

# Proceedings of the BCAS Annual Research Symposium 2017



**“Innovative Research for  
Economic Progress of a Nation”**



## Building Careers – Transforming Lives

### Vision

To become the  
premier private university  
in the region

### Mission

Produce quality human  
resources with ethics and social  
responsibility, having innovative  
thinking and analytical skills to  
serve humanity

**Proceedings of the  
BCAS Annual Research Symposium  
2017**

**27th November 2017 (Monday)**

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**@ BCAS Mount Campus**

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# Contents

<b>Keynote 1</b> - Planning Healthy Cities - Professor Reima Suomi, Turku School of Economics, University of Turku, Finland	<b>14</b>
--	-----------

<b>Keynote 2</b> - Genomics, Molecular Diagnostics of diseases and Personalized Medicine - Professor Ranil Dassanayake, University of Colombo, Sri Lanka	<b>17</b>
---	-----------

## SCHOOL OF BUILDING STUDIES

Can Contractor's Reach The Expected OH / Profit Percentage at the end of the Project? - SAS Weerasekara, <i>British College of Applied Studies (Mount Campus)</i>	<b>20</b>
--	-----------

What are the consequences in implementing the concept of Lean Management in the Construction Industry in Sri Lanka? - KGJ Tennakoon, <i>British College of Applied Studies (Mount Campus)</i>	<b>23</b>
---	-----------

## SCHOOL OF MANAGEMENT

Relative Importance of Exchange Rate in Determining Vehicle Demand: A Special Reference to Non-luxury Vehicle Market in Sri Lanka - ARF Thafani and S Gopikrishna, <i>British College of Applied Studies (City Campus)</i>	<b>26</b>
--	-----------

Impact of time management on academic achievement - KASJ Arachchige, <i>British College of Applied Studies (City Campus)</i>	<b>30</b>
---	-----------

Impact of Work-related stress on employee productivity - K Sanjeeva and A Shimaz, <i>British College of Applied Studies (City Campus)</i>	<b>33</b>
--	-----------

Factors influencing the frontline employee turnover in the Travel and Tourism Industry in Sri Lanka - TRT Halpandeniya, <i>British College of Applied Studies (City Campus)</i>	<b>35</b>
---	-----------

Identify and analyze the factors affecting the employee satisfaction (Case study on Selected Tertiary Education Institutes in Sri Lanka – Employee Turnover) - RMN Perera and S Ubayakumara, <i>British College of Applied Studies (City Campus)</i>	<b>38</b>
--	-----------

Impact of traditional business due to the emergence of online business in Sri Lanka - S Ahamed and TFM Ashiq, <i>British College of Applied Studies (City Campus)</i>	<b>42</b>
--	-----------

Exploring the investment pattern of Sri Lankans' and the effect on the economy - AAA Ahmed and A Shimaz, <i>British College of Applied Studies (City Campus)</i>	<b>45</b>
---	-----------

Improving sales through incorporating enhanced features in automotive: Special references to Micro Holdings - MM Muhammed and TFM Ashiq, <i>British College of Applied Studies (City Campus)</i>	<b>48</b>
--	-----------

A Study of Service Quality on Student Satisfaction of a Private Higher Educational Institution With Reference to ABC Campus in Sri Lanka - CD De Silva, <i>British College of Applied Studies (Mount Campus)</i>	<b>50</b>
--	-----------

Impact of Service Quality on the customer satisfaction (Students) in the higher education sector in Sri Lanka - KASJ Arachchige, <i>British College of Applied Studies (City Campus)</i>	<b>55</b>
--	-----------

Intrapreneurship - As a strategy for the Retention of Millenials - JS Sebastianpillai, <i>British College of Applied Studies (City Campus)</i>	<b>58</b>
---	-----------

## SCHOOL OF COMPUTING

Digitalization – concept analysis - R Suomi, <i>University of Turku, Finland</i>	<b>64</b>
---	-----------

Student Informational SMS and E-MAIL Retrieval / Push System - SHM Shafeer, <i>British College of Applied Studies (Kandy Campus)</i>	<b>67</b>
---	-----------

Restraining Power Consumption of Home Electrical Appliances by the Application of Digital Electronics - MRR Mohamed, British College of Applied Studies (Kandy Campus)	71
Increasing productivity in plant cultivation by minimizing additional man-hours in pit digging process - T Rangamaarachchi, British College of Applied Studies (Kandy Campus)	74
An Internet of Things system for a smart Pantries in Sri Lanka - M Shri Wathsan, British College of Applied Studies (Kandy Campus)	79
Artificial Vision of text reading, face recognition and object recognition - AS Perera, British College of Applied Studies (Kandy Campus)	82
Smart Agriculture System Using IOT - TA Saboordeen and MAM Fayaz, British College of Applied Studies (City Campus)	87
Study on efficiency of a Mobile Application to Locate Destination Bus Station for travelers who travel from Kandy - G Arunath and M Nuzarath, British College of Applied Studies (Kandy Campus)	90
'WHO AM I', Centralize National Information Repository on Registration of Birth - TA Saboordeen, British College of Applied Studies (City Campus).	93
Portable Secure Network Link Monitor - G Kalinga, KASJ Arachchige and MLM Aqueel, British College of Applied Studies (City Campus)	98
An effective Intrusion Detection / Prevention System (IDPS) implementation for an academic environment with specific requirements - G Kalinga, KASJ Arachchige and MM Rasheed, British College of Applied Studies (City Campus)	101
Assessing roles, contribution and challenges for women in the IT industry in Sri Lanka - KASJ Arachchige, British College of Applied Studies (City Campus)	104
The positive and negative Impact of ICT on Students' Academic Performance - KASJ Arachchige, British College of Applied Studies (City Campus).	107
An Information hub with easy accessibility for Sri Lanka - KASJ Arachchige and B Karthiban, British College of Applied Studies (City Campus)	110
Virtual administrative support service system for XYZ Higher Education institute - KASJ Arachchige and MRD Ahmed, British College of Applied Studies (City Campus)	113
Performance oriented job portal for the job seekers and the job posters - KASJ Arachchige and MSYP Karunaratne, British College of Applied Studies (City Campus)	116
Online Portal / Service for Player Profile Cricket - MS Dharmage, KASJ Arachchige and DLU Weerasinghe, British College of Applied Studies (City Campus)	119
Virtual shopping mall - I lyngaran, British College of Applied Studies (City Campus)	122
An Intelligent recruitment system - I lyngaran and BM Fathima Nasmiya, British College of Applied Studies (City Campus)	125
The benefits of Virtualized Internet Infrastructure Implementation for an Academic Institute - KASJ Arachchige and MIM Irfan, British College of Applied Studies (City Campus)	128
'SMART GRID' - Electricity & Water Meter Management System Using IOT Technology - TA Saboordeen, British College of Applied Studies (City Campus)	131
'USE IT OR WASTE IT' - Municipal Solid Waste Collection System Using IOT Technology - TA Saboordeen, British College of Applied Studies (City Campus)	136

# Contents

## SCHOOL OF ELTU

- Impact of urban and rural identity of undergraduates in University of Sri Jayewardenepura on learning English as a second language 144  
 - DNP Amarasooriya, British College of Applied Studies (City Campus);  
 University of Sri Jayewardenepura

## SCHOOL OF ENGINEERING

- Comparison of design finding for steel portal frame amongst British and Euro code 148  
 - M Geethanjali, British College of Applied Studies (Mount Campus)
- 
- A Suitable Engineering Technique to Strengthen the Unreinforced Masonry Walls for the Flood Load 150  
 - V Seron and ACM Suhoothi, British College of Applied Studies (Mount Campus)
- 
- Evaluation on Effective Concrete Cover Distribution Patterns for RCC Slabs to Achieve its Designed Requirements 154  
 - MM Sajidh and ACM Suhoothi, British College of Applied Studies (Mount Campus)
- 
- Cellular Antenna Network Optimization based on 'Timing Advance Profile' of 'Dedicated mode Mobile Stations' 157  
 - KM Musthafa, British College of Applied Studies (City Campus)

## SCHOOL OF HEALTH SCIENCE

- Investigation of *In vitro* anti-inflammatory activity of *Caryota urens* (Kithul) 162  
 - ST Ramu, TN Adikari and WSM Fernando, British College of Applied Studies (City Campus); General Sir John Kotelawala Defence University
- 
- A study to investigate the possibility of using *Cyclea burmanni* mucilage as a natural drug delivery system 166  
 - MKD Rodrigo and KMGP Premadasa, British College of Applied Studies (City Campus); General Sir John Kotelawala Defence University
- 
- Neolitsea cassia* water extract with a starch carrier in controlled drug delivery systems 170  
 - DR Rathnayake and KMGP Premadasa, British College of Applied Studies (City Campus); General Sir John Kotelawala Defence University
- 
- In vitro* anti-inflammatory activity and phytochemical screening of *Dipterocarpus zeylanicus* 173  
 - Z Shabbir, WD Ratnasuriya and RN Pathirana, British College of Applied Studies (City Campus); General Sir John Kotelawala Defence University
- 
- Investigation of *in vitro* anti-inflammatory activity of *Cassia tora* 177  
 - T Chathuranga, WD Ratnasuriya and RN Pathirana, British College of Applied Studies (City Campus); General Sir John Kotelawala Defence University
- 
- A study to investigate the potential of using *Gracilaria verrucosa* water extract as a polymer based drug delivery agent 181  
 - L Vaishnavee and KMGP Premadasa, British College of Applied Studies (City Campus); General Sir John Kotelawala Defence University
- 
- An Assessment of iodine exposure in Sri Lanka 184  
 - S Farood and WSM Fernando, British College of Applied Studies (City Campus)
- 
- Development of a polymerase chain reaction method for rapid detection of *Dirofilaria repens* from canine samples 188  
 - AD Jayawickrama and P Premarathna, British College of Applied Studies, General Sir John Kotelawala Defence University



Development of a loop mediated isothermal amplification method for rapid detection of <i>Dirofilaria repens</i> from biological samples - KDD Samankumari and P Premarathna, British College of Applied Studies (City Campus); General Sir John Kotelawala Defence University	191
Analysis of Vitamin C concentration in fresh and commercially available orange juices using iodometric titration method - F Rizkha and WSM Fernando, British College of Applied Studies (City Campus)	193
The <i>in vitro</i> evaluation of Antibacterial and Antifungal activities of ripe fruit extracts (pericarp and seed) of <i>Bunchosia armenniaca</i> (Cav.) DC - MK Dassanayake, British College of Applied Studies(City Campus); General Sir John Kotelawala Defence University	196
Evaluation of Farmer's E- learning System Adoption - NP Vidanapathirana, R Suomi, K Hirimburegama, SAP Nelka and SL Nawarathna, University of Colombo Institute for Agro-technology and Rural Sciences, Sri Lanka; University of Turku, Finland; University of Colombo, Sri Lanka	201

## SCHOOL OF LAW

Testimony aids for children in adjudicatory process of Sri Lanka - SADA Ranasinghe, British College of Applied Studies (City Campus)	206
21st Century Great Game and its actors: India's interests in Central Asia and It's repercussions in South Asia - P Amarasinghe, D Atapattu and P Joshi, Faculty of Law, South Asian University, New Delhi, Royal Asiatic Society, Sri Lanka, Defense Analyst, Research Observer Institute, New Delhi	209
Presidential Powers Are Determined By Respective Constitutions - K Ratnam, British College of Applied Studies (City Campus)	215
Emerging Challenges in Medical Negligence: A Critical Analysis of Sri Lankan Law - CB Alahakoon, British College of Applied Studies (City Campus)	217
Corporate Governance of Banks: A Critical Analysis of the Impact of Statutory Framework of Sri Lanka - WWASP Fernando, British College of Applied Studies (City Campus)	220
The Significant features of 19th amendment of the Constitution in the context of the Sri Lankan Politics - B Ratnayake, British College of Applied Studies (City Campus)	224
Rule of Law: An Imperative Tool of a Democratic Country to Influence Economic Development - KC Hapuarachchi, British College of Applied Studies (City Campus)	226
Survival of Kandy before three European nations - WS Eellepola, D Attapattu and P Amarasinghe, Royal Asiatic Society, Sri Lanka, Faculty of Legal Studies, South Asian University New Delhi, Department of International Relations, South Asian University New Delhi	229
A Study of Influencing Factors Believe In Horoscope Reading Among Young Women In Sri Lanka - CD De Silva, British College of Applied Studies (Mount Campus)	236

# BCAS CAMPUS

Established in 1999, British College of Applied Studies (now popularly known as BCAS Campus) has rapidly grown into a leading educational provider in Sri Lanka with a large number of students more than 4,000. BCAS Campus has strong international collaboration, especially with the University of Wolverhampton (UK), London South Bank University (UK) and Pearson (Edexcel) UK.

Besides two main campuses in Colombo (City Campus) and Mount Lavinia (Mount Campus) in the Western Province, BCAS Campus has branches in five key cities in Sri Lanka, namely, Kandy, Jaffna, Kurunegala, Batticaloa and Kalmunai with a highly successful overseas centre in the State of Qatar. Plans are under way to open more overseas centres.

Having won 17 awards nationally & internationally, the institution is highly esteemed for its exceptional quality, international recognition and market relevant training. To top it all, BCAS Campus was selected as the First of the Five Top higher education providers in Sri Lanka in 2013 by an independent survey conducted by an organization hired by Sri Lanka's pioneering business magazine LMD. Currently more than 4,000 students follow their chosen courses of study at BCAS Campus - Quantity Surveying, IT, Law, Business Management, Telecom Engineering, Civil Engineering and Biomedical Science. These courses are delivered at HND Pearson (Edexcel) UK as well as at degree levels. MSc in Construction Project Management, MBA and LLM (Professional Practice) are the three Master's programme delivered by us.

## International Collaborations

Our relationship with the University of Wolverhampton, UK was established in 2006 with an agreement to transfer students completing BTEC HND in QS to do their BSc (Hons) in QS in the UK. Thus the first batch of 30 students were transferred to the university in 2006. This trend continued steadily and more than 450 students earned their degrees directly from the University between 2006 and 2012. With the introduction of in-country delivery of degrees at BCAS Campus in Colombo in 2011 and formalization of the first agreement to that effect, the number of students opting to complete their Top-up Degrees right here in Sri Lanka gradually increased. Thus making it the most popular option among Sri Lankan Students.

Thereafter, successively, several MOUs were signed to deliver the university's selected degree programmes in Colombo at BCAS Campus itself – BSc (Hons) QS, LLB (2011), BABM, MBA (2012), MSc - CPM (2014), LLM Professional Practice (2015), BSc (Hons) Biomedical Sciences (2015).

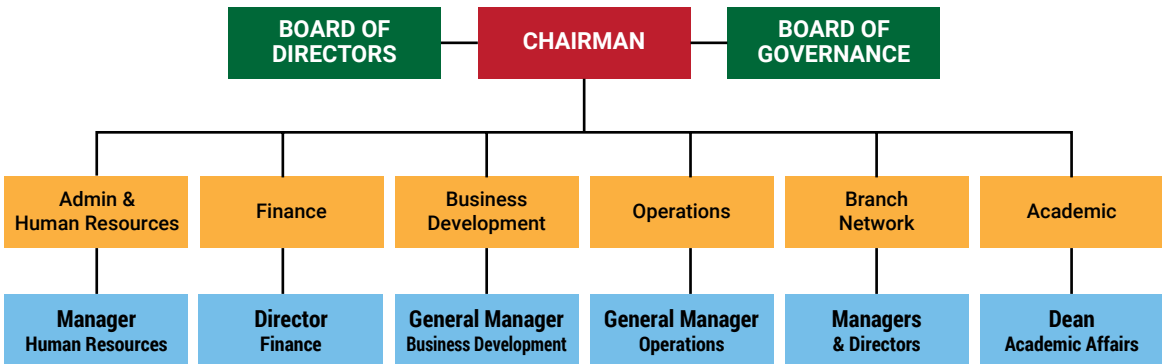
The other university we work with is London South Bank University, UK and we deliver their BSc (Hons) degree in Commercial Management (QS) and BSc (Hons) Civil Engineering while our relationship with the Edexcel, UK (now known as Pearson, UK) dates back to 2002.

### ***Building Careers - Transforming Lives***

# BCAS in Brief

<b>1999</b>	<ul style="list-style-type: none"> <li>• Founded as IT/English training institute in Kandy</li> </ul>
<b>2000</b>	<ul style="list-style-type: none"> <li>• BCAS Placement division, placed 12 students-UK Uni's</li> </ul>
<b>2001</b>	<ul style="list-style-type: none"> <li>• Established 1st BCAS Centre in Colombo</li> </ul>
<b>2002</b>	<ul style="list-style-type: none"> <li>• Setup the 'Corporate Office' in Colombo</li> <li>• Launched BTEC HND in IT/Computing</li> </ul>
<b>2004</b>	<ul style="list-style-type: none"> <li>• Vocational Courses in Construction, placed students in Industry.</li> <li>• MoU with Many UK Colleges and Universities</li> <li>• Expanded Kandy Campus /launched HND Computing /IT</li> </ul>
<b>2005</b>	<ul style="list-style-type: none"> <li>• Launched BTEC HND in QS</li> <li>• Launched Vocational Programme – 'CAD and Building Studies'</li> </ul>
<b>2006</b>	<ul style="list-style-type: none"> <li>• Articulation agreement with the UoW for students' progression</li> <li>• Launched Vocational Programme – 'Teacher Training'</li> </ul>
<b>2007</b>	<ul style="list-style-type: none"> <li>• 1st batch of students transferred to UoW</li> <li>• Established HND QS Centre in Dehiwala Campus</li> </ul>
<b>2008</b>	<ul style="list-style-type: none"> <li>• Set up BCAS Qatar Campus / Launches HND in QS</li> <li>• BTEC HND in Business Management</li> </ul>
<b>2009</b>	<ul style="list-style-type: none"> <li>• BTEC HND in Electrical / Electronic (Telecom)</li> <li>• BTEC HND in Law</li> </ul>
<b>2010</b>	<ul style="list-style-type: none"> <li>• QS Top-Up Degrees in Qatar Campus - Bsc (Hons) QS- UoW</li> <li>• QS Top-Up Degrees in Dehiwala Campus - Bsc (Hons) QS- UoW</li> </ul>
<b>2011</b>	<ul style="list-style-type: none"> <li>• BTEC HND in – Biomedical Science - UoW</li> <li>• Established Batti Campus</li> <li>• EDEXCEL UK Award - Fastest/Most Outstating BTEC HND Centre</li> <li>• ISO 9001 – 2008 Certified</li> </ul>
<b>2012</b>	<ul style="list-style-type: none"> <li>• BM Top-Up Degrees in City Campus - BA(BM) - UoW</li> <li>• LLB Top-Up Degrees in City Campus - LLB- UoW</li> <li>• Established Wayamba Campus</li> <li>• MBA – Launched in City Campus- UoW</li> </ul>
<b>2013</b>	<ul style="list-style-type: none"> <li>• BTEC Level-7 Strategic Management – MBA Pathway- UoW</li> <li>• BTEC HND – Civil Engineering</li> <li>• Recognized by LMD Magazine as the "No.1 Private Education Provider"</li> </ul>
<b>2014</b> <b>2015</b>	<ul style="list-style-type: none"> <li>• MSc Construction Project Management- UoW</li> <li>• MSc Strategic IT Management- UoW</li> <li>• MSc IT Management- UoW</li> <li>• BSc (Hons) Management of IT / BSc (Hons) Computing - UoW</li> </ul>

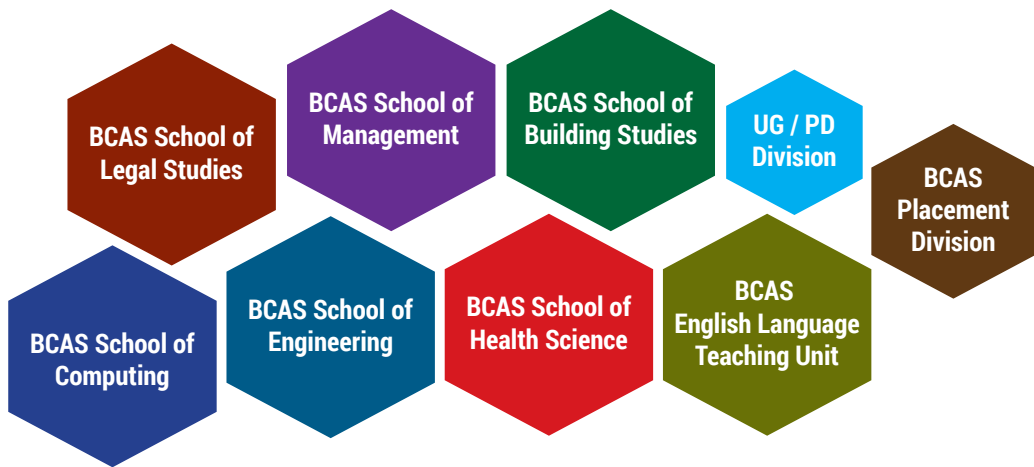
# BCAS Organization Chart



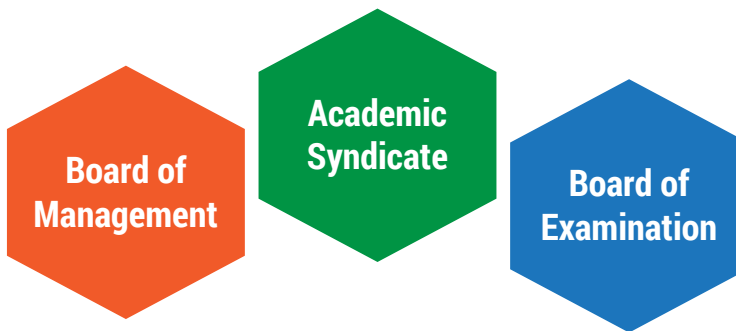
## Board of Governance

- Chairman, CEO - Eng Abdul Rahman
- Director - Eng M Mafeel
- Director - Mr J Niwas
- Dean Academic Affairs - Prof K Hirimburegama
- General Manager Operations - Eng Kawther Musthafa
- General Manager Business Development - Mr M Isthiqar
- Justice Saleem Marsoof PC, Retired Judge of the Supreme Courts of Sri Lanka
- Mr S Asiriwatham, FCA SL, Former President Partner & Country Head - KPMG
- Prof. Rohan Rajapakshe, Former Director - Ministry of Higher Education
- Dr Mahroof, Head, Civil Engineering - University of Peradeniya
- Dr K. Kobindraraja - Former Vice Chancellor - Eastern University, Sri Lanka
- Dr Yasa Siriwardana - Director - Medi Calls
- Prof M D Lamawanse - Professor of Surgery - University of Peradeniya
- Prof K K Y W Perera - Former Secretary - Ministry of Power & Energy,  
- Former Vice Chancellor - University of Moratuwa

## Divisions / Academic Schools

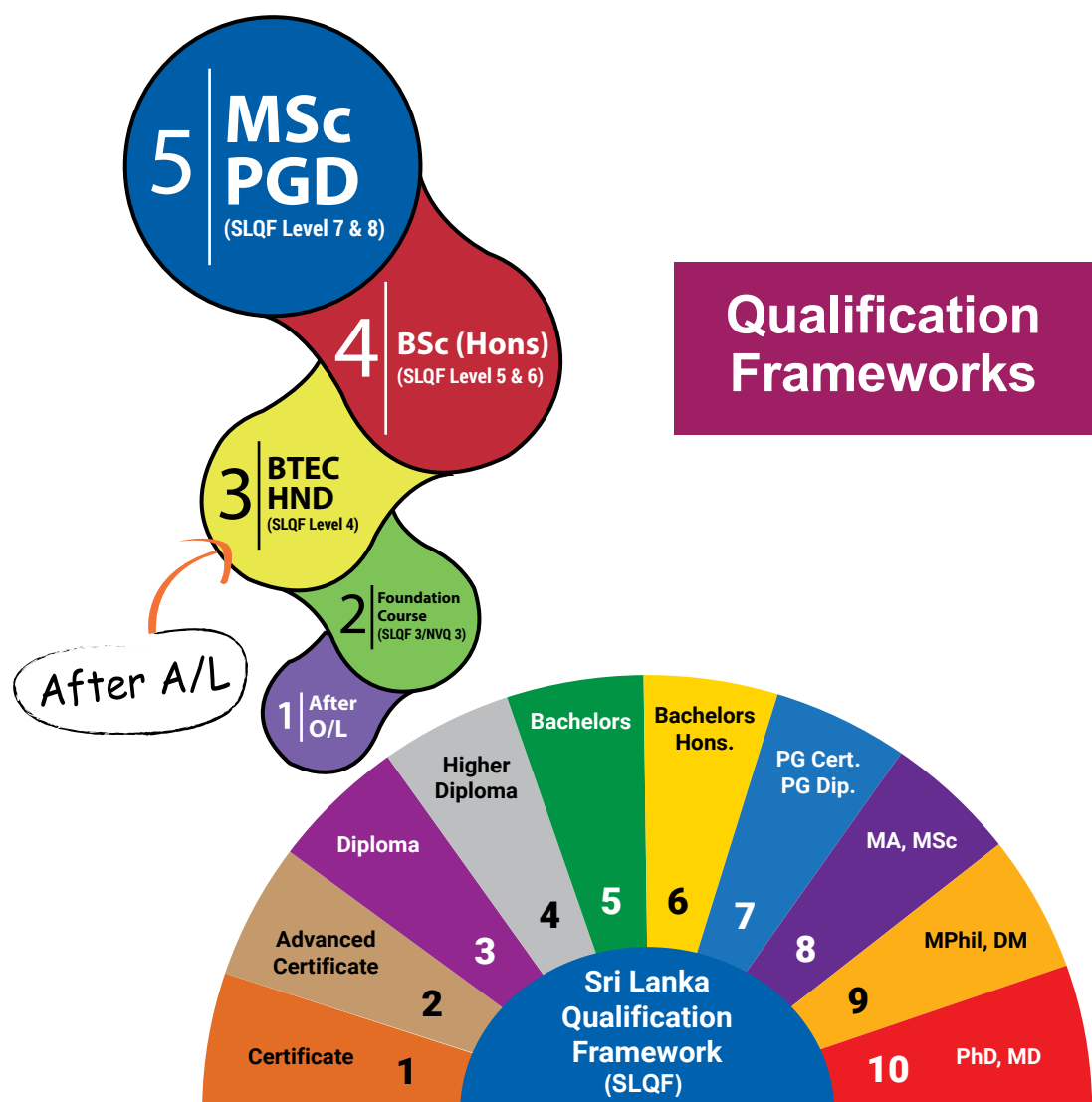


## Quality Management Structure



## Service Divisions





Sri Lankan National			BTEC/UK	
	SLQF	NVQ -	BTEC-QCF (UK)	
Doctorial Degree, MD	SLQL-10		QCF-L8	PhD/DPhil
M.Phil., Masters (Research)	SLQL-9		QCF-L7	Master's degrees
Master (Taught + Research)	SLQL-8			
Master (Taught), PG-D, PG-C	SLQL-7		QCF-L6	Bachelor's degrees, eg BA, BSc
Honours Bachelor	SLQL-6			
Bachelor Degree	SLQL-5	NVQ-7	QCF-L5	BTEC HNDs (Higher National Diplomas)
High Diploma	SLQL-4	NVQ-6	QCF-L4	BTEC HNCs (Higher National Certificates)
Diploma	SLQL-3	NVQ-5	QCF-L3	BTEC National Diploma
Advanced Certificate	SLQL-2	NVQ-4		BTEC National Extended Diploma
Certificate	SLQL-1	NVQ-2, 3		

## Quality Assurance



External Standard Verification by



## Approval, Recognition Partnership



TERTIARY AND  
VOCATIONAL EDUCATION  
COMMISSION  
SRI LANKA



Ranking  
“Platinum  
Partner”  
**No.1**

**BTEC Centre in Sri Lanka**

by Pearson - UK  
**2017**



Asia's Training  
Excellence Award  
**2017**



Best Employer  
Brand Award  
**2017**



# International & Local **Awards**



Platinum Partner  
No.1 BTEC Centre  
in Sri Lanka

**2016**



Educational Institute  
with Best Academic  
& Industry Interface

**2016**



Visionary Leadership  
Award for  
BCAS Chairman

**2016**



Academic  
Impact Winner

**2016**



Ranked as No.1  
Higher Education  
Provider

**2014**



BTEC  
Gold Partner

**2013**



Performance  
Excellence Award

**2011**



Fastest Growing  
BTEC Centre

**2010**

## Keynote 1

### Planning Healthy Cities

Professor Reima Suomi

*Professor of Information Systems Science*

*Turku School of Economics, University of Turku, Finland*

*Visiting Professor, Huazhong Normal University, School of Information Management*

*Wuhan, Hubei, People's Republic of China*

Healthy cities (or smaller municipalities as well) are safe living environments, which offer possibilities for balanced and sustainable living conditions contributing to the well-being of their inhabitants. Making a city a healthy living environment does not happen overnight, but is a project of decades.

All cities are not equal as to their environment. In some environments making the city a healthy one can be rather challenging. Extreme weather conditions and natural characteristics such as earthquake danger, polluted soil or water, can make a city vulnerable and hard to design, build and maintain. Some current cities also nowadays carry historical burdens with them, such as lasting political conflicts, which makes their development work difficult.

Healthy cities motivate their inhabitants to lead a healthy living. In such cities, pollution is pressed to a minimum through effective infrastructure. Infrastructure services like transportation, energy, telecommunication and waste management are taken care of in an efficient way.

A healthy city is not just a technical accomplishment. Healthy cities offer their inhabitants incentives for healthy and friendly social life, which leads to social and societal health of the city and its inhabitants. Services such as health care, multi-level education and security belong to the picture. As well healthy cities offer cultural encounters, and feed multicultural and liberal environment, where all human freedoms are fully implemented. Cities are of course also places where commercial offerings are expected to be rich and multifaceted.

A key component in a healthy city process is genuine participation of the citizen to the development process. This adds to the responsibility of the citizen of their city, and makes the citizen feel that the city is a product of their labor.

An approach to work towards healthy cities is health impact assessment. A health impact assessment can and should be done for all major initiatives, such as new infrastructure, new big building projects (shopping centers, hospitals, sporting facilities, conference centers, etc.) or for example in the planning of leisure and nature protection areas. Health impact assessment typically lasts 2-6 months, and it should be genuine: if the outcome is known beforehand (build or no-build decision) health impact assessment is just a theatre play and waste of resources.

