		N	103	103	103	103

**. Correlation is significant at the 0.01 level (2-tailed).

Above results revealed the correlations are significant to 1% probability and variables are strongly correlated. This positive correlation further can be demonstrated using the scatter plot diagrams.

Figure 7 - Scatter plot for Housing issues vs. Political and Economic risk

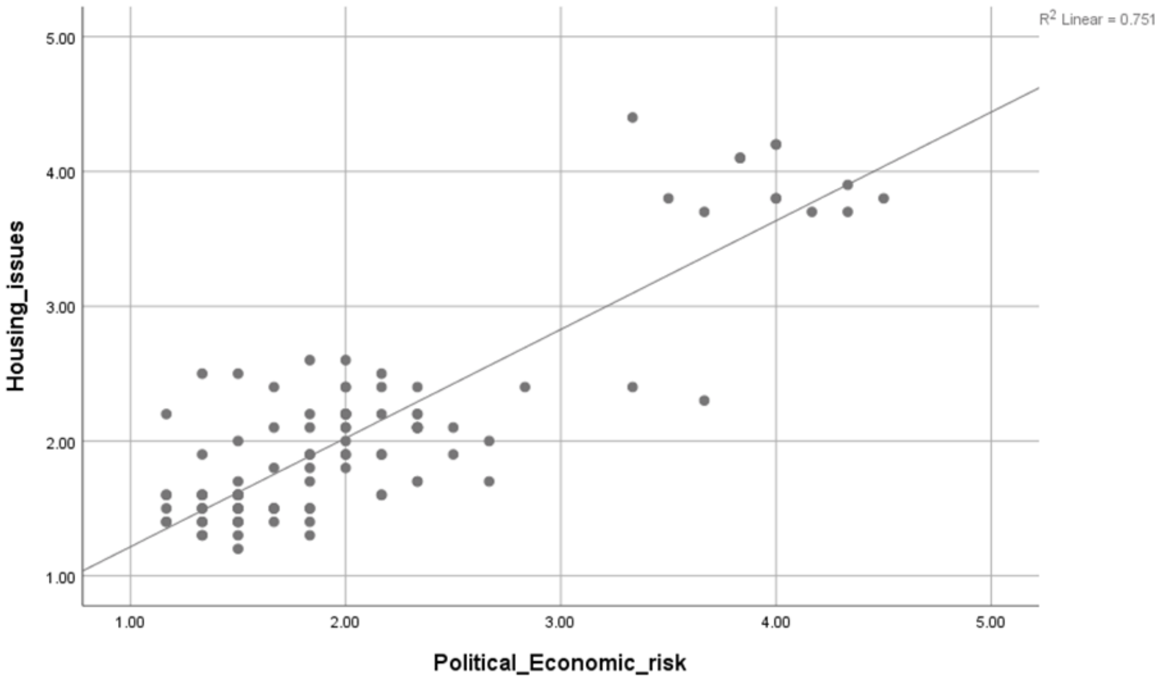


Figure 8 - Scatter plot for Housing issues vs. Preconstruction and construction stage risk

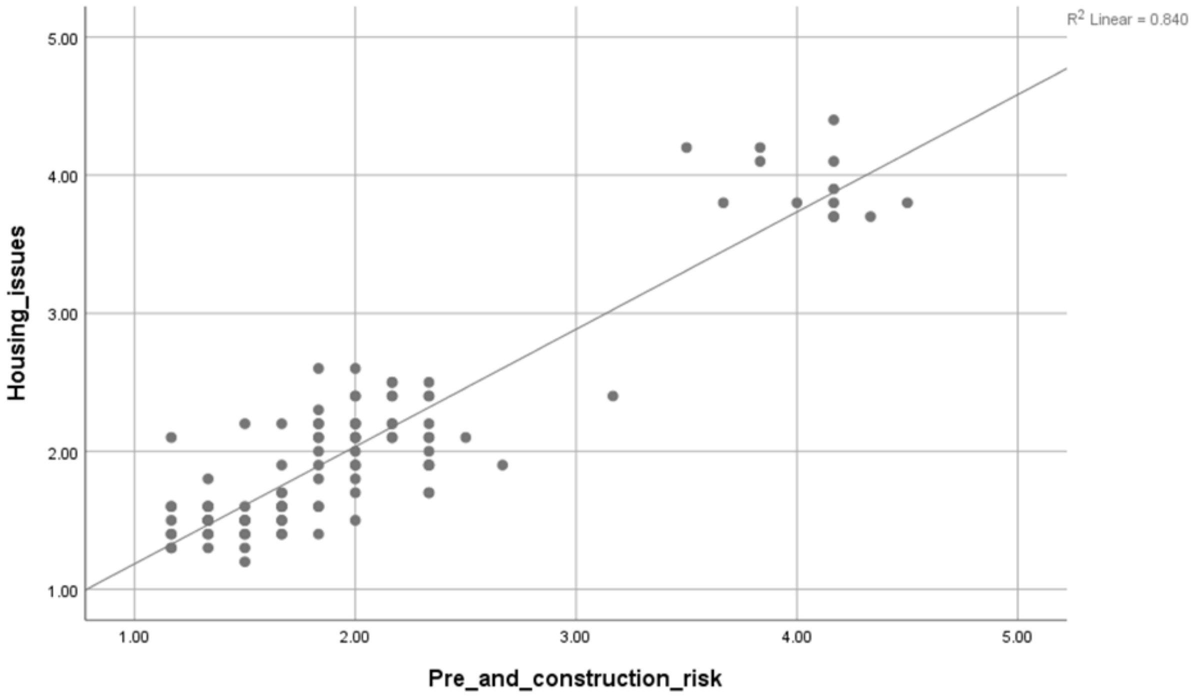
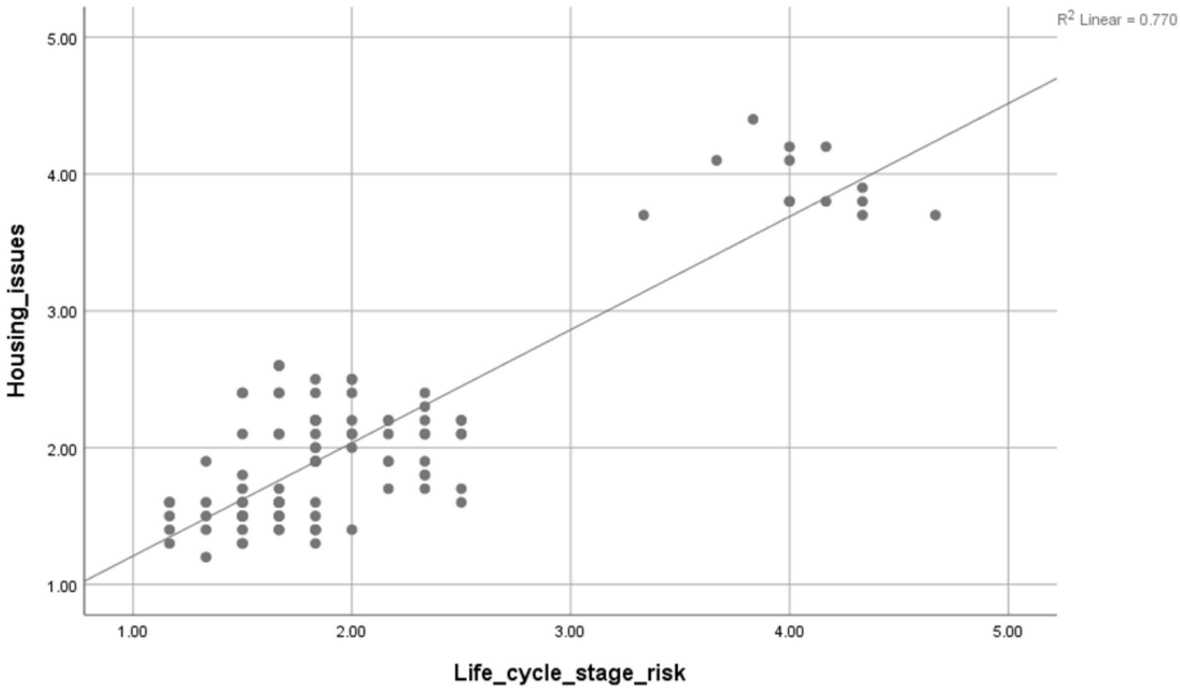


Figure 9 - Scatter plot for Housing issues vs. Life cycle stage risk



Reference to the above scatter plot diagrams, the considered dependent variable – issues in the social housing schemes has a positive correlation with all the considered independent variables. Accordingly, above diagrams revealed political and economic risk, pre and post construction stage risk, and life-cycle stage risk cause the issues relevant to the social housing scheme development projects and vice versa. Positive relationship is inevitable between afore mentioned risk categories and the existing issues in social housing projects.

Multiple regression model has utilized to analyze the impact of three major risk categories towards the issues in social housing schemes.

Table 8 - Multiple Regression - Coefficients for combined variables

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Error	Beta			Tolerance	VIF
1	(Constant)	0.221	0.080		2.758	0.007		
	Political_Economic_risk	0.162	0.077	0.174	2.108	0.038	0.195	5.125
	Pre_and_construction_risk	0.504	0.081	0.544	6.203	0.000	0.172	5.802
	Life_cycle_stage_risk	0.237	0.078	0.251	3.055	0.003	0.195	5.116

a. Dependent Variable: Housing_issues

All the Sig values of the independent variables are less than 0.05 ($p<0.05$), which indicates that all three independent variables have a positive impact on the dependent variable. According to the output coefficients given in the multiple regression table, the below equation has been derived by combining all variables to measure the final impact.

Issues in Housing schemes = 0.162(political &Economic risk) + 0.504(Pre-construction & construction stage risk) + 0.237 (Life cycle stage risk) + 0.221

In above equation, all b_1 values are positive and that indicates considered risk categories caused a positive impact on the identified issues in social housing schemes. Therefore, all the null hypotheses will be rejected, and alternative hypotheses will be accepted. Accordingly, risk categories associated with USP procurement method have a positive impact on issues related to the social housing schemes.

Based on the Relative Importance Index (RII) calculations, most critical risk factors and most suitable ten risk response methods have been identified.

Table 9 - Critical ten risk factors affect social housing schemes

Notation	**Risk factor**	**Frequency of Occurrence**	**Level of Impact**	**Rating**	**Ranking**
		R11	**R11**		
R12	Cost overruns	1.85	2.02	3.74	1.00
R8	Ground Condition	1.88	2.02	3.80	2.00
R9	Permits and approvals	1.79	2.15	3.83	3.00
R10	Price adjustments	1.91	2.02	3.86	4.00
R2	Change in laws	1.96	2.12	4.15	5.00
R11	Unavailability of labor and materials	2.08	2.00	4.16	6.00
R3	Corruption	2.01	2.07	4.16	7.00
R5	Inflation	2.11	2.10	4.42	8.00
R7	Site acquisition	2.01	2.21	4.45	9.00
R6	High Financing cost	2.13	2.17	4.62	10.00

Table 10 - Ten most suitable risk response methods

Notation	**Risk Response method**	**Relative Importance Index**	**Ranking**
		R11	
RR18	Analyze the market demand and make sure USP proposals are align with government infrastructure development plan	2.01	1.00
RR13	Update the USP proponent regarding all applicable taxes, levies, custom duties, visa fee and what can be exempted	2.07	2.00
RR19	Establish proper Dispute Adjudication and Arbitration procedures	2.13	3.00
RR8	Assign a government party to guide USP proponent through local approval and permit process	2.17	4.00
RR15	Use internationally recognized contract document such as FIDIC/JCT	2.27	5.00
RR12	Provide project detailed report	2.30	6.00
RR11	Provide clear employer requirement document	2.43	7.00
RR16	Provide proper specification for the works and establish QC and QA procedures	2.46	8.00
RR9	Identify and allocation of land for the housing projects at earliest	2.49	9.00
RR14	Follow competitive procurement process and procedures such as Swiss challenge/Bonus system	2.56	10.00

Research data analysis has revealed pre-construction and construction stage risk creates more severe impact relation to the existing issues in social housing scheme projects compared to the other risk categories. Critical risk factors that hinder the success of USP procured projects are identified and most individual risk factors fall to the category of pre-construction and construction stage risk, which highlights how important to employ proper risk management framework during all phases of the projects procured through USP route. Risk management framework has been proposed below combining the outcomes of Table 4 and Table 05.

Table 11 - Framework for critical risk management

Risk Category	**Risk Factor**	**Ranking based on the severity**	**Suitable Risk Response method**	**Ranking based on suitability**
Pre-construction & Construction stage	Cost Overrun	1.00	Provide proper specification for the works and establish QC and QA procedures	8.00
Pre-construction & Construction stage	Ground Condition	2.00	Identify and allocation of land for the housing projects at the earliest.	9.00
Pre-construction & Construction stage	Permits and approvals	3.00	Assign a government party to guide USP proponent through local approval and permit process	4.00
Pre-construction & Construction stage	Price adjustments	4.00	Update the USP proponent regarding all applicable taxes, levies, customs duties, visa fee, and what can be exempted	2.00
Political &Economic	Change in-laws	5.00	1.0 Enact Unsolicited proposal policy to the legal framework of the country 2.0 Establish a rigid framework for the USP evaluation	20.00 18.00
Pre-construction & Construction stage	Unavailability of labor and materials	6.00		
Political &Economic	Corruption	7.00	Follow competitive procurement process and procedures such as Swiss challenge/Bonus system.	10.00
Political &Economic	Inflation	8.00	Government intervention to control inflation	13.00
Pre-construction & Construction stage	Site acquisition	9.00	Identify and allocation of land for the housing projects at the	9.00

			earliest.	
Political &Economic	High Financing cost	10.00	Implement clear regulations for the assessment of financial risk and liabilities	19.00

Conclusions and Recommendations

The primary objective of this research is to identify and analyze the impact of categorical risk factors against the issues of social housing schemes procured through USP. Critical risk factors have been identified based on the frequency of occurrence and the level of impact. Outcome of the data analysis has revealed the most critical risk factors that hinder the success of social housing projects procured through USP. Most suitable risk response methods also have been identified through semi-structured interviews. Regression model analysis has proved that the pre-construction and construction stage risk factors have a stronger relationship with the existing issues in the housing schemes compared to the other major categories of risk, political and economic risk, and life-cycle stage risk. Hence, it is recommended to pay more attention to mitigate pre-construction and construction stage risk factors to minimize the issues in the social housing scheme. Accordingly, a framework has been proposed to mitigate the negative influence of risk factors and address the current issues in organized manner. By applying the mechanism proposed in the risk management framework, the Maldivian government can solve lasting issues in the social housing schemes while managing the critical risk factors associated with USP procurement method.

References –

Abdul-Aziz, A., 2001. Unraveling of BOT scheme: Malaysia's Indah water consortium. *Journal of Construction and Engineering Management,* 127(6), pp. 457-460.

Adedokun, O. et al., 2013. Evaluation of qualitative risk analysis techniques in selected large construction companies in Nigeria. *Journal of Facilities Management,* 11(2), pp. 123-135.

Akintoye, A. et al., 2003. Achieving best value in private finance initiative project procurement. *Construction Management and Economics,* 21(5), pp. 461-470.

Babatunde, S., Perera, S., Zhou, L. & Udeaja, C., 2015. Barriers to Public-Private Partnership projects in developing countries: a case of Nigeria. *Engineering Construction and Architectural Management,* 22(6), pp. 669-691.

Bajaja, D., Oluwoye, J. & Lenard, D., 1997. An Analysis of Contractor's approaches to risk identification in New South Wales, Australia. *Construction Management and Economics,* Volume 15, pp. 363-369.

Cameron, H. V. N., 2017. Unsolicited Proposals for PPP Projects in Vietnam: Lessons from Australia and the Philippines. *European Procurement & Public Private Partnership Law Review*, 12(2), pp. 132-145.

Carbone, T. & Tippett, D., 2004. Project risk management using the project risk FMEA. *Engineering Management Journal,* 16(4), pp. 28-35.

El-Karim, M. S. B., El-Nawawy, O. A. & Abdel-Alim, A. M., 2017. Identification and assessment of risk factors affecting construction projects. *HBRC Journal,* 13(2), pp. 202-216.

Fadun, O., 2013. Risk management and risk management failure: lessons for business enterprises. *International Journal of Academic research in Business and Social Science,* 3(2), pp. 225-239.

George, D. & Mallery, M., 2010. *SPSS for windows step by step: A simple guide and reference.* 10th ed. Boston: Pearson Education.

Girmscheid, G. & Busch, T., 2008. *Project risk management in der Bauwirtschaft.* Bouwerk, Berlin, s.n.

Haize, P., Wei, M. & Jian, H., 2016. The seepage risk assessment of shield tunnel on the basis of intuitionistic fuzzy entropy theory. *Electronic Journal of Geotechnical Engineering,* 21(13), pp. 4101-4119.

HDC, 2017. *A comprehensive housing market study for the Greater male region.,* Male - Maldives: Maldives National University.

Human Right Commission of Maldives, 2008. *Housing Assessment Report,* Male-Maldives: Human Right Commission Organization.

IBRD.IDA Data, 2020. *Annual GDP growth in Maldives.* [Online] Available at: https://data.worldbank.org/indicator/SP.POP.GROW?locations=MV [Accessed 16 April 2021].

Jimoh, R., Sani, M., Adoza, A. & Yahaya, I., 2016. Managing pre construction and construction risks on project sites in Abuja-Nigeria. *Civil Engineering Dimension,* 18(1), pp. 1-7.

Ke, Y., Wang, S., Chan, A. & Cheung, E., 2009. Research trend of Public-Private Partnership in construction journals. *Journal of Construction Engineering and Management,* 135(10), pp. 1076-1086.

Ke, Y., Wang, S., Chan, A. & Cheung, E., 2011. Understanding the risks in China's PPP Projects: ranking their probability and consequence. *Engineering construction and Architectural management*, 18(5), pp. 481-496.

Leedy, P. D. & Ormrod, J. E., 2015. *Practical Research: Planning and Design: Global edition.* 11th ed. s.l.:Pearson Education Limited.

Maldives Partnership Forum, 2019. *Providing inclusive, affordable and adequate housing,* Male - Maldives: Ministry of National Planning, Housing and Infrastructure.

MED, 2017. *Proposal submission and compliance check,* Male - Maldives: Ministry of Economic Development.

Mok, K., Shen, G. & Yang, J., 2015. Stakeholder Management studies in Mega Construction Projects: A review and future directions. *International Journal of Project Management,* 33(3), pp. 444-547.

Osei-Kyei, R. & Chan, A. P., 2017. Implementation constraints in PPP: Empirical comparison between developing and developed economies/countries. *Journal of Facilities Management*, 15(1), pp. 90-106.

Osei-Kyei, R., Dansoh, A. & Ofori-Kuragu, J., 2014. Reasons for adopting Public Private Partnerships (PPP) for construction projects in Ghana. *International Journal of Construction Management,* 14(4), pp. 227-238.

Pinsonneault, A. & Kraemer, K. L., 1993. Survey research methodology in management information systems: An assessment. *Journal of Management information systems,* 10(2), pp. 75-105.

PMBOK Guide, 2017. Project Risk Management. In: *A Guide to the Project Management Body of Knowledge.* New Town Square - Pennsylvania: Project Management Institute, pp. 395-458.

PPIAF, 2014. *Unsolicited proposals - An exemption to public initiation of infrastructure PPP's,* Washington DC: World Bank Group.

Project Management Institute, 2013. *A Guide to the Project Management Body of Knowledge (PMBOK Guide).* Newton Square PA: Project Management Institute.

Roumboutsos, A. & Anagnostopoulos, K., 2008. Public-Private partnership projects in Greece: risk ranking and preffered risk allocation. *Construction Management and Economy,* 26(7), pp. 751-763.

Shrestha, et al., 2017. Risks in PPP water projects in China: Perspective of local governments. *Journal of Construction Engineering and Management*, Volume 143.

Sounders, M. N., Thornhill, A. & Lewis, P., 2019. In: *Research Methods for Business Students.* Harlow - United Kingdom: Pearson Education Limited, pp. 172-221.

The President's Office, 2019. *Government announces Unsolicited Proposals Policy to promote private sector participation in development.* [Online] Available at: https://presidency.gov.mv/Press/Article/20492 [Accessed 8 March 2021].

Thomas, A., Kalidindi, S. & Ananthanaraynan, K., 2003. Risk perception analysis of BOT road projects participants in India. *Construction Management and Economics*, 21(4), pp. 393-407.

World Bank, 2017. *Review of Experiences with Unsolicited Proposals in Infrastructure Projects,* Washington DC: World Bank Publications.

Yuan, J. et al., 2018. Social risk factors of Transportation PPP projects in China: A sustainable development perspective. *International Journal of environmental research and public health*, 15(7), p. 1323.

Yun, S., Jung, W., Han, S. & Park, H., 2015. Critical Organizational success factors for public private partnership projects - a comparison of solicited and unsolicited proposals. *Journal of Civil Engineering and Management*, 21(2), pp. 131-143.

Zhao, X. & Singhaputtangkul, N., 2016. Effects of firm characteristics on enterprise risk manage-ment: case study of Chinese construction firms operating in Singapore. *Journal of Management and Engineering,* 32(4).

Zou, P., Zhang, G. & Wang, J., 2007. Understanding the key risks in construction projects in China. *International Journal of Project Management,* 25(6), pp. 601-614.

A STUDY OF VIABILITY IN E-TENDERING AS A PHASE OF GREEN PROCUREMENT FOR CONSTRUCTION INDUSTRY IN SRI LANKA

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Abstract
A disgraceful pessimism to the environment had been fabricated by the construction industry. Hence, the implementation of green procurement initiated appending a phase of Electronic Tendering (E-Tendering). The study was conducted to investigate the viability of e-tendering as a phase of green procurement for the Sri Lankan construction industry. Concurrently, both quantitative and qualitative approaches accumulated data. A questionnaire survey, a semi-structured interview, together with a comprehensive analysis of the existing literature had been carried out. Subsequently, the worldwide current practice level of e-tendering had been investigated through the literature survey while the capability and the incapability of implementing e-tendering in Sri Lanka had been studied through the questionnaire survey and the semi-structured interview. In the conclusion, it had been investigated that, e-tendering as a phase of green procurement is viable to the Sri Lankan construction industry though an insignificant level of practice in e-tendering could be conceived within the industry.
Keywords: E-Tendering, Green Procurement, Sustainability, Construction Industry, Sri Lanka

Introduction

Unquestionably, amidst each phase of a project; the pre-contractual phase, the contract administration phase, and the post-contractual phase, Green Procurement can be conducted. Electronic Tendering (E-Tendering) is dominant in the contractual phase under Green Procurement and, "*can be defined as the issue and receipt of tender documentation through electronic means which facilitates the procurement of construction work and the award of contracts*" (Geoff Tindsley, Paul Stephenson, 2008) Countless working hours are wasted and the inaccuracy of the calculations could be seen during traditional tendering. Importantly, effective communication is obtained and premature meetings are conducted while increasing accountability of the whole process of tendering through a transparent policy within the process. The cost of tender issuing, as well as evaluation, is saved while the wastage of time is minimized through E-Tendering. (Ezanee Mohamed Elias, Norlila Mahidin, Norshuhada Shiratuddin, 2003) The repeated and the renewed tenders can be handled effectively as the previous tenders are already in the system while the missing of tenders due to distance are avoided by anywhere any time tender procedure. (Piyadasun Amarapathy*, Himal Suranga Jayasena and K. A. T. O. Ranadewa , 2013) (A.Girish Nandan1, C.Nagarjuna2 , 2017 June) But, the acknowledgment and the use of e-tendering in a virtual platform had been indecisive among the stakeholders of the Sri Lankan construction industry in the absence of any essence in divergent platforms.

Aims and objectives

The declared objectives were identified to realize to investigate the viability of E-Tendering as a phase of Green Procurement for the Construction Industry in Sri Lanka.

1. To study the current practices in E-Tendering globally.
2. To discover the Current practice level of E- Tendering in Sri Lanka.
3. To find the capabilities and in-capabilities of practicing E-Tendering in the Sri Lankan Construction Industry.

Methodology

The data was collected through a mixed data collecting method where both quantitative and qualitative techniques were involved. Secondary data was accumulated through existing research articles, related books, and the latest news publications to investigate the global practice level of E-Tendering. Subsequently, primary data was collected through a questionnaire survey and a semi-structured interview. A questionnaire was distributed among 40 to 50 Quantity Surveyors and Project Managers who forthwith the construction industry within Central and Uva Provinces consisted of ten multiple-choice questions. One matrix question was used to investigate the contemporary attitude of the use of E-Tendering in the Sri Lankan construction industry. The capability and incapability of initiating E-Tendering were addressed through some closed-end questions. Three open-ended questions were drafted to conclude the questionnaire. Meanwhile, a semi-structured interview with 06 public and private expertise of the construction industry was arranged to discover the viability of e-tendering in construction over their intention.

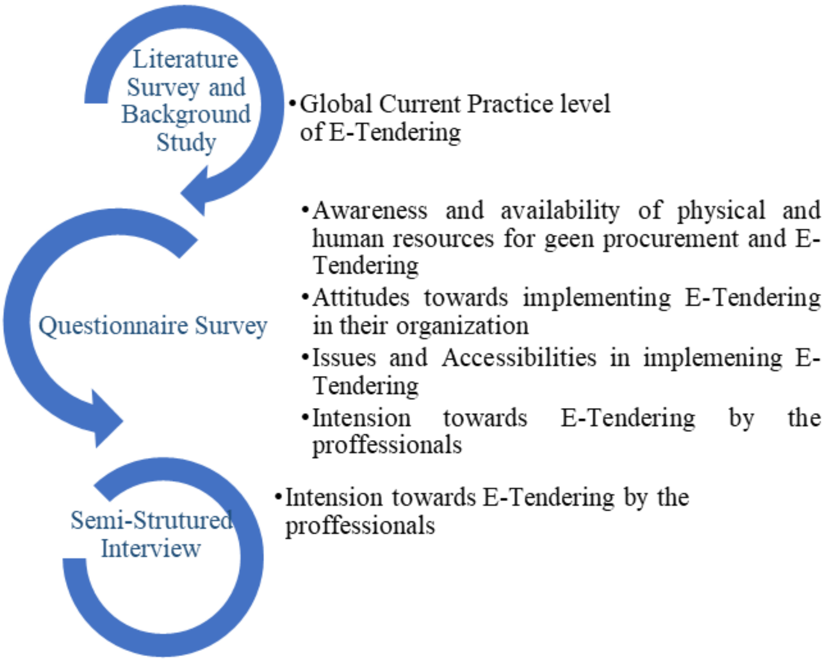

Figure 01 Research Methodology

Data Analysis

Data which was collected through a mixed-method; literature survey, responses to the questionnaire survey, and transcripts of semi-structured interviews had been analyzed. Across the study, the viability of implementing E-Tendering in Sri Lanka was investigated. Moreover, similar research was conducted in India and through this, the barriers and benefits of implementing E-Tendering in an Asian Country could be clarified. It had been indicated Quantity Surveyor was the main significant person in this process and therefore, the questionnaire and the semi-structured interview were made to answer by the Quantity Surveyors and Project Managers. Furthermore, most of the literature had been thoroughly discussed the adaptation to the technology.

The final data analysis was done by Google data analysis and SPSS (Statistical Package for the Social Sciences) Statistics. Among 41 respondents, 65.9% were Quantity Surveyors and 34.1% were Project Managers.

Table 01 – Analysis of responders

Years of Experience	**Number of Quantity Surveyors**	**Number of Project Managers**
0 – 5	18	6
5 – 10	7	3
10 – 15	3	4
Over 15	1	-

Awareness and availability of physical and human resources for green procurement and e-tendering

Based on the study, the majority of the professionals had been aware and never used Green Procurement or E-Tendering in Sri Lankan Construction Industry.

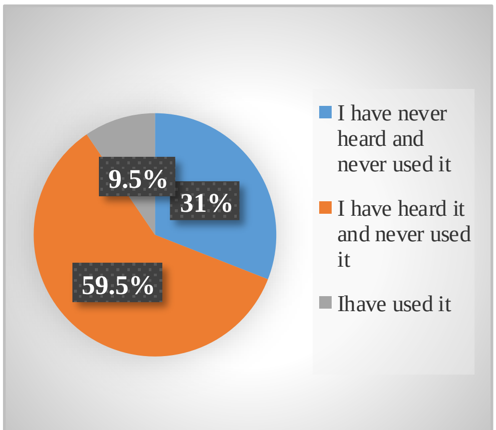

Figure 02 Green Procurement Awareness

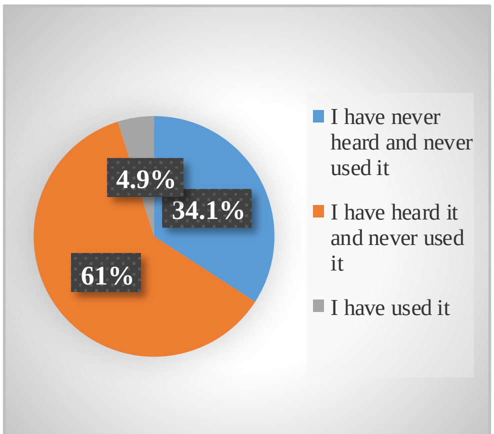

Figure 03 E-Tendering Awareness

Additionally, 75.6% of the professionals had been indicated that they were available with facilities to implement E-Tendering while 65.9% of professionals had been mentioned that they had consisted with enough resource persons in their organizations.

Attitudes towards implementing e-tendering in their organizations

A Linear Scale was drawn on to quantify the attitudes towards implementing E-Tendering in their organizations. The majority of the professionals had been indicated as 7 and were given a positive attitude towards implementing E-Tendering in their Organization. The mean value was 7.26 and the median value was 7.00 which had been skewed the graph towards a favourable direction.

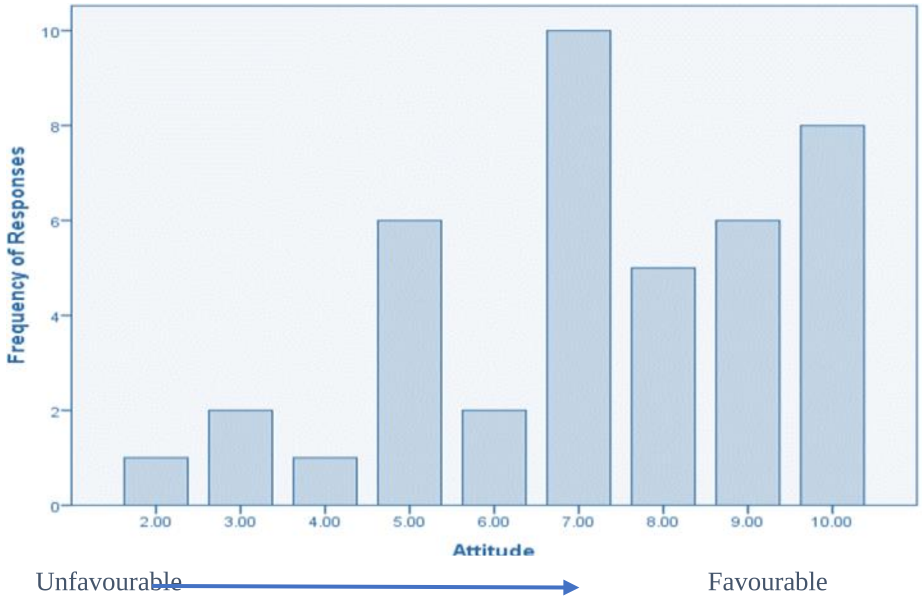

Figure 04 – Analysis of the results in Attitudes towards implementing E-Tendering

Table 02 - Attitudes towards implementing E-Tendering

N	**Valid**	**41**
	Missing	**0**
Mean		7.2683
Median		7.0000
Mode		7.00
Std. Deviation		2.17973
Variance		4.751
Skewness		-.545
Std. Error of Skewness		.369
Range		8.00
Minimum		2.00
Maximum		10.00
Sum		298.00

Table 03 –Analysis of the results in Attitudes towards implementing E-Tendering

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2.00	1	2.4	2.4	2.4
	3.00	2	4.9	4.9	7.3
	4.00	1	2.4	2.4	9.8
	5.00	6	14.6	14.6	24.4
	6.00	2	4.9	4.9	29.3
	7.00	10	24.4	24.4	53.7
	8.00	5	12.2	12.2	65.9
	9.00	6	14.6	14.6	80.5
	10.00	8	19.5	19.5	100.0
	Total	41	100.0	100.0	

Issues and the accessibilities in implementing e-tendering

The next three questions were open-ended questions organized to identify the issues and the accessibilities in implementing E-Tendering in the Construction Industry.

Capabilities

- Internet
- Computers
- Technology tools availability
- E-banking facility
- Online meeting platform facilities
- Computerized database
- Email facilities
- Availability of physical and human resources
- Increase in electronic communication
- Fast network connection
- People with Information Technology knowledge
- Reliable network
- Good attitude to bear new technology
- Administration staff with ICT qualification

Incapabilities

- Security concerns such as cyber-attacks could ruin the hard-earned works
- In Sri Lankan context people hardly use Internet hence using E-Tendering would be a little bit tricky to adopt
- New to introduce to the group
- Software and its versions are not popular among the industry
- Lack of resources and Lack of knowledge
- Sometimes server not responding errors may occur.
- No training to the employers for ICT related works
- No one introduces the concept though there are enough facilities
- The cost of e tendering process is high
- Less awareness about the process
- The process is not active
- Not familiar to every party
- Training is not provided by the professionals
- No resources and no one has the attitude to move towards technology
- Not having enough human resources to implement e tendering
- High Cost in implementing
- Very slow internet connection

Figure 05 –Capabilities and incapabilities of implementing E-Tendering

Intension towards e-tendering by the professionals

The final question was provided to obtain their opinion towards E-Tendering in the Construction Industry. Most of the responders had been indicated it as a good initiative as it could even lead to a speedy and accurate process. It had been indicated that using 0% papers could increase the efficiency and it is a requirement of an organization. Accuracy would be increased through this and indicated as a good initiative for sustainability, cost-effectiveness, time effectiveness, and the increase of profitability with new technological knowledge while minimizing the use of manpower. The insufficient inclination of government institutions towards E-Tendering though private institutions were ready to implement E-Tendering in the Construction Industry was pointed out. Moreover, the suggestion of sharing knowledge and improving attitudes towards technology through communication platforms had been initiated by the professionals.

During the semi-structured interview, it had been investigated that everyone was using manual tendering as a phase in procurement and they had not implemented E-Tendering or Green Procurement within their organizations. Some were having the experience E-Tendering during abroad working and in higher studies. But in Sri Lanka, they had been experienced online procurement notices and an online bid opening event during the pandemic situation recently. It was clear that the organizations were equipped with enough resources to implement and the inspiration and awareness about government-imposed policies are the missing tools to implement E-Tendering in the Sri Lankan construction industry.

Discussion

According to the investigation, currently, in Sri Lanka, enough resources are available and it seemed a hesitation in the implementation of the process though already policies had been implemented for green procurement in Sri Lanka. Other than this, the awareness about e-tendering as a sustainable measure was very low among the construction community. Though there is an availability of resources, technology, and policies, the reason for the drawback of implementing e-tendering and green procurement remains to be a complication and future researchers are encouraged to investigate this matter of contention. A reliable e-tendering system considering the capability and incapability of the clients is another prerequisite to achieving the goal of green constructions through the path of sustainability with the implication of improved technology in the 21st century.

Conclusion and Recommendation

This research was an exercise to study and investigate the viability of E-Tendering in the Construction Industry of Sri Lanka. Taking advantage of Information and Communication Technology throughout the project life cycle, globally, techniques were being used and relevant policies had been implemented by several governments for E-Tendering. The majority were European Countries and Middle East Countries. It could be seen that Asian Countries as well tend to implement green measures in the Construction Industry through reliable frameworks. The governmental institutions which are responsible for issuing tenders for construction works had been only published procurement notices on websites and they had gone extend up to the level of online bid opening. Moreover, some institutions are being considered the implementing cost as a risk that cannot be overcome with the profit. Lack of awareness could be seen through this and also it had been mentioned as the issues in implementing e-tendering in Sri Lanka. Most importantly, it was investigated the majority of the population who participated in the data collection had positive attitudes towards implementing e-tendering as a phase in green procurement and their requirement is the inspiration to set foot in the process with the available resources.

To sum up that had been indicated so far, e-tendering as a phase of green procurement is viable to the Sri Lankan construction industry withstanding with the identified global level practice, competence, and incompetence. Government is the main authorized body to implement e-tendering for a sustainable Sri Lanka. Nevertheless, the study may work as an ambition to a new world from conception.

References

A.Girish Nandan1, C.Nagarjuna2 , 2017. Suitability of E-Tendering Process in Indian Construction Sector. *International Journal of Innovative Research in Science, Engineering and Technology,* VI(6), pp. 11847-11854.

Anon., 2020. *Next Generation Procurement.* [Online] Available at: http://www.nextenders.co.uk/etendering-and-sub-tendering-in-the-construction-industry/
[Accessed 10 March 2021].

Antonio Davila, Mahendra Gupta, Richard J. Palmer, 2002. *Moving Procurement Systems to the Internet: The Adoption and Use of E-Procurement Technology Models.* s.l., s.n., pp. 1-35.

AYOTI, B. N., 2012. *FACTORS INFLUENCING EFFECTIVENESS IN TENDERING PROCESS IN.* s.l., School of Continuing and Distance Education , University of Nairobi .

Elena Vitkauskaite & Rimantas Gatautis, 2008. E-procurement perspectives in construction sector. *Journal of Civil Engineering and Management,* XIV(4), p. 287–294.

Ezanee Mohamed Elias, Norlila Mahidin, Norshuhada Shiratuddin, September 2003. *E-Tendering System for Consitruction Projects.* Sintok, Kedah Malaysia, Universiti Utara Malaysia 060 10 Sintok, Kedah Malaysia.

Geoff Tindsley, Paul Stephenson, 2008. E-Tendering Process Within Construction: A UK Perspective. *TSINGHUA SCIENCE AND TECHNOLOGY* , 13(S1), pp. 273-278.

Joe Martin, Steve Pittard, Peter Sell , 2010. *e-tendering RICS guidance note.* 2nd ed. Coventry CV4 8JE : Royal Institution of Chartered Surveyors .

Kajewski, D. S., 2001. *Electronic Tendering: An Industry Perspective* , s.l.: s.n.

Piyadasun Amarapathy*, Himal Suranga Jayasena and K. A. T. O. Ranadewa , 2013. *The Second World Construction Symposium,* pp. 218-225.

Raufdeen Rameezdeen, Sadhana De Silva , 2002. Trends in Construction Procurement Systems in Sri Lanka. II(02), p. 2.

Rehana Mohammed, Sabrina Esufally, 2017. Enabling Business through Efficient Systems. *E-Government Procurement,* pp. 2-29.

Robert Eadie, Srinath Perera, George Heaney, Jim Carlisle, 2007. *DRIVERS AND BARRIERS TO PUBLIC SECTOR E-PROCUREMENT WITHIN NORTHERN IRELAND'S CONSTRUCTION INDUSTRY.* s.l., University of Ulster Jordanstown Northern Ireland .

"Cardio Therm Oxy Meter (C-TOM)"
DOMICILIARY MULTI-PARAMETER MONITOR FOR PATIENTS WITH DIABETES AND OTHER NON-TRANSMITTED DISEASES

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Abstract
Domiciliary medical devices are important these days to maintain a healthy life and to reach treatment goals faster. As diabetes and non-transmitted diseases are secretly growing, it is significantly important to check conditions of those patients regularly. As glucometers are highly available in the market in cost effective prices, diabetes patients tend to check only the blood glucose level. However, this project focuses on the other vital parameters to check in patients as well as for everyone to maintain a healthy life. This design is based on IoT (Internet of Things) technology. The outcome of the project consists of mainly three parameter readings. The results were analyzed using data of five participants on six different days.
Key words: Heart Rate, Multi-parameter, NodeMCU, SpO_2, Temperature.

Introduction
Diabetes mellitus, generally known as diabetes, is a group of metabolic disorders. The main goal of diabetes management is to restore carbohydrate metabolism to a normal state. Diabetes level of the patient can be checked easily by using a simple device called "Glucometer". However, other diabetes related parameters that indirectly affect the body, such as blood pressure, heart rate, blood oxygen level (SpO_2) and temperature are also important to measure frequently, because diabetes can cause rapid complications faster than we think. Self-testing the diabetes level and other diabetes related parameters can be important in managing diabetes as well as preventing complications that may lead to serious losses to the life.

Background
According to the World Health Organization (WHO), about 42 million people worldwide have diabetes (WHO, 2006). According to the recent statistics by the International Diabetes Federation (IDF), the prevalence of diabetes among adults in Sri Lanka is 8.5%. At present, one in 12 adults in the country suffers from diabetes (Bandara, 2016).
If someone suffer with diabetes, self-testing the blood sugar level, blood pressure, SpO_2 and temperature can be important in managing diabetes and in preventing complications. Now it is important to track the progress in reaching their overall treatment goals under doctor/ consultant's recommendations.

Blood glucose level/ blood sugar level of a patient is the most important parameter in diabetes management. According to Mayo Clinic Web site, "With both 1 & 2 types of diabetes, glucose cannot be used for energy, and it builds up in your bloodstream, causing

potentially serious health complications" (Anon., 2020).
As the patients with diabetes have higher glucose concentrations in their blood system and insufficient blood oxygen, it can cause for poor blood circulation. Lin Ong-Hui stated that, "Poor blood circulation raises the likelihood of peripheral nerves experiencing pathological changes, such as peripheral arteriosclerosis, and consequent foot ulcerations" (Lin, 2013). Furthermore, he explained that, **patient blood oxygen saturation (SpO_2) levels** serve as an early warning of foot ulcerations in patients with diabetes. Low oxygen levels can be an early warning sign that medical care is required. **Heart rate** is a simple and accessible clinical cardiovascular parameter. According to Healio.com website, "Larger increases in resting heart rate can lead to greater risk for developing type 2 diabetes". The risk for type 2 diabetes development was positively associated with a change in resting heart rate (RR = 1.03; 95% CI, 1.03-1.04)" (Anon., 2019). According to the Phil Neuffer's research, relatively **high resting heart rate** is often found together with increased **blood pressure**. There are some projects in measuring heart rate and SpO_2 with MAX30102 and Arduino. Heart rate monitoring system project was published in the JETIR found useful for this project. Fingertip sensors, microcontroller and other auxiliary components were used in that project. A project, that monitored blood pressure integrated with wireless technology also found useful. It used multiple blood sensors and a single computer. According to that project, "It divided into two major parts, which are the BP sensor and network topology for remote monitoring. A simple test on wireless part gives confidence that the Design and Implementation of Blood Pressure Monitoring System project is feasible to be done" (Muhammad, 2013). Based on research in WebMed. LLC official site, diabetes damages arteries and makes them targets for hardening (atherosclerosis) and it causes difficulties in regulating the **body temperature**, which may lead in to medical emergencies such as heat exhaustion and heat stroke. Bikman (2020) in Metabolic Health (Levels) describes how glucose level affects our body temperature, and how glucose spikes can lead to elevated temperature. For body temperature measurement, several techniques in both contaminated and contact-less method are available. Gupta (2017) in circuit digest, have implemented an Arduino based digital thermometer using MAX30205 human body temperature sensor. A design of a contactless body temperature measuring system, using Arduino by I.J.E.E.C.S. (2020) was also helpful in the research.

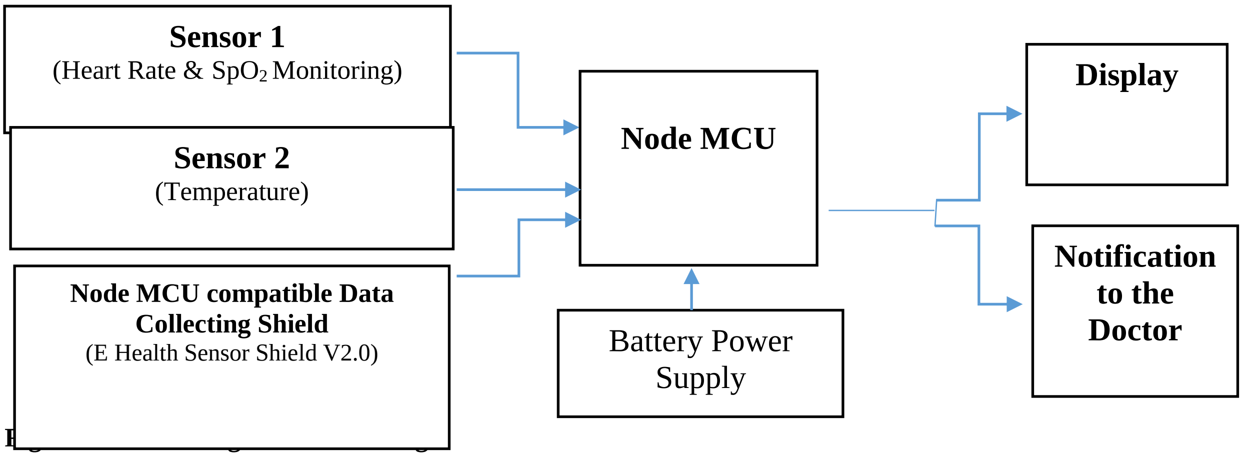
According to a research article by Thomson et al. (2013), "Increased life expectancy and the accompanying prevalence of chronic conditions have led to the focus and delivery of health care migrating from the hospital and into people's homes". Then a multi-parameter monitoring device, that can be used within home environment found important. Measuring heart rate, SpO_2, blood pressure typically done only prior to a consultation session or clinic between 3-6 months. With this pandemic situation, people avoid going outside, especially the hospitals and channeled consultation centers because those are high-risk areas. Then medical appointments can be missed. As diabetes is not a painful disease at the beginning, people do not focus on periodical consultations and on the seriousness of this disease. Due to the less awareness of the importance of time-to-time measurements of these parameters, serious damages to the body organs can occur unexpectedly.

As the development board of the project, Node MCU (ESP8266) have being selected as, it is a low-cost open source IoT (Internet of Things) platform. Its' operating voltage is considerably law. This service provider is similar to Arduino yet advanced. NodeMCU have different libraries along with Wi-Fi SoC. rather than using Arduino. Some designs have found in both wired and wireless multi-parameter patient monitoring systems.

For example, (Martinho_et.al, 2013) published an article on a multi-parameter monitoring device that can be remotely operated. A development project by Azizulkarim_et.al (2017) consisted of devices that measure, display and record human vital signs, including body temperature, heart rate, blood pressure and other health-related criteria. Harry (2020) designed a project of a vital signs patient monitoring system using Raspberry Pie. It included ECG, Pulse rate and temperature. A multi-parameter monitoring device designed by Alexsis_et.al (2014) had found as a wireless patient monitoring system that could allow patients to be mobile in their environment.

Methodology

After extensive studies on literature, following block diagram of the design have been selected as the best solution (Figure 1).



Along with the cost effectiveness and easy data transmission access, the design is easily accessible. Use of a single sensor (sensor 1) to represent multiple parameters was a good investment on this project. Sensor shield converts data from separate devices to make them compatible to the Node MCU.

Design & Implementation

The six steps of engineering design process have been adapted to this project (Chicago-Architecture-Center, 2019).

This design was implemented using NodeMCU, MAX 30100 (HR and SpO2 Sensor), MLX 90614 (GY 906-IR) non-contactable temperature sensor, Arduino IDE, push bullet application and plushing box open-source software.

Even though E-Health sensor shield is the best option for the device, it could not be used due to the worldwide pandemic situation. Also due to the low precision of the proposed temperature sensor (LM35), it was replaced with MLX 90614 (GY-906 IR) sensor, which is a non-contactable, IR based temperature sensor with high precision.

Readings from external devices (Blood pressure monitor and glucometer) were unable to add without the E-Health Sensor shield. The basic plan proceeded with above-mentioned changes.

Implementation

As the first step in implementation, codes were compiled and checked before connecting the components as a security step. Then components were connected into the breadboard to check the code with the component arrangement.
First simulation work was based only on heart rate monitoring and SpO2 monitoring (Figure 2). Temperature monitoring have done separately (Figure 3).

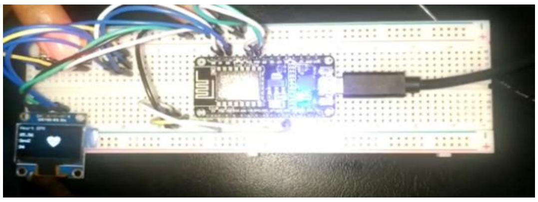


Figure 2: Heart Rate and SpO_2 Monitoring

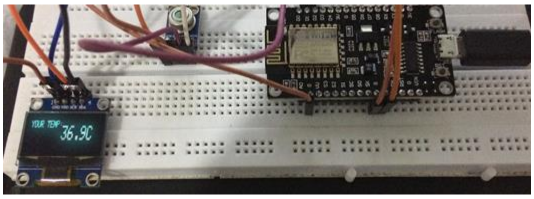


Figure 3: Temperature Monitoring

Compilation of the code to monitor three parameters have done after soldering the verified circuit. Additionally, a housing for the circuit was designed.

Figure 4: User-friendly Hardware Interface of the Design

The effort to get the notification as an email was tried using "PlushingBox online operating system".

Results and Discussions

As mentioned under implementation, all the parameters were tested. Normally, a healthy person's resting heart rate should be 60–100 beats per minute. In the testing step of the project, the resulted heart rate was 79.54 and it is approximately 80 BPM (Beats per Minute). A normal level of oxygen (SpO_2) of a person is usually 95 % or higher. In the testing step, SpO_2 was 94 %. The average normal body temperature of a human is 37°C. According to studies, the "normal" body temperature can have a wide range, from 36.1°C to 37.2 °C. In the project's testing step, the body temperature measured using an Infrared (IR) sensor and it was 36.8 °C.
The device was checked with only five persons due to the covid-19 pandemic restrictions. Three participants were physically and mentally healthy. Other two participants were diabetes

patients. For the analysis, data were collected on six different days (Mornings). Collected data have gathered using Microsoft Excel and analyzed manually (Figure 5).

Patient	Average Heart Rate	Average SpO2	Average Temperature
1	79	92	36.5
2	88	93	36.4
3	81	94	37
4	78	93	37.1
5	85	97	36.7

Parameter	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5	Average Reading
Heart Rate	79	88	81	78	85	82.2
SpO2	92	93	94	93	97	93.8
Body Temperature	36.5	36.4	37	37.1	36.7	36.7

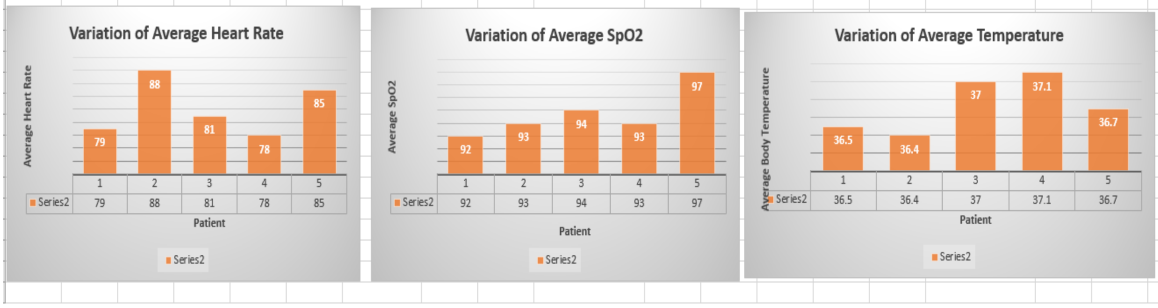


Figure 5: Graphical Representation of the Collected Data.