In the Nordic countries, good results have been found from development initiatives that do not segregate city parts to the living areas of rich, poor, certain social groups, different age citizen, language groups, nationalities, religion holders, etc. Making people live in environments where different population groups live side by side is usually a very good idea.

A healthy city is often associated with a smart city, also a city taking advantage of modern information and communication technology, a city with deep digitalization. A smart city uses its resources efficiently, and is all the time aware of its situation, and also informs the citizen of the living conditions. A good example is helping people to avoid traffic jams with real time information or to help car drivers to find a parking lot.

A smart city motivates its citizen to do physical activities. Take the example of bicycling. A prerequisite for bicycling is availability of good and safe bicycling roads. As can be understood, these are not established overnight, but the building of a good bicycling road networks takes maybe hundreds of years. However, the payback might be very high. Sporting people stay in good physical condition and save on the healthcare costs. Bicycling is an environment friendly means of transportation, and avoidance of pollution is a key component of a healthy living environment. According to WHO, polluted air causes most premature deaths in the world, is also the leading death cause.

A healthy city is not an island. It has good connections to its environment, both in the transportation of data, humans and goods. Earlier the concept of teleport was used to denote a location with good telecommunication facilities. For physical transportation ports are also needed: effective harbors if the city is by a sea, and maybe even airports, if the city is big enough.

A big or a small city can both be healthy or unhealthy living environments. Healthy city is not a function of city size. Cities are like ships: a big city is anyway more difficult to guide and redirect, especially if it is on a bad road. Big cities usually however have more resources, and easier get for example national support for their activities than smaller ones.

A healthy city has a balanced demographics. It has young and old population. A misbalanced population structure that at the first looks good (for example now most inhabitants being good taxpayers at their 50s) might end up to difficulties later (after thirty years the city being mainly a place for pensioners needing care but paying little taxes).

Needless to say, a healthy city is a safe environment. Criminality is pressed down to be very low or nonexistent, and all people feel free and save to move anywhere in the city, at any condition and company, and at any time-point.

A healthy city is liberal. It is open to different kinds of cultures and social groups. Different forms of art and sport co-exist and support and feed each other. Culture also needs resources: a healthy city has the needed infrastructure also for culture - exhibitions centers, conference facilities, museums, music and concert halls, etc.

A healthy city knows its past, and does not hide it, even if history would not always be the best one. A healthy city cherishes its past, but is not bound to it, but looks forward towards an even better future. A healthy city is also respectful towards different areas: a healthy big city does not look down to its smaller neighbors, and a healthy smaller municipality is a place, where citizen have no difficulty to move to a bigger or otherwise different city. Sadly, healthy cities are hard to find.

Health and wealth often go hand. A healthy city typically also is a wealthy city too, but must still be affordable to its citizen or to tourists. For example accommodation prices must be kept at a tolerable level for all citizen groups.

The perfect city is not yet there. Work on healthy cities development must be intensified.

## **Keynote 2**

### **Genomics, Molecular Diagnostics of diseases and Personalized Medicine**

Professor Ranil Dassanayake

*Department of Chemistry,*

*University of Colombo, Sri Lanka*

The genomics is one of the fastest growing areas of Molecular Biology. Constant introduction of new-advanced-robust technical platforms for genome sequencing facilitates generation of alphabet of the life rapid and economical manner to assist investigation of the formula of the life. Molecular diagnostics, essentially the analysis of DNA and RNA at the molecular level, is a fast-growing business, made possible by the growing understanding of the human genome, which has driven growth in the diagnostics industry.

With the mapping of human genome in 2003, the pace of discovery steadily and gradually increases. One of the areas that have enormously benefited from the discovery of genome projects is medicine and through the identification of errors/polymorphisms in genetic material scientists were able to explain the genetic basis for diseases, phenotypes, therapeutic responses etc. Subsequent to the knowledge derived from genome projects, most awaited disciplines such as pharmacogenomics, genomic medicine, molecular medicine etc are coined and integrated to the stream of medicine. With the advent of genomic projects and high throughput techniques such as DNA microarrays, next generation sequencing followed by bioinformatics to analyze the person's entire genomes for Single Nucleotide Polymorphisms (SNPs) / mutations, copy number variations (CNV) make possible to predict individualized risks and to design tailor-made treatment according to individual's genetic makeup, which is currently known as personalized medicine

Personalized medicine is an extension of traditional approaches to treat disease with greater precision. A profile of a patient's genetic variation can guide the selection of drugs or treatment protocols that minimize harmful side effects or ensure a more successful outcome. It can also indicate susceptibility to certain diseases before these manifest, allowing the physician to set out a plan for monitoring and prevention. In personalized medicine, SNPs have received increased and special attention as the latter has shown to have a direct bearing on phenotypic differences between individuals, and have been shown to affect the development of diseases in humans and the response to drug treatment and environmental stress.

Harping the human genome for SNP, CNV and better understanding of potential disciplines such as pharmacogenomics, pharmacoproteomics, pharmacometabolomics personalized medicine etc., will give a fruitful return in the form of better understanding of complex diseases by deciphering metabolic pathways, reduction of drug toxicity, development of predictive genetic tests and this will lead ultimately to the development of individualized medicine in modern medicine prescribing practices. Although, these are the fastest growing knowledge-based sectors even amongst our neighbouring countries such as China, Japan, India, Korea, Singapore, Malaysia, Taiwan, Thailand etc., Sri Lanka is yet to harness the full potential of these areas of Molecular life science.



School of  
**Building Studies**



## Can Contractor's Reach the Expected Oh / Profit Percentage at the End of the Project?

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### **Abstract**

Today the most companies aim for moving targets by attempting to make as much money as what they expecting or more than they are currently making. So similarly this also affect by the construction firms also. But it was depend on the capability of the each and every construction firm and there financial positions of the companies. So in this research I expected to find out, whether the contractor can achieve the percentage of the overhead and profit as he stated in the tendering stage.

D and S Construction is a fast growing construction company in past 10 years and the company has more experience about the commercial and the residential building constructing and installation the wind mills in the coastal areas.

By considering the Overhead and profit percentage of the relevant projects, in main contractor's point of view is, there is no considerable profit from the completion of the projects as what they expected. So in the aim of this research is to find out the actual OH/P percentage after completed the projects and which factors are affected to differ this percentage from commencement to complete.

### **Background literature review and referencing**

(Tung Au) in his report : The gross profit for a construction project undertaken by a contractor is commonly measured by the difference between the total income received and the total expense incurred in all time periods agreed upon in the construction contract.

(Percentage Profit Margins Of A Project Construction Essay, Published: 23, March 2015) The net price of measured work is the final price taking into consideration all the elements. In other words the net price is the overall and final price, including labour, plant and materials without any profit or overhead allowances which are priced elsewhere in the preliminaries.

Overhead costs are those costs that cannot be attributed to a single task of construction work. Costs that can be applied to a particular item or work should be considered a direct cost to that item and not be included in overhead costs. The overhead costs are customarily divided into two categories:

Profit is shown as a percentage loading and provides the Contractor with an incentive to perform the work as efficiently as possible. The Cost Estimator must use previous historical data to provide a suitable industry profit loading, modified by an in-depth understanding of marketing conditions likely to impact the current project.



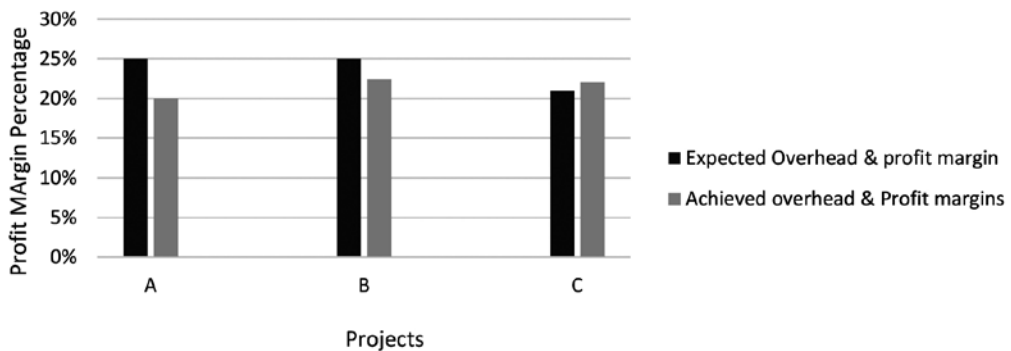
The overhead and the profit margins has to be decided by the main contractor in the “Tendering” stage. Today the most of the projects consultants are not offering the price escalations for their projects. Due to the price increasing of the projects in a number of reasons, such as extra works, variations the agreed cost of the project may differ and the unavoidable cash problems may occur to the client. So the most Consultants are avoiding to this issues without offering the escalations of the projects.

### **Methodology**

This research project endeavours to evaluate the achievement of overhead and profit margin of the different types projects in a ‘D and S Constructions’.

This case study that was selected to find the profit margin states among 03 projects of above selected company and find out the success of the achievement. The section of process was made by repeatedly referring back to the research question and to the purpose of my study. This allowed me to focus attention on where to look for case and evidence. So this way the design of my case study was planned ahead to ensure that all collection data is relevant. A data gathering format was designed and copy is inserted in Appendix – 1 below. Before designing the data collection format, there are four key questions that needed to be address during the case study.

1. Identify the project incomes and expenses separately.
2. Identify the each project overheads with relevant time periods.
3. Find out the reasons for increasing or decreasing the expenses against the Bill of Quantities amounts.
4. How to apply the finding to success the future projects



**Figure 1 : Graph of profit margin percentage against Projects**

### ***Findings and Discussion***

Considering the answers of questioners of above projects, clearly we can identified the main contractor “D and S Constructions” was unable to reached the overhead and profit margin as what they expected in the tendering stage. This may happened in to the different types of issues were occurring in the projects while it was moving.

In a construction industry most contracts require the contractor to carry out and complete the project by a specified date or within a specified period from a commencement date. Intermediate dates may also be specified for the completion of sections of the works. Such dates are referred to as sectional completion dates. Sadly, such timetables are not complied with in many cases.

Lack of labour was became big issue of above those projects. When we considering above few projects awarded from southern areas. We were unable to provide enough labor for those projects from Colombo and we have to outsource the labour from those areas.

Finally projects often fail to achieve expected profit margins because of one or more of the following reasons. Poor planning with Lack of communication, not breaking down development into phases or steps, not prioritizing operational activities, objectives, not obtaining stakeholder approval, no business plan or inadequate business plan, unrealistic expectations set, e.g., financial investment, time required, set-up costs, inadequate funding/capital or poor use of funds/capital, lack of time commitment, unrealistic scheduling.

### ***Conclusion and Recommendation***

According to this report there are some critical problems that are directly effect to the profit. Such as material transport delays, Document errors, and clearing issues, lack of labour, lack of communication at site and with management also. Aim of this research was found the reasons which were mostly effect to the project success and solution for those matters. Understanding above mentioned issues and we can early address to those issues we are able to reach success and achieve target profit margin or more than that in future projects

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# What are the Consequences in Implementing the Concept of Lean Management in the Construction Industry in Sri Lanka?

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## **Abstract**

The term Lean Concept is widely practicing in the Manufacturing Industries all over the world from decades. This too is very popular in Sri Lanka's Manufacturing Industries but in the Construction Sector this concept is not commonly used. It is understood that they have different strategies implemented in the construction projects on their own.

## **Keywords**

The real meaning and idea of Lean Concept is to maximize customer value while minimizing waste.

## **Introduction**

The strategy to find the current practices and the methodologies used in construction organizations is to have face to face interviews to study whether the lean management is in practice or if not what are the similar methods they practice and the end results of those organizations that are not practicing Lean management are successful as expected through Lean Concept. It is the method of selecting a few leading Companies in Sri Lanka and having face to face interviews with the relevant Authorities.

After having individual interviews, it was found that the behavior of the whole construction industry in Sri Lanka is in the opinion of having their own practices rather than shifting on to a new concept. The selected three construction companies are in the top order in construction arena having excellent experience and good reputation in the country. They have their own adopted systems in practice. It is beneficial to their companies and beneficial to the clients. The main arrears of wastes are commonly the material, time and people. When asked about the transformation, they all are clueless and stated that not relevant. They have no intention in forming a different new department for Lean Management but they have to study further and through thorough understanding they might switch on to the implementation to the Lean Concept in future. Until such time they are satisfied with their current practices. Their personal view on Lean Management is totally negative.

Basically, the participants at the interview of the construction companies were lack of understanding on lean concept and then the steps have been taken to brief them on this subject. Each company practices an internal company system successfully. All are in agreement that implementation of lean concept to achieve zero waste is an impossible task. Currently they are satisfied with their own systems but they prefer to study the concept in future for a possibility. The question is that if their current systems

are successful, what is the necessity in adapting the lean theory? The answer is already discussed reference to the fourth interview the writer had with industrial organization. That discussion was based on the motivation of the people, the systematic stimulation of the thinking pattern of the employees, methodology of problem solving, visual management, idea management and finally organizing the work. After careful observation of the each and every individual system practiced by the construction people, it is understood that the Lean Concept is within their systems. Hence, they are reluctant to switch on to a similar concept with a new identification.

### **Experiment**

The Lean Concept could be practiced in the construction industry. Understanding the meaning and the knowledge on this concept shall be the most vital phenomena during the process of converting the current systems that the construction industry adopted, to Lean theory. First of all the management of the relevant organizations should arrange a team to handle the Lean concept. This particular team should be well trained before the implementation practices. Achieving zero waste has been a difficult task in the construction arena but methodologies could be adopted to minimize the waste. Motivating the workers, time management and the material wastes are the key areas the Lean Team should be taken in to consideration. In construction industry, contractors are covering up their wastes by adding a percentage to the rates in the BOQ items. Though the contractor covers up his wastages through his BOQ but the Client has to bear up the total wastage cost as the end result. So the Lean concept will provide the total solution and it is beneficial to the Client.

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School of  
**Management**



# Relative Importance of Exchange Rate in Determining Vehicle Demand: A Special Reference to Non-luxury Vehicle Market in Sri Lanka

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## **Abstract**

This study attempts to find the relative importance of exchange rate on demand for vehicle in the non-luxury segment. Monthly demand of Toyota Aqua for a period of two years is used for the study. The study employs regression analysis and hypothesis testing to examine the relationship between exchange rate and demand for car while controlling for interest rate, income level, tax rate and fuel price. The results of the study reveals that there is a significant negative relationship between exchange rate and demand for the selected car model suggesting the importance of exchange rate on demand for car in non-luxury segment. Further, it is observed that tax rate and fuel price have a strong effect on car demand than exchange rate fluctuations whereas per capita income has lower effect on car demand compared to exchange rate fluctuations as revealed by results of multiple regression analysis. Yet, the impact of exchange rate on the demand for vehicle is relatively important even with the influence of other variables.

## **Keywords**

Exchange rate, interest rate, income level, tax rate, fuel price

## **Introduction**

Automobile industry is rapidly growing worldwide and Sri Lanka is not an exception for this. The industry in Sri Lanka is booming despite the low motorization rate compared to many other developing countries. According to World Bank, motor vehicle per thousand persons in Sri Lanka is forty seven as in 2009. Demand for automobile is showing a strong growth with the positive growth in per capita output in Sri Lanka (Perera, 2015). Despite the fact that there is an increasing trend in the demand for vehicle, there are no empirical studies have been carried out in Sri Lanka to find out the factors influencing the demand. Consequently, this research attempts to study the factors that determines the demand for vehicle in the non-luxury segment vehicle market in Sri Lanka.

The general objective of this research is to reveal the relative importance of exchange rate in determining the demand for vehicle in Sri Lanka. The research is also guided by the following specific research objectives.

- To find out the impact of exchange rate on the demand for imported vehicles in the non-luxury segment in Sri Lanka
- To assess the relative importance of exchange rate amongst other major drivers of car demand i.e. interest rate, income level, tax rate, fuel price.

- To study the impact of interest rate, income level, tax rate, fuel price on the demand for cars in non-luxury segment in Sri Lanka.

### ***Literature Review***

Exchange rate is always considered to be an important factor in any import decision and vehicle imports are also not an exemption to this. Fluctuation in the exchange is one of the main issues faced by the vehicle importers in Sri Lanka especially, the rapid fluctuation in Japanese yen (Merenchig, 2016). Exchange rate fluctuation has shown impact not only in Sri Lanka but also in many other countries. Consistent to this, Coffin (2013) found that the profitability of the vehicles for exports are affected in the country where there is free-floating exchange rate implying that exchange rate has an impact on the demand for passenger vehicle.

Copeland, Hall and Maccini (2015) studying the impact of interest rate changes on both the demand and supply of new light vehicles concluded that an increase in the consumers' interest rate raises their cost of financing and thus lowers the demand for new vehicles. Perera (2015) revealed a negative relationship between interest rate and vehicle registration suggesting that declining interest rate boosts vehicle purchase in Sri Lanka. In contrast, Chisasa, and Dlamini (2013) could not find a significant relation between interest rates and the borrowers' decision to purchase a passenger vehicle in South Africa.

Sharma, Jain and Sign (2011) stated that the availability of more income gives individuals and households the economic opportunity to purchase more luxurious items like automobiles revealing a positive relationship between, disposable income and demand for vehicles. Haugh, Mourougane and Chatal (2010) identified that automobile ownership tends to rise with GDP per capita but in a non-linear way.

Miller and Langer (2008) discovered that consumer value low fuel cost in demanding automobiles. Empirical results of Kilian and Sims (2006) suggested that the effect of changes in the real price of gasoline on the demand for automobiles is likely asymmetric since the increases in the price of gasoline appeared to have important implications for automobile demand while decreases likely did not.

Kher (2012) stated that considerable increase in import tariff in Sri Lanka would negatively impact the car exports to Sri Lanka. Consistent with this, Perera (2015) pointed out that increase in import duties increase the price of vehicle thus decrease the demand for vehicle.

### ***Empirical Model and Analysis***

Considering the variable employed, the study is modeled as follows:

Where the function of demand for passenger vehicle is given by;

$$\text{Demand for Vehicle} = f\{\text{EXCHANGE, INTEREST, INCOME, FUELPR, TAX,}\}$$

The regression model that is to be used to examine the impact exchange rate will be operationalized as follows;

$$\text{Demand for Vehicle}_t = \beta_0 + \beta_1 \text{EXCHANGE}_t + \epsilon_t$$

The model to examine the relative importance of the exchange rate is operationalized as follows;

$$\text{Demand for Vehicle}_t = \beta_0 + \beta_1 \text{EXCHANGE}_t + \beta_2 \text{INTEREST}_t + \beta_3 \text{INCOME}_t + \beta_4 \text{TAX}_t + \beta_5 \text{FUELPR}_t + \epsilon_t$$

This study uses a quantitative approach to measure the impact of the selected variables on demand for vehicle. Regression analysis and hypothesis testing are used to analyse the data. Statistical package for Social Sciences (SPSS) is used to perform the analysis while MS excel is used to compile the data.

### **Data Analysis**

Simple and multiple linear regression analysis are performed respectively to identify the importance and relative importance of exchange rate on demand for selected passenger vehicle of non-luxury segment.

The value of adjusted R square of 0.494 in simple regression analysis implies that 49.4% of variation in demand for selected car is explained by the variation in exchange rate. The F-statistic is 23.475 and significant at 95% confidence level ( $p < 0.05$ ) confirming the overall soundness of the model. The standardized beta of exchange rate is -0.718 implies negative impact on the demand and is statistically significant at 5 percent significance level ( $0.000 < 0.05$ ). This reveals the importance of exchange rate in purchase decision of car in non-luxury segment.

As per the multiple regression analysis adjusted R square is 0.748 and implies that the model consisting of exchange rate, interest rate, tax rate, fuel price and per capita income accounts for 74.8% of the variability of the car demand. The F-statistic is 14.649 and is significant, confirming overall soundness of the model. Exchange rate, tax rate and fuel price have negative effect on car demand whereas the fuel price and income level have the positive effect.

It is evident from the hypothesis testing that exchange rate still have a significant effect on the demand for car even after controlling for other important variables. Exchange rate, excise duty and fuel price have a significant negative impact while income level has a significant positive influence on the demand for car whereas interest rate seems not to have a significant effect on the purchase decision of car in non-luxury segment.

### **Conclusion**

Overall findings suggest that there is a stronger negative association between exchange rate and vehicle demand. Further it is revealed that it is not only exchange rate that determines the demand but there are other important factors that have comparatively higher relative significance in the purchase decision of car in non-luxury segment.



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# Impact of time management on academic achievement

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## **Abstract**

The objective of the exploration was to decide the impact of the time management abilities and academic success of students. Since commonly undergrads have not needed to deal with their opportunity proficiently preceding college since they are brilliant and weren't generally tested in secondary school. Those getting lower grades are most likely no less fit than those accepting higher assessments however frequently their investigation aptitude, including time management are less successful.

Time management is vital and it might really influence person's general execution and accomplishments. Be that as it may, these are connected by how people deal with their opportunity to suit their everyday living or to make it stream consistently with their schedules. Helpful settings and condition will without a doubt elevate positive results to the understudies, other than having great addresses given by their educators. In any case, students' opportunity management can be considered as one of the angle that can move an understudy to be a decent student. A proper time management is key for student to sparkle. The utilization of time by students in advanced education establishments is identified with their everyday schedules and exercises. Time management can likewise influence stretch level of student as they have to adapt to their assignments and their own accomplishments. In such manner, the information was gathered from the undergraduates who are progressing to the degree. This investigation has revealed two imperative discoveries, one is students who has time management abilities has accomplished the objectives and academic achievement and who were coming up short the use their opportunity appropriately wound up with low evaluations and stressed.

## **Keywords**

Students, Time management, academic achievement, stress

## **Introduction**

In the cutting-edge world, time is viewed as an uncertainly distinguishable and usable ware. It implants the idea of time through the establishment. All the material and HR controlled by associations can be improved over the span of time or be changed over the long haul; yet the main resource that can't be changed or bought or put away is time itself. The key to making progress in life is successfully dealing with this asset that everybody has similarly and paying adequate accentuation to arranging (Macan, Shahani, Dipboye and Phillips, 2000). Despite the fact that viable and productive utilization of time changes as for the errands played out, the further increment in the level of information and aptitudes anticipated from present day workers has additionally expanded the need of time management. The way to achievement in social life goes through viable and effective working which is just conceivable by means of time management. The focused condition we live in today empowers individuals from as ahead of schedule as their rudimentary instruction to design and oversee time successfully. The superior required by focused conditions powers associations and superiors to utilize time adequately and stipulates the hunt to control time (Alay and Koçak, 2003).

### **Experimental**

The approach of the survey is the social research system proposes that review is the open instrument to assemble essential statistical data points by utilizing questionnaire about the attitudes and perceptions of students. The literature recommends that survey approach is the best usually utilized approach of perception in the social sciences (Babbie, 2001:256-257). The whole gathering of substances in which the researcher is concerned and wants to plan and sum up is the populace (Boyd *et al.*, 1977). Every one of the components that we are considering and about which we are endeavoring to make determinations is the populace (Levin, 1984:9)". In this exploration paper, the number of inhabitants in intrigue comprised of the 101 undergraduate students. Various articles and books, for example, Lakein's (1973) *How to Get Control of Your Time and Your Life*, have been composed on time management, yet the counsel on overseeing time appears to be very reliable over the different writers. The fundamental proposals are to recognize needs and needs, rank them as to their significance or need, and after that allot time and assets as needs be. Different tips include: Try to deal with each bit of paper just once, assign work, and persistently ask yourself "What is the best utilization of my opportunity at the present time?" Of the restricted research that has managed time management, most investigations have concentrated on the impacts of various sorts of direction on saw stress and conduct. Despite the fact that this past research experiences methodological defects, the discoveries appear to show that preparation can change how one invests energy. Maybe training by methods for a manual or course can change time spent on specific exercises, yet it isn't certain that preparation diminishes stretch or enhances general execution. Lord, Winett, and Lovett (1986) found that neither of the two worldwide anxiety measures indicated dependable differential change crosswise over conditions after the mediations.

The point of this investigation was to decide the correlation between the time management and academic achievement of the college students. With everything taken into account, author discovered that time management is very identified with the academic performance of the college students. As the research results has demonstrated that highly performed students were able to manage the time effectively. The students those who failed manage the time properly has proven low performances in the academic activities. The exploration additionally uncovered that ineffectively time oversee students has used more hours for getting to online networking and given less need for sleeping hours and furthermore uncovered that dominant part of them experiencing frequently headache. Time management scores of the students demonstrate the best approach to score of academic success as reasoned that students who scored poor in academic achievement picked up altogether bring down in time management. There found relationship between time administration rehearses, scholarly accomplishments and stress diminishment as the exploration examine showed that an affiliation exists between nervousness decreasing, practices of time management and higher academic achievement. Also, there is a relationship between time management capacities and instructive results. Offering time to thinks about outside the class or at home have some positive effects on the examinations and investing more energy working have some negative effects on the yields of students.

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# Impact of Work-related stress on employee productivity

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## **Abstract**

In today's competitive global environment, employee productivity is an important element of a company's success. Employee productivity can be significantly decreased by high levels of stress experienced in the work environment (Holroyd *et al.*, 2017). Stress is a universal element and people from nearly every walk of life have to face stress. Employers today are critically analyzing the stress management issues that contribute to lower productivity of employees. The main aim of the study was to evaluate work related stress and its impact on employees' productivity.

Random sampling techniques were used in selecting a sample size of 145 and from the results obtained, it was evident that there were several factors of stress that the respondents endured, and the results proved that stress had an impact on employee productivity.

Researcher is of the belief that the study would contribute some valid findings to the managerial studies especially in the field of human resource management. It is recommended that Management must conduct an analysis of stress management within the organization. It was also suggested to conduct stress relief programmes within the organizations in order to maintain and enhance employee productivity.

## **Keywords**

Work related stress, Employees' productivity, Types of stress, Causes or Sources of stress at work, Symptoms and effects of stress on employees' productivity, Stress on productivity and organization, Managing stress.

## **Introduction**

In today's world, stress has become a worldwide phenomenon, which occurs in various forms in every workplace. Employees are generally working for longer hours, as the rising levels of responsibilities require them to exert themselves even more strenuously to meet rising expectations about work performance. Omolara, (2008), described work related stress as the adverse psychological and physical reactions that occur in an individual as a result of their being unable to cope with the demands being made on them.

Work related stress is the main reason for low productivity of employees. Employees, are expected to deliver a world class service without the corresponding increase in resources and training, Yet those who fail to deliver face a threat of dismissal and/or other forms of punishment.

It is in this view that this study is being conducted; to identify the effects of work related stress on the productivity of employees of selected five private organizations within the Colombo area.

### **Research Body**

The aim of the study is to understand the effects of work related stress on employees' productivity. Research body shows that the many of the stressful type of work is that which demands excessive work load that are not compatible to workers' knowledge and abilities, because there is no opportunity to practice any choice or control, and there is no support from others. Work related stress can be caused by not properly managed work organisation, by not properly managed work design, poor management; working folks are not happy with conditions, and less of support from colleagues and supervisors.

Quantitative data was collected by a self administered but structured survey comprising of 26 questions with both closed and open ended questions. The sample consisted of a total of 145 people working in 5 selected private organizations within Colombo. The responses revealed that work load is main reason for the work related stress.

This research study will help to identify various aspects causing stress, its signs and methods to control the stress levels. When the work place is flexible enough, it can help the employees to come out of any sort of stress they are facing. It is important for any individual to get away from the problems causing stress and find solutions as these are quite damaging to employee in terms of physical and psychological health.

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# Factors influencing the frontline employee turnover in the Travel and Tourism Industry in Sri Lanka

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## **Abstract**

Travel and tourism plays a significant role in the economy of Sri Lanka – a country that is surrounded by exotic beauty and popular among tourists as a paradise on earth. Whilst generating foreign exchange, the contribution of travel and tourism in providing employment opportunities is significant. Given the nature, its success depends on the front line employees, who are the interactive service delivery partners, seen by the outside world as the industry itself. However, retaining knowledgeable and experienced front line employees has become a major challenge, in the context where trained and highly skilled employees are on high demand. In line with the stated challenge, this study examines the factors that influence the front line employee turnover in the travel and tourism industry in Sri Lanka. Accordingly, job satisfaction, organizational commitment, remuneration and benefits, work environment and career development were identified as the key factors that are negatively correlated with the turnover intention. Findings of the study revealed that only remuneration and benefits, when contributing simultaneously with other factors, has a significant impact on the turnover intention of the front line employees. Finally, this study has contributed to the Human Resource best practices, in terms of stimulating front line employee retention in the travel and tourism industry in Sri Lanka.

## **Keywords**

Employee Turnover, Front line Employees, Sri Lanka, Travel and Tourism Industry

## **Introduction**

First impressions matter. Hence, the role of the front line employees, who are the face and the voice of the organizations involved in travel and tourism, is significant in converting cautious and unconvinced first time customers into strong and loyal brand followers and placing the organization at a competitive edge. Yet, as a result of the increasing front line employee turnover rate, the organizations in travel and tourism sector in Sri Lanka, strive hard to deliver a “wow” experience and impress their customers.

Turnover can be in two forms, namely involuntary and voluntary. Involuntary turnover takes place when the termination decision is taken by the employer, mostly to get rid of the under performing employees. In contrast, voluntary turnover happens when the termination of employment is initiated by the employee, which leads to many negative consequences in terms of both financial and non-financial losses stem up from losing employees. Whilst the financial loss of recruitment, selection and training remains significant, indirect non-financial losses such as diminished service quality and productivity, lower morale and reduced profitability arising from turnover can largely disrupt operations and influence the organizational performance.

It is a management misconception that they cannot do much to influence voluntary

turnover, as it is inevitable. Although, this is true for certain turnover decisions like better job offers and other personal reasons, there are turnover instances which can be prevented by following right strategies to retain talent. Given the nature of the employment contract and the competition in the job market, employers are always left in the dark wondering, “Will they stay or will they go?”. Accordingly, it is pivotal that organizations take proactive strategies to “make them stay” rather than taking reactive strategies to “stop them going”. Identifying causes of voluntary turnover is of paramount importance in such an approach.

### ***Experimental***

This study was conducted with the aim of investigating the factors that influence the voluntary turnover of front line employees in the travel and tourism industry in Sri Lanka. Based on the prevailing theories on the subject, identified through a thorough literature review, job satisfaction, organizational commitment, remuneration and benefits, work environment and career development were figured out as the independent variables, whilst considering front line employee turnover as the dependent variable.