According to the figure 5, heart rate was 82.2 as an average value. It is approximately 82 BPM. SpO_2 was 93.8% and it can be evaluated as approximately 94% and the body temperature was noted as 36.7 as an average value.

According to the literature, all the parameter readings were approximately correct.

Conclusion

“C-TOM” is a domiciliary multi-parameter monitor for patients with diabetes and other non-transmitted diseases. By using this device, we can measure heart rate, SpO_2 and temperature for this extent. Importance of this concept have verified through a survey and a poster presentation as the preliminary work of the project. A box type housing was designed to give the device a user-friendly look. Some modifications could not accomplish due to coding errors and other barriers.

In conclusion, future improvements for this project are combination with other domiciliary devices to read more parameters, creating monthly report by collecting the data through a database, and developing the device to get non-invasive blood sugar monitoring techniques.

References

Anon., 2019. *Change in resting heart rate accelerates 'vicious circle' of diabetes development.* [Online], Healio.com, Available at: https://www.healio.com/news/endocrinology/20190103/resting-heart-rate-accelerates-vicious-circle-of-diabetes-development#:~:text=Larger%20increases%20in%20resting%20heart,Nutrition%2C%20Metabolism%20and%20Cardiovascular%20Diseases. [Accessed 02 10 2020].

Anon., 2020. *Mayo clinic- How diabetes affects your blood sugar.* [Online] Available at: https://www.mayoclinic.org/diseases-conditions/diabetes/multimedia/blood-sugar/vid-20084642#:~:text=When%20the%20glucose%20enters%20your,t%20get%20into%20your%20cells. [Accessed 01 10 2020].

Alexsis_et.al, 2014. *Wireless patient monitoring system.* Seattle, WA, USA, 2014 IEEE Healthcare Innovation Conference (HIC).

A. Rghioui_et.al, 2020. *A Smart Glucose Monitoring System for Diabetic Patient*, Morocco: MDPI.

Anon., 2017. *WebMed.LLC.* [Online], Available at: https://www.webmd.com/diabetes/high-blood-pressure#:~:text=Diabetes%20damages%20arteries%20and%20makes,heart%20attack%2C%20and%20kidney%20failure. [Accessed 03 12 2020].

Anon., 2019. *Healio.com Change in resting heart rate accelerates 'vicious circle' of diabetes development.* [Online] Available at: https://www.healio.com/news/endocrinology/20190103/resting-heart-rate-accelerates-vicious-circle-of-diabetes-development#:~:text=Larger%20increases%20in%20resting%20heart,Nutrition%2C%20Metabolism%20and%20Cardiovascular%20Diseases. [Accessed 02 10 2020].

Anon., 2020. *Mayo clinic- How diabetes affects your blood sugar.* [Online] Available at: https://www.mayoclinic.org/diseases-conditions/diabetes/multimedia/blood-sugar/vid-20084642#:~:text=When%20the%20glucose%20enters%20your,t%20get%20into%20your%20cells. [Accessed 01 10 2020].

Azizulkarim_etal, 2017. *Design and Development of Patient Monitoring System,* Malaysia: International Research and Innovation Summit (IRIS2017).

Bandara, Apr 07, 2016. *Talking Economics.* [Online] Available at: https://www.ips.lk/talkingeconomics/2016/04/07/beat-diabetes-in-sri-lanka-too-much-sugar-is-not-that-sweet/#:~:text=Sri%20Lanka%20too%20is%20seeing,which%20totals%20to%201.16%20million. [Accessed 29 09 2020].

B. Bikman, OCTOBER 7, 2020. Levels Health.com. [Online] Available at: https://www.levelshealth.com/blog/glucose-levels-body-temperature [Accessed 02 01 2021].

Boyce and Brown, 2019. Economic and Social Impacts and Benefits of Health Systems-WHO-Europe, Europe: s.n.

Chicago-Architecture-Center, 2019. The Design Process Consists of Six Steps-The Design Process Consists Of 6 Steps, s.l.: s.n.

DATASHEET-MLX90614-GY906-IR, 2019. s.l.: MELEXIS.

DATASHEET-MAX30100-Heart Rate and Temperature Sensor.

Harry, 2020. *DesignSpark.* [Online] Available at: https://www.rs-online.com/designspark/development-of-a-portable-patient-monitoring-system-1 [Accessed 28 01 2021].

Hybridized fuzzy analytic hierarchy process and fuzzy weighted average for identifying optimal design concept - Scientific Figure on ResearchGate. Available from: https://www.researchgate.net/figure/Framework-for-selection-of-optimal-design-concept-in-engineering-design-process_fig2_338761385 [accessed 2 Mar, 2021]

Jahan, E., 2020. *An Overview on Heart Rate Monitoring and Pulse Oximeter System.* Chittagong-4349, Bangladesh, MNK Publication.

Kumarn_et.al, M., 2019. *Health Monitoring and Stress Detection System,* International Research Journal of Engineering and Technology (IRJET), 06(03), pp. 90-93.

Lin, 2013. *Preventing Diabetes Extremity Vascular Disease with blood SpO2 Images.* International Journal of Instrumentation Science, 2(2), pp. 2(2A): 1-7.

Martinho_et.al, 2013. *Design and Implementation of a Wireless Multi-parameter Patient.* Caparica, Portugal, Science Direct.

Menon.et_al, 2013. *A survey on non-invasive blood glucose monitoring using NIR.* India, Communications and Signal Processing (ICCSP), 2013 International Conference.

MUHAMMAD, 2013. *Design And Implementation of Blood Pressure Monitoring System,* s.l.: Universiti Teknologi PETRONAS.

Musallam.et_al, 2015. *An Automatic Blood Pressure Measurement system based on Auscultation & Oscillometry*, Qatar: Research Gate.

P. Neuffer, 2019. *Endocrinology-diabetes.* [Online] Available at: https://www.healio.com/news/endocrinology/20190103/resting-heart-rate-accelerates-vicious-circle-of-diabetes-development#:~:text=Larger%20increases%20in%20resting%20heart,Nutrition%2C%20Metabolism%20and%20Cardiovascular%20Diseases. [Accessed 01 10 2020].

T. Boyce and C. Brown, 2019. *Economic and Social Impacts and Benefits of Health Systems-WHO-Europe,* Europe: s.n.

Thomson et al., 2013. BMC Health Services Research. *The psychosocial impact of home use medical devices on the lives of older people*, p. 13:467.

WHO, 2006, *World Health Organization.* [Online] Available at: https://www.who.int/health-topics/diabetes#tab=tab_3 [Accessed 29 09 2020].

Zijlstra, 2018. *Profil Answers for Diabetes-Smart ideas for noninvasive glucose monitoring.* [Online] Available at: http://blog.profil.com/blog/smart-ideas-for-noninvasive-glucose-monitoring [Accessed 02 10 2020].

INFORMATION TECHNOLOGY

SIGN LANGUAGE TO SINHALA LANGUAGE SPEECH CONVERSATION TO ENHANCE THE QUALITY OF COMMUNICATION BETWEEN THE HEARING IMPAIRED AND THE REST OF THE COMMUNITY.

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Abstract
Most people believe that hearing and listening impaired people are not able to live happily or to make their life successful due to their disabilities. But there have been many doors opened for these people with the enhancement of technology. The main goal of this progressive web app (PWAs) is to enhance the quality of communication between the Sinhala hearing impaired and the rest of the community. With the proposed progressive web app individuals with hearing and speaking impairments will communicate with others using object detection in AI only using their mobile phone. Out of the methods tested the most suitable and most efficient method is Object Detection using SSD Mobilenet and TensorFlow Object Detection API.

Keywords: Sinhala Sign language, object detection, SSD Mobilenet, TensorFlow Object Detection API

Introduction

Sign language is the primary and only language used by people with speech and hearing impairment to communicate. Sign language is a popular communicating method among extensive communication processes. (nidcd, 2019). Every country in the world has its distinctive sign language. Sri Lanka also has a standard sign language. The main parties which use sign language, in other terms, speech and hearing-impaired people, will face difficulties while communicating with the people who use oral language due to the inability of convenient techniques in Sri Lanka. Almost all fields have lots of predicaments, but not all of them have huge problems. Nevertheless, sign language in Sri Lanka can be seen as a field that faces many significant issues. In general, people with speech and hearing impairments face many problems in their daily lives. (disabilityexpertsfl, 2018) The main problem they face is isolating them from the society Not being able to tell anyone what he or she wants to say: only sign language users and interpreters use this Sign language, and other people cannot understand the language. Therefore, if a person who only knows the oral language and speaks sign language wants to communicate, it becomes an impracticable task. As a result, sign language users try to stay away from society they cannot share their words with others.

There is a mobile application called “Sanvaadha” that build for deaf people. When the user wants to say something, the user must press each sign GIF and show that sentence on the phone screen to the person that he/she wants to speak with. According to the research, this is not a very successful method to a conversation with people that non-sign language use. (google playstore, 2021) In 2012, a mobile application called Handtalk was launched in Portugal. It is designed for people with visual and hearing impairments to communicate with people who use oral language. (handtalk, 2021) There are a limited number of software and applications designed for sign language. In particular, there is simply one software for

Sinhala Sign Language, and it cannot be seen as an adequate solution to the problem. (Sugathadasa, 2021)

the given solution web app can detect Sinhala sign words with a good amount of accuracy. And the web app interface is very simple and easy to use because 95% of Sri Lankan sign language users can't read or write.

Methodology

For the final design, there were three prototype models, and the final prototype was the one that was selected for the final design. The first prototype was about Action Recognition with LSTM Model using MediaPipe Holistic. But the detection label shows the detection name again and again as a loop. The main problem here is, MediaPipe holistic key points cannot gather sensitive data. sign language has lots of sensitive actions that can change the complete meaning of the word or a sentence. Object detection computer vision technology has been used for prototypes two and three.

The SSD architecture is a single convolution network that learns to predict bounding box locations and classify these locations in one pass. Hence, SSD can be trained end-to-end. The SSD network consists of base architecture followed by several convolution layers. By using SSD, it only needs to take one single shot to detect multiple objects within the image, while regional proposal network (RPN) based approaches such as the R-CNN series need two shots, one for generating region proposals, one for detecting the object of each proposal. Thus, SSD is much faster compared with two-shot RPN-based approaches.

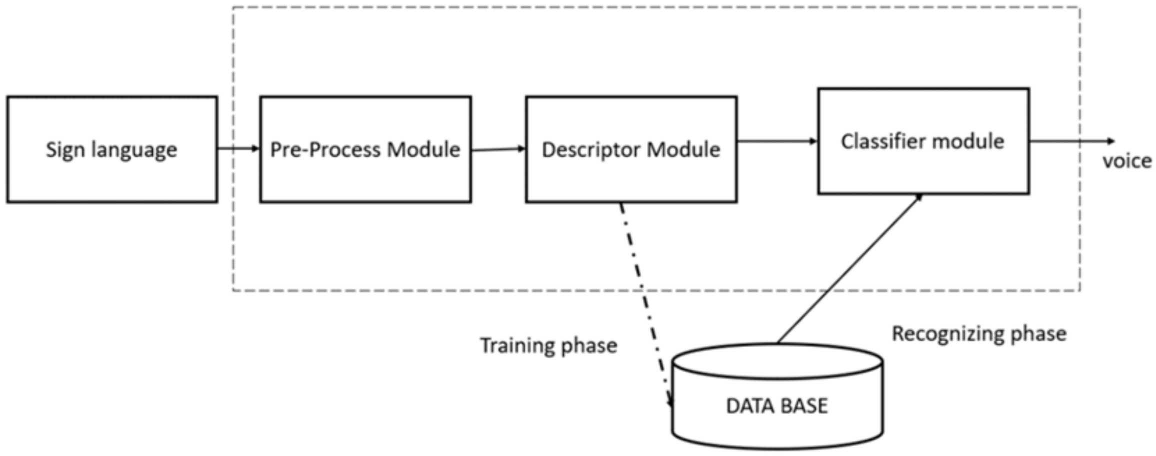

Figure 10: figure 1 system architecture

The progressive web app application based on a TensorFlow Js Model it can detect the Sinhala sign words with high accuracy. When it detects objects, it uses the IBM object storage cloud that has been hosted the converted TF JS model in the final prototype.

TensorFlow object detection API is the framework for creating a deep learning network that solves object detection problems. There are already pretrained models in their framework which they refer to as Model Zoo. This includes a collection of pretrained models trained on the COCO dataset, the KITTI dataset, and the Open Images Dataset. (singhal, 2020)

For the final prototype there 1000 images were collected for each class. Like the previous prototype, image collecting, and labeling were the first steps in the primary process, but after the image collecting process, one more step was added. It is called data augmentation. As usual, data flapping and cropping are the methods used in object detection, but that method cannot be used here because sign language users mainly use their right hand as the main hand and left hand as support hand, so if the side of the image is flipped, the right-hand changes to the left hand or the left hand to the right hand. A green screen has been added to the background of all these images. (Herath, et al., 2013)

Results

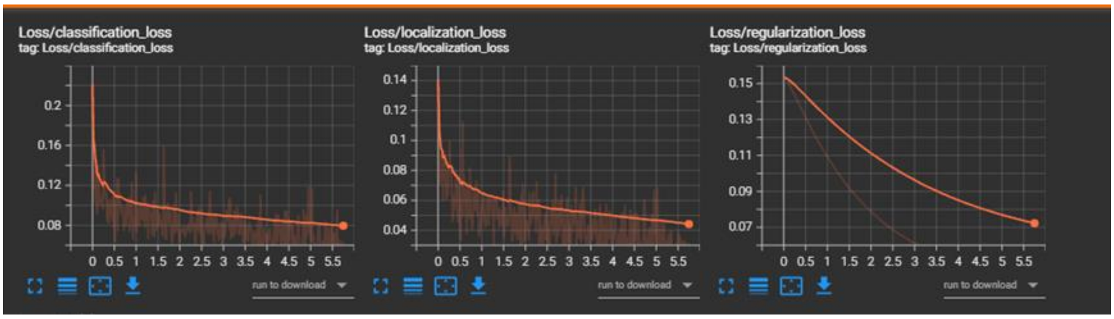

Figure 11: Loss curve

According to the model loss curve, it can be confirmed that the model has been well trained while training processes happened, and the model learning rate has a considerable good level. That's the reason why this trained model has become the main model in this progressive web app.

```
Average Precision  (AP) @[ IoU=0.50:0.95 | area=   all | maxDets=100 ] = 0.735
Average Precision  (AP) @[ IoU=0.50      | area=   all | maxDets=100 ] = 1.000
Average Precision  (AP) @[ IoU=0.75      | area=   all | maxDets=100 ] = 1.000
Average Precision  (AP) @[ IoU=0.50:0.95 | area= small | maxDets=100 ] = -1.000
Average Precision  (AP) @[ IoU=0.50:0.95 | area=medium | maxDets=100 ] = -1.000
Average Precision  (AP) @[ IoU=0.50:0.95 | area= large | maxDets=100 ] = 0.735
Average Recall     (AR) @[ IoU=0.50:0.95 | area=   all | maxDets=  1 ] = 0.758
Average Recall     (AR) @[ IoU=0.50:0.95 | area=   all | maxDets= 10 ] = 0.758
Average Recall     (AR) @[ IoU=0.50:0.95 | area=   all | maxDets=100 ] = 0.758
Average Recall     (AR) @[ IoU=0.50:0.95 | area= small | maxDets=100 ] = -1.000
Average Recall     (AR) @[ IoU=0.50:0.95 | area=medium | maxDets=100 ] = -1.000
Average Recall     (AR) @[ IoU=0.50:0.95 | area= large | maxDets=100 ] = 0.758
```

Figure 12: Average precision

Here, the average precision value is 0.735 and that's a stable value for using this model for detection.

Figure 13: detection accuracy of tested results

So, because of well-trained model the detection accuracy is very high compared with other trained models. Also, the IBM cloud object storage can provide fast service when it comes to machine learning models.

Discussion

When considering the results of confusion matrix sample results, classification accuracy-test it is very much evident that this application has a higher-level accuracy rate. If the solution was a mobile app computer users can't use it. Considering the platform independency progressive web application is most suitable for this study. The IBM cloud storage receives fast results even it is not on higher-speed internet. The web app can detect any number of sign words at the same time that means users can use both hands when they are using it. The web app performs well with a high level of accuracy on a mid-range mobile device. This Website has only one web page; it is a straightforward web application; anyone can use it without any technical knowledge. This website Build using React Js. Normally a react web apps memory usage significantly increases as it been used but this web app always clears the data that detect from the camera, and it also helps to protect the ethical side of this application.

Conclusions and Recommendations

So far, various research has been done on this issue. Out of this (Herath, et al., 2013) research specifically mentioning, the bitter and disgruntled problems faced by the individuals who use the Sinhala Sign language. Also, as the (Author, 2016) researcher shows, some countries were able to successfully overcome these kinds of problems, according to their discoveries. But the problem was, most of their findings were long-term solutions. That means it takes more time to get a good consequence. Hence it is not possible to use them for this. Even though many have tried to find solutions to these problems, they have not been able to achieve a successful outcome. However, the technology used for this sign language problem was found in various research as well. Meanwhile, (Shaira, et al., 2020) had tried identifying the sign words through object detection. And the techniques used for this have been used in this project as well. This new implementation made the path for the sign language users to communicate with any other party very easily, by just using a mobile phone. Because of the well-trained dataset, the web app can detect Sinhala sign words with a high accuracy rate even the confidence rate gets a low amount. Therefore, this study is a quick and successful solution for this problem which were a considerable effect on speech and hearing-impaired people.

The current model can only detect up to 25 words, but this amount can update and then it will be able to recognize a more sign words than now. This is a web app that anyone can use on their smartphone and from their computers. Anyone can use it If it is making it more flexible and responsive for their mobile devices. According to the interview found that, 95% of Sri Lankan sign language users can't read or write because of that this progressive website is design with a simple frontend to increase the usability. For a future recommendation, we can add sign language gif images as buttons for any advanced or essential action. Here, only one sign word is detected and output it as a single word. If there is a way to output this as a complete sentence, it will be easier for the user to communicate what they want to say.

References

Author, G., 2016. *10 Challenges Deaf Students Face in the Classroom.* [Online] Available at: https://www.gettingsmart.com/2016/08/21/10-challenges-deaf-students-face-in-the-classroom/
[Accessed 10 october 2021].

disabilityexpertsfl, 2018. *difficulties-the-deaf-face-every-da.* [Online] Available at: https://www.disabilityexpertsfl.com/blog/difficulties-the-deaf-face-every-day
[Accessed 19 august 2021].

google playstore, 2021. *sanvaadha.sinhala.one.* [Online] Available at: https://play.google.com/store/apps/details?id=com.sanvaadha.sinhala.one
[Accessed 10 septermber 2021].

handtalk, 2021. *handtalk.* [Online] Available at: https://www.handtalk.me/en
[Accessed 10 september 2021].

Herath, H., Kumari, W. A., Senevirthne, W. A. & Dissanayake, M. B., 2013. IMAGE BASED SIGN LANGUAGE RECOGNITION SYSTEM FOR SINHALA SIGN LANGUAGE. *SAITM Research Symposium,* pp. 107-111.

nidcd, 2019. *american-sign-language.* [Online] Available at: https://www.nidcd.nih.gov/health/american-sign-language
[Accessed septemebr 2021].

Shaira, T., Sabbir, U., Hossain, N. & A.-n., 2020. Poribohon-BD: Bangladeshi local vehicle image dataset with annotation for classification. *elsevier,* Volume 33.

singhal, m., 2020. *Object Detection using SSD Mobilenet and Tensorflow Object Detection API.* [Online] Available at: https://medium.com/@techmayank2000/object-detection-using-ssd-mobilenetv2-using-tensorflow-api-can-detect-any-single-class-from-31a31bbd0691
[Accessed 2021].

Sugathadasa, H., 2021. *විශේෂාංග.මැන-නොවනු-නොමිනිසුන්-මිනිසුනේ/* [Online] Available at: https://www.silumina.lk/2021/09/18/%E0%B7%80%E0%B7%92%E0%B7%81%E0%B7%9A%E0%B7%82%E0%B7%8F%E0%B6%82%E0%B6%9C/%E0%B6%B8%E0%B7%92%E0%B6%B1%E0%B7%92%E0%B7%83%E0%B7%94%E0%B6%B1%E0%B7%9A-%E0%B6%B1%E0%B7%9C%E0%B6%B8%E0%B7%92%E0%B6%B1%E0%B7%92%E0%B7%83%E0%B7%94%E
[Accessed 25 September 2021].

WEB APPLICATION FOR PERSONALIZED COSMETIC RECOMMENDING

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Abstract

The study is conducted to find various reasons holding back customers from purchasing cosmetics online and to propose design and functionality improvements to e-commerce cosmetic stores to match customer requirements. A sample of thirty is interviewed to gather data.

The research reveals that only 30% are purchasing cosmetics online and 78% of them have faced difficulties. 27% of the participants are either unaware or only partially aware about their skin type, hair type, skin tone and undertone and requires support when selecting products. 50% of participants visit e-commerce cosmetic stores even when they have not purchased cosmetics online. There are many reasons holding them back from online cosmetic purchasing.

A combination of user accounts, virtual-makeup-try-on, user reviews and a chatbot is explained to overcome current limitations and to offer a better service meeting up to the standards expected by customers.

Keywords: DSS, Cosmetics

Introduction

Background of Study

A cosmetic is any substance including beauty preparations and grooming aids used to clean, improve, or change the complexion of skin, hair nails or teeth (Government of Canada, 2021). Cosmetic products have been used for centuries by both men and women in various events to protect form the sun, indicate class and to enhance beauty (Cosmetics Info, 2021).

Innovation is the basic principle of globally prospering cosmetics industry. The latest concept of this industry is to use natural substances as active ingredients (Rodrigues, et al., 2018). According to (Chouhan, et al., 2021) skin and sun care products constituted the largest market share of the industry in 2019.

E-commerce business model allows people to buy and sell over the internet (Bloomenthal, 2020). Convenience, and access to products that are otherwise unavailable due to geographical limitations are two main advantages of this model. Yet, E-commerce can only offer limited customer service, and it is not possible to touch, smell or test products before purchase. These drawbacks substantially affect online sales of businesses in cosmetic industry.

Covid-19 pandemic has impacted businesses in many ways, lowering the revenue, requiring managers to re-think business strategies. According to (PWC, 2021) accelerating digital transformations is a strategy that will allow businesses to survive and make profits while Covid-19 is around. For businesses in cosmetic industry, this means finding ways to help customers select products exactly matching their requirements with less hassles and more confidence.

Objectives

i. Support customers in finding cosmetic products available at the store matching their skin, hair, face types, gender, age, and budget with less time.

ii. Allow the business to provide a more customized service to the customers.

iii. Enable the business to maintain reputation while increasing revenue and profit.

Methodology

The study aims to identify functionality improvements for e-commerce cosmetic websites to increase customer satisfaction. Data on customer requirements, difficulties faced, reasons for not purchasing online are collected through interviews. Qualitative data analysis is used to analyse data using charts and graphs as it gives more information with lesser sample size and analyse deep into how people feel. As this is qualitative-descriptive research, the study takes place in a natural, real-life setting. Inductive approach is selected as frequent, significant themes are believed to emerge from data. (Soiferman, 2010).

Population, Sample, and Sampling Method

The target population is 15–54-year-olds. Participants (i) over 54 years, (ii) without computers, mobile phones etc. (iii) without internet, and (iv) no technical knowledge were not selected for interviews as they are essential for online purchasing.
A sample of 30 was selected using convenience sampling to collect data as it is fast, cost effective, and has fewer rules to follow (QuestionPro, 2021). Sample being readily available makes it convenient to collect data amidst Covid-19 measures and restrictions.

Results

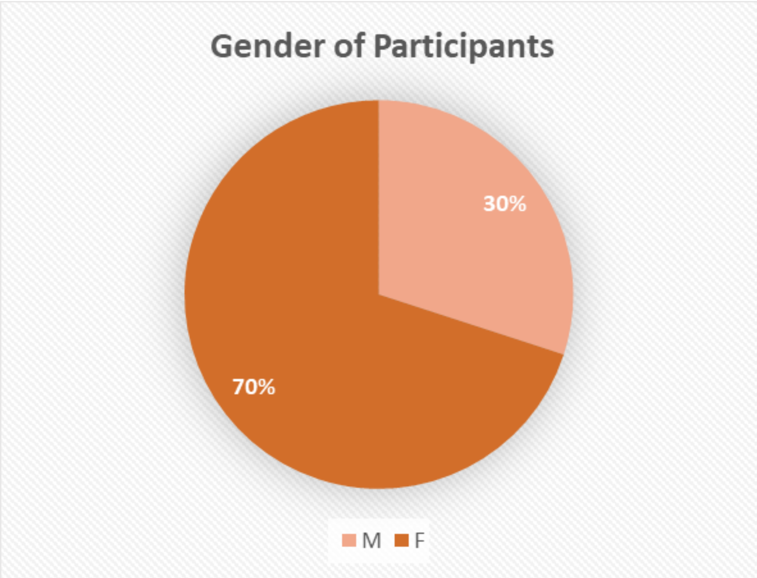

Figure 14: Gender of Participants

Figure 15: Do Customers Purchase Cosmetics Online?

Participants not purchasing online, prefer (i) a 24/7 hotline that instantly replies to messages, (ii) more details regarding cosmetic products, (iii) more details regarding delivery process, (iv) better categorization and filtration of cosmetic items - one participant even preferred product filtering based on speech recognition, (v) a method to easily locate products designed for hyper-sensitive skin, (vi) have customer reviews displayed alongside products, (v) getting recommendations on colour cosmetics matching outfit colour, season, and time of the day they will be using the product, (vi) checking how cosmetics look on them before purchasing.

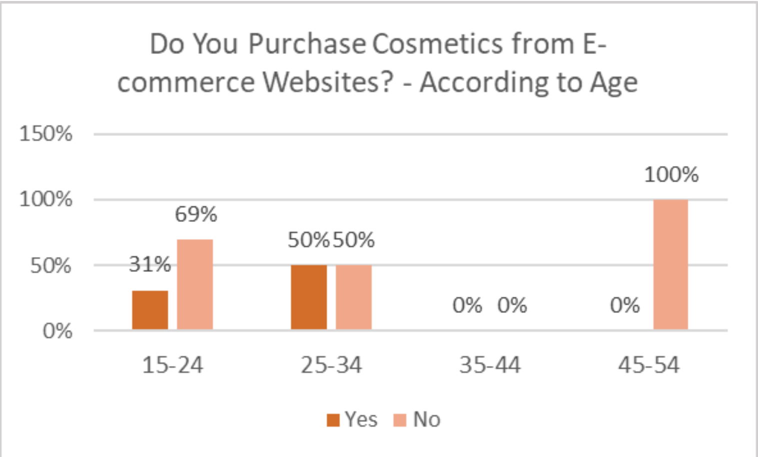

Figure 16: Do Customers Purchase Cosmetics Online? - According to Age

Participants of 45-54 age category mentioned not being comfortable with online platforms as the main reason for not purchasing cosmetics.

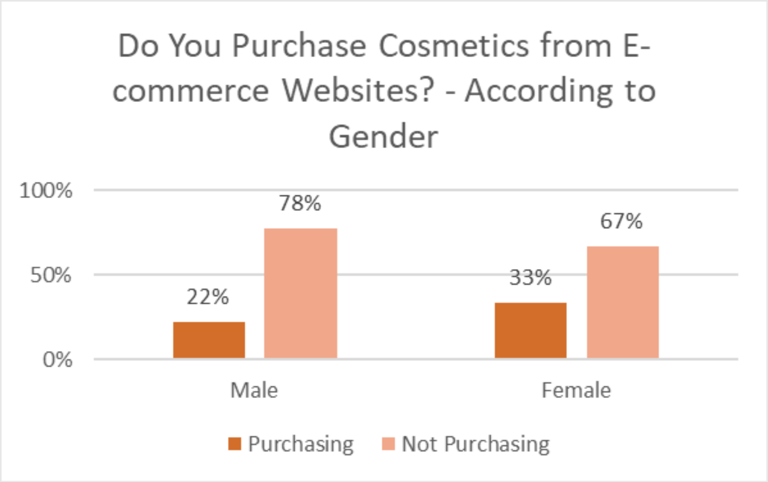

Figure 17:Do Customers Purchase Cosmetics Online? - According to Gender

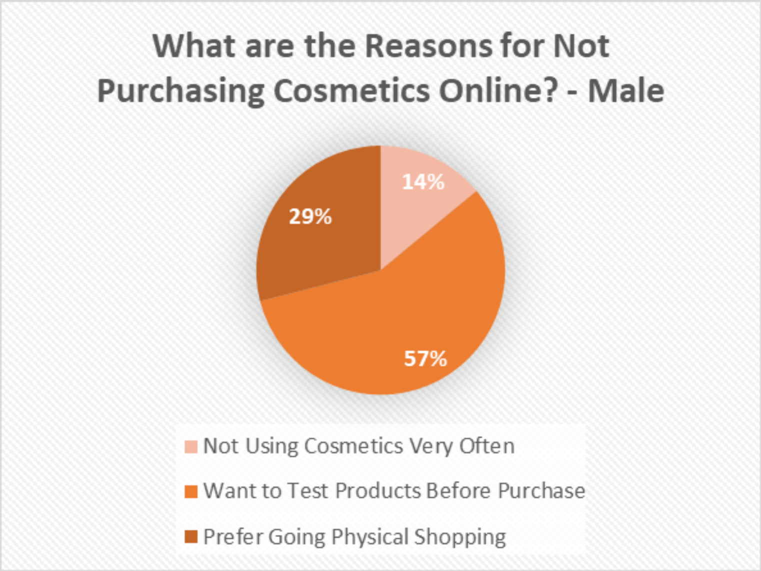

Figure 18: Reasons Male Participants are Not Purchasing Cosmetics Online

Figure 19: Do Customers Visit Ecommerce Cosmetic Websites when Not Purchasing Online?

Figure 20: Do Customers Purchase Cosmetics from Physical Stores after Checking Products Online?

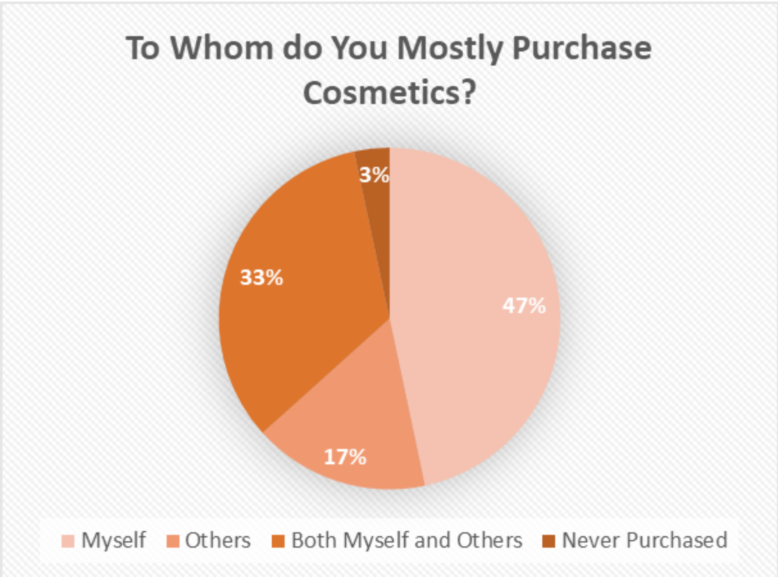

Figure 21: To Whom Do Customers Mostly Purchase Cosmetics?

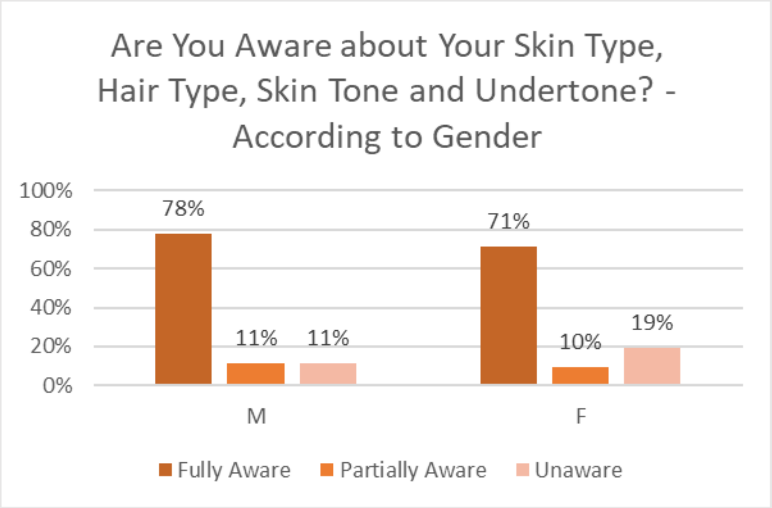

Figure 22: Are Customers Aware about Their Skin Type, Hair Type, Skin Tone, and Undertone? - According to Gender

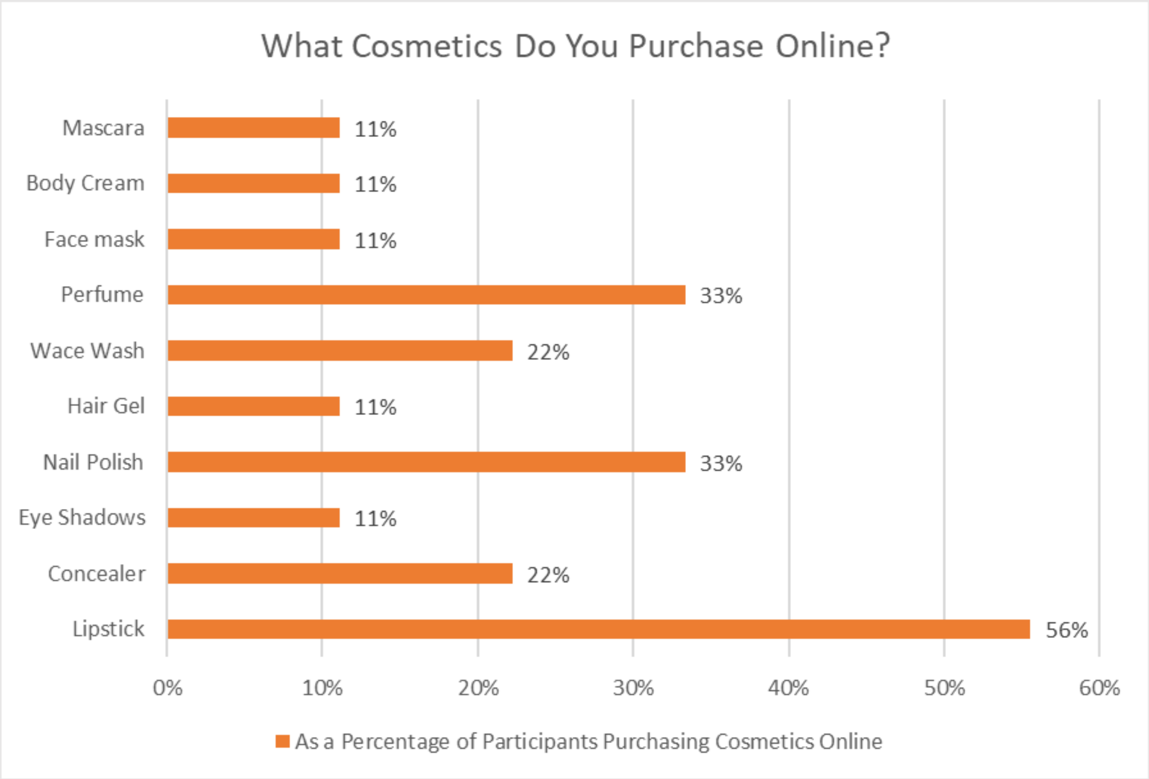

Figure 23: Cosmetics Purchased Online by Customers

Figure 24: Have Customers Purchased Difficulties When Purchasing Cosmetics Online?

The 23% of participants who have faced difficulties purchasing online have experienced, late delivery, inadequate information on payment process, difference in product delivered or not being delivered, and difficulty to select colour cosmetics.

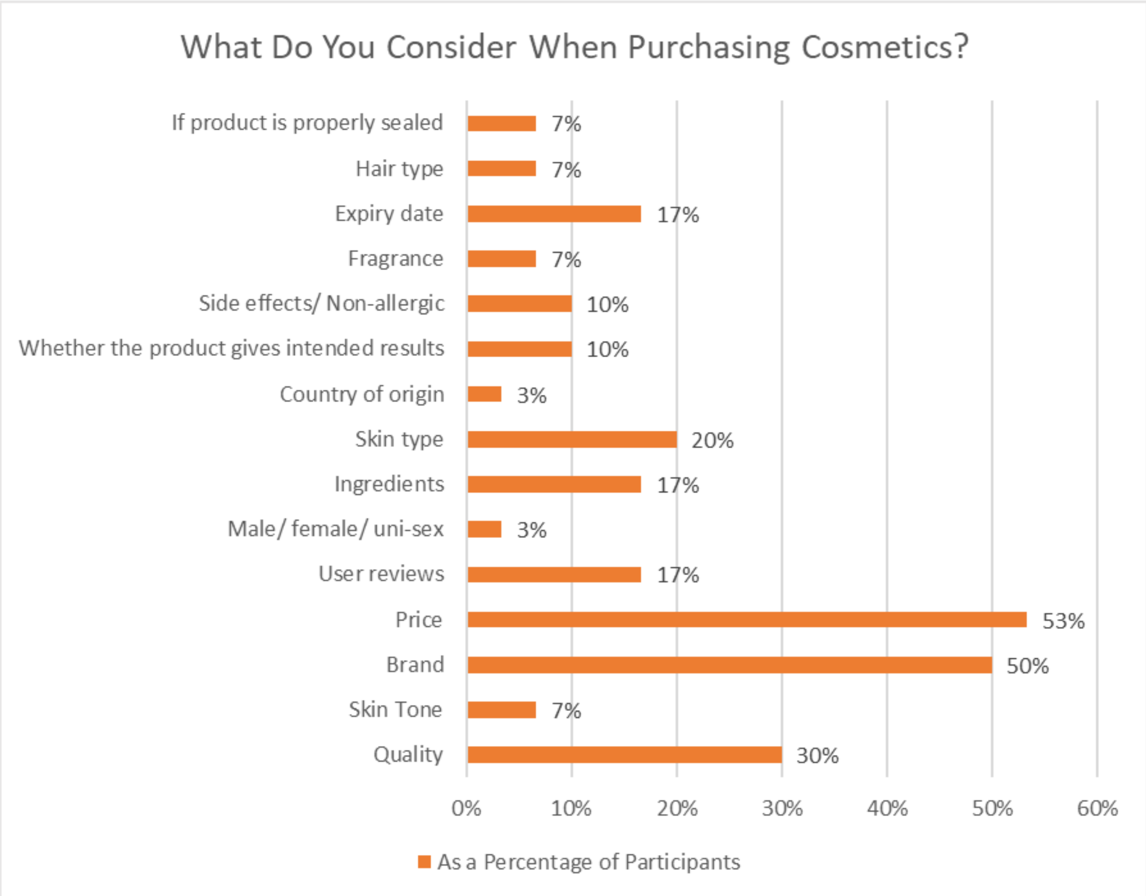

Figure 25: Factors Considered When Purchasing Cosmetics Online

Discussion

Based on findings, 70% is not purchasing online. A personalized product recommendation based on features and requirements of individual customers is better suited over a recommender system recommending products analysing purchasing habits to attract customers purchase cosmetics online. (i) age, (ii) gender, (iii) skin, hair, face types, (iv) skin tone, (v) undertone, (vi) eye colour, (vii) face shape, (viii) body shape, (ix) hyper-sensitivity, (x) skin problems, (xi) favourite fragrance notes, etc. of customers required to provide personalized recommendations can be collected when customers set up user accounts.

Despite 70% of the sample being females, only 33% purchase cosmetics online. They face difficulties selecting colour cosmetics online without a method to receive support selecting colours matching their requirements. Only 71% of interviewed females are fully aware about their skin tone and undertone while 29% is unaware and requires support in purchasing. Apart from that, face shape, age, eye colour, outfit colour, function, and day/night setting of the function are also to be considered when selecting colour cosmetics. Customer's features saved in user account can be used to filter colour cosmetics. Manual filtering can be added to narrow down already filtered colours to match outfit, season, and day/ night usage of colour cosmetics according to requirement. This feature also supports customers fully aware about their skin tone and undertone. It will attract female customers, especially those currently visiting e-commerce cosmetic websites but not purchasing online and those purchasing from physical stores after checking products on e-commerce websites to purchase online.

As identified under results, 'price' is the most considered factor when purchasing cosmetics. A manual filtering process further filtering out cosmetics recommended by the system based on customer's features based on price will make the site more user-friendly. Weight and active ingredients are two other features that can be used for filtering.

Another problem highlighted on online cosmetic purchasing was, not being able to check how colour cosmetics look on skin. Many respondents are only comfortable purchasing colour cosmetics of a brand and colour already used or tested at a physical store limiting sales and competition. Virtual-makeup-try-on can be included in the site to allow customers test colour cosmetics before purchase and be enhanced with click-and-share to post virtual makeup look on social media giving them a chance to receive feedback on their look before purchase.

Perfumes being one of the widely used cosmetics by males, 57% of male participants not purchasing cosmetics online as they cannot test before purchase. To get customers a similar experience as testing perfumes at physical stores, (i) perfumes can be filtered using favourite fragrance notes details in customer's account, (ii) further filtered with a manual filter based on formulation, size, price, lasting time, strongness, occasion and scent family according to customer's requirements and, (iii) perfume sample kits can be included for customers to purchase.

As per responses, not having customer reviews is holding back customers from purchasing online. Customer reviews can be combined with fragrance selection process by requesting customers mark similar scents to a selected fragrance product to display alongside the product for future customer references after verifying the data with another customer.

Customer reviews reflects both pros and cons promoting better-informed purchase decisions. Customers who purchase the product can be requested to leave a review than allowing random users, to collect more honest reviews. Reviews will be mostly positive if product recommending is accurately done by the system and if customer selects within recommended range. A mark can be displayed with customer's review to indicate whether product was recommended by the DSS or not, providing a better insight on the review, and uplifting customer's trust on DSS recommendations.

Also, not having enough details regarding products was holding back customers from purchasing online. Ingredients, price, expiry date, country of origin, if product is gender based or neutral, age category product is designed, if it is non-allergic, conditions the product is designed to treat, how to use for best results are considered before purchasing. Apart from that, weight and dimensions of product, delivery charges, and method of sourcing ingredients can be mentioned for better marketing.

Customers with less technical knowledge will require customer support despite the automated process in place. An instant messaging chatbot can be included to handle simple customer queries and can be directed to a customer service representative for requests beyond the scope of chatbot. This feature will especially support customers in 45-54 age category as they mentioned not being very familiar with e-commerce platforms as the reason for not purchasing online.

50% of the sample responded they mostly purchase cosmetics for others or for both themselves and others. A filtering process can be added to support the selection of products for others where the customer can enter (i) age, (ii) gender, (iii) skin, hair, face types, (iv) skin tone, (v) undertone, (vi) eye colour, (vii) face shape, (viii) body shape information regarding the person they are purchasing to filter products available at store to match details. An option can be added to save the information for future use.

This system can also be used to provide personalized discounts such as on customer's birthday. Also, promotions can be sent to purchase a refill/ new product after calculating the date product may end using average time to completely use product and date of purchase.

Conclusion and Recommendations

Conclusion

Personalized cosmetic recommending is indispensable for cosmetic businesses to retain customers and to uphold brand reputation. Providing a personalized service though e-commerce cosmetic stores is truly challenging. The research explains user accounts with customer's features, product recommending and filtering, virtual-makeup-try-on, user reviews and chatbots to cover up for salesperson support and testers available in physical cosmetic stores which are developed based on expectations of customers not purchasing online and enhancements preferred by customers purchasing cosmetics online.

Recommendations

Voice recognition can be implemented to collect customer requirements in providing recommendations on products.

"Add friends" function can be added to user accounts as on social media, where friends can recommend products to each other and use details from friend's account to filter content when purchasing a gift for the friend.

Digital try-on can be developed to automatically detect face shape, skin tone, undertone, and eye colour. This will increase both accuracy and user-friendliness. Manual detail entering can be kept available for customers not comfortable with image processing.

References

Bloomenthal, A., 2020. *Electronic Commerce (E-commerce).* [Online] Available at: https://www.investopedia.com/terms/e/ecommerce.asp [Accessed 16 03 2021].

Chouhan, N., Vig, H. & Deshmukh, R., 2021. *Cosmetics Market by Category, Gender, and Distribution Channel: Global Opportunity Analysis and Industry Forecast, 2021 - 2027*, s.l.: Allied Market Research.

Cosmetics Info, 2021. *A History of Cosmetics from Ancient Times.* [Online] Available at: https://cosmeticsinfo.org/Ancient-history-cosmetics [Accessed 14 03 2021].

Department of Census and Statistics, 2021. *Gender Statistics.* [Online] Available at: http://www.statistics.gov.lk/GenderStatistics/StaticalInformation/Population [Accessed 05 05 2021].

Distante, D. et al., 2014. *Business processes refactoring to improve usability,* New York: s.n.

Forefront Dermatology, 2020. *What Is My Skin Type? : Picking Skincare Products for My Skin Type.* [Online] Available at: https://forefrontdermatology.com/skin-type-picking-skincare-products-skin-type-forefront-dermatology/#:~:text=According%20to%20Christian%20Millett%2C%20a,size%20does%20not%20fit%20all.%E2%80%9D [Accessed 16 03 2021].

Government of Canada, 2021. *What is a Cosmetic?.* [Online] Available at: https://www.canada.ca/en/health-canada/services/cosmetics/what-is-cosmetic.html [Accessed 14 03 2021].

Heijden, H. v. d., 2006. Mobile Decision Support for In-store Purchase Decisions. *Decision Support Systems,* Issue 42, pp. 656-663.

Hwangbo, H., Kim, Y. S. & Cha, K. J., 2018. Recommendation System Development for Fashion Retail E-commerce. *Electronic Commerce Research and Applications,* Issue 28, pp. 94-101.

Noor, N. M., Muhamad, N. J., Sahabudin, N. A. & Mustafa, Z., 2018. Development of Skin Care Routine Support System. *Journal of Computational and Theoretical Nanoscience.*

Photoslurp & Zinklar, 2019. *2019 eCommerce Cosmetics trends: How European women purchase cosmetics online,* s.l.: s.n.

PWC, 2021. *COVID-19: Impacts to business.* [Online] Available at: https://www.pwc.com/gx/en/issues/crisis-solutions/covid-19.html [Accessed 16 03 2021].

QuestionPro, 2021. *Convenience Sampling: Definition, Applications, Advantages, Method, and Examples.* [Online]

Available at: https://www.questionpro.com/blog/convenience-sampling/ [Accessed 13 05 2021].

QuestionPro, 2021. *Qualitative Data – Definition, Types, Analysis and Examples.* [Online] Available at: https://www.questionpro.com/blog/qualitative-data/ [Accessed 10 05 2021].

Rodrigues, F. et al., 2018. *Polyphenols: Properties, Recovery, and Applications.* s.l.:Woodhead Publishing.

SCENTBIRD, 2016. *Fragrances, Mood, and Personality Types: Are They Related?.* [Online] Available at: https://www.scentbird.com/blog/fragrances-mood-and-personality-types-are-they-related/?__cf_chl_captcha_tk__=a360db1a337e914ddd70653eef062d87b95130a7-1615895755-0-AeCLh6JhnczrozRY7kBw7B2gl3QE2qq0XmntUy_uI1f1B3heRRg6d1eSySTHFwc53Dopoo6uUz3e7tmkloU8DBorNjgG [Accessed 16 03 2021].

Scholz, M., Dorner, V., Schryen, G. & Benlian, A., 2017. A Configuration-based Recommender System for Supporting E-Commerce Decisions. *European Journal of Operational Research,* 259(1), pp. 205-215.

Schwanke, C., 2021. *How to Choose Makeup Colors.* [Online] Available at: https://makeup.lovetoknow.com/makeup-tips/how-choose-makeup-colors [Accessed 27 04 2021].

Sivapalan, S., Sadeghian, A., Hossein, R. & Madni, A. M., 2014. *Recommender Systems in E-Commerce.* s.l., s.n.

Sohrabi, B., Mahmoudian, P. & Raeesi, I., 2011. *A framework for improving e-commerce websites usability,* London: Springer-Verlag London Limited.

Soiferman, L. K., 2010. *Compare and Contrast Inductive and Deductive,* s.l.: s.n.

Wang, Y.-F., Chuang, Y.-L., Hsu, M.-H. & Keh, H.-C., 2004. A personalized recommender system for the cosmetic business. *Expert Systems with Applications,* Issue 26, p. 427–434.

Way2Benefits, 2021. *Advantages and Disadvantages of Physical Shopping.* [Online] Available at: http://way2benefits.com/advantages-and-disadvantages-of-traditional-shopping/ [Accessed 02 05 2021].

Westerman, S., Tuck, G., Booth, S. & Khakzar, K., 2007. Consumer Decision Support Systems: Internet versus In-store Application. *Computers in Human Behavior,* 23(6), pp. 2928-2944.

World Bank, 2021. *Population - Sri Lanka.* [Online] Available at: https://data.worldbank.org/indicator/SP.URB.TOTL?locations=LK [Accessed 05 05 2021].

Yu, C.-C., 2004. *A Web-Based Consumer-Oriented Intelligent Decision.* s.l., s.n.

Zhang, Y. et al., 2011. Repurchase Intention in B2C E-commerce—A Relationship Quality Perspective. *Information & Management,* 48(6), pp. 192-200.

MASKED FACES RECOGNITION WITH ARTIFICIAL-INTELLIGENCE-BASED APPROACH

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Abstract

Almost everyone wears a mask during the coronavirus outbreak to effectively avoid the spread of COVID19. To prevent the spread of infection, people are advised to cover their faces while in public places. In certain cases, such as group access control, face access control, facial attendance, facial security checks at train stations, and so on, this almost renders traditional facial recognition technology ineffective. Many organisations use facial recognition for authentication and have already established the datasets required to implement such a system in-house. Regretfully, masked faces make detection and identification challenges, threatening to invalidate in-house databases and render certain facial recognition systems inoperable. The primary focus of this work is on facial masks, specifically on improving the identification accuracy of various masked faces. A Multi-Task Cascaded Convolutional Neural Network was used to solve the occluded face detection problem. Experiments show that the aforementioned technique performs admirably on masked face recognition. Furthermore, its performance has been evaluated within excessive facial masks and yielded favourable results.