Study followed a deductive approach in order to conceptualize the variable relationships. Accordingly, 150 front line employees representing 5 main organizations involved in travel and tourism sector in Sri Lanka were approached as the sample size. Further, multi-stage clustered sampling method was followed and hypotheses were tested using inferences statistics, whilst descriptive statistics were used to explain extra findings. However, the questionnaire was designed to measure the factors influencing the turnover intention of the existing front line employees instead of the turnover, as a result of the difficulty in gathering an adequate number of front line employees who have resigned on voluntary basis. Also, the quality of the responses received is questionable, due to unanticipated communication barriers and the biasness towards selecting the most extreme answers available.

The survey results proved that all five factors are negatively correlated with the turnover intention of the front line employees. Although, the adverse effect posed by these factors is significant when contributing in isolation, remuneration and benefits is the only factor that can pose the same significant negative effect on the turnover intention when contributing simultaneously.

A few open ended questions were included in the questionnaire to gather the personal opinion of the respondents, in order to draw conclusions and recommendations on how to “make them stay” by eliminating the adverse effect of each turnover determinant. Accordingly, a few key motivational factors that stimulate employee retention were identified. A comprehensive blend of the motivational factors such as variations in employee selection, work design and job definition, training and development, recognition/ rewards for good performance, a competitive salary package, good interpersonal relationships, friendly working environment, sense of belonging to the organization and job security can “make them stay” with the organization for a long-lasting career.



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# **Identify and analyze the factors affecting the employee satisfaction (Case study on Selected Tertiary Education Institutes in Sri Lanka – Employee Turnover)**

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## **Abstract**

Human resources are the most valuable assets of every organization. They are the key drivers of organization who brings success and prosperity to the organization. Business organizations consider the employees as a primary source of increases productivity. Those kind of organizations consider employees as same as the capital that can use as the core foundation of business. As mentioned above human resources are the key drivers of a successful organization. But unfortunately some organizations do not care the contribution of employees. This may affect directly to the employee turnover.

This research is to be identify & analyze the factors affect to job satisfaction among the employees who work in private Tertiary Education Institutes in identified areas in Colombo district from Colpetty to Mount Lavinia, as authors identified the labor turnover is high in the administration departments of those institutes through the observations. Since those institutes are private higher education institutes, administration staff is playing significant role as well as the academics. To investigate the reasons for labor turnover authors wanted to measures whether employees are satisfy with their job. Questionnaire is the main instrument used in the research to grab the information from the Administration staff. There are 60 responses were received and the results showing there are positive relationships between working conditions, supervision, rewards & recognition with job satisfaction.

Based on findings of research, it has been proven that working conditions, supervision and rewards & recognition can affected to employee satisfaction. Also research could not find employees who are satisfied with working conditions, supervision and rewards & recognition in the administration departments of those private higher education institutes.

## **Keywords**

Job satisfaction, Labor turnover, Working conditions, Supervision, Reward & recognition

## **Introduction**

Presently, Human resource becomes survive and thrive of competitive environmental organizations. Employee's attitudes and values influence their behavior. If the employees are comfortable with the environment where they work, it is the basic satisfaction of job. Business organizations consider the employees as a primary source of increases productivity. And also those kind of organizations consider employees as same as the capital that can use as the core foundation of business. Organization creates obligation

and cooperation with employees through policies that facilitate employee satisfaction. It is a way to get bigger productivity and lower turnover.

Henry Ford, an American Industrialist pointed said "Take my business, burn up my building, but give me my people and I will build the business right back again" (Shah, *et al.*, 2012). This shows the importance of Human Resources. There are no doubts employees are the resource of the institution who can take an institution towards prosperity with their hard work and determination. If employees' needs are not satisfied it may lead the institution towards the downfall.

### **Scope**

This research is based on institutes which are the leading private tertiary education institutes in education industry situated at identified areas in Colombo district from Colpetty to Mount Lavinia. This study is an effort to find out the major factors affect for the job satisfaction of academic administration staff at above institutes.

### **Objectives**

- 1) To understand the employees understanding of the concept of employee satisfaction.
- 2) To identify the factors affecting the employee satisfaction in institutes
- 3) To identify the causes / reasons for high employee turnover
- 4) To recommend the techniques to enhance the employee satisfaction to minimize the employee turnover

### **Research Body**

Job satisfaction and dissatisfaction do not only depend on the nature of the job, it also depend on the expectation what's the job supply to an employee & it is influenced by the factors like salary, working environment, self-sufficiency, communication, and organizational commitment (AL-Hussami, 2008). Employees are more loyal and productive when they are satisfied (Hellriegel, 2001) and these satisfied employees affect the customer satisfaction and organizational productivity (AL-Hussami, 2008).

According to Griffin, (2001) support of the supervisors has a positive impact on satisfaction, but it is not very essential as much in satisfaction. Reilly, (1991) argues that supervision can be directly affected to the employee satisfaction & the quality of the leaders and supervisors has an effect on the working environment of the academic. Sarwar & Abugre (2013) explored there is a powerful impact of the reward and recognition given by the company to its employees' satisfaction. Akafo & Boateng (2015) examined that having the employees who motivated by the rewards of the organization are the employees who satisfied with the job and they can bring the success to the organization because their performance act as the competitive advantage of the organization and due to that organizaions can easily achieve its goals.

Ali (2016) executes the redundancy of turnover would be have a huge impact on the organizational productivity and it is a prohibitive and unnecessary cost to the organization. Lambert (2001) proves in his study that a company which has a high level of job satisfaction, the level of labor turnover is low in that company.

### ***Methodology***

In this survey, sampling frame was people who working in Academic Administration department of selected private education institutes. It was somewhat a large number but the sample size was 60 and Stratified Random Sampling method was used as the sampling method. Because Stratified Sampling allows the authors to allocate a larger sample size to strata with more variance and smaller sample size to strata with less variance (Bryman & Bell, 2011). As a result of this sampling every member of each stratum in the population has an equal chance of being selected into the sample. In this survey, population is all the staff who works in administration department of listed institutions. In the sampling method randomly selected 06 from each institution, as a results of this sampling every member of each institution in the population has an equal chance of being selected into the sample. Distributing questionnaire was the first primary data collection of this research.

### ***Findings & Recommendations***

Based on analysis of the research, it is cleared that working conditions, supervision and rewards & recognition can affected to employee satisfaction. According to the analysis, close relationship can be seen between independent and dependent variables in different dimensions of employee satisfaction. As example Research has found some employees are well qualified for higher positions but still they are in same position where they start the career with company.

Based on the finding of the research, authors would like to recommend below recommendations for increase the employee satisfaction which helps to minimize the employee turnover of the organization.

1. As it has proven working conditions of the organization has effects to the job satisfaction organizations should build a better working environment with favorable working conditions.
2. Employees are satisfy with the flexible working hours. By given them a flexible working hours, company can gain a high productivity. So it is better to provide them flexible working hours as much as organization can since it increase the engagement & productivity too.
3. Management should re-arrange their working environment with new updates with technology and facilities. It may build a confidence of employees regarding their job as a first impression.
4. It is must to identify the individuals' values, skills, knowledge before allocate the job tasks for them.
5. Also management can rotate employees' job role in a department. It is an opportunity and helps employees to perform different tasks using different skills and talents. On the other hand, it may not delay the task completion even though the particular employee is absent.
6. Supervisors should know to utilize the individuals depend on their strengths. Because some individuals like when organization utilize them not for company benefits but for their individual exposure.

7. Supervisor should act as leader, not as a boss. Because work together with sub-ordinators can make them happy.
8. Organizations should have a proper reward management system including increments, promotions, training & developments etc. There must be a reward after every hard work apart from the day to day works.

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# Impact of traditional business due to the emergence of online business in Sri Lanka

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## **Abstract**

Traditional business has been in existence for many years. However, in the modern day business world, internet has brought new ways of doing business for companies and hence has affected the traditional way of doing business. E-business is where internet is used to do business processes, functions and to carry out business activities. Although traditional business and online business are both depending on the sale principles where they differ as substantially on showcasing their goods, on targeting the audience they appeal to, and their service and convenience they appeal to different demographics.

The aim of this study was to identify the impact on traditional business due to the emergence of online business and to present the comparison and differences of characteristics between them. This research was also done in order to find out better ways of overcoming the impact on traditional business.

The information gathered in this study was obtained through random sampling. Data were gathered through issuance of 200 questionnaires in Colombo, Sri Lanka.

Through analyzing different aspects of theory, comparison and responses to questionnaire, the researcher has proven that online business has affected traditional business.

## **Keywords**

Online Business, Traditional Business, Substantial, Perception, Diversified world, rapidly growing, contradicting, overcome, defending, vertically integrated, downsizing, restructuring.

## **Introduction**

With the change of time, many new things are coming up, such as Online Business. This is being something new in the face of traditional business. Simply said Online Business is done through internet, which includes almost most of the things in the real world, including retail shopping, banking, trading of shares and more. So with this advent of online business, it has an impact over traditional business.

Presently most of the traditional businesses are succeeding with the help of doing trade online. For example Cargills Food city, Kapruka.com is its website to carry out their online business. Many traditional companies are looking forward to have better development in future.

This research is mainly to understand the impact on the traditional business in present and how further online business will affect it, along with the differences and characteristics between them, Customer's perception on business and to analyze the influencing factors between both. As business is something more important to this present diversified world.

### **Research Body**

As online businesses are rapidly growing and also has changed the way of doing business. Previous researches on this topic is done in many other countries where it cannot be applied to Sri Lanka, So that it has a research gap the researcher is doing this research to fulfill the gap.

Briggs (2017), states that Online business has affected traditional way of doing business in a positive and also a in a negative way. Where online businesses make it easier on reaching a wider client base at a less cost than the requirement of the traditional methods was applied. Through doing business online there is no need of acquiring of showroom or shops to showcase their goods, whereas it can be the place the goods are being produced to still advertise and sell it worldwide. Cost of developing a good website would not be that expensive when compared to a store front in a basic location which may cost more. Online business contradicting the classic economic theory of decreasing returns to scale which states that business cannot grow its profits infinitely. Online based companies have been showing faster growth even in increasing their returns too. This impact on traditional Business is expected to increase in future as internet penetration in emerging markets increase.

However Jayanetti (2014), argues that online business is changing traditionally accepted way of doing business and making competition tougher than the past. As it has brought up vast opportunities to take advantage of, while flexible competitors entering to the market and offering respective prices to attain the market share.

There is no security of sustaining to be the market leader tomorrow. In order to maintain as being the market leader the traditional companies should take a further step on the challenge of the upcoming difficulties and painful changes to overcome this impact, not only in the way of enhancing technologies but also bringing up a change in their employees and their administration to a different new level.

Stratified sampling method was used for this research. A sample of 200 from Colombo was selected and divided into 8 areas, which were Dehiwala, Wellawatte, Bambalapitiya, Slave Island, Dematagoda, Maradana, Hulsdorf and Grandpass with 25 respondents from each area. A questionnaire consisting of 24 questions was distributed to collect data.

Finding of the study show that 58% of the population prefer online business. But the 42% of the population strongly withhold that although online business is dominating, traditional business will long last because it was the basic way of doing business. The main reason for traditional business being impacted is due to adherence to old rules which are becoming obsolete. Nevertheless, traditional businesses when faced with new challenges should implement strategies to respond effectively and defend themselves against their competitors.

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# Exploring the investment pattern of Sri Lankans' and the effect on the economy

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## **Abstract**

The most common misconception is that investments and savings are common. But actually they are different from each other. Plemon, (2014) differentiate both of them using two key words; risk and liquidity. He states that the savings are comparatively low in risk and is high in liquidity. And the main purpose of making a saving is to use the saving for a more specific nature. While the investment deals with a higher risk but will have higher return. These investments are made in order to increase or develop one's wealth.

Kulasena, (2017) states that compared to other South Asian countries, Sri Lanka has a higher financial literacy rate. But yet there is a huge gap between the print literacy and financial literacy. So, the country is in need of more awareness about financial literacy to reduce the gap.

The questionnaires which was distributed for 150 samples indicated that many of the respondents were not aware of many investment opportunities that are available in Sri Lanka to increase their wealth. Most of them are using their excess reserves (The reserves are created after they make their expenses from the income generated) in the form of Seettuwa and cash reserves. And out of the people who uses savings account, some of them use it because of the obligation to pay loan and leasing payments to those institutions.

## **Keywords**

Investment, Savings, Print Literacy, Financial Literacy, Risk, Liquidity, Wealth, Excess Reserves, Aggregate Demand, Aggregate Supply, Economic Growth, Investment Pattern, Standard of Living, Household, Personal Finance Management.

## **Introduction**

Webb, (1992) states that investment is one of the reason for the increase in the rate of economic growth because investment is one of the component of the aggregate demand. And when the investor invests in share market on a company, the company will invest in more new technology, new machineries and also invest in educating and improving the skills of the labour which will lead to an increase in the productive capacity and thus the economy will grow because now the long run aggregate supply will turn to the right and Webb, (1992) states that long run aggregate supply is compulsory for an economy to grow in the long run.

It is understood that investment is one of the major reason for the growth of the economy. So, it is important to identify how Sri Lanka and its citizens' give prominence to the term investment. This research is done in order to identify the present culture and the investment pattern that the people of Sri Lanka follows, because this research is aimed to understand the present pattern and provide suggestions to help the economy grow and uplift current publics' standard of living.

### **Research Body**

The researches that was conducted previously was conducted in Western countries and in some Asian countries and there are no notable researches that has been conducted in Sri Lanka. So, findings that are found in the researches took place in the countries mentioned above will be not applicable because of the differences in timing, culture etc. Therefore, this research will fulfil the research gap that is been identified above.

Census and Statistics, (2015) states that for the year 2012/13 on an average the household that lives in the urban earns an income Rs. 69880, a household in the rural area earns an income of Rs. 41478 while the household in an estate earns an income of Rs. 30220. It further states that the average expenditure incurred by the urban household is Rs. 58930, for the rural household was Rs. 38274 and the estate household was Rs. 29379. Based on this it is understood that on an average a household as excess reserves once they spend their incomes on their expenditures.

Ashford, (2013) states that investors normally keep their reserves as cash. He also states that it is essential to have the reserves in cash for short term liquidity issues but for long term savings it is not advisable since there is an increase in the inflation rates. With the inflation the value of money will gradually depreciate resulting in a less purchasing power for the cash holders.

This study focused on identifying the investment patterns in Sri Lanka. In Sri Lanka, Colombo city was taken for the research because Colombo is the commercial capital of Sri Lanka. A stratified sampling was used and 10 strata was chosen and for each strata's 15 questionnaires were distributed. The questionnaire consisted From Colombo, the questionnaires were distributed to people who were working in Fort, Slave Island, Wellawatte, Bambalapiti, Dematagoda, Maradana, Armours street, Borella, Grandpass and Kollupiti. This is because many leading companies and employees work in those places, therefore it would give an overall picture about the investment pattern of people in the Colombo district.

Out of the 150 questionnaires issued 132 responded back and 12 of them were invalid. From the questionnaire the major findings indicated that 80% of the people had surplus after their income is spent on their expenditures. And around 37% of the people still use Seettuwa has a method of investment from the household income saved and only 38% of them use savings account as an investment and 14% of the people keep their income as cash reserves. Out of the 38% of the people who use savings account, 13% uses them in order to pay their loan and leasing due obligation. 28% of people doesn't have basic knowledge about share market, fixed deposits, treasury bonds and bills.

It is evident that still people are not aware of certain investment opportunities available to them and still following traditional methods of savings. So, it is essential for financial institution like Central Bank of Sri Lanka, Colombo Stock Exchange and other accounting bodies to take further initiatives apart from what is already being done and carry out knowledge sharing programs in all districts in all three major languages to improve the awareness and increase financial literacy. Kulasena, (2017) states that it is essential for all school students to be taught about personal finance management and importance of investments because after they come out of school their activities will have an impact on the economic growth of the country.

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# Improving sales through incorporating enhanced features in automotive: Special references to Micro Holdings

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## **Abstract**

Automotive industry can be described as companies that are involved in developing, designing and marketing of vehicles in a wide range. A means of analyzing and enhancing features of automotive has become a necessary factor in the automotive industry. The link between the people or organizational profit depends on the product/vehicle that is being sold. Considering the above factors, it can be concluded that sustainability and future of automobile industry depends on more safer travel experiences for the consumers.

## **Keywords**

Safety, Automotive, Organizational profit, buying pattern, accidents, enhanced features and improving sales.

## **Introduction**

According to Raymond (2015) vehicles are being increased gradually with the demand for vehicles being at a high level. People have the ability and willingness to purchase high end vehicles. And at the same time, car dealers have mentioned that 60% of Sri Lankans use offline marketing to sell their vehicles and 10% of them are undergoing a research on vehicles in their dealer's page. Ensuring the safety of the people is very much essential to the company while it contributes to profits too. Safety plays a major role in automobile industry. Currently several features are available for safety, but it should be more efficient through added features to give a higher level safety for passengers. Yoshioka, (2017) states that there is a 6,302,141 vehicle population in Sri Lanka and only 3,695,061 have passed the emission test. The vehicles which runs on the road is mostly harmful to the environment, which can be reduced by driving zero emission vehicles (Electric vehicles) and with biogas which is the future of automobile.

## **Research body**

According to Wellmilla, (2016) from the past 10 years many vehicle brands have been imported. Accordingly Indian, Japanese, Korean, European vehicles play the major market share in Sri Lanka. According to the author, Sri Lanka has lost 2801 lives in 2015 from accidents. Mainly these accidents are due to lack of safety in compact cars. As stated in global NCAP, (2014) India's highest selling compact cars fails to achieve the minimum standard safety ratings given by NCAP. Suzuki Maruti 800 LXi has got zero ratings for adult protection according to a crash test of 57KPH Speed test.

Primary method of gathering data is through a questionnaire, consisting of 20 questions distributed to 100 consumers selected from areas of Borella, Bambalapitiya, Kollupitiya, Wellawatte and Dehiwela

In Small car segment the fatal accidents has gone up and it is increasing gradually. In

the compact car segment where most vehicles are sold on their brand loyalty, the cars lack safety features. According to internal company RMV report, (2017) Suzuki alto, Renault Kiwid, Tata Nano, vehicles sales has gone up to more than 100 cars per month, however these vehicles have not achieved the minimum safety standard that was given by Euro NCAP, the company which test the strength and safety of the vehicles that is being manufactured). As stated in company internal RMV report, (2017) in April, May, June and July vehicle sales of Suzuki Alto 800 LXI has gone up to 607 units whereas micro panda has gone up to 257. The Researcher is of the opinion that brand loyalty plays a major role here. The reason for the reduction of vehicles sales in micro cars is because of its semi/partly assembled vehicles in Sri Lanka whereas other company brands such as Suzuki, Datsun and Tata imports vehicles directly from its manufacturer.

It is recommended that the government implements a regulation stating that a basic car should be manufactured with minimum safety features consisting of passenger airbags and ABS. By providing this enhanced safety feature with ABS and airbags the price of the vehicle price would be higher. However considering the fact that fatal accidents can be minimized prize of the vehicles is not a matter as safety of the driver and passengers is ensured.

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# **A Study of Service Quality on Student Satisfaction of A Private Higher Educational Institution With Reference To ABC Campus In Sri Lanka**

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## **Abstract**

Service quality is considered as a critical dimension of competitiveness. Hence providing and maintaining an excellent service quality and higher customer satisfaction is a challenge, especially for private educational institution in the field of service today. The purpose of this research was to study the service quality on customer satisfaction with data obtained from higher educational institution named as ABC Campus in Sri Lanka which is based on Colombo district. The present study identifies the level of perceived quality and the level of customer satisfaction in mentioned field. This paper has started with the concept of service quality and to achieve these purposes, 5 dimensional scale SERVQUAL model were used for the study; suggested by Parasuraman et.al (1988). The results of the survey reveal that to minimize the gap which expected to exist and as same it was suggested to prepare profit strategies based on customers' end and managers' end by removing the whole between management / employees and its customers.

## **Keywords**

Service Quality, Student satisfaction, Private educational institutes, SERVQUAL model.

## **Introduction**

Education is one of the major service industries of the world. Education in Sri Lanka, is a fundamental right it has contributed to the higher literacy rate in South Asia and overall, third world. In general, education in Sri Lanka; primary, secondary and tertiary, is provided by the government free of charge. Sri Lankan higher education has been a state monopoly and the public sector has not expanded adequately to meet the required demand. As a result of that more private investments entered to the market and competition has been rose by fulfilling the required demand. Due to this rivalry, maintain high level of required service quality plays a vital marketing aspect in the present day commercial environment. Best marketing strategies determines the keeping of or loosing of customers, thus leading to customer loyalty and long term relations which will profit the organization. In association to this trend, the design of service quality has become an extremely modern issue within the services literature (Baron *et al.*, 2009).

Service quality is an important subject in both private as well as public institutions (Zahari *et al.*, 2008) which has been playing a significant role during last two decades. It has become a major area of attention to academics, managers, practitioners and researchers however which effect to business performance, lower costs, return of investment, customer satisfaction, customer loyalty and gaining higher profit etc (Leonard and Sasser, 1982; Cronin and Taylor. 1992; Gammie, 1992; Hallowell, 1996; Chang and

Chen, 1998; Gummesson, 1998; Lasser *et al.*, 2000; Newman, 2001; Sureshchander *et al.*, 2002; Seth and Deshmukh, 2005). Therefore number of conceptual models (most probably, service gap) has been developed by different researchers for measuring service quality and these enable management to identify quality problems and help to fill the gap through quality improve programs, thereby improving the overall performance, efficiency and profitability.

(Seth and Deshmukh, 2005). Hence the outcome of service quality gap is stressed as the difference between customer expectations and perceptions of service remain; greater the expect creates delighted customers and lesser they expect defines dissatisfied customers.(Parasuraman *et al.*, 1985; Lewis and Mitchell, 1990).

It seems that the education segment is being appeared to be more attractive due to the number of factors as stressed per Porters Five Force module. Therefore, at present, the level of competition in the market is severe that not only the requirement of marketing strategies but also of keeping the quality assurance has become more essential for survival. Hence, the educational institutes which are service providers' needs to maintain high standards of service quality to withstand the competition in the industry.

### **Research Questions and Objectives**

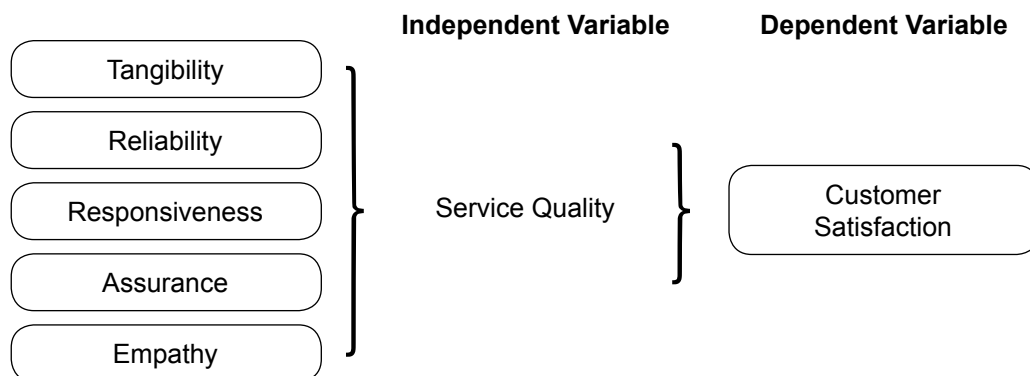
As per the requirement of the study, the researcher has already selected a Private Campus (ABC Campus) which is mainly located in Colombo, Sri Lanka. Hence, the study deals with the evaluation of customer satisfaction and service quality within the institution.

No	Research Question	Research Objectives
1	What is the level of perceived quality of the student of ABC Campus?	To identify the level of perceived quality for customers (students) of ABC Campus.
2	What is the level of customer (Student) satisfaction?	To assess the level of customer satisfaction.

**Table 1 : Research Questions and Research Objectives**

Based on the Literature reviewed, the below conceptual framework was designed for the survey. The five dimensions of the SERVQUAL model (V.A. Zeithaml, A. Parasuraman and L.L. Berry, 1991)

The following conceptual framework has been developed for the purpose of this study.



**Figure 1 : Conceptual Framework**  
**Source: Parasuraman et.al, 1988 and 1999**

### **Methodology**

The research methodology was quantitative as well as primary and secondary data has been acquired for the study. The first hand data was collected by a self-admin steered questionnaire method and secondary data were explored by means of research articles, published literature via journals, marketing professionals internet and non-internet sources of libraries and etc. The first hand data source is somewhat easy and accessible as the participants attend the Colombo branches daily. Basically the questionnaire was submitted randomly to the selected 100 participants and returned with exceptionally filled. Data has been recorded and analyzed using SPSS IBM 20 software.

Before distributing the final questionnaire, the researcher has done an exploratory study to check whether the survey needs further improvements. After the exploratory study the researcher has re-ordered the questions according to the selected model of SERVQUAL. The questionnaire has prepared in three parts. The first part has been made up of six questions to determine the demographic information of the respondents. The second part emphasis on student satisfaction criteria's towards the campus which is basically align with model SERVQUAL on likert scale. Part three remains for respondents to make free answers of their thoughts regard with the service quality of the campus.

### **Results and Discussion**

Reliability test was carried out in every variable to ensure best outcome of the questionnaire. As per records, all variables measurement values fall between the range of 0.7 – 0.9. Therefore the Cronbach's alpha values were within the acceptable range and gave assurance of internal consistency and reliability of all the scales.



<b>SERVQUAL Dimensions</b>	<b>No of Items</b>	<b>Cranach's Alpha</b>
Tangibility	4	0.914
Reliability	5	0.876
Responsiveness	4	0.817
Assurance	6	0.889
Empathy	4	0.789
Satisfaction	10	0.916

**Table 2 : Results of Reliability Test**

According to the survey results, it was found that the students of ABC Campus are satisfied with its service quality than what they expected; It seems that the current students not much worrying about the academics or academic structures. However it stated the overall their needs have met from the campus. As same ABC Campuses' level of satisfaction seems to be more improved in further which need to reach delighted status.

#### ***Recommendation and Further Research***

There are number of recommendations for the management and staffs 'Campus to improve the service quality of ABC Campus; allocate more staff training to improve employee effectiveness and efficiency towards day to day operations.

The current basic study has been limited to two research objectives. The researcher expects to discover few objectives in future. Hence the current study will be continued with more analytical aspects combine with SPSS IBM 20 software with hypothetical tests ; ANOVA, Regression analysis, Correlation Analysis etc.

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# Impact of Service Quality on the customer satisfaction (Students) in the higher education sector in Sri Lanka

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## **Abstract**

Service Quality is a measurable, quantifiable and non-tangible component of the any given organization especially that deals with masses of customers. The aim of this research is to understand the association of the quality management structure in higher educational institutes, and the impacts that has on the student/learner satisfaction and performance within higher education sector, it focuses on the results of a practical implementation of quality management and its primary effect on the students, and also their view of quality management system.

The current education sector suffers from a major crisis that is lack of quality education providers and resources management within educational institutes, which ranges from quality delivery to quality resources provisions, these issues have impacted the quality of not only the institutes but also the education sector regarding higher education. There is a monopoly between government universities and private sectors regarding the degree qualifications and awarding bodies, one major issues that causes a disparity is the quality of education of private institutes, and causes a rift that seems to enforce the monopoly.

The research was done with the data gathered from 601 students ranging from Diploma to Master's Degree, ranges includes Diploma, Higher National Diploma, Degree (Hones) and Master of Business Service, the key important information gather from the students include student satisfaction based on service quality, in order to facility the survey, the selected method of data gathering was questionnaires, and the design and the methodology used to evaluate the gathered data was using the SERVQUAL model.

## **Keywords**

Service quality, Satisfaction, Higher educational institutions, QMS

## **Introduction**

Education is a standout amongst the most noteworthy division and assuming a dynamic part in national development in Sri Lanka. With acceptance of the open economy in 1977 to Sri Lanka, private higher education organizations likewise came up to the market. Regularly it is an indefinable that there is a connection amongst training and monetary development of the nation (Husain.*et al*, 2009), that as well as the education sector gives the general public by human asset as well. Customer fulfillment has been measured by utilizing nature of service (Lassar, Manolis and Winsor, 2000; Abu Hasan, 2008; Khodayari and Khodayari, 2011). Most organizations however they're in to item or service, they utilize the service situated showcasing way to deal with pull in the clients. The present education area experiences a noteworthy emergency that is absence of value training suppliers and assets service inside instructive organizations, which ranges from quality conveyance to quality assets arrangements, these issues have affected the nature of the foundations as well as the education part in regards to advanced education.

There is an imposing business model between government colleges and private sector with respect to the degree capabilities and granting bodies, one noteworthy issues that causes a uniqueness is the nature of education of private foundations, and causes a crack that appears to implement the syndication.

### **Experimental**

The principle issue discussed about in this present investigation is the relationship between customer satisfaction, benefit quality and service quality measurements through essential information gathering and optional information were utilized to quantify the student performance. The result of this investigation was displayed in two ways; the service quality measurements were introduced independently and student performance investigation were independently. This exploration comes about synopsis demonstrates that, the present investigation has more to be talked about in future also. customers of the organization were fulfilled in view of service quality which they are devouring. The clients has given normal importance for benefit quality in the different study programs which were going with to the SERVQUAL measurements) supporting the hypothesis that the service quality is an engaged appraisal that reproduces the client's view of unwavering quality, confirmation, responsiveness, sympathy, and physical assets" Zeithaml (2006, p. 106-107).

The present investigation additionally needs to enhance the examination which has been as of now taken by Wang and Hing-Po (2002), who utilized SERVQUAL demonstrate for measuring service quality with the utilization of theory testing for the relationship among the service quality measurements and service quality. In the event that they could get huge measures for assessment comes about then they could have an immediate connection and this was watched. Moreover, the investigation satisfies with the investigation of Bennett and Barkensjo, 2005, p. 101, who delivered a result from their examinations where " the hypothesis elements of SERVQUAL model were scientifically associated with the service quality construct ". This present investigation all the quality measurement of SERVQUAL which were substantial quality, unwavering quality, confirmation, responsiveness and sympathy altogether identified with benefit quality and to the consumer loyalty. Accordingly, the gathering consequences of service quality measurements of 3 different HE institutes affirmed to the aftereffects of (Kuo-YF, 2003; Gera, 2011, p. 2-20; Sureshchandar, *et al.*, 2002, p. 363-379; Sivadas and Baker-Prewitt, 2000 p. 73-82; Liang and Zhang, 2009 p. 113-124) that there is an immediate relationship among consumer satisfaction and service quality. They likewise satisfy with the proposal of Parasuraman *et al.*, (1985) that " when perceived service quality is high, then it will lead to increase in customer satisfaction and the acknowledgement of (Saravana & Rao (2007) and Lee *et al.* (2000) that "Customer satisfaction is based upon the level of service quality that is provided by the service providers" (Saravana & Rao, 2007, p. 436; Lee *et al.*, 2000, p.226).

The consequences of the present examination absolutely supporting the position for customer satisfaction. For example, students are fulfilled has demonstrated positive outcomes since it is gotten some information about satisfaction. This acclimates the service quality offered by private HE institutes are prompting customer satisfaction. (Sivadas and Baker Prewitt, 2000, p. 75) on the grounds that all the study programs students come about introduced more elevated amounts of fulfillment than disappointment (Bennett and Barkensjo (2005). The benefit can pick up to the foundation by applying

QMS is identified with the chance to enhance interior procedures and systems of the establishment, to the change of administration, execution and viability. Ruževičius *et al.* (2007) shapes that the improvement of the regulatory quality inside HEIs is one of the basic necessities planning to address the issues of customer and to achieve the objectives set. By demonstrating above explanations, the once investigation of student completion rate in the wake of picking up Quality standard has been moved forward. At the point when students are happy with the administration quality they won't see for options and furthermore the degree of consistency will high. At the point when students are making the most of their investigation they complete their study program and furthermore perform well in their appraisals. The part could close utilizing above study that if the organization offer quality administration up to appropriate standard to the students then satisfaction rate will increase henceforth their culmination rate of the study program likewise will increment.

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# Intrapreneurship - As a strategy for the Retention of Millenials

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## **Abstract**

The study aims to discuss the importance of the relatively new concept named 'Intrapreneurship' and how organisations could use it as a strategy to retain the best talent of the Millenials who are becoming the major part of the global workforce landscape. Number of literature has been reviewed to conduct the study and to provide recommendations for the Sri Lankan businesses.

## **Keywords**

Corporate Entrepreneurship, Intrapreneurship, Millenials, Retention, Sri Lanka, Workplace Loyalty

## **Introduction**

Organisations today are operating in an extremely dynamic environment where even a minor change in technology, politics, economy, socio demography and law and order is likely to have a significant impact on the organisation. Global workforce is one of those changes that keeps today's organisations in a state of flux as it is growing to be increasingly multigenerational with the entrance of large number of Millenials, to an extent where the Millenials are predicted to make up to 3/4 of the entire workforce by 2025, among whom is a high employee turnover and less workplace loyalty.

Hence, retention of the best talent has become one of the most complex challenges that is confronting today's organisations and it becomes imperative for Sri Lankan organisations to embrace innovative HR strategies such as Intrapreneurship to retain the best talent in the organisation, as businesses are no longer competing for a better product but competing for a better human resource who makes better product. Corporate Entrepreneurship or Intrapreneurship, in general, is entrepreneurship practiced by the employees within an organisation.

## **Objectives**

As the awareness of this relatively new concept Intrapreneurship is relatively less in the Sri Lankan business context, the present descriptive study aims to review the existing literature about Intrapreneurship and to provide recommendation for Sri Lankan organisations and policy makers as to how it can be effectively used as a retention strategy especially for millennial employees.

## **Methodology**

The Author discusses the introduction, evolution and significance of the concept of intrapreneurship, reviews the standpoints of previous literature on this area of study and highlights the benefits for the organisation as well as employees with a comparative analysis of selected successful cases worldwide. Data for the study has been collected

from secondary sources such as journal articles, organisation magazines, books and internet on the focused subject.

### ***Findings and Recommendations***

The first publication of the term Intrapreneurship occurred in the late 20th century in a university paper of Pinchot & Pinchot (1978). And then the term was used and credited to Pinchot in the publication of Macrae (1982), *The Economist*. The first formal academic use of the term was in a Master's thesis by Haller (1982). It is often seen as a school within entrepreneurship theory. Jones & Butler (1992) views the CE process as internal corporate entrepreneurs. He defined it as any type of formalised entrepreneurial activity within an organization. Therefore, Johan-Maes (2003) states that corporate entrepreneurship is thought of as the act of rejuvenating and revitalizing existing organisations.

Intrapreneurship has a number of synonyms in the literature. These include: 'intrapreneuring' (Pinchot, 1985); 'corporate entrepreneurship' (Burgelman, (1984), Antoncic & Hisrich, 2001); 'internal corporate entrepreneurship' (Schollhammer, 1981, 1982) 'entrepreneurial activities' within an organisational setting (Heinonen & Korvela, 2003); and 'corporate venturing'. Baruah & Ward (2015) note that some researchers (e.g. Toftoy and Chatterjee, 2004; Fitzsimmons *et al.*, 2005; Christensen (2005); Bosma *et al.*, 2010) use these different descriptions as 'interchangeable terminologies'.

As the organisations are in the need of cultivating and retaining the excellence of their human resources, especially Millenials, as they are becoming a major part of the workforce landscape. Organisations that have adopted and applied the concept of Intrapreneurship, allow their employees to take risk without the fear of personal liability in the case of failures and reward employees in case of success. Millenials, having the qualities of wanting to experiment and innovate, taking risks, questioning the traditions or routines of work, being more efficient when empowered with authority are proven to become more engaged and committed to the workplace when provided with such intrapreneurial opportunities. This also evidently minimises the organisation's employee turnover among the Millenials, because, the right connect between the talent and opportunities is being built by this concept which is the key to success of any business.

Some examples of successful intrapreneurial organisations, extracted from the literature are:

**3M** - Post-it-Note, established by an employee which was a successful outcome of intrapreneurship practised at 3M. The company's employees are allowed to spend their 15 per cent of their working hours on the project they like for the company. This is one of the reasons why 3M is often synonymous with the term innovation.

**Google** - A contemporary tech companies in the world, has a programme named "20% Time", which allows and encourages the employees to spend 20% of their time to work on the project they wish. Gmail, Google News, Adsense, and Google Now are the result of such intrapreneurial activity and one of the reasons why Google often tops the list of the world's best workplaces.

**Sony** - The Sony Playstation, one of the most recognisable brand came from a work of a relatively junior employee named Ken Kutaragi.

**Dreamworks** - Dreamworks trains its employees how to formulate their pitch and allows them to practise in front of executives, to ensure that their employees move on and start their own thing, but it also means that the company has first option on their ideas. On the other hand, it gives the organisation a definite advantage before someone else does and triggers competition.

The management style of an organisation plays a major role in fostering the intrapreneurial culture. Transformational management and leadership style becomes a necessity where employees feel empowered with autonomy rather than instructed what to do. This makes it mandatory for the organisational structure/hierarchy to be less rigid and more flexible to pave way for innovation. It is also vital to recognise and value the entrepreneurial spirit among the employees. Management must review intrapreneurial activities of employees regularly and initiate a suitable reward system to recognise them.

In the Sri Lankan context, SLASSCOM Survey reveals that 75% of the Sri Lankan start-up entrepreneurs are aged between 20 to 35 years. This proves that the entrepreneurial culture is vastly growing among the Millennials. If this spirit of the Millennials backed by experience, safe funding and recognition from the organisations they work for, it will result in a win-win situation for both employees and employers.

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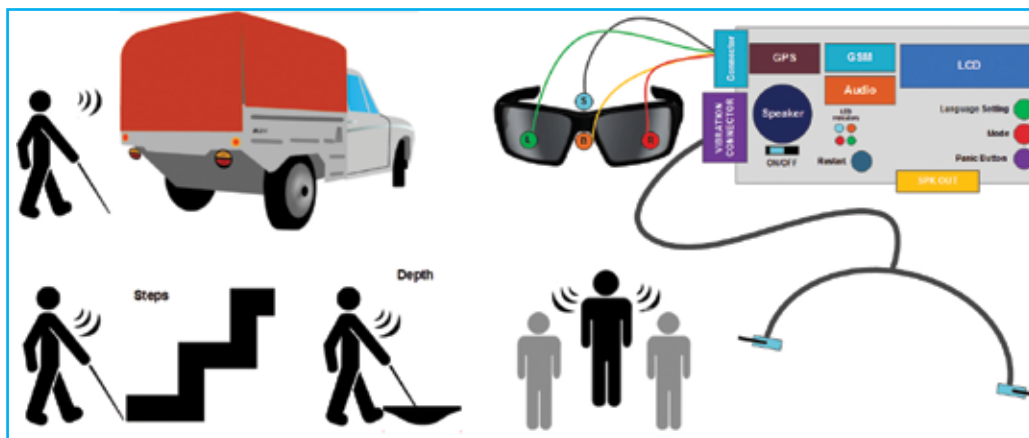


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## Smart - Eye Navigation System for Visually Impaired





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# Digitalization – concept analysis

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## **Abstract**

Digitalization is a current trendy word in academia as well as in industrial lives. Different organizations, including countries, build digitalization strategies. This article discusses the concept and searches what kind of digitalization incentives have there been in earlier years.

## **Introduction**

Digitalization is a frequently used keyword and panacea candidate for current societies. This article discusses the concept on a conceptual level, based on a non-systematic literature review that utilized the snowball sampling (Biernacki & Waldorf, 1981).

## **Concept analysis**

Our analysis is just limited to the English language. Other languages might have more sophisticated terms for the differences. The issue is not made easier by the English language possibility to use the versions Digitalisation / Digitalization etc. simultaneously. The first task is to differentiate between digitalization and digitization. Digitization is the process of converting information into a digital (i.e. computer-readable) format, in which the information is organized into bits. Many parties, purposefully or unconsciously, use digitalization to use this very same too. Digitalization represents the integration of multiple technologies into all aspects of daily life that can be digitized (Gray & Rumpe, 2015). From the business side, digitalization opens up new business opportunities: “Digitalization is the use of digital technologies to change a business model and provide new revenue and value-producing opportunities; it is the process of moving to a digital business” (Gartner, 2017).

Digitization is a needed prerequisite for digitalization. Digitalization cannot take place without Digitization. On the other hand, just digitizing data is not often bringing much benefit.

Because these terms are easily mixed, often the term “Digital transformation” is used in English to mean digitalization. Digitalization or digital transformation is a way of life, not a collection of technologies.

## **Modes of digitalization**

Complete digitalization would eliminate humans totally from the society, it would be a world of robots. It is not the goal. The goal is to support humans in their life, through digital technologies-based innovations.

We used to think that digital technology was just implemented to computers. Now we are however in a world where almost all devices could contain digital components: cars, home appliances, watches, phones, machinery in factories, you name it...

Digitization and also then digitalization means turning something from analog to digital. Maybe for some hard to admit, but many phenomenon are actually analog in the word, and digitalization forces the natural phenomenon into unnatural setting. It might be said that the digital presentation of items is always a model (also a simplified presentation) of the real world (Hengl & Evans, 2009). This is not to say that the digital models in many cases might not be very accurate if not perfect. However, real word is seldom digital, black and white, zeros and ones.

Technologically digitalization can happen rather fast. A typical example is that of turning a country's television and/or radio broadcasting from analog to digital, an act that happens in one timepoint (Dai, Wang, & Yang, 2012). However, the existing infrastructure needs time to adjust, and different kinds of extra devices might be needed. Even more demanding is anyway human adjustment: television watching habits change only slowly and take advantage of the possibilities of digitalization – this might take decades.

Instead of fast overnight digitalization, activities are usually turned slowly into the digital direction. Evolutionary transfer gives all components and stakeholders of the transfer process needed time. However just this turnover period is the hard one. Simultaneously several technologies must be maintained, and resources must be allocated to the transformation process. Human habits change more slowly than available technologies. For many industries, the turnover period can last several decades. For humans, several generations might be needed to face the challenges of many digitalization initiatives.

An interesting trend might be dedigitalization of some activities. So far we have seen rather little of this activity.

### ***Industries meeting digitalization***

Digitalization has hit different industries and areas of life in variable speed and intensity. Computer have been always been digital by definition (although analog computers are also on the way (Pour-El, 1974). A basis prerequisite for the digital world was the digitalization of telecommunication – a process that has taken over 40 years of time and still is not complete.

Financial industry was one of the first to adjust to digitalization. No wonder – financial information is mostly about numbers. At the moment industries like retail and manufacturing go through a big change – Internet of Things is the next big step in digitalization (Li & Da Xu, 2017). The whole tourism industry has been deeply transferred by Internet – travelling is very information intensive. The big change is a the moment happening in healthcare, and social care is soon to follow. Even basic industries such as agriculture, fishing or forestry (Moisescu, Sacala, Dumitrache, & Repta, 2017).

### ***Conclusions***

Digitalization is much more complicated issue than what might be the first thought. Digitalization and Digitization must be clearly separated. Transfer of analog to digital activities might take place very fast, but usually at least humans need time to adjust. Digitalization of telecommunication was an important step in the digitalization of the world. In the future the concept of dedigitalization will surely emerge, as world is mostly analog, not digital.

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# Student Information SMS and E-MAIL Retrieval / Push System

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## **Abstract**

The Internet and Mobile technology has grown extraordinarily in the past few decades. In recent past the use of mobile devices in teaching and learning environments has risen rapidly in almost all higher educational institutions. Studies shows that reaching Students through SMS has a higher involvement than email, the present widely used mobile technology such as SMS has a vast impact in academic institutions, but most of the colleges still have to engage with the students through SMS. Currently there are many different types of mobile devices which can be used different learning purposes. In most of the Institute they have implemented a centralized mail system to forward mail to the students where they have recorded all the student mail address. Since the E-mail service requires internet connection. This may not reach some student in some situation. These finding is to show how much effective SMS over other communication methods.

## **Keywords**

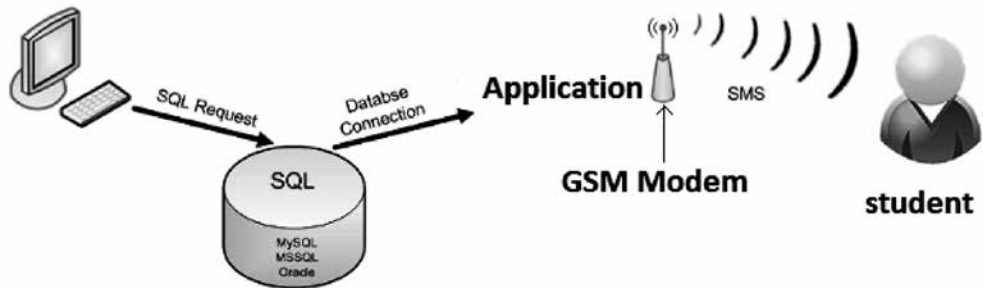
SMS Gateway, Student data retrieval, Bulk message sending, Push Notification. Mail vs. Short Messaging Service, Email

As Mobile Phone usage is dramatically increased in this 21st century. There is more opportunity to keep in contact with students. By implement the SMS gateway service to the Educational Institution. SMS Gateway is a technology which is using GSM (Global System for Mobile Communications). This technology does not require an internet connection. It can be sent and receive SMS through the GSM service. The Aim of this project to have an appropriate system which will reach immediately to all of the students in particular subject without any interruption, When a Student ask for some significant data from the database by sending a SMS through his/her cell phone. With a keyword, once the database received the SMS. That data will be retrieved from the database and will send back to the person instantly.

## **Methodology**

The database has all the data about Student, course, module, time and room in a created table. For example there is an extra lecture to be taken place on a different day. In this case an Extra table will be created by the admin or whoever has the authorization to read and modify the current database. This is where all the data has stored and this database is linked to another software which as the ability to connect the database to the GSM Modem. The above mentioned tables are created in SQL 2008.

- Retrieving information by SMS



The SMS of sms-integration's photo (2012)

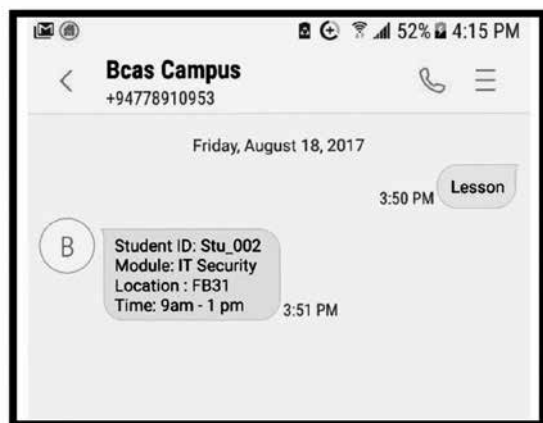


The Mail of sms-integration's photo (2012)

As you all can see when a student request for an information. The SMS will reach the GSM Modem and then the requested details will be retrieved from the database which as all the information and send back to the student through the GSM Modem.

Assume a student is willing to retrieve his module information using the SMS gateway system. This progress can be take place by just forwarding relevant keywords to the SMS Gateway. The output of the SMS gateway will look similar as shown in example field.

Example: type "Lesson" and mail to > 0770123456  
Reply from the database



In above Example it is shown how a student gather some information from the database, by simply sending a SMS to the gateway. Once the user is authenticated it will push the relevant answer instantly. Once he sent the request a message will be sent back to the student saying which class room he has to attend on that day. Not only the rooms this can help the student by many was such as knowing the deadline alerts, Room changes, Holidays. Library book updates.



**(Figure 1.1 - Lesson Reply)**

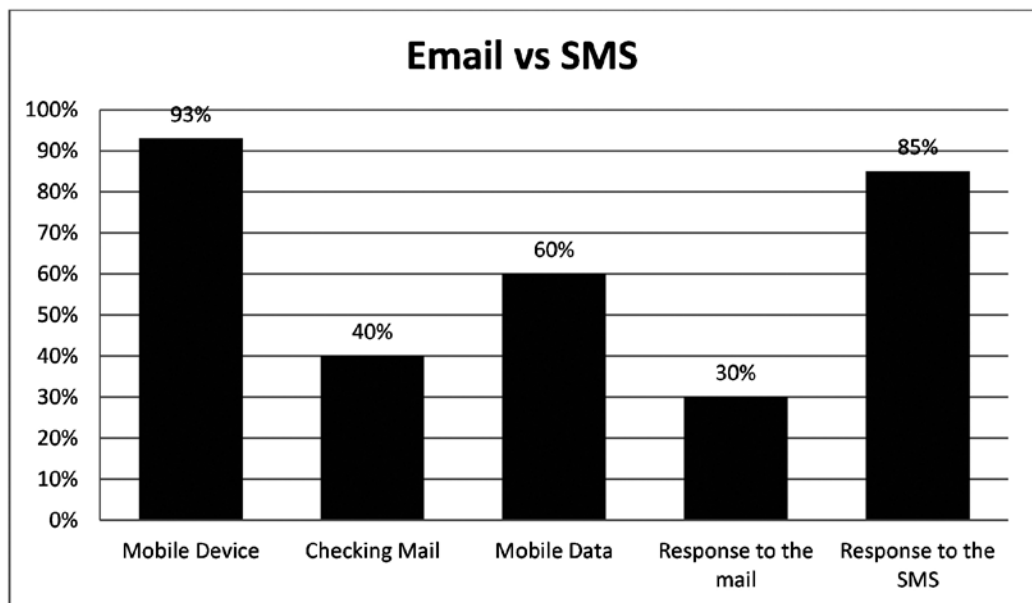
In this case if the student does not hold a mobile phone, still the student will be able to retrieve same details from his mail. What the student has to do is simply login to his/her mail account and send a request to the mail ID instead of mobile number.

Example: type "Lesson" and mail to >database@bcas.lk

If a student send a request to the database using a different mobile number or a mail ID .Once the GSM modem received the request which has been sent from an unknown number. Then the request will be destroyed immediately in between the application for the privacy reason. And no reply will be sent back to that unknown number. This can be misused by an outsider.

**Experimental**

As Per the Survey 95% of Students have access to Short Messaging Service (SMS) and 70% of students have access to email in this fastest growing technology. This will be the only way to reach the student very faster.



As shown in the above chart there are 93% of mobile Devices have access to mail and SMS. 40% of Student checks their email inbox in every 2 days where most of the student does not use mail.60% of students turn on their internet on their mobile device in every 4 hours a day. Only 30% of Student responding to their mail out of that 40%.And 85% student Response to their SMS instantly.

This information gathered from 150-180 Diploma Students. Most of them prefer Short message Service (SMS).

Action	SMS	Email
Response Time	5 – 10 Minutes	5 hrs. – 1 day
Time Taken to Access	Instantly	Internet Availability
Interference	Very Rare	Depend on the Internet Connection

It takes 5-10 Minutes to get the response to the SMS where email takes around 5 hours to 1 days of time. SMS can be accessed instantly on any mobile device and for email internet availability is a must. Very rarely interference occurs in GSM Network.

### **Conclusion**

Research shows texting Students and providing SMS gateway service in an education Institution has more effective over any other communication methods by implementing a SMS gateway service in the institute, Students can retrieve information regarding their studies and other events without any interruption.

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# Restraining Power Consumption of Home Electrical Appliances by the Application of Digital Electronics

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## **Abstract**

Electric power consumption (kWh per capita) in Sri Lanka was reported at 531kWh (kilowatt hour) in 2014, according to World Bank collection of development indicators, compiled from officially recognized sources, (tradingeconomics, 2017). Today the entire world is reaching towards a series of energy crisis due to inadequacy of energy sources, especially the electric energy. This study focuses in restraint the power consumptions of domestic electrical appliances in order to control the monthly electricity bill.

## **Keywords**

Restraining Power Consumption, Unit Measurements, Electricity Usage, Electricity Monitor, Electricity Unit Value (EUV), Current Transformers (CTs).

## **Introduction**

Electricity power consumption is the major factor which role in the day to day activities. Restraining the electricity power consumption is the process of making the reduction in the monthly electricity bill which effects in our monthly expenses. This study uses Electricity Unit Value (EUV) formula which assist to find the unit values of domestic electrical appliances. This EUV formula uses the data instances in order to make the predictive decisions. The values of the electrical appliances which taken from the EUV formula to control the electric power consumption by triggering an alarm to alert the person who uses the electrical appliances when the proposed device exceeding daily usage limit.

This paper applies EUV formula to obtain data instances by the minimum usage of electrical appliances to restrain monthly home electricity usage.

## **Methodology**

Current transformers (CTs) are sensors that measure alternative current. They are particularly useful for measuring whole building electricity consumption (openenergymonitor, 2013).

The CT sensors are used in this study, saves the each day usage of electrical devices to the database, the data is as follows :

Name of the devices, the usage time in a day, the date (day, month, and year) and the usage values in Units.

This research uses three home electrical appliances to calculate the usage value (Iron, Washing Machine, and Water Heater). The data from each device separately collected every day, for a period of twelve months. Usage values of each appliances are captured

throughout the day whenever the appliances are in use. The main goal of this study is to restrain the over power consumption based on data set collected.

**Experimental**

The test was carried out in a residence at Mawanella area which reside six members. This study uses the collected data from twelve months of electricity usage of a residence. There are three measurements of total daily usage time of each electronic device in hours, name of the device and the usage value in Units.

The EUV formula was implemented using in C++ language. The data collected from each day were given to the application as a coma separated value file (.csv), then the data set is split into days corresponding to a month giving twelve data sets, one data set per month.

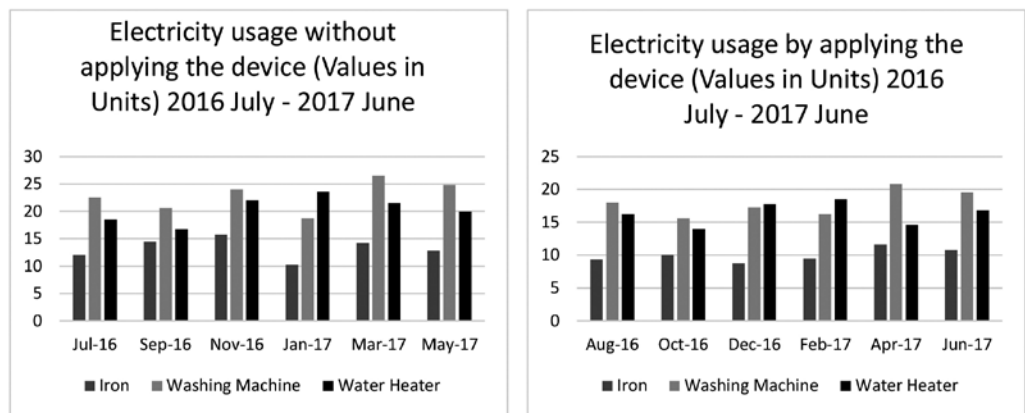
The system calculates the unit value of each electrical appliances which is used in this research. Each appliance used in this system has different wattage (Iron – 1200W, Washing machine – 400W, and Water Heater – 1000W). Each appliance Unit value is measured with the EUV formula.

Electricity Unit Value (EUV) = (30 x n x W x H)/1000

Where,  
W = Energy Consumption Unit (watts)  
H = Time (Hours)  
n = Number of Appliances

The Unit value of each electrical appliance is shown in the digital display where it triggers an alarm when it reaches the daily usage limit of the particular appliance. Each appliance is given an average of unit value for each day when the appliance is active (Iron – 0.3Units, Washing Machine – 0.5Units, and Water Heater – 0.2Units).

The power consumption of electrical appliances in months.



The above graphs show the normal usage of the electrical appliances (Iron, Washing Machine, and Water Heater) and the usage is recorded by applying this device to each electrical appliances.

The proposed system is applied in even months and not applied in odd months. The normal usage values are recorded at the odd months then by applying the system values are taken in every even months. So, the usage values are compared in odd and even months.

Comparison of the above electricity usages,

Months	Usage without applying the device	Usage by applying the device	Usage difference
July – August	53.00	43.50	9.50
September – October	51.85	39.60	12.25
November – December	61.75	43.75	18.00
January – February	52.60	44.20	8.40
March – April	62.25	47.00	15.25
May - June	59.60	47.20	12.40

The table clearly shows that the normal usages of the electrical appliances which are having an average value of 56.84 Units each month. By applying this device usage recorded with an average value of 44.20Units when this device is active on electrical appliances. So, this proposed device could make an average of 12.64Units usage reduction in each month when the device is active. This method controls the monthly electricity bill and it lead to make a huge control in the monthly expenses. So this study, proves that the proper usage of the restraining power consumption by the application of digital electronics could be the solution to control in monthly electricity bills where It benefits the people to use the electricity in given 90Units.

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# Increasing productivity in plant cultivation by minimizing additional man-hours in pit digging process

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## **Abstract**

Cultivation of plants is one of the main occupations in Srilanka and many more other countries. Considering about Srilanka, out of total population 31.8% involve in this plant cultivation. In order to do this more man power is needed for different agricultural tasks. Not only man-power but mechanical power of machineries also needed. Nowadays plenty of machines are developed in order to decrease the work load of the farmers and to provide efficiency in those agricultural tasks. Though those machines facilitate farmers, still machines alone cannot do any of agricultural tasks. These machines need to get the support from a live-ware throughout its whole process. Hence this research is focused on an automated machine in pit digging process which will be a great relief to the farmer in many aspects.

## **Keywords**

Plant Cultivation, Pit digging, Measuring distance, Ultrasonic sensor, Motor, Microcontroller.

## **Introduction**

Plant cultivation is a field which is very important to almost every living being as it provides basic food source. One of the barriers in plant cultivation is the time and effort on tasks to be carried on. Hence nowadays people are reluctant to engage in those tedious agricultural activities such as preparing land, digging pits, watering plants every day. Etc. If the land area is very large more man-hours are needed in order to cover the whole land. To overcome those tedious tasks people have invented many machines but still those machines need man support throughout their whole process.

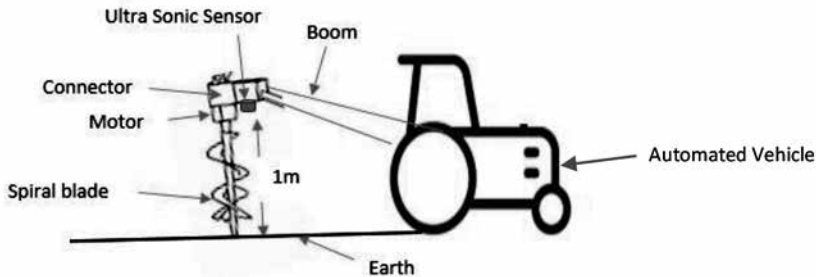
In this study, pit digging is the main concern which consider about the depth of the pit, diameter of the pit, gap between two pits that lead for proper growth of a plant. Here in this research it is considered about a prototype machine which is capable of digging pits by considering all relevant factors without the involvement of man throughout the whole process.

### ***Present System and Drawbacks***



As mentioned in above pictures we can get a clear idea of how man power is still needed though the machines speed up tasks.

### ***Recommended Methodology***



The above picture shows the outcome of the proposed system for the purpose of digging pits. After the machine is turned on, user can input necessary data to the machine by a key pad attached to the LCD which is fixed to the machine.

Basic Inputs are as follows

(All are in meters)

- Length of the land.
- Breath of the land
- Gap between 2 pits
- Depth of a pit

Then the user has to fix a suitable spiral blade to the Connector. Radius of spiral can be varying according to the purpose or diameter of the pit. Provided that user has given many spiral blades with usable radius.

After that user is able to start machine, so that machine is going to dig a pit where it is originally located.

► In order to measure the correct depth of the pit, machine follows following mechanism.

- An ultra-sonic sensor is fixed to the Connector. So that original reading of sensor is 1m assuming that the maximum length of the spiral blade is 1m. So that distance to the disturbance (earth) from sensor is 1m. Boom can be moved down with the help of motor. When it moves down, the reading by the ultrasonic sensor is decreased gradually (0.95m, 0.90m, 0.85m...etc.) while spiral blade is digging the pit with the rotation of the motor attached to the Connector.