Key Words: Face recognition, Masked face, Neural network, Machine learning, COVID19

Introduction

Face recognition is one of the many great features of AI research in the world. There has been an emergent demand in recent years for robust algorithms for facial recognition that can handle images of the real world. Facial recognition has been extensively studied and is relatively advanced in well-regulated environments. Informational facial characteristics are often recognised by earlier face methods directly applied by design recognition and by machine learning techniques and are accurate only when the sample and pictures are frontal. Due to the covid-19 situation, all the face recognition tools and techniques were faced many problems. All the people had to wear a mask to prevent the virus infection and spread of the virus. Because of that previous face recognition, techniques and datasets were useless. As a solution for this situation, various face masks and occluded faces were used to overcome this problem and some specific face recognition techniques such as multi-task convolutional neural network (MTCNN) has been used and applied to overcome this situation. (Güse, 2020) A large number of humans and companies will benefit when the implementation of this technique is completed. Specific organization or consumer electronic devices will be overcome a common issue while covering the most important biometric authentication method. This application will be aiming at covered faces with masks in order to recognise with occlusion face recognition techniques and support with the pre-trained dataset.

Methodology

This research study is based on quantitative analysis. I had to test out many human faces along with occlusion faces. The data was gathered with real-life human face datasets which were able to access everyone also pre-trained datasets were used to test. There are many ways of methods and techniques that can identify occlusion faces.

The first way to detect facial regions was suggested to be feasible. Multi-task Cascaded Convolutional Neuronal Network (MTCNN) to detect and harmonise the face in a picture that goes above several facial detection criteria while preserving efficiency in real-time. Use a pre-trained MTCNN model to detect masked and unmasked facial candidates for the image provided. (Md. Sabbir Ejaz, 2019) To find a suitable face recognition technique many research papers, paper articles and literature reviews were considered. The developed application was tested with real-life image examples. Multi-task Cascaded Convolutional Neuronal Network (MTCNN) to detect and harmonise the face in a picture. This is a model which goes above several facial detection criteria while preserving efficiency in real-time. The MTCNN model uses Non-Maximum (NMS) Suppression to refine the candidate bounding boxes suggested by first phase P-Net, second phase R-Net and third phase O-Net before delivery of output. (Dulčić, 2019)

Results

As per the tested images carried out, it was identified the accuracy rate of the application developed and there were some testing methods also used. A confusion matrix is a matching learning measure of a classifier's number of predictions. The performance of a classification model can be evaluated by calculating performance metrics such as precision, recall and F1 score.

The following table values are used to get the confusion matrix of this application. Some faces with masked and without masks were tested out to get a confusion matrix. Here is the result of predicted values taken by the application and the application given output values.

Table XII: Prediction vs actual results confusion matrix

Predicted values	Actual values
Charitha	Charitha
Lakshan	Lakshan
John	John
Unknown	Unknown
Charitha Masked	Charitha Masked
Lakshan Masked	Lakshan Masked
John Masked	John Masked
Charitha	Charitha
John	John
Charitha	Charitha
Lakshan Masked	Lakshan Masked
John Masked	John Masked
John	John
Unknown	Lakshan
Charitha Masked	John Masked

John Masked	John Masked
Lakshan	Lakshan
Charitha	John
Lakshan	Lakshan masked
John	John

The following confusion matrix plot diagram was able to generate according to the given data by Spider IDE. This confusion matrix provides a summary of classified data. The number of correct and wrong predictions are summarised and broken down by class with count values. (Brownlee, 2020)

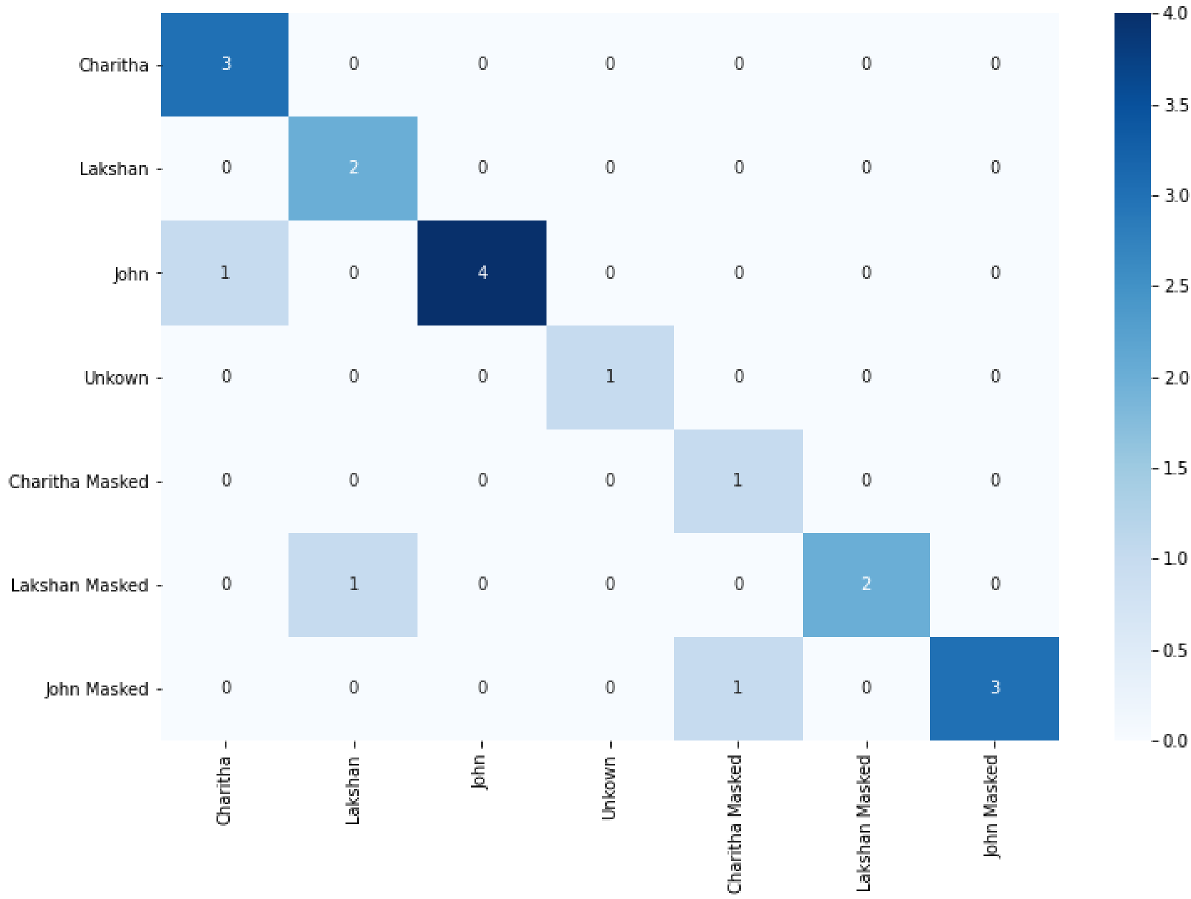

Figure XXVI: Confusion matrix plot diagram

Mean Square Error (MSE) in statistics is defined as the mean or average of the square between the actual and predicted values. To get the MSE value actual values are taken as the X-axis and for the Y-axis predicted values are used. From the sklearn python machine learning, library mean square error finding was used to get Mean Square Error. (Deval, 2020)

Actual = [0.5, 1.0, 1.5, 1.5, 2.0, 2.5, 3.0, 3.5, 3.5, 4.0, 4.0]

Predicted = [0.5, 1.0, 1.5, 0.5, 2.0, 2.5, 3.0, 3.5, 1.0, 4.0, 2.5]

The Mean Square Error was: 0.8636363636363636

According to the confusion matrix plot figure linear regression analysis was calculated and get the below figure. Data points are shown on the figure according to the confusion matrix figure X-axis and Y-axis. (Brownlee, 2020)

The confusion matrix is used for assessing the accuracy of a classification problem. Mean square error (MSE) is used to assess the precision of the regression problem.

Discussion

The face mask recognition and masked tasks of face recognition are two closely connected and separate applications compared to the ordinary face masks today. The role of facial mask detection must show whether a person is wearing a mask. An individual with a personal identity must be recognised by the masked facial identification task. There are different specifications for each task. The former requires masked face photos only, however the former requires a dataset comprising several face images of the same subject with and without a mask. In comparison, the data set utilised to recognize the face is tougher to build. In this application, a pre-trained dataset and masked face dataset are presented as an image for masked facial recognition activities. (Bishwas Mandal, 2020) While changes in face posture, occlusions and other restrictions are usually experienced during unrestricted circumstances under which images degrade, popular systems continue to suffer. A person can mask his identity by changing his face or by using different altered physical attributes. Masks or occlusions of various types decrease the fundamental characteristics to recognise a person with fewer facial characteristics cause masked face problems than other typical facial recognition algorithms. Consequently, the identification accuracy rate decreases. Terrorists and suspects are disguised because they obscure their identity. For this reason, the veiled face is an important facial component. On the other hand, a deep learning network is difficult to apply since there is not enough training material to create deep learning networks that have to use transfer learning.

Conclusion and recommendation

The pre-trained model was employed to enhance masked faces' recognition. This method has been benchmarked using two well-established data groups and a pre-trained data set. In these data sets, mask identification of the face shows superior detection rates with the tested Artificial Intelligence approach. It enables the accuracy of a pre-trained data set and image database model which is trained in masked and unmasked images to be determined better. The technique can be applied to more difficult and many other occlusive sources, whilst the application focuses on masks that come from a hat, shade and barley, longer hair, moustache and medical mask. The masked face recognition with an application for Artificial Intelligence covers the ability to read faces to be masked whether one face or several faces depending on the look. It is pleasing to highlight that even if a human is wearing a mask, the application can identify human visions and recognize the face. (Hajjaji, 2021)

This method is not appeasement with all sorts of masks. It could also be more accurate and complex than needed. In the case of variable light conditions on the face and low light circumstances around the face, face recognition also may be mistaken. In order to solve the many severe masks and light situations of facial recognition, it is vital to develop and expand the application work in future. At the same time, Sustainable Technology can improve the adoption and manufacturing of devices with autonomy and intelligent data and machine learning systems. In order to deal with data, security is crucial.

References

Bishwas Mandal, A. O. a. Y. T., 2020. Masked Face Recognition using ResNet-50. Volume 1, pp. 2-6.

Brownlee, J., 2020. *confusion-matrix-machine-learning/.* [Online] Available at: https://machinelearningmastery.com/confusion-matrix-machine-learning/ [Accessed 15 09 2021].

Brownlee, J., 2020. *confusion-matrix-machine-learning/.* [Online] Available at: https://machinelearningmastery.com/confusion-matrix-machine-learning/ [Accessed 20 09 2021].

Deval, S., 2020. *blog/mean-square-error-explained/.* [Online] Available at: https://www.mygreatlearning.com/blog/mean-square-error-explained/ [Accessed 20 09 2021].

Dulčić, L., 2019. *face-recognition-with-facenet-and-mtcnn/.* [Online] Available at: https://arsfutura.com/magazine/face-recognition-with-facenet-and-mtcnn/ [Accessed 20 9 2021].

Güse, J., 2020. *face-detection-using-mtcnn-a-guide-for-face-extraction-with-a-focus-on-speed-c6d59f82d49.* [Online] Available at: https://towardsdatascience.com/face-detection-using-mtcnn-a-guide-for-face-extraction-with-a-focus-on-speed-c6d59f82d49
[Accessed 20 09 2021].

Hajjaji, M. A., 2021. *Real-Time Implementation of AI-Based Face Mask Detection and Social Distancing* , Tunisia: s.n.

Md. Sabbir Ejaz, M. R. I., 2019. MASKED FACE RECOGNITION USING CONVOLUTIONAL NEURAL NETWORK. Volume 1, pp. 1-3.

IT ASSISTANTS FOR ELDERLY PEOPLE TO AVOID THE MEDICATION ERRORS

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Abstract
Old age is the final stage of the human life cycle, and it is an age group or generation which comprises a segment of oldest people in a society or a country. A common fact amongst the members of this age group is the deterioration of physical and mental strength. As a result, medication errors seem to be a common condition among elders. Medication error is a failure that can happen in the treatment process that may lead to a risk of human life. According to the U.S. Food and Drug administration, medication errors cause at least one death for elders every day in USA, and injury roughly 1.3 million every year. (mmLearn.org, 2019) Hence, the main aim of this study is to investigate the relationship between the difficulties and the medication errors faced by the elders, during their medication taking process. The study has conducted with four objected variables by targeting the age limit over 60 on elders. And the correlation analysis had used to find the several major challenges facing by elders in obtaining medication, many of which are externally occurring problems and could be affecting medication errors. Hence, this study emphasizes the importance of a medicine reminder and a health care management application as a solution for the problems found. IT assistance application for an error free medication process was recommended successfully based on the study findings.
Key Words : Elders, Medication Errors, Medication Reminding, Older Age

Introduction

There is no universally accepted age which can be labelled as old within societies, it's usually a disputable fact as to what age a society may consider old. Nevertheless, 60 or 65 is the age of eligibility for retirement, to receive special concessions and also for participation of old-age social programs in most of Western countries as well as in some Eastern countries at present. The detection of chronic degenerative diseases, as well as the recommending and utilization of medications have increased due to this fact. In addition to that, aging brings out various kinds of health issues. With the impact of several health-related issues, most of the seniors are required to take multiple medications daily. According to some of the studies, 87% of elders are taking at least one prescribed drug, 36% are taking 5 or more, and 38% use over-the-counter medications. (DailyCaring Editorial Team, 2018)
Although all medications do not cause adverse side effects, quite a few commonly used drugs are known to make thinking capacity and balance weak in aging adults. Medical conditions can usually be considered as a prominent part in old age. Also, the elderly people living with such conditions inevitably need more support than ever before in their lives. According to the facts available at the Department of Health and Human Services of UK, fifty five percent

of the elderly do not comply with their prescribed drug orders, which means that they do not take their medication according to the doctor’s instructions.

Although, the most common medical conditions in the old age have been identified as arthritis, heart attacks, diabetic, cholesterol and blindness, there are also many other ailments that elders suffer from. Approximately 200,000 older adults have to be hospitalized annually due to adverse drug reactions and mistakes which happen when having the medicines. The significant memory loss and the problem of identifying would be lead to certain problems like misuse of the doses, getting the wrong drug or the wrong dosage, inability to identify the drugs correctly, etc. So, due to these kinds of shortcomings, many older people get into serious health issues like unexpected heart attacks, kidney failures, drug interactions, and the worst thing is, some of them die as a result of such mishaps. (Sollitto, 2011)

Objectives

- To identify the level of health status of elders over sixty years
- To identify the difficulties faced by the elders in their consultation process.
- To examine the impact of non-adherence of medication on elders.
- To find out the impact of pharmacy related issues for the medication errors to be occurred.

Literature findings

Many Medication Systems have been developed based upon different platforms and concepts. Sharma et al (2018), has designed and developed a medication reminder application targeting to provide an effective health care approach. Their main objective is to provide services on a reminding basis of the timing of the dosages through an alarm ringing system as a solution for the medication errors. The application will run on the Linux-based operating systems. In their application, the reminding system process is working/operating as ringing an alarm with an image of the medication according to the patient's medication intakes. Following is the overview of the application (Sharma, et al., 2018)

Deepti, et al, had developed a health care application by identifying the factor of medication non-adherence among so many patients. This application help in reducing the errors and issues which can arise while taking medication. The patient login module consists of four main modules: Alarm setting, getting a notification, health care and getting an alert to deactivate it if they don't take their medication on time. (Ameta, et al., 2015)

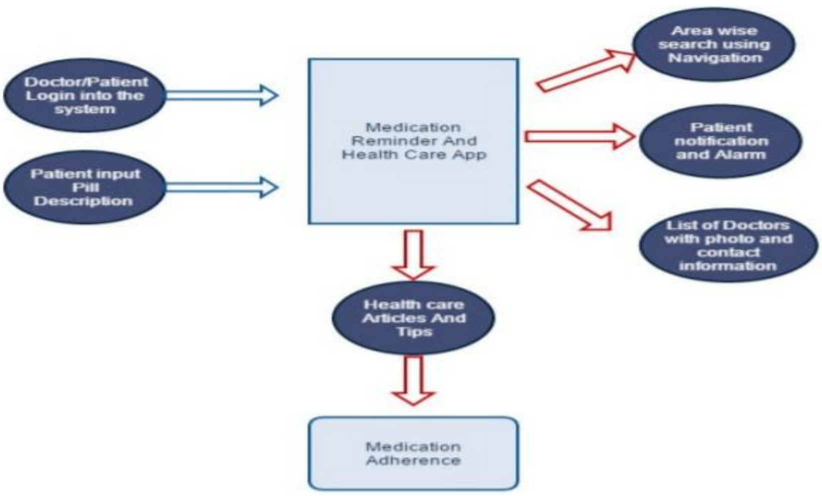

Figure 1- Medication Reminder and Healthcare: System Overview cited from IJMPICT

Methodology

Conceptual Framework

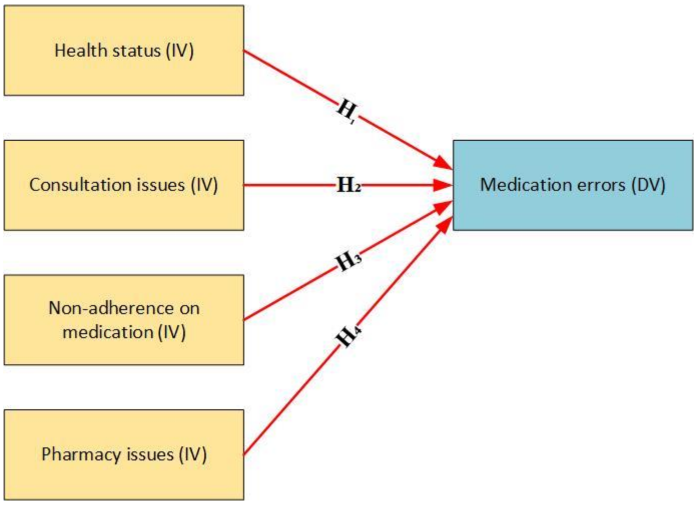

Figure 27- conceptual framework

Hypothesis

H_1: There is a positive relationship between health status and medication errors of elders.

H_2: There is a positive relationship between consultation and medication errors of elders.

H_3: There is a positive relationship between non-adherence to medication and medication errors of elders.

H_4: There is a positive relationship between pharmacy related issues and medication errors of elders.

The study will be conducted with the above given independent and dependent variables. The selected age category was elders over sixty years who represents the total of 2,520,573 as the elderly population. The used sample size was sixty, Elders over sixty years were selected from an elderly home by using the sampling method of convenience sampling. Although, it is easy to use a google form or any other online platform to collect the data, most of the elders are not familiar with such technologies. Therefore, due to the current situation, the most convenient way for data collection is an elders' home, as it can be easily identified as the perfect place to meet a considerable number of seniors at any given time. Quantitative data collection method is used for this study, and the tool used to collect the data was a questionnaire.

Data Analysis and Hypothesis Testing

Statistical analysis

Analysis of the Distribution of Age of the Sampled Population

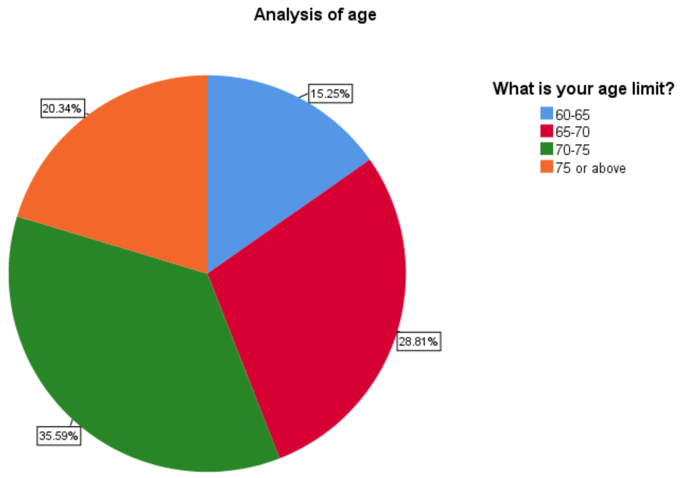

Figure 3- Age analysis

According to the age analysis, the maximum range of age limit who responded to the questionnaire was 70 – 75 years old elders.

Analysis of the patients who suffer from chronic medical disorders or any other condition.

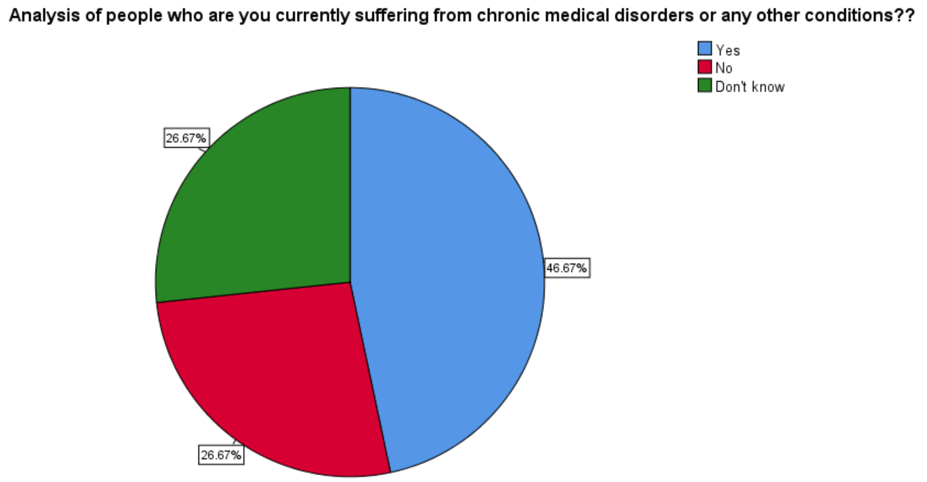

Figure 4- patients who suffering from various health problems

As per the analysis, out of sixty elders, forty-three are suffering from some kind of health issue. As a percentage, it is 46.67%. Accordingly, a higher number of elders are in a condition of taking medication due to various kinds of health issues.

Reliability testing

To measure the reliability in this study, "Cronbach's Alpha≥ 0.7" is the used alpha method. (Pallant, 2013)

Table 1- Cronbach's Alpha value table

	Variable (Dependent / Independent)	Cronbach's alpha value
1	Medication errors (Dependent)	0.670
2	Health status (Independent)	0.731
3	Consultation (Independent)	0.695
4	Non-adherence (Independent)	0.705
5	Pharmacy issues (Independent)	0.795

The overall Cronbach's Alpha value of all the variables was 0.866. Hence, the internal consistency was very good and acceptable, and it will also give credible results.

Correlation testing

Correlations

		errors	Health	Consultation	Non_adherence	pharmcy
errors	Pearson Correlation	1	.513**	.879**	.512**	.080
	Sig. (2-tailed)		.000	.000	.000	.556
	N	60	59	59	60	57
Health	Pearson Correlation	.513**	1	.539**	.615**	.096
	Sig. (2-tailed)	.000		.000	.000	.476
	N	59	59	58	59	57
Consultation	Pearson Correlation	.879**	.539**	1	.602**	.027
	Sig. (2-tailed)	.000	.000		.000	.842
	N	59	58	59	59	56
Non_adherence	Pearson Correlation	.512**	.615**	.602**	1	.108
	Sig. (2-tailed)	.000	.000	.000		.425
	N	60	59	59	60	57
pharmcy	Pearson Correlation	.080	.096	.027	.108	1
	Sig. (2-tailed)	.556	.476	.842	.425	
	N	57	57	56	57	57

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 5- correlation analysis

The correlation between medication errors and health status was statistically significant at the 0.01 level with a Pearson correlation coefficient of +.513. The correlation between medication errors and consultation issues was statistically significant at the 0.01 level with a Pearson correlation coefficient of +.879. The correlation between medication errors and medication non-adherence issues was statistically significant at the 0.01 level with a Pearson correlation coefficient of +.512. So three of these three variables show a strong positive linear significant relationship to medication errors.

The correlation between medication errors and pharmacy issues was statistically not significant at the 0.01 level with a Pearson correlation coefficient of +.080. It shows that there is a weak relationship between the impact of pharmacy issues and medication errors.

Normality test

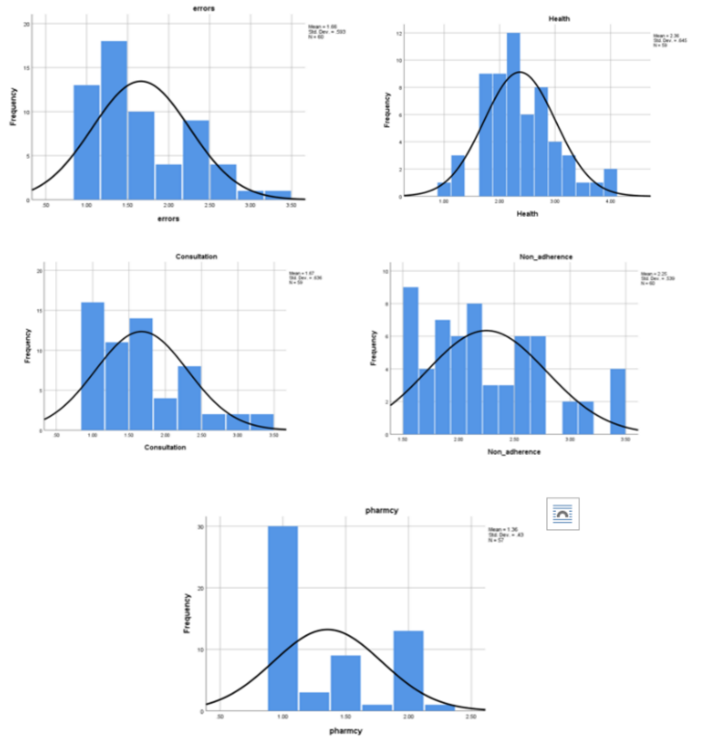

Figure 6- histograms of normality testing

According to the data on the table, most of the independent variables and dependent variables are within the range of -1< skewness<+1.