Depth of the pit can be given as follows,

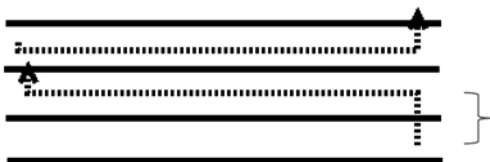
$$\text{Moved Depth of spiral blade} = 1\text{m} - \text{Sensor Reading}$$

- If the “moved depth of the spiral” calculated by the system program is equal to the given input by the user (Depth of a pit), then the digging of that pit can be stopped and machine can move forward in order to dig the next pit.
- Following description explains how the machine is moved forward till it satisfies the gap between two pits.
- Distance travelled by a wheel can be calculated as follows,

$$\text{Distance Travelled} = \text{Circumference} * \text{revolutions of the wheel}$$

$$\text{Distance Travelled} = 2 * \pi * \text{Radius of the wheel} * \text{revolutions of the wheel}$$

Revolutions of the wheel can be calculated by a Speed sensor attached to the motor of a particular wheel. When the “Distance Travelled” matches with the user input (Gap between 2 pits) the machine is going to be stop and starts the digging process as explained above. Then the same process is followed continuously till it covers the “length of the given land”. After it matches total distance travelled the with the length of the land ,machine notices that it is the time to turn to other line so that bend is taken and when the machine is settled back as a liner way, digging process is started back. Similar digging process is continued till it covers whole given land area. Breadth of the land is calculated by the distance travelled by the machine after getting the turning decision and till it settle back in liner way. Here zigzag movement is maintained in order to change track lines as shown below.



Gap between two pits are maintained which also considered to calculate breadth of the land till satisfies user's input.



Here the devices that we use such as ultrasonic sensor, motors (attached to boom, connector, wheels) key pad and LCD are controlled by a microcontroller (Arduino UNO) which is attached to the machine.

### Assumptions

Land has been totally prepared for digging purpose. Slopes, large barriers like rock, trees.etc are not going to consider at the moment.

### Experiment

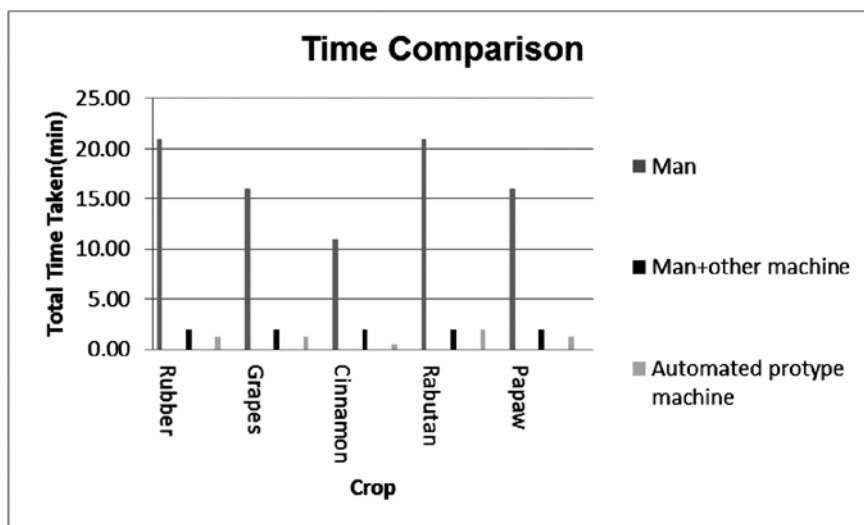
Depth of the pit, diameter of the pit and gap between two pits are more essential criteria for the best growth of plants and for proper crop production. But these sizes may vary according to the type of crop. Following tables show how far this suggested automated machine is effective in Time wise and accurate wise compared to man power.

### Considering Time

Crop	Depth(ft)	Diameter(ft)	Gap(ft)
Rubber	2	2	8
Grapes	1.5	1.5	2.7
Cinnamon	1	1	4
Rabutan	2	2	30
Papaw	1.5	1.5	3

Prototype Machine Scale  
1ft → 5cm

	Crop	Time taken on 1 pit (min)	Time Taken to tavel to next pit(min)	Total time(min)
Man	Rubber	20.00	1.00	21.00
Man+other machine		1.00	1.00	2.00
Automated prototype machine		1.00	0.30	1.30
Man	Grapes	15.00	1.00	16.00
Man+other machine		1.00	1.00	2.00
Automated prototype machine		1.15	0.10	1.25
Man	Cinnamon	10.00	1.00	11.00
Man+other machine		0.50	1.00	2.00
Automated prototype machine		0.50	0.03	0.53
Man	Rabutan	20.00	1.00	21.00
Man+other machine		1.00	1.00	2.00
Automated prototype machine		1.00	1.00	2.00
Man	Papaw	15.00	1.00	16.00
Man+other machine		1.00	1.00	2.00
Automated prototype machine		1.15	0.10	1.25



### Considering Accuracy

	Depth of the pit(%)	Gap between 2 pits
Man	67	60
Man+other machine	67	60
Automated prototype machine	100	100

### Conclusion

Digging pit is an essential and important task in plant cultivation. Though farmers can use some machineries to that task still farmer has to operate machine throughout the whole process. But as proved by above mentioned experimental results, an automated machine can be used to increase the productivity of cultivation by minimizing additional man hours at the same time can maintain the accuracy of cultivation measurements. Preparation of land, watering of plants also can be programmed to the same machine as future enhancements of this project.

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# An Internet of Things system for a smart Pantries in Sri Lanka

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## **Abstract**

IoT (Internet of Things) is one of the largest and fastest growing field in the world. IoT connects physical devices and collects data from them and share that data across the Internet where it can be processed and utilized for various purposes. But it's still in the back foot when it comes to the Srilankan homes. The second most influencing factor in our day to day life is the mobile devices. Mobiles devices have become smarter as a small size computer. But not all the Srilankan community uses a smart mobile. This paper joins IoT and mobile device to identify and update a remote user of a kitchen inventory system, to save time and money for both android and non-android users.

## **Keywords**

Arduino Mega, Ethernet Shield, GSM Module, Android, Internet of Things and Load cell.

## **Introduction**

Forgetting is common human nature, we use various kind of devices and techniques to keep us reminded. When you want to buy grocery, you might not remember what's running low on your pantry. And you might have bought something else instead of what you need. To save time precious time and money this study was done to create a smart system called S2K. This system is mainly focused on the inventory of the pantry cupboard. S2K is focused on updating a remote client about current status of the inventory and it can alert the client when the goods limit reaches a certain threshold. The client is notified using an android app or the clients who does not have a smart phone or non-android users will be notified via a text message. S2K uses Arduino as the motherboard and it cooperates with Ethernet shield to connect internet. To send and receive text messages GSM technology is being used. Using GSM technology, it makes S2K unique from other existing IoT systems such as T<sup>3</sup>: IoT Smart Pantry (Poole, 2016) and Smart Pantry (arduino-raspi, 2017) with android application.

End of the day S2K is a system where it saves precious time and money by notifying the client on the relevant moment. And another unique feature of this system is, it's a portable system and an existing pantry cupboard does not need to be remodified S2K can be just plugged and played and Easy to be used even for a non-technical person. This study proves that using S2K improves the efficiency of work and saves time and money comparing when the system was not available.

## **Methodology**

Individual load cells were used to determine the exact weight of each slots of the pantry cupboard. And these load cells were attached to a mother board called Arduino mega which will collect and process the received data. According to the input Arduino Mega

determines the output, if it is a smart phone user it sends the data to a web interface using an ethernet shield, which acts like the default gateway to connect internet. For non-smart mobile or non-android users, the output is sent by a text message using GSM module which has a SIM to send and receive messages. These outputs were given when the grocery items reach a certain threshold.

To get the available amount of the grocery items before they reach the threshold the remote user can send a text message to the GSM module which passes the in incoming data to the Arduino Mega and then Arduino mega gets the input from the loadcells. Loadcells gives available amount of groceries to Arduino Mega to send the message through GSM module via a text. The same method is used for the Android users also but rather using text message it uses web interface to communicate with Ethernet shield which sends the data to Arduino Mega and gets back the remaining amount of groceries.

The groceries items are determined or measured by kilograms (Kg) and/or grams (g).

**Experimental**

The test was done in a family where both husband wife go out to work and no one else at home. This was done for 145 days almost four months. The first two month of the data was takes before the S2K was implemented. They have forgotten to buy the relevant goods 6 times in the past two months. So one of them had to go back to the grocery shop which 1km far and if travelling by bus 10Rs. One-way travel time is 5-6 mins.

Next two months of data was taken after implementing S2K at the same users and then the data was collected and compared. Below data shows the comparison of data.

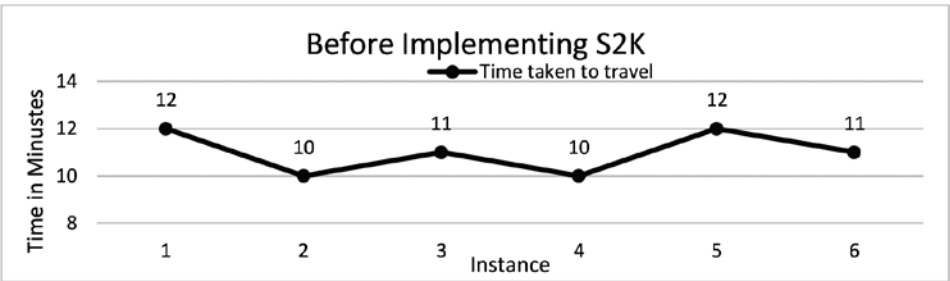


Figure1 Before implementing S2K

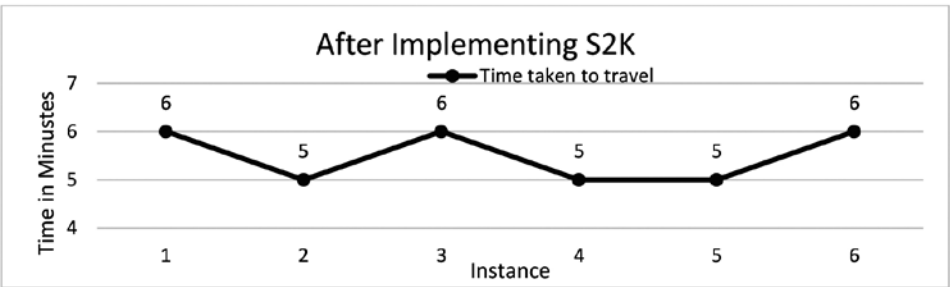


Figure 2 After implementing S2K

The test results showed almost 50% time is saved after S2K was implemented. Figure 1 showed the travel time when the user has to travel two times because user forgot what were the missing grocery items so he/she had to come back to grocery shop and go back home. Figure 2 shows when the user knows what to buy with help of S2K, they got down near the grocery shop and bought the items so it's a one-way travel.

Meanwhile the below tab table shows exactly 10 Sri Lankan rupees were saved after implementing the S2K.

Value in Sri Lankan Rupees

Instance	Before Implementing S2K	After Implementing S2K
1	20	10
2	20	10
3	20	10
4	20	10
5	20	10
6	20	10

**Table 1 cost comparison**

Based on these data the conclusion is that, by taking only from a user for 145 days S2K has clearly saved time and money. If it this is to be implemented for multiple users it generates more valuable data and that data can be used to save more time and money in different area of the country.

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# Artificial Vision of text reading, face recognition and object recognition

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## **Abstract**

Different societies or cultures or countries may use different languages in their tasks. It will be a difficulty to whole community for an effective communication. And there are some separate crowd in our society who Blind/vision impaired people get major role in this. They may find difficult to recognize people, identify objects and reading. this Artificial Vision of text reading, face recognition and object recognition system will suggest some techniques and mechanisms to overcome above difficulties.

## **Keywords**

Android studio, JDK, Adriano, Text Recognizer, Object Detection, Face Detection, Bluetooth Module.

## **Introduction**

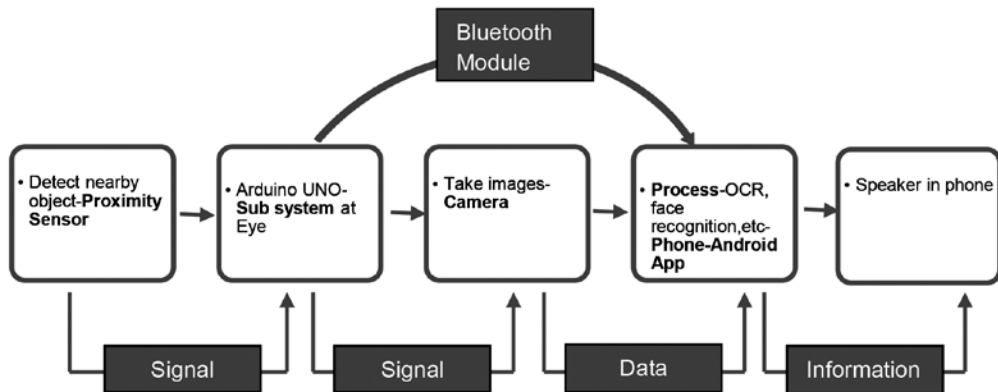
When we are dealing with day today activities “Language” acts as an essential requirement to fulfil the tasks. But the barrier is that different societies or cultures or countries may use different languages in their tasks. It’s difficult to Communicate effectively. And there are some crowd in our society who face a severe difficulty in their communication. Vision impaired people get major role in this. They may find difficult to recognize people, identify objects etc. this system will suggest some techniques and mechanisms to overcome above difficulties. As an example if a person doesn’t know to read a book, this system will tell, the content in the reading material by their own language. And when they wants to read a distant name board or something similar to that, they can induce the system to focus the camera to that particular object and hear the words on it, by them own language. And when comes to vision impaired person, they also can hear the texts which is in front of them using the Optical Character Recognition (OCR) technology possess in this system. And also this system will enable that person to identify faces of individuals that were previously photographed with the device's camera which is already stored in the memory. Recognizing of previously entered things like money notes also can be done using advancements in object recognition technology. This system will provides quality product which will provide our visually impaired community the same benefits and enjoyment that everyone else gets from reading and expressing themselves. And also to cut over the language barrier faced by many of us.

## **Methodology**

In text recognition we are going to detect texts in images which contain only English letters. And when comes to translation of those letters we are going to limited only for one or two languages.

In object detection, not going to concern on many objects .only going to focus on single object money notes.

When comes to face detection it is very challengeable task as appearance of an individual can vary due many reasons. So that first what we are focusing is just to identify a person from the stored parameters in our system.



Text Recognition system of our project is going to implement by using the mobile vision text Recognition API available in the android studio. As this is powered by Google we can use it easily for many languages. In order to get done the work following steps have to be followed up.

- Mobile Vision TextRecognizer library has to be configured.
- In order to receive images from the camera have to setup the processor.
- Extract the text in the image.
- Finally have to send those texts to Android's TextToSpeech engine to speak it out.

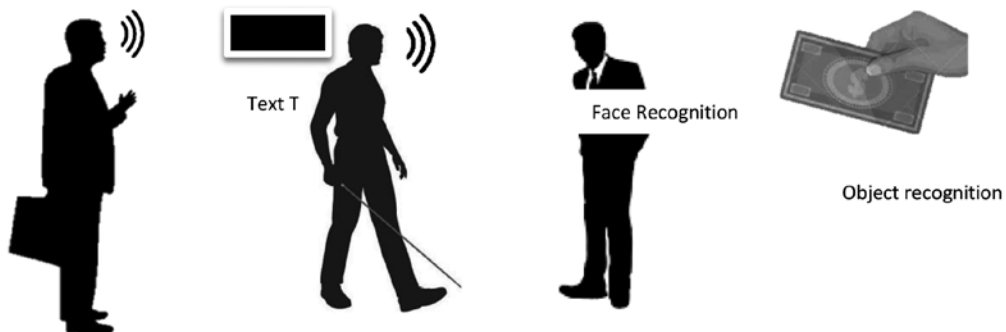
In object detection process what we are going to use is OpenCV library which is available in android studio. ORB (Oriented FAST and Rotated BRIEF) is an algorithm used there to detect object using the technique Scale Invariant Feature Transform (SIFT) which is an Appearance based object recognition.

In Face detection also OpenCV can be used with the help of Google Face API. Following steps can be followed in order to detect the face.

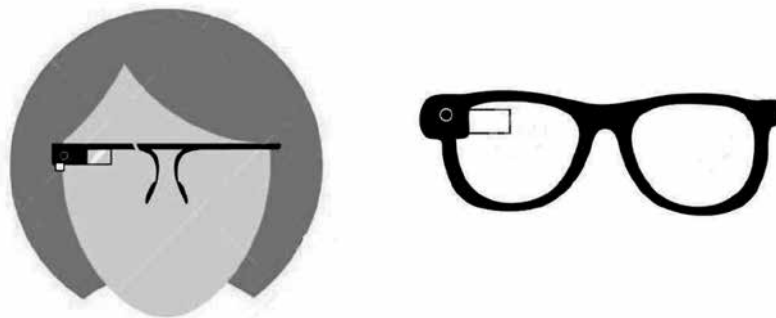
- Face recognition- Determines whether two faces are likely to correspond to the same person
- Face tracking
- Detecting landmarks- Check for special points within a face.
- Classification - Checking whether the particular characteristic is present or not.

## Recommended Solution

The following figures describe the solutions



1. A wearable glass with a subsystem including camera.



2. An android app which can output processed data (Text reading, Names of person, objects etc.)





In the future we will be able to enhance this system further more to detect text in many languages and different objects even within the clusters of objects. And faces of different individuals though they have changed their appearance from stored parameters. In the future I will be able to enhance this system further more to detect text in many languages and different objects even within the clusters of objects. And faces of different individuals though they have changed their appearance from stored parameters.

### **Experimental**

A system to read texts (Books, Newspapers, restaurant menus, distant name boards etc.) and translate to preferred language.

To help vision impaired people to identify faces of individuals that were previously photographed with the device's camera which is already stored in the memory and in text recognition, detect texts in images which contain only English letters. And when comes to translation of those letters, limited only for two languages.

In object detection, not going to concern on many objects. Only focus on single object like money notes.

When comes to face detection it very challengeable task as appearance of an individual can vary due many reasons. So that first, focusing is just to identify a person as same to the stored parameters in our system.

In this system methodologies which use, the mobile vision text Recognition API available in the android studio for Text Recognition system of this project and also OpenCV library which is available in android studio for object detection process. Optical character recognition, Face recognition and object recognition techniques will be applied to get through this system.

The test was done with five members.

	<b>Accuracy</b>	<b>Language quality</b>	<b>Improvement</b>
<b>1</b>	60%	52.8%	42.9%
<b>2</b>	70%	22.7%	46.35%
<b>3</b>	65.5%	55.5%	60.5%
<b>4</b>	75.5%	60.5%	68%
<b>5</b>	60%	75%	67.5%

### **Face Recognition**

<b>Images</b>	<b>Before Prediction</b>	<b>Recognition Rate</b>	<b>Improvement</b>
<b>1</b>	90%	91%	90.5%
<b>2</b>	85%	84.2%	84.6%
<b>3</b>	80%	75.5%	77.75%
<b>4</b>	90%	88%	89%
<b>5</b>	80%	60%	70%

Based on the above table there are mainly consider about accuracy and language quality of the Language Translation and before and after prediction of Face Recognition. Ultimate result that is supposed to get will be a more advanced system to our society to overcome difficulties faced due to language problem and some physical difficulties like vision impairment.

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# Smart Agriculture System Using IOT

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## **Abstract**

If we observe the current generation of technologies in the world we may notice that there are a lot of fields with IT support. But it lacks in the field of agriculture, therefore, I desired to reach out to give a push towards the agricultural field to start a new generation where anyone would like to take part in the field of agriculture since it wouldn't be so hard just the way it was when you innovate IT based technologies for support. This project was designed to be developed to reach out for the farming and agricultural activities whole throughout the world due to help the need of farmers indeed which will make their field of agriculture more active and easy with IOT. This project is designed with quality products and components where it is small yet tremendous in performance which provides a long-lasting durability which is worth a shot to farmers since it is a one-time investment and they could gain worth-able benefit for their invested money where they would be satisfied for their expectation. This project enlightens the agricultural tasks easier for farming thus anyone could engage themselves in this field hence it is super fun to do it with technology as well as advantageous in various ways. Using IOT technology in the field of farming makes the work easier for farmers where it saves their time, wealth, and energy.

## **keywords**

Smart Agriculture, IOT, Arduino MEGA 2560, air quality sensor, rain drop sensor, water level sensor & water motor, temperature & humidity, Soil Moisture, Water Flow Sensor, Relay Module, ESP8266 IOT Wireless, Solar Panel & Lithium battery, I2C WITH LCD 20\*4 Display, LED (RGB), Real Time Clock (RTC), Real-time Monitoring, Buzzer, Light Dependence Resistor (LDR), Automated Agriculture, Thinger.io Dashboard.

## **Introduction**

Introducing all new smart agriculture system using IOT with fully updated ultimate features of aspects and perspectives of agriculture. Smart agriculture system using IOT is the latest and the trending on the present world is useful. IOT is internet of things where all the data and information will be representing to the phones, laptops or on any other devices which has internet connection that can access and control the smart agricultural system anywhere in the world with any monitoring device where It's a system on the go wherever you go in the whole world & whenever you require.

## **Experimental**

It is featured with world's update all in one version as it includes main device Arduino MEGA 2560 is a microcontroller where it could inter connect with many peripherals of smart agricultural system project that could work efficiently and accurately within performance to analyze and detect all the sensors; air quality sensor measures environment's atmospheric quality where it detect and provide the required environmental oxygen level; rain drop sensor measures the amount of rain and utilize accordingly to the requirements of the plants water requirement; water level sensor & water motor

measures the water level of the tank where it on and off the water pump to fill the tank, temperature & humidity where it measures the temperature of the environment and the humidity measures the water level contain in the atmosphere through the air also in the green house planting and agriculture the system provide necessary temperature to the plant; Soil Moisture sensor analyze the soil's water level in the agriculture plot; Water Flow Sensor measures the water flow through the tube; Relay Module helps the high voltage peripheral to on and off also to maintain the agriculture system, ESP8266 IOT is an Wireless module which helps the entire system to communicate, transfer and control the complete system using IOT; Solar Panel charges the Lithium battery through the charging module and it generates a minimum power to power up the Arduino MEGA for an emergency situation as a backup contingency plan; I2C WITH LCD 20\*4 Display allows you to display the status of the system and the peripherals at the location of the green house or the plot, LED (RGB) it represent the system is on or off and also it represents the caution of the system, Real Time Clock (RTC) allows the system to keep real time monitor the update information of the each and every components and peripherals, Buzzer notify in case of an event of emergency, Light Dependence Resister (LDR) measures the intensity of the sunlight.

Every sensor and sensitive component have its individual unique features which can be able to measure the status and the situation of the surrounding environment. All these sensors are interconnected and joined each other by out-coming as a single system which is a smart agricultural system using IOT which is an automated agriculture era. The smart agriculture system is an ultimate upgraded with features where other previously developed projects have drawbacks one way or another therein as a solution this smart agriculture system using IOT was structured, designed and developed to launch an ultimate solution to cover all those drawbacks in every aspect of perspectives.

The smart agricultural system is an IOT system where it connects to the internet 24/7 and updates the real-time status of all peripherals, sensors, and components information are updated to the thinger.io. thinger.io is a dashboard where it provides the smart agriculture system to monitor and control the system from a remote location.

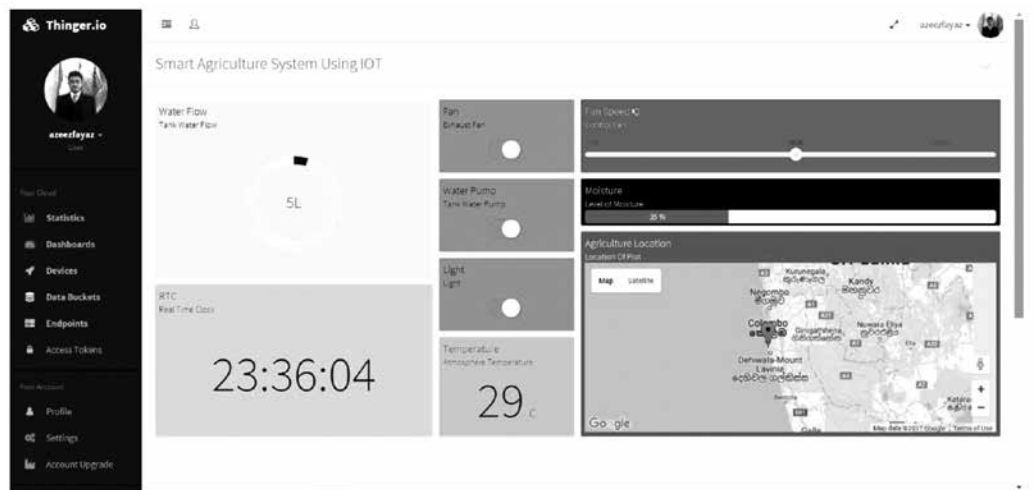


Figure 1: IOT Dashboard

This system can benefit the agriculture industry to all the farmers in the world. This is a basic system where each user would be adapted to utilize easily since it is very user-friendly. This project is an overall of smart agriculture system using IOT where it is fully updated to cover in all the perspective of farming agriculture.

Farmers will be more satisfied by this system cause the system meets the requirement of the farmers what the farmer exactly needs. This smart agriculture system using IOT contains a fully automated system which is ultimate system gives you a maximum benefit to the farming. This would be a great system for the farmers who are in the field of agricultural farming industry where the agricultural industry plantation differentiates among every farmer this system can be customized accordingly to their individual perspectives of requirement. The Smart Agriculture System Using IOT where all the sensors and the components, peripherals were combined and developed as one artifact. Step by step all the peripheral was developed and connected to the main Arduino board mega Atmega 2560 thus finally a total set of the project was innovated.

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# **Study on efficiency of a Mobile Application to Locate Destination Bus Station for travelers who travel from Kandy**

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## **Abstract**

Mobile Application are making a large impact on applications related to traveling, tourism, and weather forecast and so on. Mobile application provides potential solutions in all these domains and more, further it provides effective and efficiency solutions to civilians. Especially a country like Sri Lanka, Travelers face many difficulties while locating their intended Bus station. This paper addresses an effective way of finding destinations' bus station within the limits of Kandy city, Sri Lanka, via a user friendly Mobile Application. The objective of this paper was to study the efficiency of a Mobile Application's usage for locating the intended destination bus station. In order to study about the efficiency, a survey has been conducted within Kandy city, around 50 travelers who were walking from Clock Tower to Good Shed bus stand to find their destination bus station. The results of the survey shows that with the help mobile application, it was easy to get travelers' destination bus station and it was efficient in terms of saving time convenience compared to, not using a Mobile Application.

## **Keywords**

Android Studio, JDK, Eclipse Juno, SQLite

## **Introduction**

With the explosive growth of Internet and related technologies, especially the advancements in Mobile devices and related software have opened new possibilities to accomplish tasks in much efficient ways, even though technological advancements are present; when it comes to applications which run on such devices, still there are areas where huge demand for certain applications to be developed.

One of the major issue in Kandy city is Enormous amount of Traffic, this leads to wastage of time of travelers who are waiting to depart from Kandy, another major problem is that people who come to Kandy City does not know where the relevant destination busses' bus station location is.

Therefore to provide an efficient solution for the above mentioned problem, as well as optimizing the travelers time a Mobile Application is implemented.

## **Methodology**

The implemented mobile application was used to study the time pattern taken by each traveler to get to the specific destination bus station. For the study purpose "Good shed" Bus station has been considered for this examination.

From each traveler, the time of arrival to Kandy City, the day of arrival, time taken to reach the correct destination bus station - Good Shed was marked.

The above parameters have been collected from several individuals who were travelling from outside the Kandy city from Monday to Saturday for a period of six months between 7am to 9am. Further in order to get real data, Conditions such as bad weather, unexpected road constructions or maintenance work were not taken into consideration for the above mentioned parameters.

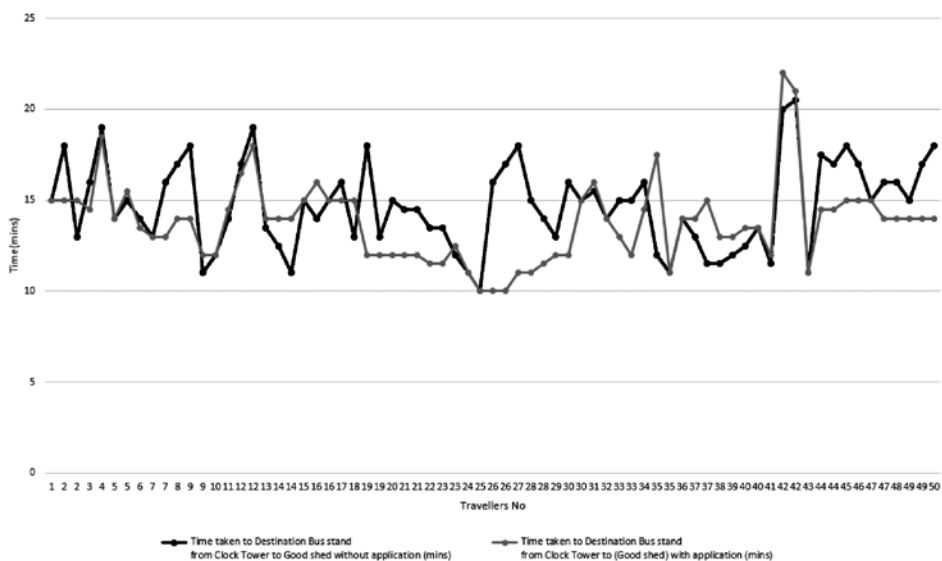
The goal of this research study is to optimize the traveling time with the use of developed Mobile Application.

### **Experimental**

The test was done using above-mentioned parameters for six months, for each traveler between 7am to 9am Monday to Saturday. There were three parameters used to check the efficiency of traveling time. In order to find the efficiency of usage of implemented Mobile Application, Travelling time has been collected from around 50 random travelers who didn't use the Mobile Application, they were getting assistance by talking to people around them to get directions for the destination, and simultaneously time has been collected from another 50 random travelers who did use the Mobile Application to get to the same destination. The age of participants who involved in this experiment was in the range 18-50 years.

After getting the above data it was used to analyze the efficiency of usage of travelers to optimize the time taken to find the destination bus stand using Mobile Application.

The Following Graph shows the time pattern taken by 50 travelers who walked to Good Shed bus station with and without Mobile Application between 7am to 9am for a time period of 6 months.



### **Conclusion**

As per the results shown above in the graphs it is clearly noticeable that via using the Mobile Application to locate the correct bus station reduces the total time taken during a travelers' journey, the 50 travelers who were picked randomly wanted to get to Good Shed bus station, the average time without the Mobile Application was 20.92mins and with Mobile Application, was 19.02mins, which saved almost 2 minutes. Provided that the Mobile Application is available for some time in the Market Place, finding the desired bus station in future will definitely be more efficient on both saving time and convenience. Further being a new Mobile Application, travelers took some more time to be familiarized. The Efficiency of the Mobile Application also depends on the Age group, hence above 40 years and whom were not moderated users of Mobile Applications might not support efficiency. The great challenge of this project was finding the right travelers who had at least moderate knowledge on usage of Mobile Application.