Result Discussion

Due to the limitations presented by the COVID-19 epidemic, the study sample of sixty has been taken with a 12.65 confidence interval. The followings were the most common identified reasons throughout the questionnaire which led to medication errors of elders:

- Impact of current health status
- Impact on consultation
- Non- adherence to medication

According to the correlation analysis, it indicates the possible evidence in health status (0.513), consultation (0.879), and non-adherence impacts (0.512), to have an effect on the medication errors on elders. However, the pharmacy-related issues (0.08) needed to be excluded because correlation proves that there is no relationship between pharmacies and medication errors.

Conclusion and Recommendations

Analysis proved remarkable impact on health status, consultation issues and non-adherence to medication among elders rather than pharmacy related errors. The recommendations for the application targeted the main three key areas. Study was concluded successfully recommending an effective solution for the elders to engage for an error free medication process.

The recommended platform is an application. It has two approaches like dashboard and android/iOS platform. The dashboard will be used by the hospitals and the medical centers, and the application is using by patients. When a patient went for a consultation for a medical center or hospital, it will be providing registration for the application as the patient's preferences. Registered patients will be getting permission to log into the system. The registered patient will be saved on the database of the dashboard, and when the patient engaged with the consultation, the doctors or the consultors will be providing prescriptions, instructions, and all for the nurse. The nurse is adding the prescriptions, instructions, side effects, etc, according to the patients' ID. Then the system automatically setting up the reminders as per the added information.

Patients get a reminder as per the added information by the nurse and the reminding tone will be coming as a voice record, announcing the name of the pill and the dosage with the milligram type. During the registration process, the hospital will be adding a contact number and the name of a caretaker who is close with the patient. At the same time, the reminder will be coming to the caretakers' phones as a text message. Also, another benefit of this application is all the registered patients will be getting an opportunity to contact a medical assistant freely in an emergency case. And the registered patients can get to know the current appointment number which is being attended to at the consultation. Then he/she can manage their time accordingly.

Reference

Ameta, D., Mudaliar, K. & Patel, P., 2015. MEDICATION REMINDER AND HEALTHCARE – AN. *International Journal of Managing Public Sector Information and Communication Technologies (IJMPICT),* VI(02).

DailyCaring Editorial Team, 2018. *medication-management-for-seniors-10-safety-tips/.* [Online]
Available at: https://dailycaring.com/medication-management-for-seniors-10-safety-tips/
[Accessed 18 april 2018].

mmLearn.org, 2019. *the-most-common-medication-errors-for-seniors-and-how-to-avoid-them.* [Online]
Available at: https://training.mmlearn.org/blog/the-most-common-medication-errors-for-seniors-and-how-to-avoid-them
[Accessed 13 September 2019].

Pallant, . J., 2013. SPSS SURVIVAL MANUAL. In: *SPSS SURVIVAL MANUAL.* Australia: Midland type setters, pp. 101-104.

Sharma, S., Tyagi, K. & Shishodia, P., 2018. Salubrity- A medicine reminder application using android. *International Journal of Advance Research, Ideas and Innovations in Technology,* IV(4), pp. 1473-1478.

Sollitto, M., 2011. *medication-problems-elderly-people-have-146111.htm.* [Online]
Available at: https://www.agingcare.com/articles/medication-problems-elderly-people-have-146111.htm
[Accessed April 2011].

AUGMENTED REALITY BASED MOBILE APPLICATION FOR SECONDARY SCHOOL STUDENTS

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Abstract
Education is a part of human life. The Generation Y" and "Generation Z" students are technology centric audio-visual learners, and they fail to visualize and understand the lesson effectively in the traditional classroom methods of teaching and learning. The needs of modern students can be fulfilled through digital learning. The traditional classroom methods have less engagement, less interactivity, less knowledge checks, and old-fashioned textbooks filled with letters and plain images. In this research it is focused on developing an Augmented Reality based mobile application to improve the student learning.
Keywords: Digital Learning, Interactivity, Audio-visual aids, Augmented reality, Image processing, Artificial intelligence

Introduction

Background of the study

Kids of "Generation Y" and "Generation Z" are technology centric audio-visual learners. The common problem that is seen in most of these two generations of learners are the difficulty of visualizing the architectures and concepts. This issue is specific for all the human beings psychologically (Supan, 2019)
Dual-coding theory says that brain uses various memory paths for various types of information. Therefore, visual learners use more paths to store information, that can be easily recalled later. (Paivio, 1990). Instructional theory explains about using visual learning materials to improvise learning. This theory guides on organizing, coordinating with learners, introducing visual learning materials, and supporting the usage of a similar tools (Donggil Song, 2018).
In 1993 research that was conducted, concludes that auditory learners achieve more since they can remember and manipulate information (Dunn & Dunn, 1993). In 1999 another research says that auditory learning is effective for school students since they can be trained to achieve learning in various forms (ARI, et al., 1999). Also, in 2003, research confirms that auditory learners can arrange words easily. (Tabanlioğlu, 2003).
Therefore, rather than using old plain textbooks, students can learn interactively by using mobile phone through which audio-visual learning can be done effectively. To create 3D visuals Augmented reality (AR) is used. AR is a technology that can place computer graphics on top of the real-world objects. It can create 3D (Three dimensional) images and 2D (Two dimensional) images which can interact with the users (Silva, et al., 2003). This research is based on using AR and AI to create an interactive learning application for the students.

Aims and Objectives

In Sri Lankan Education System, the textbooks are filled with a lot of plain letters and images which are complicated for the students to understand. The main aim of this research is to overcome this barrier and provide a smooth mobile learning experience to the learners.

Objectives of the study,

- Using Augmented Reality to create easy methods to understand the concepts of lesson through to visual aids effectively by using 3D images, 3D videos and 3D diagrams. These images can be further zoom in, zoom out, rotate and see-through.
- Using Artificial Intelligence to create audio aids, such as mnemonics and music, to support the learner to memorize and remember the information for a longer period while improving listening skills.

Methodology.

Data can be collected in qualitative and quantitative approach. For this research, data is collected in qualitative approach using interviews, documentations, and observations. (Maxwell & Kaplan, 2005).

As a result of the gathered data, it was easy to distinguish the problem domain. Therefore, the problem domain is introduced with a solution, using Augmented Reality, Image Processing and Artificial Intelligence. As the initial phase, the solution is implemented for Grade 11, Local syllabus Science Part 1, for lesson "Biological Process in Human Body" (Educational Publications Department, 2019).

AR is a technology that is bound with the computer-generated enhancements to perform meaningful interactions. AR generates a 3D environment to interact with. Users can immerse themselves on the synthetic environments to feel different phenomenon (Silva, et al., 2003).

AR can be used via mobile devices. If AR is compared with VR (Virtual Reality), AR stands as the best. It's due to the high accessibility, easiness to experience, easiness to create, and high scalability (Romanhuk, 2018).

To create AR objects, image processing techniques are used. Positional-based augmented reality is used to identify the real-world objects and to superimpose them on top of the images (Kim & Jun, 2008). This technique can be easily achieved by using Vuforia engine.

To create the AR experience, in this application Vuforia engine SDK is used. Vuforia is integrated with Unity to create AR models. There are many features such as cloud targets, image targets, multi targets, VuMarks, user defined targets and AR stereo rendering in Vuforia which make the AR component development easy.

Unity is a famous game development tool which is used here to develop an educational application. Compared to other game development applications, unity performs better with augmented reality. Unity can support a variety of platforms. It is a beginner friendly tool which can be easily written with C# (Buyuksalih, et al., 2017).

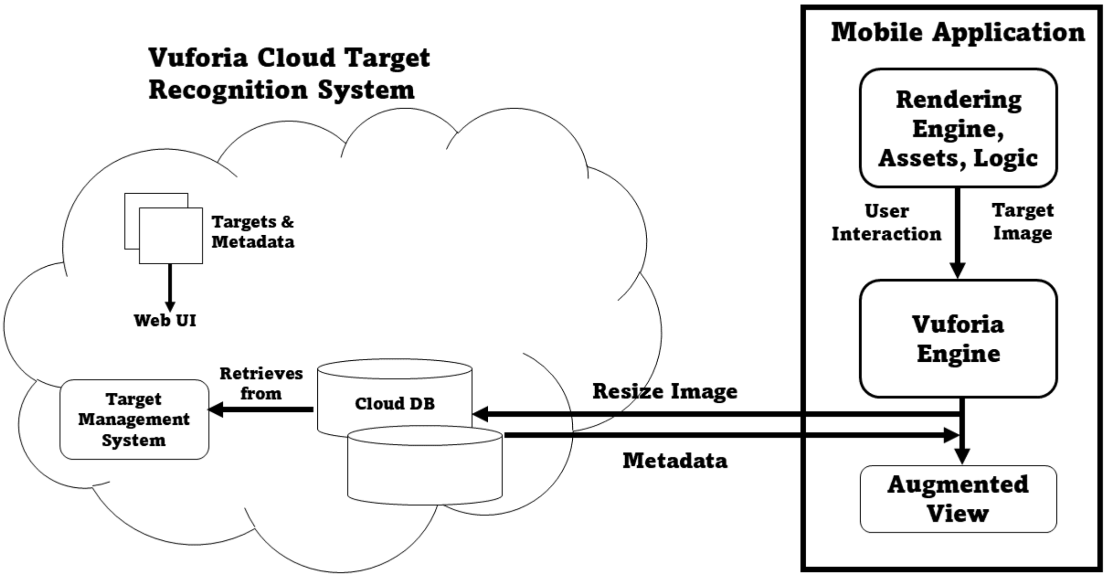

Figure 01: Architecture used for the Augmented View creation

In this application to create the augmented view, a client server architecture is used. Vuforia Cloud Target Recognition system (VTRS) communicates with the mobile application created with Unity. The scanned AR image targets are transmitted to VTRS as they request corresponding metadata to return to the response.

Using C# this android Mobile application was implemented. It's responsible for finding and controlling images from the mobile camera. AR markers provides a good recognition for image targets, providing needed interpretation, sending requests based on the AR markers, sending them back to VCTRS for recognition to display interpreted data as augmented information on top of the mobile. VCTRS is a system that can recognize solutions to manage and host image targets online. It identifies systems that compare and recognize requests from mobile applications where the target is saved in the cloud database to search for the match and bound to the target to response to the client.

Apart from creating an interactive 3D environment, this application will provide a piece of study music and an explanation on each of the object which helps to keep the attention of the student for a prolonged period. Artificial intelligence is used train the model to speak. A Microsoft speech service that comes under Azure Cognitive Service, text to speech is used train the model (Microsoft, 2020).

In 1954, physiologist Paul Fitts presented his theory of "Human Mechanics and Aimed Movement". He states when an object is bigger its closer to us and it's easy to reach. This theory is used in current UI UX to provide better user experience. According to Fitts law the interactions are places on the right position with the right size in this application (Interaction Design Foundation, 2020).

As "the rule of first impression" says the first screen of the application is kept, simple and attractive. This is a fundamental principle of UI UX. The simple and easy to explore screens give a better UI control for the end users. (Roth, 2017).

While creating this application, KISS (Keep it simple stupid) law is also considered. This law emphasis the developer to understand the usability of the application by the end user and to keep it simple and straightforward (Interaction Design Foundation , 2020).

In 2021, the use of mobile devices in Sri Lanka is high (Simon Kemp, 2021). Currently the use of mobile devices among students are rapidly increasing (Papadakis & Kalogiannakis, 2017). Therefore, an android mobile application is created. It supports all the android devices starting from Oreo OS which is a 2013 release that is created by integrating with Unity.
As the test data, the collected data is used. To verify the correctness of the application Unit Testing and End-to-end testing was conducted. During the Unit testing several functional corrections were made. The unit testing was then followed by an end-to-end testing. In End-to-end testing the flow of the application was tested from the starting to the ending.

Results and Discussion.

As a result of this research, students will get an opportunity to learn interactively through this mobile application. Students can scan an image on their textbook. As they scan the image, they can start to interact with the 3D Object that pops on top of the screen. Student can see the actual-colored images in a 3D view which let them see-through, rotate, zoom in, and zoom out.
This application not only provides a 3D view but also it will provide sounds for each object making it more realistic and engaging. A background study music will be provided to the student along with an explanation of the object. This will maintain the attention of the student for a prolonged period.
As this application follows the UI UX principles, the screens are kept simple for the students to understand and interact easily. Below attached are few UIs of the application.

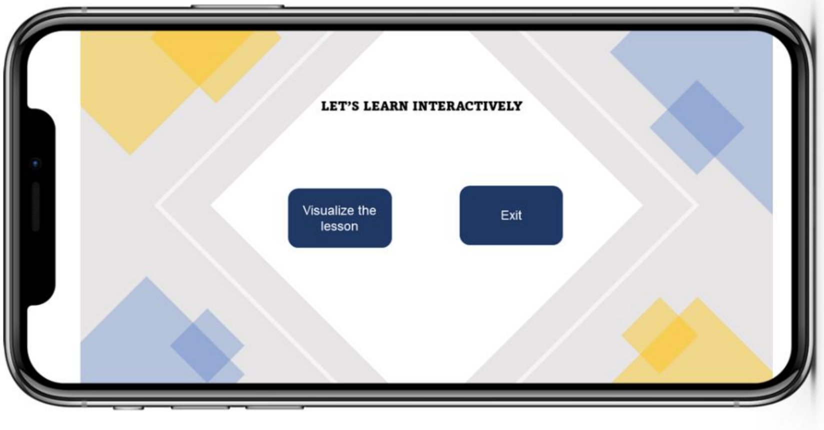

Figure 02: Home Screen

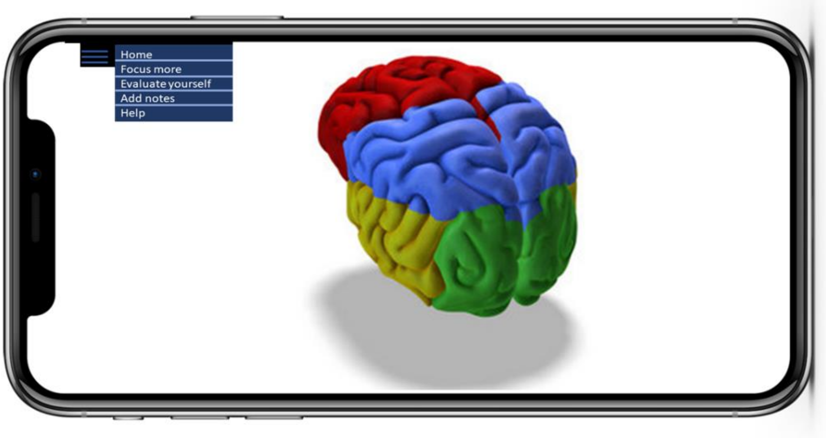

Figure 03: Scanned 3D object with the menu list

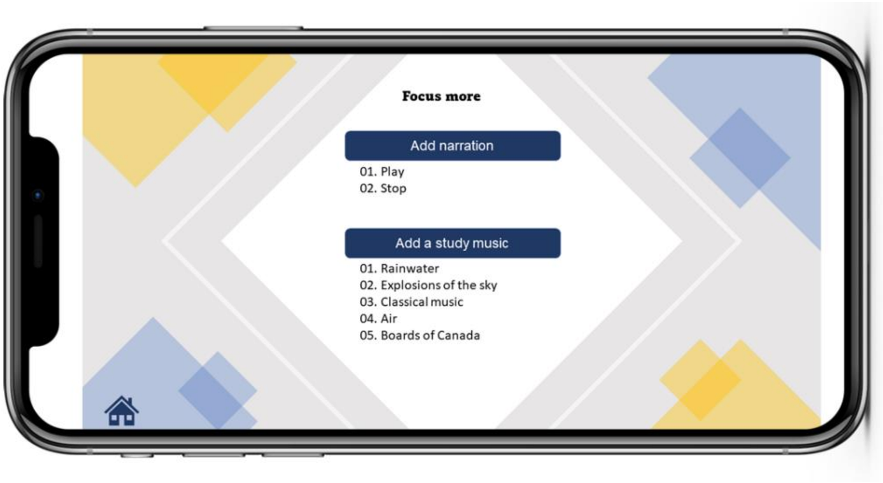

Figure 04: Screen to customize the narrations and study music

Going forward this research can be enhanced further to create a better application. As on the test phase currently this solution is applied only to one lesson. But this can be applied for multiple lessons. As an enhancement this application can be integrated to a LMS to monitor the progress of the student along with an automated proctoring tool and multiple quiz types. Also, an AI Bot can be implemented in the application to further interact with the student. As this application is currently available only on android, it can be made available in iOS too.

Conclusion and Recommendation

This research paper is based on developing an application through which it is possible to conceptualize and understand the concepts of the lessons easily through visual aids such as 3D Images, 3D Videos and 3D diagrams which can be zoom in, zoom out, colorize, see through, and rotate just by scanning an image.

Side by side audio aids such as mnemonics and music are added where the learners can listen to the background narration and focus on to the lesson for a prolonged period.

The research has given an overall better interactive educational application with the essence of Augmented Reality, Image Processing, and Artificial Intelligence along with the community-based data. The research-based approach will help students for better understanding, conceptualization, and visualization of every lesson effectively.

References

Ari, R., Ure, O. & Yilmaz, H., 1999. *Gelişim Ve Öğrenme Psikolojisi.*. Konya: Mikro Yayinlari.

Buyuksalih, I., Bayburt, S., Buyuksalih, G. & Baskaraca, A. P., 2017. 3d Modelling And Visualization Based On The Unity Game Engine – Advantages And Challenges. *4th International Geoadvances Workshop,* Iv-4/W4(160-166).

Donggil Song, 2018. *Instructional Theory (Or Instructional-Design Theory). 4 Characteristics.* [Online]
Available At: Https://Einbrain.Com/1807
[Accessed 13 10 2021].

Dunn, R. & Dunn, K., 1993. *Teaching Elementary Students Through Their Individual Learning Styles: Practical Approaches For Grades 3 - 6.*. Boston: Allyn & Bacon.

Educational Publications Department, 2019. *Science Grade 11 Part - I.* Isbn 978-955-25-0314-6 Ed. Colombo: Educational Publications Department.
Interaction Design Foundation , 2020. Kiss (Keep It Simple, Stupid) - A Design Principle. *The Encyclopedia Of Human-Computer Interaction, 2nd Ed.*, P. 4000.
Interaction Design Foundation, 2020. What Is Fitts' Law?. *The Encyclopedia Of Human-Computer Interaction, 2nd Ed.*, P. 4000.
Kim , J. & Jun, H., 2008. Vision-Based Location Positioning Using Augmented Reality For Indoor Navigation. *Ieee Transactions On Consumer Electronics*, 54(3), Pp. 954 - 962.
Maxwell, J. A. & Kaplan, B., 2005. Qualitative Research Methods For Evaluating Computer Information Systems. *Evaluating The Organizational Impact Of Healthcare Information Systems,* Pp. 30-55.
Microsoft, 2020. *Azure Cognitive Services Research.* [Online]
Available At: Https://Www.Microsoft.Com/En-Us/Research/Group/Cognitive-Services-Research/Speech-And-Dialog/
[Accessed 10 11 2021].
Paivio, A., 1990. *Mental Representations: A Dual Coding Approach.* S.L.:Oxford Science Publications.
Papadakis, S. J. & Kalogiannakis, M., 2017. Mobile Educational Applications For Children. What Educators And Parents Need To Know. *International Journal Of Mobile Learning And Organisation,* 11(3), P. 256–277.
Romanhuk, A., 2018. Virtual Reality Vs Augmented Reality. *Academia,* P. 16.
Roth, R. E., 2017. User Interface And User Experience (Ui/Ux) Design. *The Geographic Information Science & Technology Body Of Knowledge (2nd Quarter 2017 Edition),* Volume 10.22224/Gistbok/2017.2.5.
Silva, R., Oliveira, J. C. & Giraldi, G. A., 2003. Introduction To Augmented Reality. *National Laboratory For Scientifc Computation,* Pp. 1-11.
Simon Kemp, 2021. *Digital 2021: Sri Lanka.* [Online]
Available At: Https://Datareportal.Com/Reports/Digital-2021-Sri-Lanka
[Accessed 02 11 2021].
Supan, J. E., 2019. P/Reaching To The Post-Millennial: An Analysis Of Youth Groups In Evangelizationthrough Storytelling. *Academia,* Pp. 1-10.
Tabanlioğlu, S., 2003. The Relationship Between Learning Styles And Language Learning Strategies Of Pre-Intermediate Eap Students. *Graduate School Of Social Sciences, Master Thesis, Odtu.*

SOCIAL SCIENCE

A CASE-STUDY ON PERCEIVED STRESS AND WORK-RELATED BURNOUT IN EDUCATORS BEFORE AND DURING COVID-19 IN COLOMBO DISTRICT

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Abstract
Transforming physical learning to online in a rushed and forced manner because of COVID-19 pandemic created many challenges. Therefore, this study was conducted to investigate the effects of involuntary online teaching, on work-stress and total work-related burnout levels of teachers during COVID-19 pandemic. Data were collected from selected 100 teachers in Colombo District via an online questionnaire based on Perceived Stress Scale & Copenhagen Burnout Inventory. The results of pooled t-test and Wilcoxon signed ranks test showed that average perceived stress and total work-related burnout has increased among teachers due to involuntary online teaching during the pandemic as well as significant difference in perceived stress before and during the pandemic. Therefore, this study would help to make improved decisions on support mechanism to adopt for those who may remain at home on similar outbreaks in future.
Keywords: Online Teaching, Perceived Stress Score, Work-Related Burnout, COVID19.

Introduction

SARS-CoV-2, the virus that causes COVID-19 disease, began to spreading in December 2019. The outbreak has caused over 220 million cases, and more than 4.5 million deaths worldwide (worldometer, 2021). Sri Lanka is currently in its second wave of the virus with over 450,000 cases and 9500 deaths (Health Promotion Bureau Sri Lanka, 2021) at the time of the study.

Owing to the closing of schools and colleges as a move to curb the transmission of disease, students had to be kept away from the educational premises and taught online. In a news article published by Kadirgamar and Thiruvarangan, (2020) it was stated that teachers are often shamed for not having the technical skills to competently teach using digital platforms. It was further stated that traditional classroom curricula cannot be superimposed so that they can be delivered digitally during a pandemic and become equally burdensome for students, anxiety and depression has increased (National Center for Health Statistics, 2020).

In a study conducted by Suganya and Sankareshwari (2020), showed that the level of satisfaction felt by the teachers was less in online teaching. The study also highlighted the intensity of impacts among educators and how online education has affected their psychological well-being.

Since there was little empirical research carried to understand the stress and work-related burnout experienced by teachers caused by this forced remote working on a Sri Lankan context, it became significant to carry out the study in context with valid and reliable instruments to help Sri Lankan education sector employers to take favorable decisions on teachers whose work remain from home and it can also achieve better understanding of the future of the remote working in Sri Lanka that is in a rapid transitional stage in the global arena. Therefore, the objectives of the study were;

- To identify the difference in perceived stress before and during early Covid-19 pandemic.
- To identify the significant difference in work-related burnout between educators who worked remotely before Covid-19 pandemic and those who have not worked remotely before Covid-19 pandemic.

Methodology

Data were collected by using selected 100 respondents through convenience sampling which contain teachers and lecturers in different institutes in Colombo district. Two standard questionnaires which measure Perceived Stress Scale (PSS) & work related burnout were distributed among selected respondents.

The Perceived Stress Scale (PSS) was used as the stress inventory instrument for the study (Cohen, 2019). The participants were asked about participants' feelings and thoughts "during the last month before the COVID-19 restrictions" (pre-COVID) and then the 10 questions were repeated again asking participants to answer about their thoughts and feelings "since the COVID-19 restrictions began" (during-COVID). Each question carried a score between 0-4 and questions had 5 possible answers on a Likert scale and each of the answer were assigned points: Never = 0, Almost Never = 1. Sometimes = 1, Fairly Often = 3 and Very Often = 4. The summation of total, results in a PSS score that is ranged from 0-40, categorized as 0-13-=Low Stress, 14-27= Moderate Stress and 27-40= High Stress (NH Departement of Administrative Services, 1983).

Copenhagen Burnout Inventory (CBI) which contains 7 questions was used for this the study in order to measure Total Work Related Burnout score (TWRB). All burnout questions had 5 possible answers on a Likert scale and each of the answer were assigned points: Never/ Almost Never = 0, Seldom = 25, Sometimes =50, Often =75, and Always =100. These score values were reversed for the 7th question in this scale. The score of the total work-related Burnout level was calculated as mean value; therefore, every score had value between 0–100 where average burnout scores greater than or equal to 50 was taken as High burnout and average burnout score less than 50 was taken as low burnout (Kristensen, et al., 2005).

Descriptive analysis was used to identify patterns of data using SPSS version 20. In addition to that, independent sample t-test and Wilcoxon Signed Ranks Test were carried out after checking the normality of variables in order to check below hypothesis based on research objectives.

H_{11}: there is a significant difference in perceived stress before and during early Covid-19 pandemic.

H_{12}: there is a significant difference in work-related burnout between educators who worked remotely before Covid-19 pandemic and those who have not worked remotely before Covid-19 pandemic.

Results

According to results of descriptive and inferential analysis, below mentioned important findings were obtained.

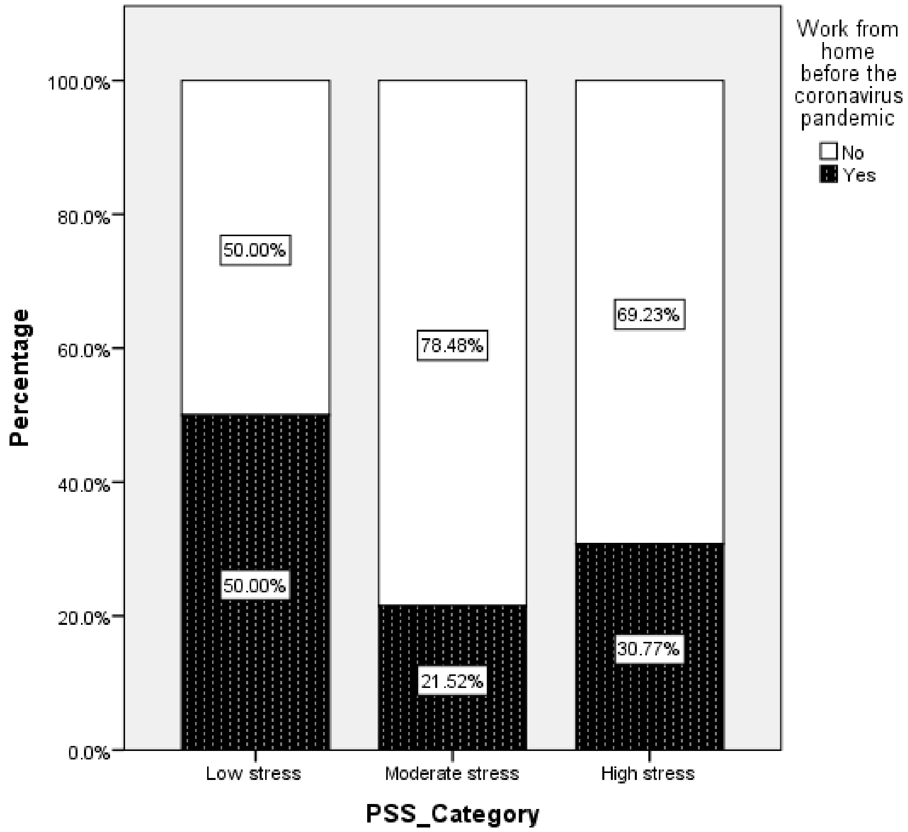

Figure 1: Distribution of Perceived Stress Score (PSS) Category

The result of Figure 1 shows that the majority of respondents who fall on high stress and moderate stress categories have not worked from home before COVID-19 restrictions.

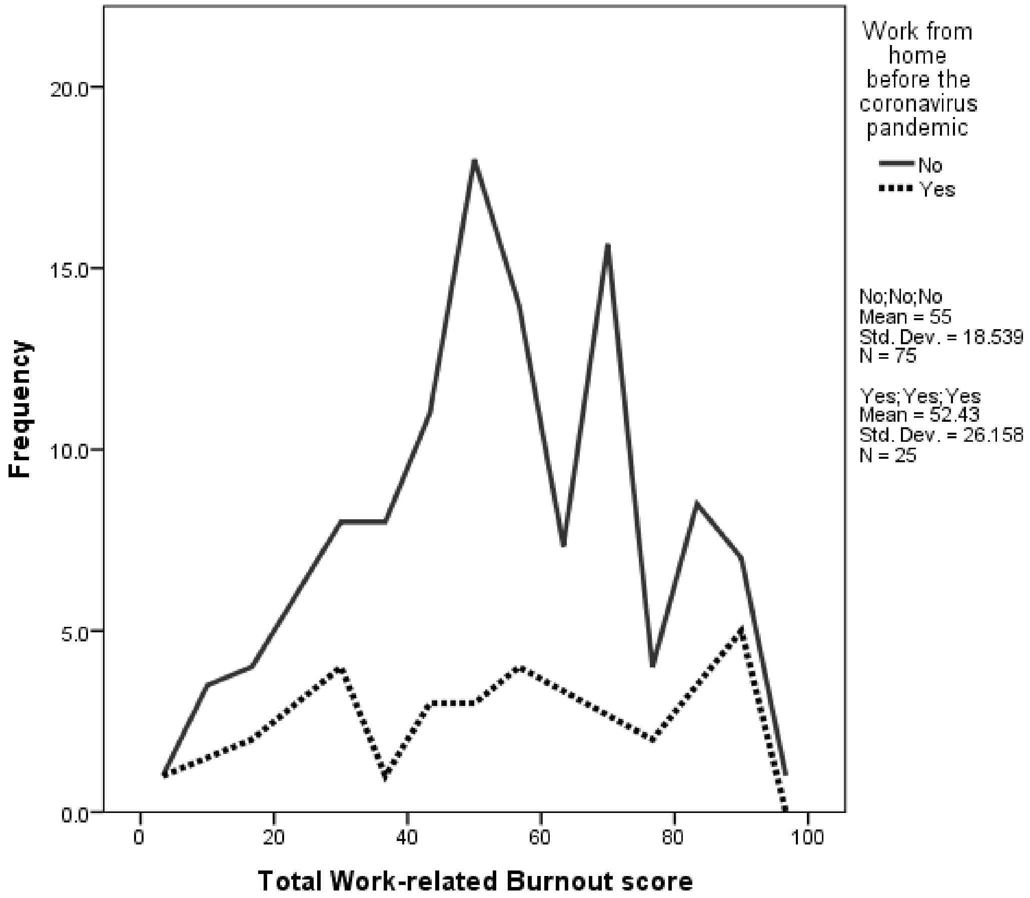

Figure 2: Distribution of the Total Work-related Burnout Score

According to Figure 2, it can be clearly identified that high work related burnout score can be seen among respondents who have not worked from home before COVID-19 restrictions (mean value of 55) compared to respondents who had that experience before the pandemic (mean value of 55.43).

Table 1. Total Work-related Burnout score

Mean	54.36
Std. Deviation	20.592

The mean value of the Total Work-related Burnout (mean value of 54.36) was greater than 50 indicating a high burnout among respondents during COVID-19 pandemic (Table 1).

Table 2. Normality test of Total Work-related Burnout score

	Work from home before the coronavirus pandemic	Shapiro-Wilk		
		Statistic	df	Sig.
Total Work-related Burnout score	No	.975	75	.138
	Yes	.939	25	.140

Table 2 shows the result of normality test of Total Work-related Burnout score among respondents who have not the work from home experience before the pandemic and those who had that experience. According to sig-values of 0.138 and 0.140 which are greater than 0.05, it can be identified that Total Work-related Burnout score follows normal distribution.

Table 3. Association of TWRB with those who have worked from home before the Pandemic (Independent Samples Test)

	t	df	Sig. (2-tailed)
Total Work-related Burnout score	0.539	98	0.591

The result of independent sample t-test sig value is 0.480 which is more than 0.05 implies that there is no significant difference in Total Work-related Burnout score among educators who have not the work from home experience before the pandemic and those who had that experience.

Table 4. Normality test of Overall Perceived Stress Scale (PSS)

	Shapiro-Wilk		
	Statistic	df	Sig.
Overall PSS before the Pandemic	.979	100	.119
Overall PSS during the Pandemic	.968	100	.017*

**Significant at 5% level of significance*

According to the Test of Normality, the Shapiro-Wilk Sig value for Overall Perceived Stress Scale score before pandemic of 0.119 was greater than 0.05, implying that the variable follows a normal distribution. However, the value for Overall Perceived Stress Scale score during Pandemic of 0.017, was less than 0.05, implying that the variable deviates from normal distribution (Table 4).

Table 5. Mean Ranks of PSS

		N	Mean Rank	Sum of Ranks
Overall PSS during the Pandemic - Overall PSS before the Pandemic	Negative Ranks	29[a]	35.07	1017.00
	Positive Ranks	58[b]	48.47	2811.00
	Ties	13[c]		
	Total	100		

The Mean Ranks table showed positive ranks value (48.47) as greater than the negative ranks values (35.07), implying that the stress levels of majority of respondents was higher during the Pandemic than before the pandemic.

Table 6. Wilcoxon Signed Ranks Test

	Overall PSS during the Pandemic - Overall PSS before the Pandemic
Z	-3.808[b]
Asymp. Sig. (2-tailed)	.000*

**Significant at 5% level of significance*

Wilcoxon Signed Ranks Test (Table 6) shows a sig value of 0.000 which is less than 0.05 implies that Overall Perceived Stress Score (PSS) during the pandemic and before the pandemic are significantly different at 5% level of significance.

Discussion

The findings of this study showed that having to teach online whilst remote working from home as a result of the pandemic has resulted in higher perceived stress and burnout scores for all participants in the current study and results prove that the overall Perceived Stress (PSS) is significantly higher for all participants in the sample since COVID-19 restrictions began because of that first hypothesis (H_{11}) is supported by the analysis. It is consistent with ongoing studies on technology centric, "ghost work" that suggest on more unique group of factors that associate with work-related stress and burnout (Gray & Suri, 2019). This is also consistent with similar research study published by Hayes, et al., (2020) which stated that people that had limited experience working from home and were female. Individuals who worked from home before COVID-19 had higher levels of work-related burnout but did not differ based on gender or part-time work status and it suggests that working from home may create more stress and result in more burnout.

Conclusion and Recommendations

The study revealed an increased work-burnout and an increased PSS in all respondents since COVID-19 restrictions began. It also showed a lack in the technical skills to competently teach using digital platforms may have contributed to stress.

Despite the limitations, the results of this study contribute to literature on stress and burnout of Sri Lankan teachers due to involuntary online teaching enforced during this pandemic. It also validates the instruments, Perceived Stress Scale (PSS) and Copenhagen Burnout Inventory (CBI).

As recommendations, teachers must be supported, trained, counseled to help cope with technological culture and psychological well-being to improve their performance in online teaching. Traditional classroom curricula must be modified to suit digital delivery. In addition to that, the total work-related burnout (TWRB) questions must be repeated as done for Perceived stress scale for comparison of "pre" and "post" scores in future studies.

References

Cohen, S., 2019. *http://www.mindgarden.com.* [Online] Available at: http://www.mindgarden.com/documents/PerceivedStressScale.pdf [Accessed 21 10 2020].

CVS Health, 2020. *https://cvshealth.com.* [Online] Available at: https://cvshealth.com/news-and-insights/articles/most-adults-are-experiencing-more-stress-same-time-last-year-new-report
[Accessed 15 10 2020].

Gray, M. L. & Suri, S., 2019. *Ghost Work: How to Stop Silicon Valley from Building a New Global Underclass.* Houghton Mifflin Harcourt: Eamon Dolan.

Hayes, S. W. et al., 2020. *"I'm not Working from Home, I'm Living at Work": Perceived Stress and Work-Related Burnout before and during COVID-19,* Kennesaw State: Analytics and Data Science Institute.

Health Promotion Bureau Sri Lanka, 2021. *Health Promotion Bureau Sri Lanka.* [Online] Available at: https://www.hpb.health.gov.lk/en
[Accessed 26 1 2021].

Kadirgamar, N. & Thiruvarangan, M., 2020. *Daily Financial Times.* [Online] Available at: https://www.ft.lk/columns/Learning-lessons-The-COVID-19-challenge-to-education/4-700218
[Accessed 11 February 2021].

Kristensen, T. S., Borritz, M., Villadsen, E. & Christensen, K. B., 2005. The Copenhagen Burnout Inventory: A new tool for the assessment of burnout. *An International Journal of Work, Health & Organisations,* 19(3), pp. 192-207.

Lucas, G. N., 2020. COVID-19 pandemic and school education. *Sri Lanka Journal of Child Health,* 49(3), pp. 207-209.

National Center for Health Statistics, 2020. *https://www.cdc.gov.* [Online] Available at: https://www.cdc.gov/nchs/covid19/pulse/mental-health.htm
[Accessed 15 10 2020].

NH Departement of Administrative Services., 1983. *State of New Hampshire Departement of Administrative Services.* [Online] Available at: (https://das.nh.gov/wellness/docs/percieved%20stress%20scale.pdf)
[Accessed 15 3 2021].

S. KRISTENSEN, M. B. E. V. &. K. B. C., 2005. The Copenhagen Burnout Inventory: A new tool for the assessment of burnout. *Work & Stress,* 19(3), pp. 192-207.

Suganya, S. & Sankareshwari, B., 2020. job Satisfaction Level on Online Teaching among Higher Secondary School Teachers during Covid-19 Pandemic. *International Journal of Education,* 9(1), pp. 138-145.

worldometer, 2021. *https://www.worldometers.info.* [Online] Available at: https://www.worldometers.info/coronavirus/
[Accessed 15 10 2020].

THE RELATIONSHIP BETWEEN ONLINE EDUCATION & STUDENT SATISFACTION OF PRIVATE HIGHER EDUCATION INSTITUTES IN THE SOUTHERN PROVINCE

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Abstract
Online education has created an opportunity with COVID 19 pandemic. Online education is a learning style empowered by the digital technology. The specialty of this distance learning is the instructor and learner both are in two different geographical areas. Due to it being the newer concept to Sri Lanka, there are lack of studies which have focused on the satisfaction of students with this concept. Thus, the basic purpose of this study was to investigate the relationship between online education and student satisfaction. The satisfaction of the learner is inevitable for the successful implementation of e-learning educational environment. Undergraduates of private higher education institutes in the southern province were considered as the population. 348 undergraduates were selected randomly as the sample of the study. Quantitative data was collected through a self- administrated questionnaire. The hypothesis was tested using the Pearson correlation analysis. Findings suggested that there is a strong positive relationship between modality and pedagogy concerning online education with the student satisfaction of private higher education institutes in the Southern province. As the study suggests an empirical validation to existing body by providing a practical contribution to the organizations to develop e learning by developing technology.
Keywords: Higher education, Online education, Private Institutes, Student satisfaction.

Introduction

Education can be identified as the most powerful tools that can be used to change the world. (Mandela, 1940). Education is the first step for people to gain the knowledge, critical thinking, empowerment & skills they need to make this world a better place. Opening a private university has become a common phenomenon in the educational arena of Sri Lanka. At present, a large no of students is engaging in private tertiary education in Sri Lanka. Modern revolution of information technology has turned our wishful thinking into a reality with the development of the technological facilities the online education system came to the field as the best solution for students to complete & continue their education. Learning through information technology leads to innovation in mainstream education and may even have effects beyond the realm of education itself (Hussian, 2007).

Most of the online education concepts have been combined with the modality, pedagogy. Only limited studies have identified the link between modality and students' attitudes (Khan, 2007). Higher education institutes need to revisit curriculums, pedagogy and assessments for online education with blended learning. (Ke and Kwak, 2013) had identified that there are five aspects with online learning concept; learner relevance, active learning, authentic learning, learner autonomy and technology competence, (Kuo et al., 2013) determined that learner instructor interaction and learner content interaction with the technology efficiency are valid indicators of student's positive perceptions. There is a significant relationship between student satisfaction and online modalities in online education (Long, 2011; Bordelon, 2012; Allen & Seaman, 2013). Within the Sri Lankan context, there is a lack of empirical studies focused on modality and pedagogy concepts especially with the private higher education. This study has been a natural extension of inquiry into student satisfaction in higher education. Hence the study addressed following research objectives.

Primary Research Objective

- To investigate the relationship between online education & student satisfaction of private higher educational institutes in the Southern Province.

Secondary Research Objectives

- To investigate the relationship between Modality & student satisfaction of private higher educational institutes in the Southern Province.
- To investigate the relationship between Pedagogy & student satisfaction of private higher educational institutes in the Southern Province.

Methodology

As the present study attempt to investigate the relationship of the independent variable with the dependent variable, the research is identified as explanatory. The study was designed to test the hypothesis and described the relationship between online education and student satisfaction of private higher education institutes in the Southern province. The deductive approach was used in the basic question reviewing. Designated population for the study was the undergraduates in the private higher education institutes in Sri Lanka. 348 respondents selected as the sample of study. The sample has calculated under confidence level 95% & confidence interval was 5.0. Two dimensions identified under the online learning and five-point Likert scale (1=strongly disagree to 5= strongly agree) has applied to construct the measurements. Pearson Correlation analysis was conducted to test the developed hypotheses and to achieve the objectives.

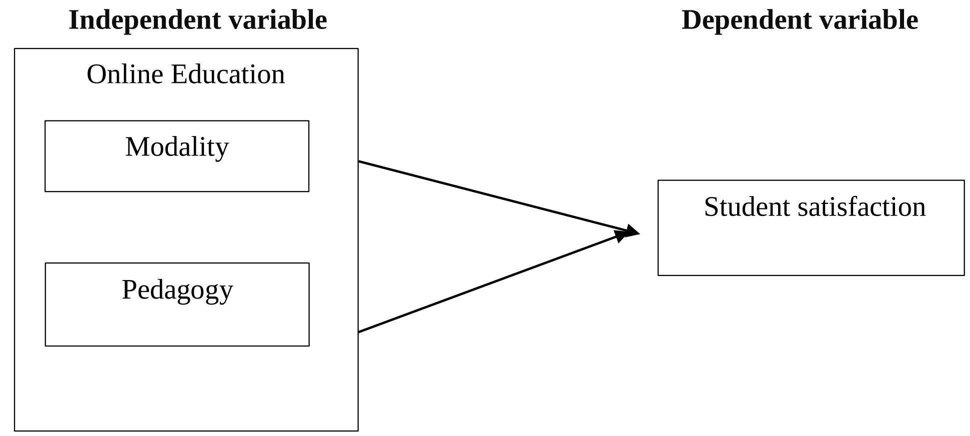

Figure 01: Conceptual framework
Source: Developed by the scholar

- H1: There is a significant relationship between Modality & Student Satisfaction of Private Higher educational Institutes in the Southern Province.
- H0: There is no significant relationship between Modality & Student Satisfaction of Private Higher educational Institutes in the Southern Province.
- H2: There is a significant relationship between Pedagogy & Student Satisfaction of Private Higher educational Institutes in the Southern Province.
- H0: There is no significant relationship between Pedagogy & Student Satisfaction of Private Higher educational Institutes in the Southern Province.

Results

Reliability test

Table 01: Reliability Statics

Constructs	Cronbach's Alpha	No of items
Modality	0.840	7
Pedagogy	0.871	5
Responsiveness	0.845	4
Assurance	0.928	7

Source; Analyzed statistical output from field survey

Descriptive Statistics

Table 02: Descriptive statistics for variables

	N	Mean	Std Deviation	Skewness	
	Statistic	Statistic	Statistic	Statistic	St. Error
OEM	348	3.99	0.733	-2.557	.131
OEP	348	4.26	0.776	-3.007	.131
SSR	348	4.1566	0.81937	-2.718	.131
SSA	348	4.1987	0.81004	-2.968	.131
Valid N [List wise]	348				

Source; Analyzed statistical output from field survey

As the above table 02 shows the mean values are close to 5. It can conclude that respondent have almost agreed with the variables. The factor modality shows the lowest value for the standard deviation, most of the numbers which have given by the respondent are close to the average. And by the highest standard deviation shows that numbers are spread than the other variable. As the skewness values are higher than -2 & +2, distribution is highly skewed.

Correlation analysis

Table 03: Correlation between all variables & dimensions of three objectives

	1.	2.	3.	4.
1. Student Satisfaction	1			
2. Online Education	.896**	1		
3. Modality	.829**	.789**	1	
4. Pedagogy	.873**	.651**	.798**	1

**Correlation is significant at the 0.01 level (2 tailed)

N= 348

Source; Analyzed statistical output from field survey

As the above table 01 shows there the coefficient $r = 0.896$, indicates a strong positive relationship between online education & student satisfaction. $r = 0.829$, indicates a strong positive relationship between modality & student satisfaction & $r = 0.873$, indicates a strong positive relationship between pedagogy & student satisfaction. $n = 348$ & $p<0.05$ indicates that the coefficient is significantly from 0. Here so can conclude there is significant relationship between variables & dimensions of the three objectives.

Discussion

The study started with the goal of investigating the determination of student satisfaction with online education in private higher education institutes even during the COVID 19 pandemic. Based on the results the primary objective of the study revealed that there is a strong positive relationship between; student satisfaction & online education as the previous researchers have identified that effectiveness of the system are its acceptability and satisfaction of students who are real stakeholders in this system (Chang and Fisher, 2001; Sher, 2008; Sun et al,2008).

As the first secondary objective of this study that there is a strong positive relationship between student satisfaction & modalities of education with the e learning platform which also proved by previous scholars in a different viewing that "The child as he develops appears to use one modality on preference to others learning" (Joseph, 1995). In recent years been seeking of the oppressed or critical pedagogy & has proposed pedagogy with a new relationship between teacher, student & society (Encyclopedia Brtannica, 2015). According to the previous literature & finding in the present study fulfill the gap which have identified according to the previous literature. Higher r value supported to reject the null hypothesis of the study.

Conclusion & Recommendation

This study could contribute to the knowledge base of consumer studies by explaining student satisfaction of undergraduates with online education**.** The Pearson correlation analysis was used to test the hypothesis and based on the correlation analysis the two hypotheses were supported. When considering the modality continuous development of the e - learning tools increase the possibilities, reform of education, time -saving, flexibility, Coordination of people from different cultures & improvement of social language skills support the modality in this present study. Considering the pedagogy joint venture activity, language & literacy development, contextualization, teaching complex thinking & teaching through conversation supports the pedagogy in this present study which was earlier carried out by the questionnaires. To that, the study fulfills the gap which has been identified according to the previous literature. The average change of pedagogy & modality is 0.851 due to some unit changes in pedagogy. Therefore, pedagogy shows a higher relationship with student satisfaction than the other. The previous author had defined that it covers many aspects of teaching, but pedagogy comes down to studying teaching methods, the pedagogical questions are the center of approaching learning for students (Brooke, 1995). Clarifies the student's interest or expectations when a doubt exists, listening & responds to student needs within a legislative framework & make sure that student's needs, or requirements are met which are develop by the scholar to improve the student satisfaction in online education which can made a positive relationship for the development of tertiary education as well as for the school education system.

References

Chang, V., and Fisher, D. (2001). *The validation and application of a new learning environment instrument to evaluate online learning in higher education. School of Information Systems, Curtain university of Technology.*

Encyclopedia Britannia*, 8 th.,s.v "*Internet.". Chicago: Encyclopedia Britannia, 2015.

Hussian, I. (2007). A Study of student's attitude towards virtual education in Pakistan. *Turkish Journal of Distance Learning.*

Khan, B.H. (2007). Program evaluation in e – learning. Unpublished Manuscript Retrieved from http://asianvu.com/bk/e-learning evaluation article.pdf.

Ke, Fe., and Kwak, D. (2013). Constructs of student-centered online learning on learning satisfaction of a diverse online student body: A structural equation modeling approach. *Journal of Educational Computing Research.*

Long, W. A (2011). Your predictable adolescent Charleston, SC: Book Surge Publishing.

Mandela, N (1940). A Long Walk to freedom.

Sher, A. (2008). Assessing and Comparing interaction dynamics, student learning, and satisfaction with Web – based online learning programs. *MERLOT Journal of Online learning and Teaching,* 4 (4), 446 – 458.

CAREER DECISION MAKING APPROACHES AND MODERN PERCEPTION ON CAREER GUIDANCE

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Abstract
Perception on career guidance has changed in recent times. The objective of the study is to do a comparison on how career decision making approaches are aligned with the changes in perception on career guidance. This is a literature based comparative study. Five main approaches are evaluated based on five changes in perception on career guidance. Big five factors and Holland's approach are considered as personality trait approaches while Intelligent Quotient (IQ), Emotional Intelligence (EQ) and Multiple Intelligences (MI) are considered as intelligence related approaches. Correspondence of person environment, 'each person is unique approach', search self and world of work, focus on 'whole person', support to discover the potential are identified as new perceptions on career guidance. Findings show that there are gaps in alignment of these approaches to modern perceptions in career guidance.
Key Words: Career decision making, Career guidance, Modern perception on career guidance

Introduction
A significant attention has been created towards the career guidance during the 21st century. Especially, the influence of fourth industry revolution has created highly digitalized opportunities for all the occupations and new pathways have been emerged (Hirschi, 2018). The expectations on career guidance is significantly different from the 20th century perspectives (Yesilyaprak, 2012).
This different perception has created a paradigm shift in career guidance. According to a comparison done by Yesilyaprak in 2012, on changes of the perception of having a job and work pattern, the old paradigm focusses on life time employment on the same job while new paradigm focuses on job changes during work life and more than one jobs at the same time. Furthermore, the old paradigm values depth of specialization, standard work patterns, job security, while, new paradigm values transferable skills, flexible work patterns and employment security. Linear growth and one-time learning are focused in old paradigm while multiple careers and lifelong learning are focused in the new paradigm. Performance and skills are highly recognized in the new context rather valuing loyalty. This new perception of having a job and work pattern has a significant effect on career guidance and counseling (Yesilyaprak, 2012). Consequently, the perceptions on career guidance have also changed to focus on the fact that 'each person is unique', rather than having an approach of 'one size fits all'.

The support should be more nondirective and constructive rather than choosing a vocation through a directive role of a counselor. The new perception on career guidance considers the person as a whole instead of just focusing on ability and interests in the old paradigm.
Therefore, studying the orientation of existing career decision approaches towards the new perception on career guidance is significantly important.
Five main career decision making approaches will be considered in this study; Big five factors, Holland's approach, Intelligent Quotient (IQ), Emotional Intelligence (EQ) and Multiple Intelligences (MI) (Setiawati, Ayriza, Retnowati, Amelia, 2017). (Kırdök and Korkmaz, 2018), (Gondal and Husain, 2012), (Gardner, 1998).
The key objective of the study is to do a comparative analysis on how career decision making approaches are aligned with the changes in the perception of career guidance.