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# ‘WHO AM I’

## Centralise National Information Repository on Registration of Birth

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### **Abstract**

Every birth should be registered with the government to obtain a birth certificate which act as the main legal document for a citizen in Sri Lanka. The name of the child, details of the mother and the father will be entered in the birth certificate. In Sri Lanka a child born at hospital should be registered before leaving the hospital. A Registrar of Births appointed by the Registrar General's Department to validate the child's birth and to issue the birth certificate.

### **Keywords**

Pedigree, Secure Marks, UV Fiber Secure, Color Fiber Security, Anti-Copy Numbering, Secure Glow, Security Hologram, Anti-Copy Watermark, Micro Line Secure, Hidden Message Technology, Uv Secure.

### **Introduction**

The birth certificate will be required to obtain the national identity card, driving license or passport. Therefore this document being an important document. This is an essential document a person will carry. This piece of paper provide the vital information about your birth. There is nothing a person can do without a birth certificate.

Security of this important document is cumbersome, it is easy for a person to fake his/her own birth by produce fake documents which can produce for national identity card, driving license and passport.

In 2014 the department of registration of persons stated that around 6500 suspicious applications were received for NIC's during last year. (Anon., 2014). Department for Registration of Persons (DRP) was introduce the new 'smart ID'. (Ratnasabapathy, 2017)

A revamped national passport was introduced in 2015. And special attention was paid with regard to the inclusion of the passport holder's fingerprint, as a more secure identification method (Ariram, 2015). CID uncovers passport forging racket. 28 forged passports were discovered in his possession. (Fernando, 2016)

The present birth certificate hold the parents full name though still there are no mechanism to validate and trace the back. There are many baby rackets are happening within the hospitals because of forgery becomes subsequently easy. (Hettiarachchi, 2008)



Many authorities, diplomatic and border agencies are found difficulties on verifying the genuineness of the documents such as birth certificate, NIC, and the passport. "Base document for many services in Sri Lanka," such as applications for NICs "forged birth certificates are readily available through agents, at a reported cost of around 2,500 LKA rupees (UNCHR, 2011)

To issue a birth certificate the authority takes between two weeks to three months. In Sri Lanka there are over 1300 divisions spread across the country which 13 in the Colombo Metropolitan Area. Each division has only one Registrar of Births and Deaths. Though the certificate should be issue when child discharges the hospital.

Taking an extra original copy of the birth certificate and searching the register is another trivial situation. A photo copied birth certificate will be endorsed by the authority with a stamp as an original document.

### ***Proposed Solution***

There are certain valuable information should be collected at the time of registration such as birth time, blood group, health status, Parent's birth certificate numbers/NIC Numbers will be an entry point to other "National Information Systems" such as health, Security, Census and NIC and Passport in long term and also will lead for an effective and efficient system

Blood group and status, health status, these information is significant that can lead to identify the family pedigree and the family/genetic diseases.

Some people are carriers of genes for genetic illnesses, even though they don't show, or manifest, the illness themselves. This happens because some genetic illnesses are recessive meaning that they're only expressed if a person inherits two copies of the problem gene, one from each parent. Offspring who inherit one problem gene from one parent but a normal gene from the other parent won't have symptoms of a recessive illness but will have a 50% chance of passing the problem gene on to their children.

Genetic testing is performed to confirm the diagnosis. In some cases, it also might aid in identifying the specific type or severity of a genetic illness, which can help identify the most appropriate treatment.

There are many anti-counterfeit technologies exist such as secure marks, UV Fiber Secure, Color Fiber Security, Anti-Copy Numbering, Secure Glow, Security Hologram, Anti-Copy Watermark, Micro Line Secure, Hidden Message Technology, UV Secure etc.;

The proposed Sri Lanka birth certificate should consist with few of the following anti-counterfeit features such as;



Security Hologram



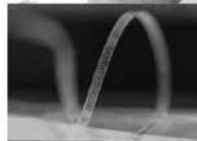
Uv Ink & Uv Fiber Application On Certificate



Hot Stamping Hologram Application On Visa



Hologram Stripe Application On Ballot Paper



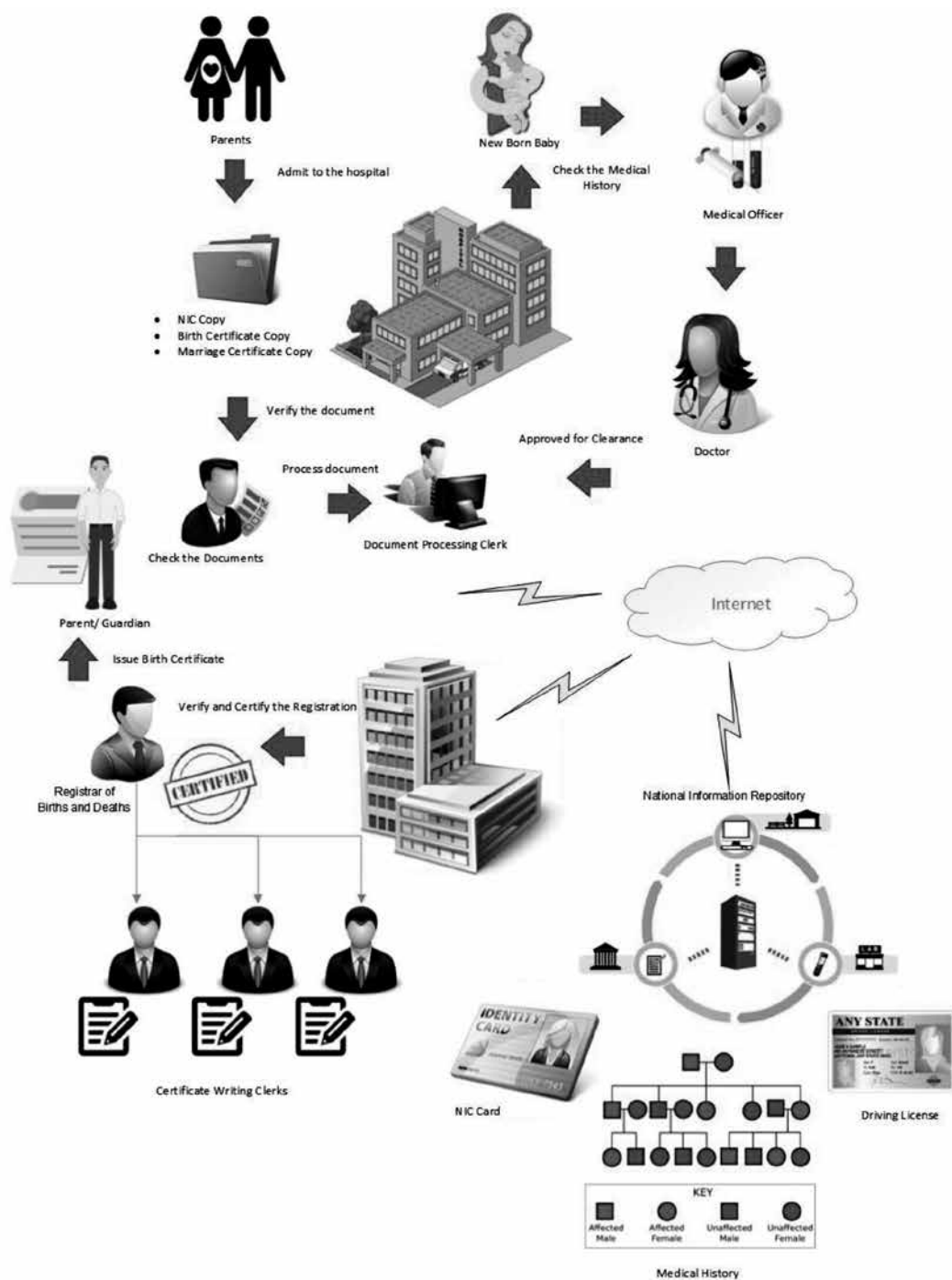
Security Thread



Passport Security Printing Combining Hologram Overlay

With all the above facts a central national information repository can be form with this potential features as follows;

- Centralise - Implementing and centralizing the national information repository
- Security – Securing and streamlining manual documents and its processes
- Capture – Collect information from different stages and points
- Open Data – Build platform to support open data through API
- Usage – Consuming central data by government institutions, other recognized bodies, and citizens
- Census/Statistical - Number of birth per day, per hospital and per division



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# Portable Secure Network Link Monitor

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## **Abstract**

The networks are used to communicate with one or more computing devices in order to share data applications and recourses. It was in fact a downfall that the connectivity and devices used with regards to network were quite lacking during the early stages of IT and its involvement with humans. But that is not the case anymore as the evolution of IT has drastically changed, hence having a rather positive impact on people around the world, especially speaking of network and its branches, there is an immense number of devices and facilities available out there.

As per the network packet sniffer, In the networking data will be send as packets or frames that includes source and destination addresses this information can be extracted and compare with per set source and destination to ensure that the packet is allow to go through the link and identify potential risks before it occurs. In order to find out whether the network packets are getting transfer one destination to another without any sort of distractions within as well as the pass over of possible network threats, organizations make use of high end firewalls with a vast capacity. If the firewalls are directly involved in the network and checking each and every packet within the network that is being transferred, causing a high network traffic, bringing about network interruptions. The project has developed form of hardware module based on Raspberry Pi. Raspberry Pi with additional network adapter and software for packet snipping will be configure in a way that it is create the secure link monitoring. The technologies that will be used includes Linux operating system and python as programming language

## **Keywords**

Network, firewall, hardware module, Raspberry Pi

## **Introduction**

The networks are used to communicate with one or more computing devices in order to share data applications and recourses. It was in fact a downfall that the connectivity and devices used with regards to network were quite lacking during the early stages of IT and its involvement with humans. But that is not the case anymore as the evolution of IT has drastically changed, hence having a rather positive impact on people around the world, especially speaking of network and its branches, there is an immense number of devices and facilities available out there.

## **Experimental**

Wireshark can show the parcel information data in three unique levels, the best level being singular edges with solitary lines of key information, the center level being a further and top to bottom look in to the single edges that were caught on the best level (For example the bundle points of interest, its layering, et cetera). Last, however positively not the minimum, the base level is partitioned into two segments, the hexadecimal crude information outline on the left and the particular ASCII measures on the right. Aside from

these it additionally can catch live information from different other system mediums like Ethernet. (Wireshark • Go Deep, 2017). Snort is a network intrusion discovery software which is open source. A portion of the highlights of snort incorporates its capacity to investigate and investigate uncommon practices in the system and system based issues, alongside assuming a part the advancement of conventions and dissecting the product untimed interchanges and in addition alarming the client. General again for clear reasons when contrasted and TCPdump, grunt isn't a decent decision when working with Raspbian OS for two primary reasons, on one hand it isn't good and on the other. It isn't dependable to work easily when contrasted with TCPdump. (Snort.org, 2017). The one of a kind angle about IPtables is the way that these charge lines now and then goes about as system parcel snippers, which is an entire other component that its standard observing and controlling of system movement. At the end of the day, IPtables have a comparative capacity to that of a system clipping instrument like Wireshark and TCPdump for example, inclining more towards TCPdump, what not with the order line interface and inhabitation of a little limit inside an OS. Raspbian Linux based working framework exceptionally outline for Raspberry Pi PC frameworks and the Raspbian working framework is free and it is open source programming to be downloaded from their official site including all the establishment directs as well.so its is by all accounts certifiable working framework. (Raspberry Pi, 2017). According to the study there are a lot of working framework accessible for Raspberry Pi PCs, for example, Ubuntu mate, RISC working framework, Fedora, Arch Linux ARM and so forth. And in addition, the current reports on their official Raspberry Pi site unmistakably demonstrates that Microsoft Windows 10 likewise accessible for Raspberry Pi PCs.

in this specific undertaking primarily, the system checking done in light of Linux stage since arrange observing apparatuses can be for the most part actualized in light of when it is come to systems administration all the product in the server locales are Linux based. With the goal that executing organizing observing in light of Linux it will give the better help and in addition its open source to build up this venture it makes simple. Developing network monitoring system on windows platform somewhat it is hard because of the restrictions and all the feathers are not accessible on windows platforms. Let us assume using network monitoring on windows computer need to install supportive software and that software must have enough privileges as well as to interact with the system need to be login as system administrator. But at the same time developing network monitoring on Linux based if the user login as super user(root) will be able to access anything such as will be able to capture all the packets with the information. Once the packets are capture as super user be able to be modify the capturing code or capturing software as per the wish of user. So developing network monitoring project based on Linux Platform it seems to be a most effective and efficient way.

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# An effective Intrusion Detection/Prevention System (IDPS) implementation for an academic environment with specific requirements

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## **Abstract**

The project being used to a true necessity in today's world where educational institutes and organizations hold quite confidential and at times, bulk data including results and other details. The project aims to implement an Intrusion Prevention System/ Intrusion Detection System for an academic environment with specific requirements such as the system being simple being simple enough to be implemented and managed by the person handling data in the institute while also covering any and all security concerns. An Intrusion Prevention System/Intrusion Detection System examines flow of the traffic in a network to find and prevent vulnerability exploits and also detect any intrusions into the system. This refers to what usually comes in form of malicious inputs to target a certain system or application. The IPS/IDS will be behind the firewall to provide an extra layer of protection to analyses and stop malicious packets while working directly with the source and destination and reporting any findings to the administrator or person managing the network in the institute.

With constant changes in the world of internet technology, its practices have led to huge growth and suppleness in how communication and information storing is being handled today. Almost every educational institute or organizations uses a system to store their confidential data, be it employ details or student progress records. The project is going strongly consider to implement a system that can be managed easily by almost anyone while also covering all security concerns another concern is to not have too many rules or constrains in the system which would interfere with the flow of information.

## **Keywords**

Internet, IPS, IDS, Technology, System

## **Introduction**

With consistent changes in the realm of web innovation, its practices have prompted enormous development and suppleness in how correspondence and data putting away is being taken care of today. Practically every instructive establishment or associations utilizes a framework to store their secret information, be it utilize subtle elements or students' advance records. The task is going emphatically consider to execute a framework that can be overseen effectively by nearly anybody while additionally covering all security concerns another worry is to not have excessively numerous standards or compels in the framework which would meddle with the stream of data.

## **Experimental**

Karen Scarfone and Peter Mell from the National Institute of Standards and Technology (NIST) expressed that associations who are wanting to actualize different sorts of IDPS innovation sort should remember if IDPS ought to be coordinated or not. (Scarfone

and Mell, 2007). Associations have been known to some of the time utilize IDPS for other reason, for example, discovering issues with security arrangements, discovering officially existing dangers and furthermore discover when security strategies have been disregarded by a person. Interruption recognition framework and interruption counteractive action framework watch the system always, denoting the conceivable episodes and logging data about the occurrences, and stop the incredibly while answering to the executive. A portion of the virtual products are additionally fit for identifying security strategies being disregarded inside from within too. IDS/IPS has swung to be a flat out need for most establishments and associations for the sole reason that the product is fit for halting digital assaults and screen the system in the meantime. Guy Bruneau (2001) characterizes Intrusion Detection as the unwavering dynamic endeavors to find or distinguish the nearness of nosy exercises. He likewise expresses that since Intrusion Detection includes of a far more extensive degree since it's identified with PCs and system framework. This is being alluded to all procedures which are utilized when discovering unapproved utilization of a system. Thus, a specific programming intended for the sole motivation behind finding these exercises are made. A specific USAF paper distributed in the October of 1972 created by James P. Anderson put a focus on the way that the USAF had "turn out to be progressively mindful of PC security issues. This issue was felt for all intents and purposes in each part of USAF operations and organization". A study done in 1980 by James P. Anderson turned out to pave the way as form of misuse detection for mainframe systems. The idea of the study he conducted was impressive in many ways considering the time and state the Information Technology world was standing at during the time this study was done. The study was on "How to use accounting audit files to detect unauthorized access." (Anderson, 1980).

The main objective of the study was to shield the information in the establishment from any digital hazards, the actualized framework appears to hold up against inbound and outbound attacks. The IDPS could distinguish the greater part of the test dangers and was additionally ready to recognize a startling risk which originated from outside as well which expands the certainty about the framework. The executed framework could recognize dangers from both the main station and the associated station as well exceptionally well. It was likewise ready to identify infection assaults and an endeavor to hack the framework from outside by an obscure individual and stop it which was exceptionally surprising however great. So generally, the executed spreads both second and third goal. The last goal was for the framework to be anything but difficult to execute and be overseen since few out of every odd foundation is skilled or has somebody with high system security foundation to deal with the system. The actualized framework is anything but difficult to oversee and comprises of straightforward yet exceptionally viable instruments for the activity. It can be executed and arranged with a day and more standards can be included as required. The undertaking was definitely a win and can be actualized in any system with an open entryway to having more improvements and principles being added to the framework while adjusting to a danger it faces. There are various standards that can be added to the framework that would make the framework more proficient and secure. With new updates coming once in a while and the mark list being refreshed, the actualized framework would be equipped for standing against most security hazards. Moreover, the product would function admirably paying little heed to the reality whether the IDPS is being actualized in a little training environment or a substantial instructive environment with different stations and clients who utilize the system.

The framework is sufficiently straightforward to implemented and oversee even by a person who has next to no information with respect to the utilization of system security programming projects or Linux Software's. Also, the execute IDPS can be balanced according to the span of the environment its being introduced in and cover and secure the entire system. In any case, there is dependably opportunity to get better and shot of unexpected dangers as well. Alongside that, it is additionally essential to take note of that an excessive amount of security executed in a training establishment requirement the stream of data in the institute which is something that ought to be remembered. In rundown, the undertaking was a win with great outcomes.

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# Assessing roles, contribution and challenges for women in the IT industry in Sri Lanka

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## **Abstract**

The ICT industry plays very significant role in the development of every country in terms of technology development and enhancing the digital facilities. The industry is notwithstanding, seen as a larger part safeguard of men. It is against this setting women's investment in the industry was surveyed. This examination explored the particular parts of women, their portrayal in ICT industry, regardless of whether women are sufficiently occupied with different positions and their difficulties as far as various levels of inspirations in the business. The exploration configuration was embraced to consider mix of various organizations' women who are in the social IT section. The investigation uncovered that the instructive foundation of female specialists was relatively higher than the men a similar segment. In same path capacity of the utilization of the practical application were higher in the men workforce than ladies and furthermore examining about the challenges for women in the IT industry.

Women were in this manner occupied with supervisory and quality confirmation parts. It was likewise noticed that by generally women were underrepresented in the ICT industry and in senior management position. Substantial workloads, boundless working hours for due dates, uneven way of life, gatherings and meeting scheduled on out of working hours have been affected exit from the industry for the greater part of women. In light of these conditions, it was prescribed that women ought to be have completely consciousness of the IT industry happenings and ought to be completely prepared and furthermore proposed the employers must be given adaptable working schedule for extraordinary women in the industry. Women with important capability and the encounters ought to be given equivalent open doors in the IT industry and in higher management positions as their male counterparts.

## **Keywords**

IT Industry, Women, skills, challenge

## **Introduction**

information Technology is rapidly changing the world; it has fundamentally changed the way we do, the way we speak with individuals everywhere throughout the world. In spite of the fact that in the present world the both male and female are in to the IT business the gender orientation apathies in IT vocations appear to influence the aggressiveness of organizations all inclusive. It set that given the present work lack in the IT business, it has turned out to be more basic than any other time in recent memory to diminish wellsprings of spillage in the IT vocation ways of women.

## **Experimental**

according to J. Cohoon and W. Aspray, contends "Information technology/ computing remains a heavily male dominated area even after twenty-five years of extensive efforts

to promote female participation" (Joanne and William, 2012). Most mainstream dialog and research concentrates on the expanding quantities of women as clients of data innovation with a solid accentuation on their utilization of the Internet and World Wide Web; a few endeavors have been outfitted to pull in more women into the business, in order to lessen the strength of the male genders who have taken up more vocations in the business. Be that as it may, as detailed by Cheri Kramarae, these endeavors have not raised the normal outcome, and particular components are ascribed to be in charge of the gender imbalance and substantial divergence in the business (Cheri, 2003). The endowment of this information time for women is word related open door and versatility. However, this blessing has turn into an incredible test for the working women of today as they are not just presented to an indistinguishable workplace from men however thus are likewise presented to the weights made by the different part requests and clashing desires. "By satisfying their monetary needs, business has no uncertainty made women autonomous with an identifiable societal position however it has additionally made them to juggle into two primary areas of lifework and family. They have ventured into work put however the part obligations of women still continue as before, i.e., ladies might be a best official, still the "sustaining" or "care giving" parts are viewed as much a piece of female parts." (Sunita and Sapna, 2005).

This investigation could quantify the commitment and test for working women in the IT sector. It is uncovered that the significant difficulties for women working in the IT sector were the time management and stress management. This study uncovered that married working women who were in to the time critical activities were think that it's difficult to adjust their work and individual life. Members affirmed that They feel Commitment for personal life much critical and some of them have left their occupations due to the in-adjust way of life. Members from the academic part were capable adjust work life and the individual life and furthermore they make the most of their profession. Working hours related issues were more for the IT part experts while time to mingle or being casual is extreme for working ladies of scholarly segment. The wedded working women of the considerable number of areas dominantly think that it's difficult to take out time for their own side interests or relaxation exercises and keep up relationships or broadened networks. The married working women in the age gathering of under 30 years were in the IT segment found to have more work-life awkwardness issues consequently they hesitant to get higher management positions. The investigation uncovered that, the men are dominating and the senior position in the IT business. Vocation way and other expert movement has been made for all the more suiting the men and furthermore most critical meeting, exchanges were utilized to held in the night took after by supper. Members in this investigation were focused on that Entire expert vocation structure was made given less priority for women exceptionally to work moms. Members from the age gathering of 30 to 40 years while married working women more than 40 years were observed to adjust work-life somewhat better and furthermore holding management positions than the previously mentioned age bunches in the business. When it is assessing the competency level of the participants, the women who are in to the IT sector had applicable competences and aptitudes and furthermore they demonstrated enthusiasm of haling senior positions in the sector. The exploration also revealed that the informative formation of female masters was moderately higher than the men a comparative section. In same way limit of the usage of the practical application were higher in the men workforce than women and moreover inspecting about the difficulties for women in

the IT. this study discoveries uncovered the significance for adaptable working society, appropriate profession movement structure for working women for the work-life adjust have clear vocation way in the IT industry and enjoyment and life fulfillment.

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# The positive and negative Impact of ICT on Students' Academic Performance

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## **Abstract**

In modern era, students shouldn't be bound just to the learning in a classroom setting. They are relied upon to investigate the tremendous skyline of learning made accessible today through ICT. In reality as we know it where innovation is assuming an even critical part regular, it is basic to support and improve the utilization of ICT in the scholastic field to remain fully informed regarding whatever is left of the world and to benefit of the open doors that the cutting-edge world brings to the table. In this unique situation, this investigation uncovers that despite everything we have far to go as long as our orientation to ICT as an imperative apparatus to improve academic performance is concerned.

This paper investigates the connection amongst ICT and the performance of students at the undergrad level. The research sample was taken from a gathering of group of students contemplating in three higher education institutes. The examination found that the effect of ICT on the academic performance of the undergraduates was exceptionally irrelevant. The discoveries likewise uncover that lion's share of the students are oblivious about the potential part of ICT in their academic life. The students are in to ICT education have demonstrated the positive outcomes Moreover it has been found in the investigation that the ICT get to give to the undergraduates are not used to improve scholastic performance but rather it is somewhat a wellspring of diversion. The paper likewise proposes steps that if taken would guarantee better utilization of ICT by the students and would over the long haul build up a sound and productive relationship between ICT and academic performance.

## **Keywords**

ICT, student performance, Higher education.

## **Introduction**

Among the most recent two decades advanced education foundations have put intensely in information and communication developments (ICT) in Sri Lanka. ICT has had a noteworthy effect in the institution setting, in association and in instructing and learning techniques. One perplexing inquiry is the viable effect of these developments on student achievements and on the returns of training. Numerous academic specialists have attempted to answer this inquiry at the hypothetical and exact levels. They have confronted two fundamental troubles. On one hand, students' performance is difficult to monitor and there is still disarray about its definition. Then again, ICT is progressing innovations and their belongings are hard to detach from their condition.

## **Experimental**

Leuven *et al.* (2004) expressed that there is no confirmation for a connection between expanded instructive utilization of ICT and students' performance. Truth be told, they

discover a reliably negative and insignificantly vast connection between ICT utilize and some students' achievement measures. In help to these, a few students may utilize ICT to build their recreation time and have less time to consider. Web based gaming and expanded correspondence channels don't really mean expanded success. Then again, Abdulla, Al-Hawaj and Twizell (2008) expressed that ICT can possibly change the idea of training, where and how learning happens and the parts of students and teachers in the learning procedure.

Karim and Hassan (2006) noticed the exponential development in computerized data, which changes the way students see study and perusing and in how printed materials are utilized to encourage contemplate. In view of the broadened use of ICTs in training the need seemed to disentangle the myth that encompasses the utilization of data and correspondence innovation (ICT) as a guide to instructing and learning, and the effect it has on students' examination propensities and academic performance.

the outcomes demonstrate that the greater part (66%) of students approach the web on their cell phones, at internet cafes and tabs. As indicated by the discoveries of the exploration, students are of the view that ICTs positively affect their examination propensities (80%). Also, 90% of students say they utilize a PC day by day to encourage learning. On the premise of PC accessibility and web network, 95% of students have lap tops or PCS at home and just 70% of these lap tops/PCs have normal internet connections. It was similarly discovered that lion's share (90%) of students like to utilize their cell phones. The investigation demonstrates that 90% of students utilize a laptop every day to boost learning. 45% use it for around 1 to 2 hours, while 25% utilize it for not as much as 60 minutes, and just 30% utilize it for over 3 hours every day. The outcome equally demonstrates that male students utilize the web for the most part more than the female students, albeit female students would utilize the web for study/research and email faintly more than the male students to peruse the web amid their free periods. All students (99%) have email accounts, yet just 77% of students with email accounts, as to communicate with their teachers utilizing the email. As to students' investigation propensities, 55%, want to think about amid the weekdays, with most 52% concentrate for not over 2 hours albeit 48% investigation from 3 to 4 hours. Information likewise uncovered that most students (56%) read the subject that interest to them at time of examining, while 44 % contemplated utilizing perusing for searching and browsing. dominant part of the members (85%) has affirmed that, they favor getting to web-based social networking at whatever point have internet while 15 % they willing to get to online networking when their recreation time.

The exploration discoveries uncovered majority of students (85%) have an inspirational state of mind towards ICTs, albeit, male students (81%) are of more noteworthy help than female students (78%). This is bolstered by Schumacher and Morahan Martin (2001) who contended that females are less experienced with ICT's and are more probable than males to have negative demeanors towards IT. In addition, Shashaani (1997) inspected a few males and females about their enthusiasm for internet usage and found that there was an extraordinary distinction on the intrigue level between the two gatherings. then again students were acknowledged that now and again they experienced in negative effect (65%) by the over utilization of ICT, specially at the examinations have scored low marks because of the less practices of time set per-rehearsing. students who are not



studying ICT as major again trusted that (68%) IT has direct impact on their academic performances. Due to lack of ICT Knowledge they met numerous troublesome on report preparing, planning presentations with figures, tables and on line connect resources.

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# An Information hub with the easy accessibility for Sri Lanka

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## **Abstract**

This project is developed for E-service web application. This E-service web application contain all the critical contact points of interest like hospital, media, bank, embassy, travel so forth in Sri Lanka. The project aim was simple openness of the data. The project has given to be accessed with any devices like personal desktop Pc, laptop, tap, and smart phone. The present artifact was produced by utilizing many components include like filter search, API, mail, Google map, etc. In the API which is normal and the majority of the general population must be advantage that sort of API was utilized as a part of this web application. This component is add to make E-service web application was easy to understand.

While creating E- service Web application faced on numerous issues. And furthermore, study plentiful important areas of the project and also identified with advancement of present application. The primary go for building up this web application was Sri Lanka individuals need to get all the contact points of interest anyplace whenever. What's more, time likewise imperative so individuals need to get whatever the contact subtle elements they won't in the brief span. Prior to the advancement of the last curio Research is done one different edge and with the assistance of the exploration the components was added to the web application. Prior to the progression the model was made to that it will give some unmistakable thought regarding the outline and improvement and furthermore after the improvement test is wear and mistakes are revised and transfer to the server.

## **Keywords**

e-services, server, web application, API

## **Introduction**

The goal of this exploration is for the streams method for discovering data in Sri Lanka and pros and cons of it. This investigation demonstrates the cutting-edge technique for looking information. This additionally explores the innovation utilization of the current existing framework. The examination underpins reaching individuals in a crisis circumstance likewise explores the most well-known devices for getting to sites in the Sri Lanka. Prior to the plan the examination is done from multiple points of view like current related web application in Sri Lanka. What are highlights needing to include the e-service web application .and furthermore some Literature Review about ease of use of the web application and digital innovation and so on.