Methodology

As a research philosophy, this particular study is in anti-positivist context which believes one or multiple realities in the ontological point of view and accepting the fact that knowledge should be examined using best tools or interpretation as the epistemological point of view. This is a comparative study which is based on literature.
The factors introduced by Yesilyaprak are used to identify the change of perception on career guidance. Five change factors in the perception on career guidance are; Correspondents of person environment, 'each person is unique' approach, search self and world of work, focus on 'whole person', support to discover the potential (Yesilyaprak, 2012). Five career decision approaches in career guaidance, namely, Big Five Factors, Holland's Approach are as personality trait approaches and IQ, EQ, and MI as intelligence theory based approaches are reviewed against the five change factors in perception.

Comparative Summary of Career Guidance Approaches

Following table summarizes the five career guidance approaches against the five change factors in perception.

Changes in the Perception on Career Guidance	Approaches in Career Decision				
	Big five factors	Holland's Approach	IQ	EQ	MI
Matching traits and factors vs corresponde nce of person environment	Focus on mapping five personality traits with careers	Focus on mapping six personality traits with how it congruence with careers.	Focusing on person's decision making capacity in to a certain occupational situation.	Focusing on person's capacity to foster positive relations, perform well in groups and build social assets	Focus on MI profile of the individual

‘one size fits all’ approach vs ‘each person is unique approach’	Identified personality type of the person will be mapped to match the careers linked to each personality type	The individual will be identified in to a personality type of six traits (R.I.A.S.E.R) and map best career path.	Different IQ score levels indicates unique abilities of individuals	The individuals are in the different EQ levels	The individual will be unique in terms of unique combinations of MIs
Serve the information vs search self and world of work	Identified individual personality traits will be discovering the self.	Mapping of the personality type with career options allow to search more on self-discovery	Identifying IQ levels means focusing to identify self, but not a comprehensive self	Identifying self in terms of ability to develop relationships and work a groups.	Tries to understand the unique self in terms of MI combination, as it accepting each one possesses all nine intelligences in different levels.
Focus on ability and interest vs focus on ‘whole person’	Identifying the person in to one personality category means focusing on abilities, that would be one aspect of the person	Categorizing in to a personality type. However, real person may not in a sharply drawn categories	Identifying an ability to solve problems and decision making	Identifying an ability that require for work environment	Identifying unique MIs means identifying abilities to solve a problem. But that ability can be assessed as a whole person
Evaluate current traits vs. support to discover the potential growth	Evaluating the traits at the given situation	Evaluating the traits at the given situation.	The individual will be provided the opportunity to understand the potential of solving problems.	The individual will understand his/ her ability to work in group environment and areas to be improved	Identifying the capacity means supporting to discover the potential

Discussion

The five career decision making approaches in career guidance are critically reviewed under the five factors of changes in perception on career guidance.

Matching Traits and Factors vs Correspondence of Person Environment

All approaches, except EQ, mainly focus on individual traits or capacities in relation to required factors for careers. EQ looks at the individual's response in managing emotions of own self and with others (Goleman,1996). Therefore, the perception of EQ in changes of career guidance is towards correspondences of person's environment. EQ demonstrates this nature as it highly focuses to check whether the individual is suitable for the overall environment rather than matching with different career factors. Big five factor and Holland's approaches are straight forward trait theories in the field of personality (Lathifa, Yusuf, Afdal,2021), (Kırdök and Korkmaz, 2018). Trait theory based approaches match personality traits of the individual with career related factors in order to see the best career path. On the other hand, IQ testing in career guidance does not focus on "corresponding of person environment" as it focuses on measuring the capacity of problem solving (Gondal and Husain, 2012). Thus IQ matches inner capacities to career requirements. Howard Gardner's Multiple Intelligence theory states that each individual possesses nine types of intelligences in different combinations (Gardner, 1998). Identifying MI profile and matching with career opportunities is similar to matching traits and factors.

'One Size Fits All' Approach vs 'Each Person is Unique Approach'

Two personality trait approaches, Big five factors and Holland's theory, identify individuals as belonging to personality categories (Lathifa, Yusuf, Afdal,2021), (Kırdök and Korkmaz, 2018). If a person is fallen in to a personality category, his or her possibilities of demonstrating other personality types is ignored. In real world there are no individuals with very specifically demarcated personality types. In the career decision making process individual's personality type will fall in to a pre-defined careers to each personality type. Therefore, personality trait approaches do not focus much on considering the person in a unique way. Three intelligence theories are more oriented to 'each person is unique approach'. Among three intelligence based approaches, MI approach focuses more on individuality. MI profile is a very unique individual status (Gardner, 1998). Due to this, it is a challenge to match unique profiles to career requirements (Othman, Rahman, Malik and Wahab, 2012).

Serve the Information vs Search Self and World of Work

All five approaches show its potential for investigating the self with limited scopes. None of the approaches limited only to serve information. Personality trait approaches try to discover the self in terms of trait assessment. MI shows higher comprehension for discovering the self than other two intelligence based approaches. A study on assessing MI for career decision by Othman, Rahman, Malik and Wahab (2012) indicates that the opportunity of MI to understand the comprehensive self. Gardner defines the intelligence as the ability to solve problems, or to create products, that are valued within one or more cultural settings" (Gardner, 1983). These literature indicates that identifying unique MI profile of the individual creates a unique demand in the social context including career aspect. Even though IQ shows its opportunity for identifying unique self, its scope is limited (Gardner, 1983), (Goleman, 1996). Daniel Goleman, the pioneer to introduce Emotional Intelligence strongly criticizes the limitations of IQ and appreciates the theory of multiple intelligence of Howard Gardner (Goleman, 1996). He emphasizes the true value of multiplicity of intelligence in order to derive the unique individual. He suggests that the limitation of MI as its highly cognitive orientation and less opportunity for emotional aspect, which was the gap for him to develop the emotional intelligence theory.

Focus on Ability and Interest vs Focus on 'Whole Person'

Gestalt psychology highlights that a person is to be understood as a whole instead of identifying specific aspects. Trait theories demonstrate their nature of looking at trait aspect of the personality. Personality itself is also a part of the individual. Trait theories try to understand abilities of respective personality types. As Goleman (1996) and Gardner (1998) suggested IQ is also very limited and does not understand the person as a whole. The Scope of EQ is to highlight the emotional aspect of intelligence. With that scope EQ is also not showing any comprehensive opportunity to focus on 'whole person'. In contrast, MI demonstrates more opportunity to understand the whole person through nine types of intelligences. Gardner use the term 'MI profile' which is considered as a full intellectual specification of the individual. However, Goleman highlighted the lack of emotional aspect in the MI.

Evaluate Current Traits vs. Support to Discover the Potential

Psychometric testing evaluates the existing situation of a person. Therefore, it is required to see whether five approaches focus only on evaluating current traits / capacity or to discover the potential of a person. During the career decision stage, two trait approaches focus on evaluating current traits. Identified current traits using for career decision is questionable (Wille and Fruyt, 2014). A Longitudinal study done by Wille and Fruyt suggest that personality types will be shifted in long time due to the occupational socialization (Wille and Fruyt, 2014). They highlight the reciprocal relations between personality traits and work. On the other hand, trait theories do not focus on discovering the potential in broader scope. Scopes of intelligence theories also do not try to discover the potential. Assessment of intelligences indicates a current capacity of an individual. In to a certain extent EQ tries to understand the person's potential of managing emotions in order to work with divers groups. In the same way MI profile is also an indication of potential ability to solve problems and create products in specific cultural contexts.

Conclusions and Recommendations

The review suggest that key approaches in career decision making of career guidance are not fully aligned with the new perception of career guidance in the 21st century. Still those approaches are focused on traditional requirements expected from career guidance. According to the findings, no any single approach satisfies all the requirements in changes in perception. Personality trait approaches are still more aligned with older perception than approaches related to intelligence. Even among three intelligence approaches, IQ shows a limited alignment due to the limited scope in its nature.

Further research is recommended to validate the findings of this study.

References

Gardner, Howard. (1983). Frames of Mind: the theory of multiple intelligences. New York: Basic Books

Gardner, H. (1998). A Multiplicity of Intelligences. Scientific American. Retrieved from https://sdsu-physics.org/sdsu_per/articles/Multiple_Intell.pdf accessed on 02.08.2021

Goleman, Daniel (1996). Emotional Intelligence: Why it Can Matter More Than IQ. Bloomsbury Publishing PLC, Great Britain

Gondal, Uzma Hanif., Husain, Tajammal. (2012). A Comparative Study of Intelligence Quotient and Emotional Intelligence: Effect on Employees' Performance. *Asian Journal of Business Management* 5(1): 153-162, 2013 DOI:10.19026/ajbm.5.5824 ISSN: 2041-8744; E-ISSN: 2041-8752. Accessed on: 06.08.2021. Available on : https://pdfs.semanticscholar.org/3396/e9102c1ed65a32d273dde96b3fa12ad8d35d.pdf?_ga=2.102983744.1121181974.1637246881-1730573576.1615635309

Hirschi, Andreas.(2018). The Fourth Industrial Revolution: Issues and Implications for Career Research and Practice. *The Career Development Quarterly, Special Section: Career Development in the Digital Age.* Volume66, Issue3. Pages 192-204.

Judge, Timothy A., Zapata, Cindy P. (2014). The Person–Situation Debate Revisited: Effect of Situation Strength and Trait Activation on the Validity of the Big Five Personality Traits in Predicting Job Performance. *Academy of Management Journal.* Vol. 58, No. 4 Articles.

Kırdök, Oğuzhan., Korkmaz, Ozan,. (2018). Dimensions of personality and emotional ıntelligence as predictors of high school students' career decision difficulties. *Academic Journals.* Vol. 13(12), pp. 495-502, 23 June, 2018 DOI: 10.5897/ERR2018.3532 Article Number: B61930157526 ISSN: 1990-3839

Lathifa, Auladina., Yusuf, A. Muri., Afdal (2021). HOLLAND'S THEORY APPROACH IN CAREER GUIDANCE SERVICES IN SCHOOLS. Literasi Nusantara. vol.1 no. 3, July – October 2021 ISSN 2746-8208 (Online)

Othman, Abdul Kadir bin., Rahman, Mohd Khirzan Badzli Abdul., Malik, Ariff Md Abdul., Wahab, Samsudin. (2012). The influence of Multiple Intellegence on career Orientation: The Validation of HAMBA Multiple Intelligence Scale. *The Journal of Knowledge Economy & Knowledge Management.* Volume: VII FALL. Page 65-79. Retrieved from https://dergipark.org.tr/en/download/article-file/40386 *Accessed on* 05.03.2021

Setiawati, Farida Agus., Ayriza, Yulia., Retnowati, Endah., Amelia, Rizki Nor. (2017). The Response Patterns of the Career Interest Instrument Based on Holland's. *Anima Indonesian Psychological Journal.* Vol. 32, No. 3, Page 128-147.

Wille, Bart., Fruyt, Filip De. (2014). Vocations as a Source of Identity: Reciprocal Relations Between Big Five Personality Traits and RIASEC Characteristics Over 15 Years. *Journal of Applied Psychology*. *American Psychological Association.* Vol. 99, No. 2, 262–281. Retrieved from https://biblio.ugent.be/publication/4199219/file/5814963. Accessed on 02.08.2021

Yesilyaprak, Binnur .(2012). Paradigm Shift of Vocational Guidance and Career Counseling and its Implications for Turkey: An Evaluation from Past to Future. *Educational Sciences: Theory & Practice* - 12(1). Pages 111-118

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EXPLORE THE CLIENT NON-ACCEPTANCE TO CHILDHOOD VACCINATION: A CASE STUDY IN POOJAPITIYA AREA

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Abstract
This study was conducted in the field of childhood vaccination and human immunization in Poojapitiya, Sri Lanka. A comparatively considerable number of children are not vaccinated in Poojapitiya area, and these children would expose to vaccine preventable diseases. The main objective of this study was to discover why parents were reluctant on childhood vaccination. The study was conducted as qualitative research. The data was collected through face to face interviews with a judgmental sample of parents who refused vaccination for their children. The research provided significant insights on parents thinking patterns and behaviour on the refusal of vaccines allowing healthcare experts to prepare proper public awareness programmes.
Key Words: Childhood Vaccinations, Health, Immunization, Medicine

Introduction
Vaccination is a simple and effective way to get protection against fatal diseases. It protects children suffering from long term complication resulting from these fatal diseases and prevents deaths due to such diseases. The immunization was called vaccination because it was derived from a virus affecting cows (Latin: vacca 'cow') (Poppel, 2013).
Immunizing a child not only protects that child but also other children by increasing the general level of immunity and minimizing the spread of infection (Hinman, et al., 2002). Children getting immunized is important for two reasons. It gives protection to the child vaccinated against highly contagious diseases, and it protects people around the vaccine protected child as the child will not transmit the diseases to others (Oladokun, et al., 2010)
It is important to note that, without vaccines, a child is at risk for getting seriously ill and suffering pain, disability, and even death from diseases like measles and whooping cough. Even United States has had more than 1,000 cases of measles in 2019 (Calandrillo & Mich, 2003).
The history of immunization in Sri Lanka goes back to the 19th century. The law relating to compulsory vaccination (against smallpox) is referred to in the Vaccination Ordinance of 1886 (Ministry of Health, 2020). The Expanded Program on Immunization (EPI) established in 1978, has continued to make excellent progress over the past two decades, most notably in terms of achieving high immunization coverage and disease control.

Research Problem
The main purpose of this research is to explore the client non-acceptance to childhood vaccination on expanded program of immunization. The research was based on geographical area of Poojapitiya located within the Kandy District. Accordingly, 08 vaccines are provided at Poojapitiya area through government hospitals and other state-owned medical offices. All

vaccines are provided free of charge. A total of 1091 parents visited with their babies/children to obtain vaccines during the period. A total of 7949 vaccines are supposed to be provided for registered parents. However, the total number of vaccines had been provided only up to 7854. Accordingly, a balance of ninety-three vaccines have not been issued which represent that ninety-three number of children would be exposed to vaccine-preventable diseases if they are exposed. Total ratio of non-vaccination out of the total available vaccines is 1.16%.

Objectives

The main objective of this research is to determine why parents are reluctant to vaccinate their children. Further, the specific objectives are to analyze demographic characteristics /factors of non-vaccinated participants, to analyze social and cultural barriers for improving vaccination on children among the public, and to understand the level of awareness among the public towards child vaccinations

Literature on some segment of people refusing Vaccination

According to research carried out by (Harmsen, et al., 2013), it was identified multiple reasons why people refuse childhood vaccinations. These reasons can be listed as social environment, bad experiences received from previous vaccinations with their children, some advantages which can be received with disease conditions, efficacy of vaccines, risk created from vaccines, individual opinions on aftereffects of vaccinations and possible side effects.

According to Brunson (2013), not providing sufficient information about vaccines is a major reason parents refuse vaccinations. In other instances, people made negative comments on vaccine producing companies. Accordingly, it reveals that parents are concerned about the quality of the product as well as the health conditions of the receiver (Department of Health-Austrailian Government, 2020).

There are concerns among the parents that the vaccinations might reduce the immune system of the body against other viruses and by further exposing their children towards unidentified/ unknown diseases (Oku, et al., 2017).

Research conducted in Malaysia revealed that people had developed personal health beliefs which prevent them from using vaccinations. According to this research, five major personal health beliefs were revealed and they are religious beliefs, personal instincts, preference for approaching at natural health systems, beliefs on conspiracies of selling medicines by companies and losing the confidence on medical officers and doctors (University of Oxford, 2020).

When information about content purity and evidence on safety through vaccinations are not available, people would be reluctant to grow satisfactory concepts towards vaccinations. In such cases, some parents would prefer to give vaccines on selective basis where identified vaccines would be rejected due to the safety concerns of their children even when medical recommendations are provided (Rumetta, et al., 2020).

In certain situations, parents do not want to ask from doctors for information about vaccinations. On the other hand, doctors also do not want to check whether the parents need information about vaccinations. Based on these two factors, parents would be remained ignorant on vaccinations on children even if constant consultations are obtained from their family doctors or other physicians (WHO, 2009).

Religions also widely analyzed under the vaccination program. Some religious sects publicly declared that they do not trust on vaccinations and followers are advised not to follow them (Occupational Health Clinic, 2020).

Further, some parents must delay vaccines for their children due to job related issues. However, somehow, they manage to provide vaccines even if they are not on time as per the schedule (Upadhye, et al., 2018).

Methodology

The Inductive research style was selected as the report supplied evidence based on primary data but not measured through hypotheses. In addition to that, the Case Study method was approached in form of a qualitative approach. The research is both included with primary and secondary information. The secondary data was collected from literature reviews and vaccination records of Medical Office of Poojapitiya area. Primary data was gathered through interviews conducted on parents who rejected vaccination program for their children.

Population

The population of the study was selected as the parents who refused childhood vaccinations living in Poojapitiya area. The research was able to reach these parents to inquire for information.

Table 13: Population

#	Vaccine Type	Under Care	Already Vaccinated	Vaccination Refused Parents
1	PVV1	963	955	08
2	PVV2	966	957	09
3	PVV3	973	960	13
4	MMR1	997	977	19
5	JE	968	943	25
6	DPT4	963	951	12
7	MMR2	1025	1020	05
8	DT	1094	1091	02
Total		7949	7854	93

Source: (Internal Data, 2018)

As per the details, ninety-three children have not received the total number of vaccines or partly who were selected as the population.

Sampling

It was decided to utilize the Judgmental Sampling Method to select specific parents to have interviews for the research. It was decided to select the sample covering 10% from the population up to nine parents out of 93 (of the population) who have refused to give vaccines to their children.

Data Collection Methods and Techniques

The data collection methods were focused on face-to-face interview method from parents who refused vaccination on their children. To conduct the interview, a list of questions was prepared based on the factors identified from the literature review. The researcher personally visited the interviewers/respondents and obtained relevant information. The average time consumption per interview was 30 minutes.

Results

Main Objective – The first objective of the study was to determine why parents are reluctant to vaccinate children. The study revealed that there were multiple reasons for rejection. The following factors could be listed out based on the summary of the interview and the responses provided by the participants.

1. **Beliefs on traditional and Ayurvedic medicine over vaccinations**
2. **Influences from family and close associates to avoid vaccinations**

The above two factors are the main reasons why many parents refused vaccinations for their children based on the responses provided by the parents who refused vaccinations. Because most of the parents responded in favor of the above two factors.

Specific Objective One – The specific objective one was focused on analyzing the demographic characteristics /factors of non-vaccinated participants. Accordingly, most of the participants were females, mothers of the children. These participants were selected because they had refused to provide vaccinations for their children.

All the participants were less than the age of 45 years. 04 participants out of 09 were aged below 25 years. More than 50% of the participants were less educated. Among them, two mothers had not even received O/L education. 03 mothers had education only up to O/L exam. Only 02 others had obtained A/L educations. Two males that represented the population were educated above A/L. One had a degree and the other one had a diploma. Hence, it is a major characteristic because more than 70% of female participants were not educated enough. Accordingly, the lack of education was identified as one of the reasons for the negative responses to childhood vaccinations.

In addition to that, seven mothers had monthly income less than Rs.25,000. Hence, they had been living in poverty with minimum facilities and covering only up to basic needs. Under such circumstances, they avoided additional expenses such as medicine and traveling. Further it is observed that only three out of nine participants were employed. 06 of them were homemakers. When the situation of 06 homemakers is concerned with their lower education, they had negative influence from husbands, family members, close associates, and the society for the prevention of childhood vaccinations. And since they were homemakers, they had less social interaction and therefore they strongly believed what other people say.

Second Specific Objectives – The second specific objective of this study was to analyze social and cultural barriers for improving vaccination on children among the public. Accordingly, the primary data revealed that there were religious and social influences from society on the refusal of vaccinations. However, it was limited only to one participant under both questions. Based on that, it is concluded that the cultural and religious influence towards the refusal of vaccinations was limited, and their impact was restricted in Poojapitiya area.

Third Specific Objectives – Third specific objective of the study was to understand the level of awareness among the public towards child vaccinations. Accordingly, the following information was gathered from interviews.

1. **Eleven percent believed that vaccinations could not protect children from diseases.**
2. **Sixty-seven percent believed that there were side effects from vaccinations.**
3. **Fifty-six percent stated that they had not received proper education about vaccination from government bodies.**
4. **Sixty-seven percent stated that they did not know about the negative impact creating upon the society from non-vaccinated children.**

Conclusions and Recommendation

Two major reasons why parents refused vaccinations for their children were beliefs on traditional and Ayurvedic medicine over vaccinations and influences from family and close associates to avoid vaccinations. Further, more than 70% of parents had below-average education. Moreover, these parents had been suffering from poverty and their monthly income was less than Rs.25,000-. Further, cultural barriers, religious beliefs, pressure from society and family members were a restriction that mothers faced for vaccination program.
Communication strategies are required to increase the level of knowledge about vaccinations, immune systems, and benefits of vaccinations among parents. The government must play a major role with the support of public organizations and social-service-oriented non-government organizations (Red Cross IFRC, 2002). According to (Davis, et al., 2001), government institutions alone cannot conduct awareness program through communication programs. Hence, it is required to get the support of private hospitals and medical officers and staff who are skillful and knowledgeable about the subject matter. Hence, governments and public health offices in countries should collaborate with private medical institutions to enhance the knowledge on childhood vaccinations.

Empathy from healthcare workers is a qualitative factor that parents expect when it comes to encouragements on taking vaccinations. What it explains under empathic factors is that understanding the parents and why they refuse vaccinations for their children and to provide suitable information and guidelines to get them into the right directions (Berg, 2017). At instances where parents refuse or neglect vaccinations due to their ignorance and/or without having proper reason, such parents can be guided properly through awareness program and addressing their knowledge gaps. It is possible that once parents realize the significance of vaccinations, they would voluntarily participate for childhood vaccination programs (WHO, 2020).

References

Berg, S., 2017. Teamwork, empathic approach helps clinic double vaccination rate. [Online] Available at: https://www.ama-assn.org/delivering-care/public-health/teamwork-empathic-approach-help-clinic-double-vaccination-rate [Accessed 30 08 2020].
Brunson, E., 2013. How parents make decisions about their children's vaccinations. Europe PMC, pp. 5466-5470.
Calandrillo, S. & Mich, U., 2003. Vanishing vaccinations why are so many Americans' opting out of vaccinating their children. JL Reform, p. 353.

Davis, T. et al., 2001. Childhood Vaccine Risk/Benefit Communication in Private Practice Office Settings: A National Survey. Racism and Its Effects on Pediatric Health, 107(2).

Department of Health-Australian Government, 2020. Immunization for Children. [Online] Available at: https://www.health.gov.au/health-topics/immunisation/immunisation-throughout-life/immunisation-for-children

Hinman, A., Orenstein, W. & Williamson, D., 2002. Childhood immunization: laws that work. Heinonline, p. 122.

Ministry of Health, 2020. National Immunization Program of Sri Lanka. [Online]

Harmsen, I. A., Mollema, L., Ruiter, R. A. & Paulussen, T., 2013. Why parents refuse childhood vaccination: A qualitative study using online focus groups. BMC Public Health. Available at: https://www.epid.gov.lk/web/index.php?option=com_content&view=article&id=137&Itemid=426&lang=en [Accessed 05 11 2020].

Occupational Health Clinic, 2020. Faculty & Staff Health and Wellness. [Online] Available at: https://www.vumc.org/health-wellness/news-resource-articles/immunizations-and-religion [Accessed 31 08 2020].

Oku, A. et al., 2017. Perceptions and experiences of childhood vaccination communication strategies among caregivers and health workers in Nigeria: A qualitative study. Plus One.

Oladokun, R., Adedokun, B. & Lawoyin, T., 2010. Children not receiving adequate immunization in Ibadan, Nigeria: what reasons and beliefs do their mothers have? Nigerian Journal of Clinical Practice, 13(2).

Poppel, L. V., 2013. Strategic manoeuvring in pragmatic argumentation at the level of the discussion move: The design of pragmatic argumentation in the 2012 HPV vaccination brochure. s.l.: University of Amsterdam.

Red Cross IFRC, 2002. The voice of NGO in the global vaccination battle. [Online] Available at: https://www.ifrc.org/fr/nouvelles/nouvelles/common/profile-the-voice-of-the-ngo-in-the-global-vaccination-battle/

Rumetta, J., Abdul-Haldi, H. & Lee, Y.-K., 2020. A qualitative study on parents' reasons and recommendations for childhood vaccination refusal in Malaysia. Journal of Infection and Public Health, pp. 199-203.

University of Oxford, 2020. Vaccine Knowledge Project. [Online] Available at: https://vk.ovg.ox.ac.uk/vk/

Upadhye, J. V., Marathe, S. M., Mandlik, M. R. & Upadhye, A. J., 2018. Awareness and practices of parents about immunization of children in the age group 2-5 years. International Journal of Contemporary Pediatrics.

WHO, 2009. Pull Mechanism for Value-Added Technologies for Vaccines. [Online] Available at: https://www.who.int/immunization/programmes_systems/supply_chain/optimize/pull_mechanisms_valued_added_vaccine_technologies.pdf?ua=1} [Accessed 30 08 2020].

WHO, 2020. Raising awareness of Immunization. [Online] Available at: https://www.who.int/westernpacific/activities/raising-awareness-of-immunization [Accessed 31 08 2020].