## **Experimental**

The essential piece of the artifact was the ease of use of web application. Ease of use is the vital for the web application. In the event that the web application isn't easy to use and furthermore it eases of use is extremely poor means client wont utilized the web application more than once. There are many individuals given a few rules for the

ease of use of the web application. Basically, Paul Andrew (2011) given the principle 10 Essential Web Application Usability Guidelines. He has say about the ease of use of web application ought to be client ready to utilize the web application basically, rapidly and naturally. The one of the primary basic was have a Consistent and Standardized UI like all the page ought to have one standard style and have great shading diagram for the web application and so on. Ease of use of web application key highlights was to control the client. Client ought not think about what to do next. Give clear rule for the client what to do next. Give Feedback – Both for User's Interacting and Progressing, Never Have Users Repeat Anything and Keep Signup Info to a Minimum, Always Have Default Values in Fields and Forms. Clarify How the Imputed Info Will Be Used, Don't Have any Reset or Mass-Delete Buttons, Have Clear and Explanatory Error and Success Messages, Include a Clear Visual Hierarchy and Navigation and so on (Andrew, 2011). Dana Frank (2013) clarify what is ease of use why it is vital for the web application advancement. He said the effective item needs to work for it clients it have to function admirably. And furthermore, he said the "Ease of use building" is the way toward recognizing clients' needs to guarantee an item can accomplish particular objectives successfully and proficiently, which brings about general fulfillment and achievement and furthermore ease of use is mix of many variables and hypothesis all can be accomplished by Intuitive Design as well as UI, Ease of learning, Efficiency of utilization, Memorability, Error anticipation, User Satisfaction and so forth. (Straight to the point, 2013)

The principal point of the task was to make a web application that contain all the Contact subtle elements in Sri Lanka and furthermore People can get to them anyplace whenever they need. create a contact search Web application was effectively created. What's more, that likewise contain all the contact points of interest clients can get to anyplace whenever. Another point was to make a web application with finish Responsive web application. This point likewise entire effectively and there are more than 15 pages every one of the pages are Responsive. e-service Web application was totally responsive and client can get to this web application on any gadget like advanced cell, portable PC, tablet, PC and so on. This is effectively for the Responsive Web application. The primary go for this undertaking is to get to all the contact data anyplace whenever. So the E-service web application was create. With the goal that individuals can get to this web application anyplace and whenever. And keeping in mind that building up this web application we have one point that is this web application ought to be easy to use. Every one of the general population need to profit by that. Scholarly inquiry resembled this sort of web application truly help full for the general population. In Sri Lanka the greater part of the general population utilizing the PDA and each one are begun to utilize the PC for their everyday life.so that we intend to run with the E-service Web application so individuals can get to whenever 365 day and 24 hours. What's more, it is anything but difficult to alter and refresh the data. And furthermore, we can track the address effortlessly. We give a basic arrangement that truly help full for the Sri Lanka individuals.

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# Virtual administrative support service system for XYZ Higher Education institute

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## **Abstract**

The educational system is the backbone of each country. Therefore, it is important to give a solid educational base for the young generation to certify that the development of Global citizens to make sure there is a bright future for all civilians. There are advanced technologies available today that can play a fundamental role in the justification of processes related to education to promote unity among students, lecturers, parents and college staffs.

The present project report contains brief explanation of the artifact initial steps, the designing technique been used with a research of current systems from the market, the development methodologies with the tools been used and actual purpose of the project. The objectives of the project are to be researched the open source tools to be developed the project in cost effective manner, and also to developed and integrates different user roles to ensure system works properly, Comprehensive test to be carried out the system performance to deploy the system whether it updates real-time. the report will clearly say that how latest technologies been involved with the evidence of code snippet, the same time how it works with the project and the justification of choosing such feature among others.

The current study was directed to monitor student's activities from administrative perspective, including attendance, module results and other curricular activities within the college. The application will be in the form of web. Which can be viewed and interact using any browser. The virtual administrative support service in responsive way. So, the application can be viewed using any device which internet enabled. Also, the application will have access to students, lecturers, administrative staffs to add, update and delete activities of students.

## **Keywords**

Administrative Support, Service, Open Source, Browser

## **Introduction**

The educational framework is the foundation of every nation. Thus, it is vital to give a strong instructive base for the young generation to ensure that the improvement of Global residents to ensure there is a brilliant future for all regular citizens. There are propelled advances accessible today that can assume a central part in the legitimization of procedures identified with training to advance solidarity among students, instructors, guardians and school staffs. The point of "Student Activity Management System" otherwise called SAMS is chosen after extensive variety of research in instructive backings. The project was exceptionally successful for the field of academic additionally the objective is to evacuate the boundaries of data transaction relevant parties in all aspects.

### **Experimental**

Student Attendance Monitoring System (SAMS) is being launched to provide a reliable, highly secured and well-organized way of monitoring and tracking student attendance. The project involves two parts in IT development. The first part is the development of SAMS within SAP Student Lifecycle Management (SLMC) also incorporation with Syllabus and scanning solution. Also, it includes an online attendance, noticing and document management of approval workflow. For absence approval and log record to attendance. Also, it capable of produce reports (Ncl.ac.uk, 2017). automation is one of principle innovation to supplant the human with a machine that can be performed all the more rapidly and ceaselessly. Via mechanizing the SMS archives that will equipped for store numerous vast stockpiling inside couple of circles. Interpretation pictures can be checked. Lessen an opportunity to expend of looking old transcripts from hours to seconds. In any case, the web application framework in a large portion of the schools are not automated and enlistment and administration staffs create transcripts and reports physically and school overseers utilize their accomplished learning however at times it might can lead them to mixed up approaches in preparing schedules (Aau, 2017). Sauer (1993) argued That some people see them as an expense, others as a solution, a control mechanism, a threat to the quality of working life or even as a technical problem in 1993. The various observations of the Information system resulted in a large difference in the IS definitions that are available. Luke (1995) describes an information system as an aid to control operations in an organization, while Laudon & Laudon (2002) defines it technically as a set of interrelated components that collect (or Reclaim, process, store and distribute information to support decision-making, coordination and Control in an organization. Information systems are considered a strategic resource Organization, that is, they have a significant impact on the key operations that control of the organization (Martin, 2017).

With regards to assessment of SAMS. The application is looking hitter with some minor downsides. As depicted before in the report the application is intended for three sorts of clients that Student, Lectures or Administration staff and Super Admin client. In any case, it can be stretched out to one more advance that "Parent Access". The motivation behind parent get to is, they can get to their child or little girl's execution utilizing their qualifications. For example, their participation, the scored they again for the modules and the occasions which sort out by the college. Along these lines, the guardians no compelling reason to hold up until the point that college send execution letters to them, at whatever point they require, they can access to the student's execution page from the application. Likewise, the parent who live abroad or the understudies who consider abroad, for them this will be exceptionally useful that giving them an entrance to their assessment site. The application interface resembles a site interface which planned responsively. It gives a place for supporters of subscribe. In this way, the email id of the administrator will get put away in the database and it can be utilized for future advertising reason. In the interface, there is somewhere else to change whole web interface shading with 3 shading choices. Expectation it will make clients more advantageous of utilizing the application. Likewise, this component can be improved even within the venture. That implies, after sign in to the application clients will get another view with symbols. At present there can't be change any hues on that page. In this way, it will be easier to use on the off chance that it stretched out up to that range. The final SAMS project planned and grew effectively after numerous troubles. Among the project improvement,

the author has experienced numerous new things about the web application and the devices. Likewise, author has redesigned his insight on MVC design and the advantages of framework. this project has worked with JavaScript, PHP and new HTML additionally been added. This project was delivered the coveted result of the author.

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# Performance oriented job portal for the job seekers and the job posters

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## **Abstract**

In the current scenario finding an occupation is not a simple assignment, it is even troublesome when finding a decent and reasonable employment for the capabilities and experience. Job seekers continually searching for an occupation that could satisfied their necessities. There are conceivable ways individuals can discover the employment opening by means of print media and advanced media, for example, classifieds, paper promotions, online networking systems, sites and so forth. Among these methods for discovering occupations online employment gateways gives more choices and offices to clients to locate the more appropriate occupation opening with most recent updates of them. This project artifact has been produced to enable job seekers to discover work opening and organizations to post their opportunities and locate the most suited representatives.

The objectives of current project are, Make a web application for connect who will discover an occupation and organizations to post their opportunities and different necessities of them, Categorize work opening into many order for effortlessly discover the employment from significant industry, Provide a looking, arranging and sifting offices for the clients to discover the things effectively finished the occupation entry, Use a database for the store and recover imperative information of clients and the store information that will be utilized for the web application purposes ,Allow client to enroll for the occupation gateway by means of site and login for the framework with their data. In this project author utilized secondary data for the research. it has been found existing assets, for example, online substance, yearly reports of separate organizations, journals identified with the exploration region and government periodicals. Introduced examination has dissected every one of the assets to discover what are the certainties ailing in those assets and what ought to be done to make the project to an impeccable arrangement. In this way author has been distinguish the client prerequisites through the assets that are been utilized as a part of the numerous assets.

## **Keywords**

Job seeker, client, web application, online portal, database, technology

## **Introduction**

In this study author has been utilized secondary technique for looks into. For this situation, creator has been found existing assets, for example, online substance, yearly reports of individual organizations, diary identified with the exploration range and government papers. author has dissected every one of the assets to discover what are the actualities ailing in those assets and what ought to be done to make the venture to an impeccable arrangement. Along these lines author has been distinguished the customer necessities through the information that are been utilized as a part of the numerous information and also has contemplated what are the distinct between the best positioned destinations



and normal locales and chose what ought to be incorporated to the task and what ought to be expelled from the undertaking to progress the study.

### ***Experimental***

In this study user intuitiveness is one of the real concern. Since other conventional techniques that are utilized to discover a vocation have not given much client intelligence to cooperate with its consumers. Since this task about web application, client connections is particularly critical. Adrian Stoica (2008) discusses significance of data social affair and methods for that should be possible. To give more noteworthy client encounter, data is particularly critical (Stoica, 2008). Subsequently, that gathered data broke down and can be give the answers for client's issues. Mike Gualtieri (2009) discusses what are the client desire when they visit to a site and furthermore he discusses how to expand the client encounter on the site by making it simple to utilize, stylishly satisfying, and candidly fulfilling (Gualtier, 2009). As the main factor, it is essential to make the application that can undoubtedly achieve the client undertakings rather making it hard to finish with no backings. As the second point, client does not have any desire to squander ordinarily on the play out an errand and on the off chance that they are in hustle that may prompt baffle on the whole application also in this way that is essential to facilitate the hardness of undertakings to influence client to can without much of a stretch perform them. In moreover however it is vital assemble the data numerous clients don't care to sort much thusly engineers needs to utilize diverse procedures, for example, brisk studies and so forth. Also, clients ought to have a good time utilizing the application by having wanted outcomes with speedy process rather irritating the clients by keep hold up them. Cutting edge clients have numerous choices on the off chance that they lose one, they have some subsequently, it is truly vital to make the web application that gives awesome client encounter as opposed to making complex assignments to be performed.

These days web customers are for the most part tend to utilize the cell phones to get to web with their bustling ways of life. Henceforth, web engineers should worry about the versatile advancements since following statics of Danyl Bosomworth (2015) says today there are number of portable clients than the PC or different gadgets (Bosomworth, 2015). In view of the statics can be reason that, as standard the utilization is expanding of cell phones, As Brian Honigman (2014) talked about the responsive site and local application, making an application is exorbitant and tedious however in execution astute its bit superior to the responsive site yet in the end there is no immense separate. (Honigman, 2014). present Framework will encourage for the activity searchers to discover the most reasonable occupations for them and furthermore organizations to post their opportunities and discover the most suited laborers for them. Nowadays we barely observing that individuals are attempting to discover a vocation over the paper notices or other printed media since its waste heaps of time and assets. Finding and applying work with printed papers and over static sites would be so harder than online employment entrances since it is giving more offices, for example, arranging, separating, ordering and so on. Customers may need to enroll into the system by means of site and after that they can login into the framework for their works. After effectively enrolled to the website, work searchers could be capable post their capabilities and experience to the web application and apply for the opening and so on. The organizations can post their opening for discover the competitors too. When work searchers and organizations enlisted with the framework they can keep refresh and deal with their points of interest,

as they need. General this study has been succeeded and author was abled meet the task turning points. the venture executed the each period of the undertaking in said periods however some surprising conditions caused to defer a few conveyances and a few upgrades of the framework likewise had been intrude on the underlying arrangement a bit. On account of the time compels had amid the task time frame there were a few changes must be done however at last project has been finished in given time allotment which is likewise offered understanding to deal with the works with fundamental modifications of plan.

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# Online Portal / Service for Player Profile Cricket

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## **Abstract**

The purpose is to explore a specific online service that is designed facilitate all cricket players with varied field of competence in finding opportunities to play in any part of the world they wish. This project was initialized to enlighten a new approach of getting all cricketers' career goals to be realized. Creating a job portal in the field of cricket will enrich a new approach of recruiting upcoming cricketers to play for different countries who are unable to obtain the place they deserve for the skills they stand. This is an opportunity where all players can reach all individuals throughout the world and achieve their purpose within a short period of time. This project also explores the concept of specialized online social services, KPI factors that can be considered in future sports related online services, the drawbacks of the applied approach and the results of approach, final outcome and application of a scalable model that is ascertained by this prototype.

## **Keywords**

Cricket players, online portal, MYSQL,

## **Introduction**

The project which was proposed to be created is where cricket players can enlist and get enrolled to have in any impact of the world. This is by making the ideal utilization of web innovation where cricket players can be enrolled in a flash. It is an "Online Portal for Player Profile Cricket" which can bring an immense measure of data and administrations to numerous clients in a powerful way. The current project was created with the thought of cricket condition. The players can be arranged into a few segments according to their aptitudes. Hence, the framework was produced for the clients to enter their abilities with the limitations made inside the framework where the data of the players would be shown in the scope of the classifications of the players they are gifted for. The players will be arranged on the premise of bowlers, batsman, allrounders and wicket guardians. These classes will be additionally arranged and show their data according to their classifications to facilitate the hunt of the kind of player important for the enrollment specialists for their group. Showing their data from the sort of players in various areas would likewise add to the clients to see them all together and make their work more convenient.

## **Experimental**

keeping in mind the end goal to build up the framework with such intricacy, important research techniques were made to accumulate the expected data to build up this framework. In the first place, perception was made of how cricketers play on the field which could accumulate there are diverse sorts of players in the base of hand sort, play style and the play rate for every player. To assemble more unmistakable data for each of these classes request was made with the speaker, companions and master individuals of cricket like mentors, and more data was accumulated. This is the place more certainties and data came into light. There are players, for example, batsman,

bowler, all-rounders and wicket keepers. They all can be separated to right hand and left hand. Every one of these classes can be additionally isolated on their individual play styles. For batsman they can be Strikers end and Non-strikers end, for bowlers they can be isolated into spinner and seamer. Additionally, investigates were made to inspect how figuring were made to see the way

Online Portal for Player Profile Cricket which players abilities are been ascertained. Examines were made all through the web and found the accompanying outcomes. To figure the batting abilities of a player negligibly the batting normal and strike rate will be inspected. Batting normal = Total number of runs scored/Total number of matches played Strike Rate = Runs/Balls confronted \* 100 Bowling aptitudes Bowling Average = Total number of wickets scored/Total number of matches played Economy = Runs scored from batsman/Number of balls knocked down some pins the estimations that are made for batting and rocking the bowling alley are both considered for all-rounders. For enrolling a capable wicket keeper, the accompanying elements will be considered; Matches Played, Caught, Stumped, Total expulsions. In this way, in view of the looks into made these data was used in building up the framework by executing important requirements. The accompanying are the underlying points of the framework which is been satisfied toward the finish of the present project of the antiquity. Providing the open door for individuals to be enlisted in a cricket group, A mean of help to develop their bearer in particular field which is cricket, A help for the general population to pick the required kind of player to their group, System to facilitate every one of the exercises and accomplish their points inside a brief timeframe & System to supplant manual work. Therefore, more open doors were emerged for individuals to be enlisted in a cricket group and furthermore it renders as a mean of help to develop their transporter in specific field. This framework bolsters the enrollment specialists to pick and kind of player they require to be procured onto their group. In all actuality this gateway will facilitate all exercises and work for the client to accomplish their point. This framework in the end replaces manual work to a completely robotized framework that completes the work and get enlisted in a moment. At last, the points of this gateway are very much accomplished lastly satisfy the scholarly inquiry which is "The means by which would the Portal effect on the general population". This gateway satisfies the necessities of the player and the enrollment specialist which at last fulfills the general population's prerequisite. The reason in which the framework is created is accomplished effectively.

When assembling all the information as showed over, every application is produced to fill an alternate need. Highlights and workplaces rendered to the client are differed. At the point when it's contrasted with this curio built up an alternate point of view is made. The fundamental point is the formation of prompt open door for the player to get enlisted which in the meantime let the scout to get the get the best player. Significant employments of advancements have been connected on to this entrance which facilitates the exercises to be performed. The procedure of enlistment satisfies the point of the undertaking where welcome which is sent for the player by the scout is made mindful to the client by messaging to the client.

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# Virtual shopping mall

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## **Abstract**

E-commerce offers many ways retailers reach consumers and conduct business without the need of a storefront. It's almost economic suicide for any retailer not to sell online. This doesn't mean all the E-commerce companies are consistently making money. The small as well as big companies have to face various challenges. The main objective of this research is to study, especially what are factors affecting the retailers to develop and maintain an online shop.

## **Keywords**

Ecommerce trends, Onlineshop, shopping mall

## **Introduction**

The development of information technology and Internet has led to rapidly progressed in e-commerce and online shopping, due to the convenience that they provide consumers. As a part of E-commerce activity, online-shopping has tremendous business opportunity and market potential. However, the problems of online-shopping at present have severely limited its development. E-commerce sales are growing, but many retailers are struggling to capitalize on their digital sales channels. Also, many startup companies are unable to effort the cost of the software development and maintenance. Also, building brand identity and getting traffic to online store are the most emotional heartache in a startup. Online shopping and e-Commerce are glorious invention which allows people to buy things from the comfort of their homes. But there are many problems that customers still have to face while shopping online. The problem is such that some small businesses are actively turning away from online trading. According to my research, more than a 35% of fashion and electronic retailers choose not to sell online due to concern about the costs of system maintenance, managing delivery and returns. The e-commerce business Kalahari, the advertising firm InMobi, and e-classified site Mocality retrenched, reorganized, or closed down. According to Rocket Internet's 2014 public listing, Jumia had \$28 million in net revenues, with \$32 million in losses.

In this study I investigate leading online retailers and startup companies from fashion and electronic sectors. I studied that, maintaining the online store is being a daunting task for them as they need to make the changes frequently on their online store in order to keep potential customers on their Web pages, and also battle with security is the biggest challenge for them, as shoppers are becoming more relaxed with providing their personal and credit card information. Due to this reason, 70% of companies are spending money over than sales on their online store maintenance.

This research study shows that, they need a system that allows retailers to register themselves and sell their merchandise. This system should help retailers to automate the sales process and dramatically improve their sales and performance and also

improve customer satisfaction. There are many marketplaces like Amazon and eBay seem to be a creation of mutual benefit. On closer inspection, the mutual benefits remain, but the reality is more nuanced. A marketplace strategy may be a boon for some retailers and a bust for others. There are a lot of variables that need to be taken into consideration, including the type of products they sell, the intensity of competition in their category, marketplace fees and restrictions, and so on. When it comes to open source e-commerce solutions such as Magento, PrestaShop, OpenCart and etc, each of them comes with their own set of advantages and disadvantages, because they are all made with a different user in mind. The retailer will have to invest their time and funds to do the customisation or they must be able to pay a third party for support, but that again creates a hidden cost and security issues.

So they need a platform which brings together the various retail outlets and the public to single point for facilitating trade. The retailers must be able to register with a system and customizes a web page and displays their merchandise. Customers place selected products into a virtual shopping cart and provide payment details. Once the payment has been received, the products should be dispatched to the customer.

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# An Intelligent Recruitment System

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## **Abstract**

The growth of online recruitment has spurred the need for more effective automated systems. On the one hand, getting a good job is very intricate task for any job seekers. On the other hand, companies are unable to acquire intelligent and qualified employees. Therefore, building perfect recruitment system is not only an important part of the enterprise to get the resource, but also the key to support enterprise strategy implementation. However, the available software in the market are not intelligent based, and to make privacy, security and robustness, the software should made with the application of expert system. In this proposed study, an attempt has been made for finding the solution for job seekers and the companies with the application of expert systems. In this proposed research work, the aim is to develop a real environment application that can assists in recruitment and selection process in a company.

## **Keywords**

Recruitment System, Process Tracking System, Intelligent e-recruitment, Screening candidates

## **Introduction**

The job market has changed considerably over the last fifty years. Job seekers are requested to have more specialized skills and a greater amount of knowledge in their fields. The recruitment process has been severely affected by these changes. On the one hand, Finding the right candidate with the right skills, experience, personality and track record are becoming a daunting task to the employers. On the other hand, Job seekers who are qualified for the job sometimes get eliminated before human eyes even perused on their resume. According to human resources firm The Adler Group, many human resources departments have difficulties with the hiring manager and other recruitment personnel. Often, the person in charge of designing job descriptions or making the final decision about who is hired puts in insufficient effort to find the most qualified candidate, picks a candidate based upon personal characteristics rather than professional competence or fails to use effective interview tactics. Candidate quality is almost always an issue, particularly in a changing economy where new technologies, awareness of global economics and increasing educational requirements are in high demand. High-quality candidates are quickly snapped up, and it can be difficult to lure them to a new job, particularly if the job doesn't have a topnotch benefits package. When the hiring process itself takes a long time, the best candidates are sometimes offered -- and opt to take -- a job from another firm. For this reason, some HR departments opt to play a more direct role in recruitment.

As a way of reducing hiring costs and reaching a wider variety of qualified candidates, many companies have turned to online recruitment such as careerbuilder.com, indeed.com, monster.com, jobsdb.com, linkedin.com and etc as a resource for filling open positions. Online recruiting allows an employer to advertise a vacant position quickly, and often inexpensively. However, some disadvantages such as high volume of responses and logistical problems are also be associated with this recruiting method.

The survey on Internet for job seeking was done by Pew Research Center on June 10 – July 12, 2015 among 2001 adults in U.S aged 18 and above. This research justifies the need of online resource in job searching. There are many resources available for job search these days like online resource, connection with close friends and family, professional connection, agencies, advertisement in print publications, job fair, conference and other events. The job seekers mostly used four resources out of the above seven for their job search and 79% of job seekers used online resource as one among them. When they asked to mention the most important resource, 34% of them (roughly one – third) indicates the online resources and information. Another important decision made from the research is the people who have more education use the internet than the less educated people. In addition to that, the job seekers used employment agencies (32%), publication advertisement (32%), and job fairs and other events (28%). The number of job seekers who search for jobs through online increased in the past 10 years in U.S. 26% of adults including retired used the internet in 2005 and 54% of adults used the internet in 2015. 90% of the current job seekers are using the internet to search jobs and 84% of people applied for jobs through online. According to the survey, the need for the online resources for job search and apply increasing rapidly these days. Therefore, creating a system for recruiting is very important. (Pew Research Center, 2015 November). Glassdoor survey conducted an online survey among employees and It summarizes that, the job seekers use the online job portals frequently such as they search vacancies every day (7%), 3days a week (42%), once a week (42%). Approximately 91% of job seekers used to search once a week and 85% of the employers spend more time to select eligible candidates via online job portals and 40% of the employers do not like to get more candidates and to separate the eligible candidates from all the candidates.

This research study shows that, everyone need a platform that combines both the application form features and the recruitment process along with social media and company website integration and attract the right candidate, the selection process should be based on credible criteria to automate the recruitment process of an organization. A system should be designed to target the human resource department of an organization in order to simplify the massive process of data extraction from a large number of resumes, on the other hand to reduce the cost and time which have to be spent on the interview process and to allocate most suitable interviewers from the organization for each interviews by analyzing the past data. Information extraction must be used in-order to retrieve data from resumes as well as from the cover letters. An ontology map must be created to analyze and categorized the extracted keywords through this system. Then the resumes should be sorted and prioritized according to the requirements of the organization. Hence, we believe that this system will enhance the efficiency and effectiveness of the recruitment process of any organization.

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## The benefits of Virtualized Internet Infrastructure Implementation for an Academic Institute

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### **Abstract**

The current investigation is a system and server based framework usage in a virtualized domain, which is to be utilized as an imaginative and intelligent learning instrument. It can be considered as a venture that will sensibly utilize the business principles in a scholarly situation so as to make it less demanding for the scholastics to exhibit and get the direct involvement with web servers in a nonproduction domain.

The objectives of the project are Research on existing comparative frameworks, Identify the most appropriate virtualization innovation for the situation, Design the virtualization condition Create and arrange virtual machines, install working frameworks and instruments on virtual machines and Test the whole virtualization condition. a survey was conducted with sixty-five understudies who are presently following higher national diploma to recognize that if there is a requirement for more down to earth sessions/an apparatus for exhibit and every one of the students understood that they require more reasonable. The final artifact is a completely useful virtualized framework execution which can be utilized as an observational and intelligent learning instrument. It for the most part planned for the students and lecturers who are getting the hang of/showing Network Technologies, Internet Server Management and IT Virtualization which imitates how a customer PC speak with Web servers, DNS servers, when it is getting to the web. The copying framework has been made using the propelled arrange setup choices accessible in VMWare and totally tried utilizing Wireshark organize convention dissecting apparatus.

### **Keywords**

Students, virtualization, domain, server, system, virtual machines

### **Introduction**

With the current sprout of Information and Communication Sector in Sri Lanka, lion's share of the students who have completed their secondary education are choosing the IT related study programs to seek after their higher education. Not just that, with the current presentation of Technology Stream for G.C.E. advanced Level students, the legislature of Sri Lanka additionally is elevating and urging students to take after their optional training in IT stream, making a higher interest for IT/Computer Science courses offered by state colleges and different private scholastic organizations.

### **Experimental**

The aim of the project is set to design and implement virtualized internet infrastructure for an academic institute as an observational tool. The initial idea and the selection of the project was based on the practical experience which has been confirmed by few interviews from the lecturers and a short survey was conducted for the selected 61 HND students. Virtualization refers to the separation of service requests from the underlying

physical system (VMware, Inc, 2007). In the standard x86 and Unix/RISC systems, it is achieved either using hosted architecture or hypervisor architecture. In the hosted architecture, virtual machines containing an operating system termed guest OS are running top of standard operating system called as host OS. On the other hand, in the hypervisor or bare-metal architecture, virtualization layer is installed on „clean□ x86 system without having an operating system in between. Supporting VMware’s definition, in his book Bernard (2007) describes virtualization as the concept in which access to a hardware system is coordinated so multiple operating systems called guest operating systems can run without having the knowledge of other guest operating systems which are running on the same host system. Here the hosted architecture is referred as the hardware emulation virtualization. Hardware emulation or the hosted virtualization allows you to simply run virtual machine on top of an operating system and supports the broadest range of hardware configurations (VMware, Inc, 2007). Since this permits use native hardware platform for computations in the virtual machines, most of the commercial virtualization software like VMware Workstation use hardware emulation technique on x 86 platforms to make it efficient and the use of viable and practical (Susanta, 2005). VMware workstation is a desktop virtualization technology offered by VMware which runs on x64 based computers. It was initially released on 1999 which indicates that it has stable functionality and proven track record. It can be installed on both Windows and Linux based host systems. Even though it is a commercial version, it has more customization options, especially when it comes to network configuration. Also, it has the support for wide range of guest operating systems, including almost all versions of Windows, Linux distributions and other common operating systems. (VMware Inc., 2015). Oracle virtual box is a hypervisor developed by Oracle Corporation for x86 based systems. Oracle virtual box is a hypervisor developed by Oracle Corporation for x86 based systems. It can be installed on almost any operation system including Windows, Linux, OS X and it also have the support for Windows, Linux, OS X based guest operating systems. The main benefit of the software/hypervisor is that it is an open source freeware (Oracle, 2015).

The final artefact is a fully functional virtualized system implementation which can be used as an observational and interactive learning tool. It mainly intended for the students and lecturers who are learning/teaching Network Technologies, Internet Server Management and IT Virtualization which emulates how a client PC communicate with Web servers, DNS servers, when it is accessing the internet. The emulation system has been created utilizing the advanced network configuration options available in VMWare and completely tested using Wireshark network protocol analyzing tool. The objective of the project is achieved by designing and implementing the virtualized internet infrastructure (Web server and DNS server) in hosted virtualization software named VMware Workstation 12 Pro. This was easy to set up inside the academic environment as it was not required any special hardware or a server. The virtualization environment was set up on a desktop computer which had the Windows 7 64-bit edition as its operating system. It has been identified that hosted or the hardware emulation virtualization is the most suitable for the scenario. The researcher has identified there are free few commercial, hosted virtualization software available, including VMware Workstation and Oracle VM VirtualBox as the reliable candidates. Out of that, VMware Workstation 12 Pro was selected as the most suitable virtualization software, considering the fact that it and much more support for network configurations, which was critical

consideration. the website that has been hosted on the web server was accessed using the web browser of the client computer. it was verified that both DNS server and the Web server is functioning properly in the virtualization environment.

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# ‘SMART GRID’ Electricity & Water Meter Management System Using IOT Technology

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## **Abstract**

Saving electricity and water becomes an utmost important and isn't free. Wasting electricity and water is the same as wasting money. Ceylon Electricity Board introduces analog meters in earlier period, and at hand set up digital meters and National Water Supply and Drainage Board used analog meter since its existence, and spends a vast expense in monthly meter reading and billing. Meter readers are assigned to cover a specific area to read the meter values and provide the previous month bill to the consumers. Each authority was assigned their own officers to read the meter values. One hand it increases the usage of the electricity and water, in the other hand it increases the expenses of reading, managing and monitoring the process. European countries already use the digital meter system with SMS technology, the proposed solution well analyse and design to suite the Sri Lankan context. Unfortunately, existing system are not benefited to condense the electricity and water consumption from the consumer aspect as well to minimize the overhead expenses. Consumer are not aware the present usage of the electricity and water meter to reduce/ balance the consumption in terms of values and money. Meter readers are experiencing sophisticated issues when they reach the domestic consumers such as domestic animals, unavailability of the occupants, influences, and inaccurate reading which will lead to a financial lost to the consumer as well to the authority. A solution will be feasible;

- If the consumer can track the present usage of the electricity and the water in terms of value and money?
- If web/mobile portal is available for consumers to analyse the consumption history?
- If a single person was utilized with a wireless device which can gather the electricity and water consumption reading without entering to the premises?
- If the authority can connect and disconnect the electricity over the network

## **Keywords**

Ultrasonic, Microcontroller, Solenoid, Relay, LCD Display, GSM, Radio Frequency, IOT (Internet of things), CEB (Ceylon Electricity Board), NWSDB (National Water Supply and Drainage Board)/ Water Board

## **Introduction**

Ceylon Electricity Board and National Water Supply and Drainage Board introduces analog meters in earlier period and at hand CEB set up digital meters, where it not benefits to condense the usage from the consumer aspect. Meantime CEB and Water Board spends monthly for electricity and water meter reading and billing process. Meter Readers are assigned to cover a specific location to read the electricity meters and to hand over the previous month bill to the consumers. Once the meter reader collects the



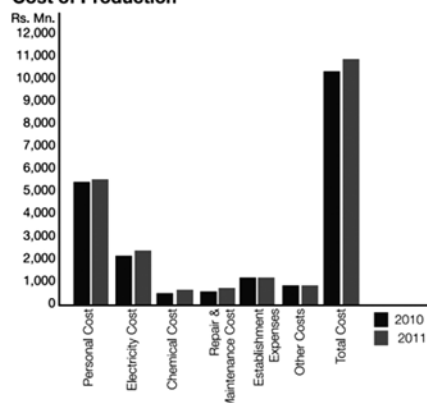
electricity usage information for the consumers, details are given to the regional offices to prepare the billing for last month usage. There is an annual 4-5% growth on new electricity connection.

Category	Number of Customers as at				Annual Growth %
	2013	2014	2015	2016	
Domestic	4,589,929	4,768,229	5,648,132	5,964,194	5.6%

Source: CEB Annual Report 2014/16

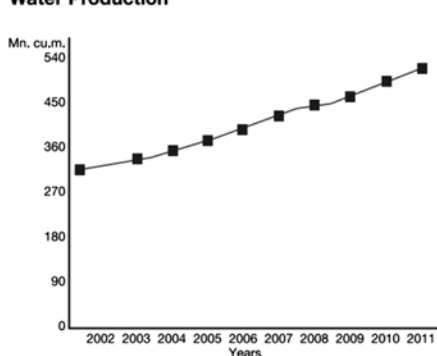
The highest energy consumption was by the consumers in the category 'Domestic and Religious Purpose' accounting for about 32.4% of the total consumption. This was followed by the industrial sector which accounted for 31.6% of the total consumption. The electricity consumption by consumers in the general purpose category was however only 19.8% of the total consumption indicating an annual growth of 6.6%.

Cost of Production



Source: NWSDB Annual Report 2011

Water Production



Source: NWSDB Annual Report 2011

The total quantity of drinking water produced in 2011 was 490 million cu.m.

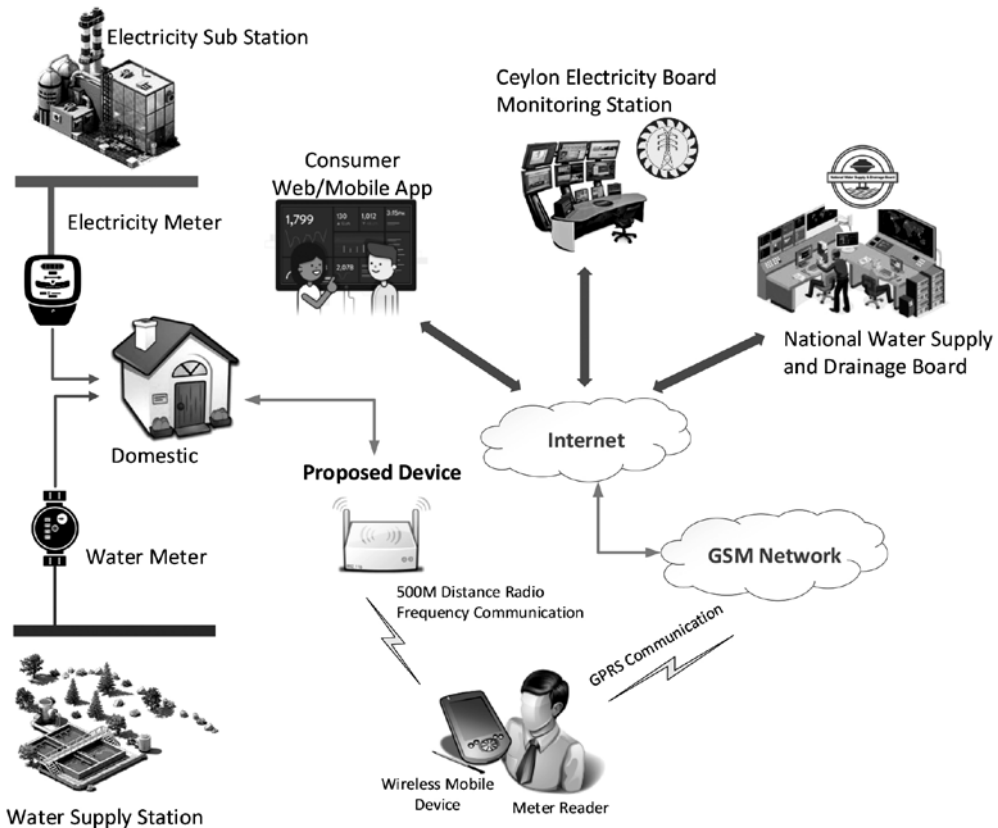
### Present system and drawbacks

- Meter Authorities receive inaccurate information.
- Employs huge manpower to manage the system to read meter values for electricity meter and water meter separately.
- Electricity and Water meter connection and disconnection on due payment are done by physically attended.
- Consumers receive billing for previous month.
- Consumers are not updated with their present electricity usage to eliminate or to balance the usage.
- Finding difficulties on converting the meter usage units into financial values.



## Recommended Solutions

## System Overview Diagram

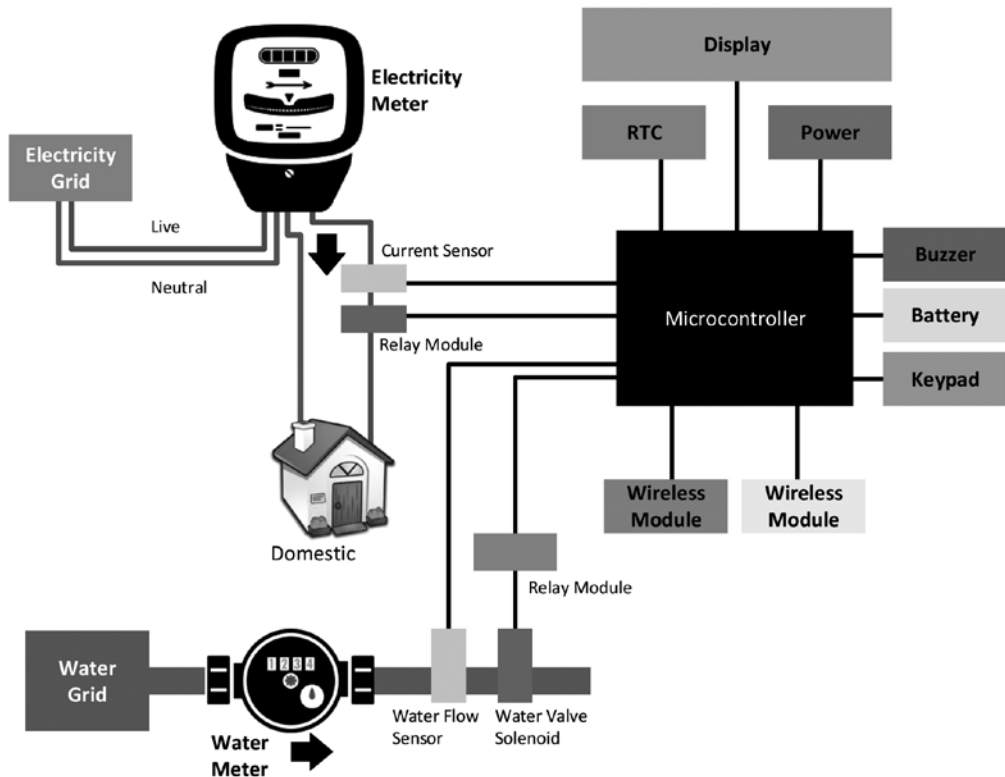


In the proposed system electricity and water consumption values will be read by a single officer with a distance of 500m without entering the premises or disturbing the tenancy. Further in a case of due in payments, connecting and disconnecting the meter can be done automatically without damaging the existing system. Replacing the existing meters are not concern in this system. Instead of, developing a cost effective electronic device to integrate both existing electricity and water meter.

Officer connects to the domestic system using a handheld system specially designed for this purpose. Each domestic unit derives with an encrypted key to connect. Handheld device can read the meter values and can communicate the details to the authorities using GPRS and IOT (Internet of Things) technology. Consumers can check their usage, status details etc.; through an IOT Dashboard and also directly with the domestic system. The domestic system will show the up-to-date usage values of electricity and water and also the financial values of usage.

Further possible to update the firmware of the proposed device and the tariff plans over the air.

## Block Diagram



### **Advantage of the proposed system**

- Centralized solution to manage utility meters with less manpower.
- Easy to manage the Automated Meter without physically visit the site.
- Industries can have their own meters to control their energy usage within departments.
- Consumers benefited and update with present electricity unit use and financial value.
- On time billing and collection.

### **Conclusions**

Most of existing systems and technologies they are adept were reluctant to address the issues. The proposed solution is an answer for all the above drawbacks addressed.

The proposed system can be extended to read the values and control from a central point directly instead of the meter reader. However, the meter reader can visit the domestic if suspicious of meter tampering.

The following are found to be conclusions for the complicated issue of existing systems drawbacks.

- Using existing meter.
- Developing a low-cost solution.
- Should be able to get the up-to-date usage values in units and cost.
- Meter readers comfortability.
- On time billing.
- Reduce the manpower and maintenance cost.
- Reduce the repetitive movements and make the system more user-friendly.

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# **‘USE IT OR WASTE IT’ Municipal Solid Waste Collection System Using IOT Technology**

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## **Abstract**

Municipal Solid Waste Management is a very serious topic in Sri Lanka for last few years. There are numerous incidents have been taken place in the past even cause human lost. Therefore, solid waste was considered as an urban environmental issue. Growth of the population simultaneously increase the consumption which will lead to large number of disposals. Internet of Thing is well accepted and rapidly growing as a technology. IOT is widely used in SMART CITY concepts. Merging the “SMART BIN” with IOT technology will establish an effective network. Which will lead to reduce the expenditure behind the collection and introduce an efficient Municipal Solid Waste Collection System.

## **Keywords**

Ultrasonic, Microcontroller, Motion Sensor, Servo Motor, Solenoid, Relay, LCD Display, GSM, Radio Frequency, IOT (Internet of things),

## **Introduction**

‘WASTE is a valuable resource at a wrong place, in a wrong form or in a wrong medium’

In Sri Lanka per capita waste generation in the country ranges between 0.4-0.85 kg. The total waste generation is estimated as 6400 tons/day whereas waste collection is only about 3740 tons/day. MSW collection being an important to maintain the public health in cities around the country. The amount of MSW collected varies widely by region and income level; collection within cities can also differ greatly such as in western province 1873 tons/day solid waste was collected.

## **Present situation and drawbacks**

Daily average receiving to Meethotamulla dump site is around 750 – 800 tons/day while Karadiyana received 400- 450 tons/day. Around 250- 300 tons per day treated as composting and the rest of the garbage in western provinces are dumped in unauthorized places.

In Sri Lanka curbside pick-up, house-to-house, community bins collection methods are widely used, which was not effective and efficient rather increase expenditures and need more manpower and resources for municipal or urban Councils. Waste collection bins/community bins are with different form factors, styles and designs. These lead the collections inefficient such as cleanliness, friendliness, protection etc.

Recycling household waste material collected by local councils is running into various problems due to poor planning, improper collection mechanisms and lack of public cooperation. (Times, 2016). One of the main problems is that recyclable items are not separated properly at the household level, Local authorities are responsible for garbage collection countrywide, but added that until waste matter is properly separated the councils are unable to meet the targets. Bio degradable food items should be collected separately and paper and cardboard in a different bin, but the garbage collectors dump everything together in the tractors. The public charge that failure by local councils to implement effective garbage collection systems and recycling methods has resulted in tons of garbage being piled up at dumping sites.

*Karadiyana Waste Management Facility.*



The collection is then rejected and sent to landfill sites. They also cited rising labour costs for the failure of recycling programmes. Seven steps of waste management– managing the waste at the place of origin, taking the garbage from the places of origin, cleaning up of public places, stopping the usage of open garbage bins, streamlining garbage transportation, using garbage as a resource and streamlining the garbage dumping sites.

Difficulties of maintain several waste bins for each category, since space limitation and nature of the building etc.; Further of present house to house schedule waste collection method, people are frustrated. If household waste cannot handover on the schedule, should kept until the next collection will cause unhealthy living and pay for the collectors will lead people to dispose the waste in an illegal manner.

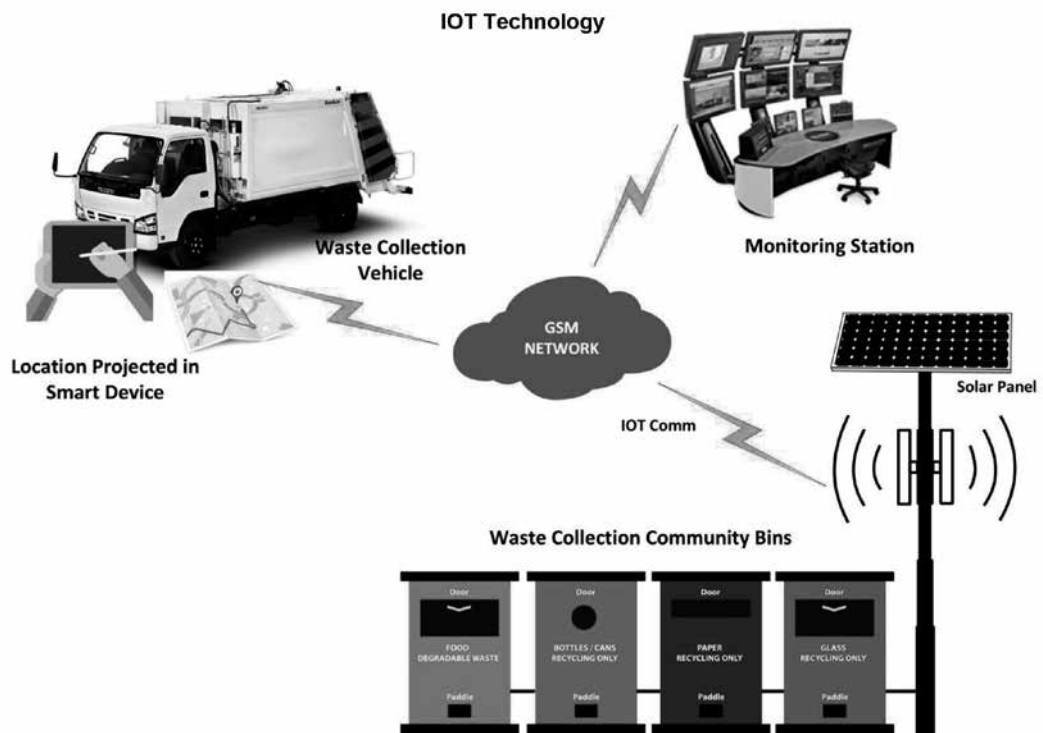


Different living environment such as housing scheme, tall apartment are also disturbing factors for collection. Household wastes are gathered in un biodegradable (grocery) bags not willing to spend extra sum on purchasing garbage bags. And the garbage collection bags are color black.

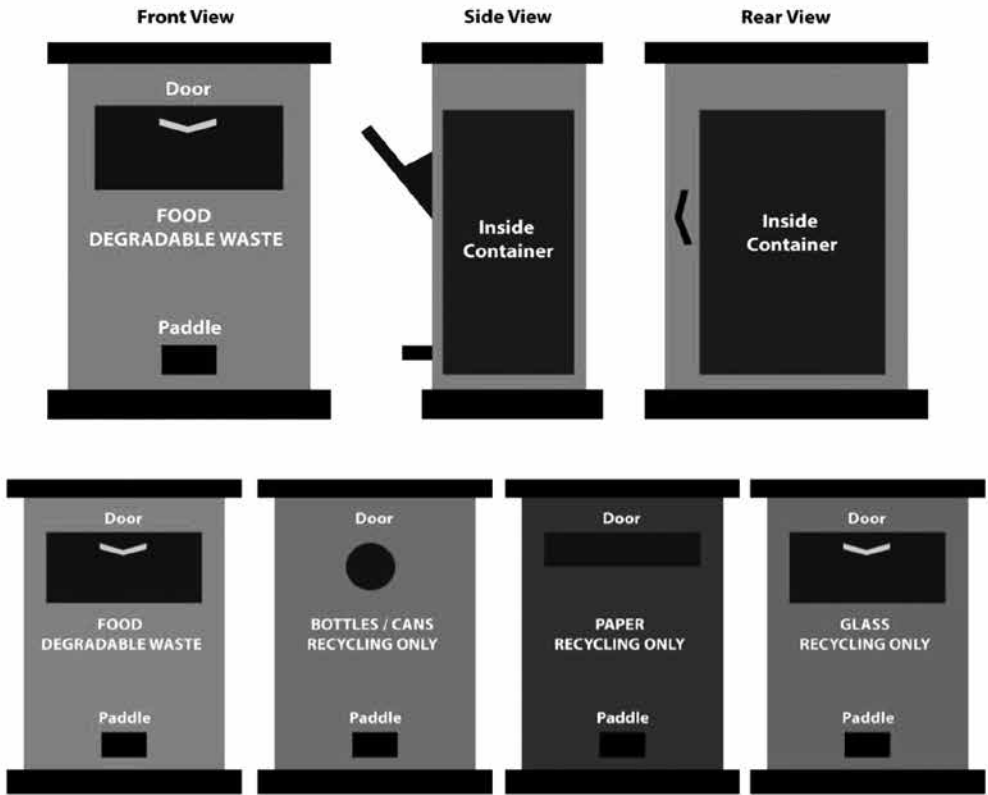
Collectors, they dump along with the bags to make their collection easy and also, they couldn't not identify the contents because of the color of the bags. Further the waste is separately handed over collectors they dump all to ether in one single truck.

### ***Proposed Solutions***

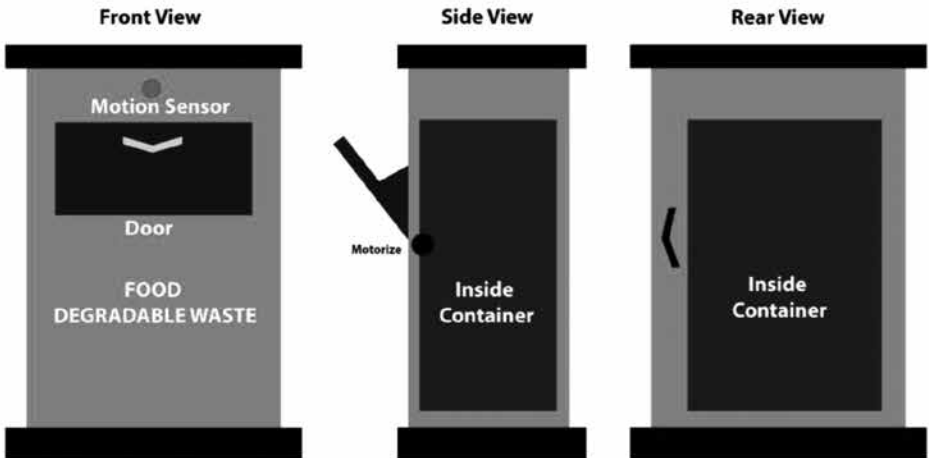
- Introduce community bins instead of door to door collection
- Should place sufficient amounts of bins.
- Propose an appropriate design for bin to cater local issues "SMART BIN"
- Reduce the cost, manpower and increase the efficiency on waste collection by introducing "IOT Technology"
- Increasing the awareness programmes on waste management for communities and waste collectors
- Introduce the need of the Waste Management into the school's curriculum
- Identify different mechanism based on the area such as apartment, schemes etc.;
- Introducing new rules and regulations not only for community, also to the collectors.
- Establish a recycle plant to produce biodegradable garbage bags and bins and supply transparent with standard color codes for free/half of the price with different sizes.

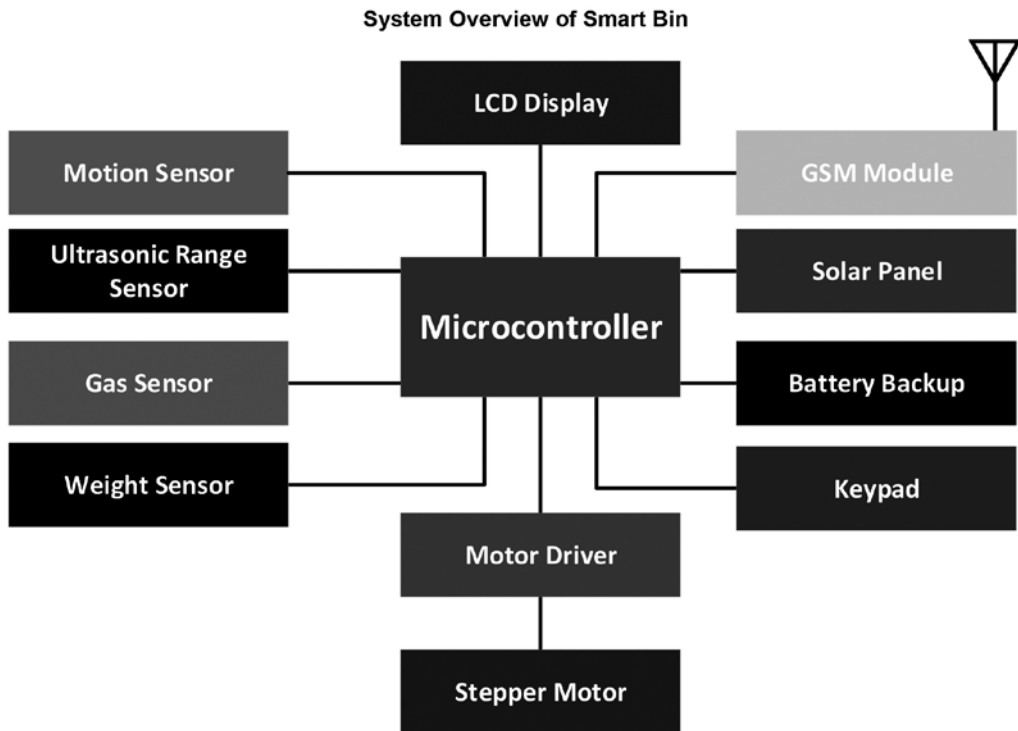


Community Bin Design



Smart Community Bin





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# Impact of urban and rural identity of undergraduates in University of Sri Jayewardenepura on learning English as a second language

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## **Abstract**

Second language learning has become a socially valued vital learning process since it has the influencing potential to form, manipulate and change the social individual identities towards the positive recognition. In Sri Lankan social system English functions as the second or target language. Through a gradual social transformation English has become the most prestigious language in the society and the competence in English is required as the most obligatory qualification for a person to be recognized in the society. The research has focused on identifying and analysing how and to which extent the social factors such as cultural diversities, disparities between the social classes and specifically the rural and urban identities of the individuals influence on learning English as the second language. Within the data collection process both the primary and secondary data collection methods have been utilized and within the primary data collection method a questionnaire has been designed and given to a sample group of 50 respondents from University of Sri Jayewardenepura. Through this analytical sociolinguistic research the relationship between identity and learning English as a second language, the impact that identity practices on person's capability and accessibility to the English language learning process have been taken into consideration. Accordingly it has been identified that English language competency level of urban respondents is higher than rural respondents and the rural identity of the individuals has an influential and discouraging impact on their English language learning process. A higher percentage of individuals believe and accept the vitality of English in higher education and it has been recognized as a supportive channel which enhances Individuals' capabilities and identities in achieving their future goals despite the existing social discriminations. In observing the suggestions and recommendations the major consideration has been given to the enhancement of the students' awareness in relation to the importance of English language, making them academically take part in the English speaking world, providing opportunities for them to become familiar with English language and use it practically and facilitating them with the necessary materials and resources.

## **Keywords**

English, Urban and rural Identity, Social discrimination, Social status, Second Language,

## **Introduction**

Language and human beings have been maintaining an integrated relationship since communication and social relationships appear as pivotal and indispensable within the second socialization process where the transformation of the human beings to social beings occurs. The role of language has developed an effect on gradual social evolution

enabling the social beings to build social relationships, societal groups and social life through the forms of communication.

Second language learning has become a socially valued vital learning process since it has the influencing potential to form, manipulate and change the social individual identities towards the positive recognition. In examining the contemporary social milieu and the continuously changing circumstances it can be observed that the identity of a person necessarily has to be accepted by the society or the domineering social order if the individual needs to ascend the social ladder towards the personal accomplishments. Similarly the relationship between an individual and second language learning has been moulded and influenced through the authoritative roles played by those social factors thus developing motivation in certain groups of learners by facilitating them with the necessary requirements and freedom while excluding another group from their right and opportunity to learn second language rendering them to stay exposed to the marginalization.

### ***Methodology***

Since the study focuses on comprehensively analysing the impact of gender and identity on second language learning, a questionnaire which is comprised of both close ended and open ended has been designed to obtain data from the sample group. In the process of deciding the sample groups, it has been decided to select 50 undergraduates representing Faculty of Humanities and Social Sciences and they have participated for the survey by providing answers for the questionnaire.

Within secondary data collection process the information has been gathered and analysed discursively based on the selected secondary sources of information and consequently the researches which has been carried out on the subject field of gender, identity and second language learning, scholarly articles and books have been referred.

### ***Discussion***

Society employs language as a measuring device to evaluate the validity of an identity of a person within specific social strata with the objective of accepting or negating one's existence within the community. Consequently learners' identity and the social context within which they engage in learning language have the influential power to change the attitudes of the learners towards positive or the negative ends thus evolving discrepancies pertaining to the relationships between the learners of different levels. Diversities of the social, cultural and the demographic and geographical factors of the learners possess a high propensity and disposition to practise a direct impact on the individuals' accessibility to learn, improve and use second language.

Pursuing through these geographical differences of the respondents the contrasting characteristics; rural and urban are accorded a specific focus since that disparity plays a dominant role in designing the boundaries which allow certain individuals to access the privileges and comfort zones while repudiating and excluding another set of individuals from the dominant group who is facilitated with the social advantages and recognition.

Accordingly the urban and rural disparity which exists within Sri Lankan social sphere has become a root cause and a crucial factor in evolving a discriminating gap between



the school English education procedures provided in rural social sphere and urban social sphere. As the study reveals the school English education in rural context is not satisfactory and it doesn't provide students with Standard English education whereas in contrary to that English education in urban school system has been observed as satisfactory and having a standard level.

In identifying the underlying demotivational factors that discourage students in rural areas, lack of talented teachers, the method of teaching, lack of resources and limited time period can be brought to light. Another interesting factor that has been found with regard to urban school atmosphere is even they stated that the resources and time period allocated for English language learning is inadequate. Consequently in looking at both the learning atmospheres it can be generalized that the rural identity of the individuals has an influential and discouraging impact on their English language learning process.

### **Conclusion**

In observing the suggestions and recommendations that the individuals have brought forward pertaining to improving the motivation of the students towards learning English, the major consideration has been given to the enhancement of the students' awareness in relation to the importance of English language, making them academically take part in the English speaking world, providing opportunities for them to become familiar with English language and use it practically and facilitating them with the necessary materials and resources. Thus at the end of the research journey which has focused on critically analysing the impact of rural and urban identity on learning English as a second language specifically within tertiary level education, it has been observed that identity of a person practices a direct and imperative influence on his or her English language learning process.

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School of  
**Engineering** 

# Comparison of design finding for steel portal frame amongst British and Euro code

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## **Abstract**

Saving electricity and water becomes an utmost important and isn't free. Wasting There are various types of frames in the steel construction industry. Among them portal frames are widely used and steel is usually preferred. Steel is usually preferred as they are relatively light, long lasting, durable, simple quickly erect and enables designing with an attractive appearance. The study is about identifying the difference between BS 5950 and EC3 portal frame used plastic analysis. This design carried out plastic analysis The aim of this research project is to design and carry out the structural analysis of a steel portal frame according to BS 5950-1:2000 and EN 1993-1-1:2005 and produce safe economic design and original design of portal frame is modified, analysed, then proposed, strength deflection of the portal frame is checked. Design was completed to allow for the most economic use of material and methods of construction. This research is to ensure that the steel portal framed shed is build safety and economically in accordance the BS codes and EC3 using manual calculation and computer programs.

It can be clearly understood the difference from the results. Euro code is more advantageous, better improvements and has a long term benefit compared to BS 5950. According to results, predicted material cost saving up to 2.85% more than BS 5950 Important part of design involves the section classification of steel. The weight of the portal frame and purlin weight in terms of EC3 is lighter than the BS 5950. Economy percentage saving using EC3 was higher than BS 5950 and EC3. Hence, EC3 design was much better for steel portal frame in economic and safety perspective.

## **Keywords**

Eurocode , BS 5950, SAP, EC

## **Introduction**

Portal frames usually have great stability against lateral and vertical actions and very rigid in plane with moment resisting connections (Davidson and Owens, 2012). Portal frames can span 15 to 45 meters without support. For portal frame, steel is most preferable material because of long span, light weight and durable. Advantages of portal frames are wide span without supports, allow a big area of free floor space, more economical than truss frame.

The aim of this research project is to design and carry out the structural analysis of a steel portal frame according BS 5950-1:2000 and EN 1993-1-1:2005. The structure has been modelled in the structural design analyse program Autodesk Robot analysis structural program.



The main scope of this research is to design and structural analyse a steel portal frame using manual calculation and using computer programs Auto Robot structural analysis software. Both designs will be compared and analysed, finding a suitable solution from those designs.

Portal frame that's going to be analysed 6m height and 30m single span portal frame in this research and bay width of this frame is 6m. Compare the two types of codes for design portal frame is complicated and takes a lot of time to analyse. In manual calculation there are too many equations have to solve finding results. The main objective of the research Have a better understanding of the steel portal frame design, Identify the differences between the BS 5950 and Euro code portal frames, Analyze the three different structural analysis software and Design a portal frame that is cost effective and safe. The Outcomes of the research project is Develop and study of portal frame design of various methods. And After evaluation of designs, find a suitable designing procedure considering various factors. In this research steel portal frame building has been designed with aid of Autodesk robot. This is a need to design finite members for this portal frames. In order to carry and this process they are regulations are followed to design in BS5950, EC3.

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Salter, P., (1999). Design of Single-Span Steel Portal Frames. 1st Edition. The Steel Construction Institute

# **A Suitable Engineering Technique to Strengthen the Unreinforced Masonry Walls for the Flood Load**

V Sheron and ACM Suhothi

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## **Abstract**

The unreinforced masonry elements are widely used for the construction of buildings because of its higher durability, lower cost, ease of construction, lesser skilled labor requirement, lesser maintenance requirement, eco-friendly and so on. They are still standing even though they were not designed considering the natural disasters such as storm surges, flood events, earthquakes etc. The idea has been arisen to do this research as some of the URM buildings were collapsed due to the flooding which affects the eastern part of Sri Lanka in 2011, because of their incapability to withstand additional hydrostatic and dynamic loads generated due to the flooding. However, In Sri Lanka there are very few amount of URM buildings were designed and constructed in accordance with Code of practice of Masonry (BS 5628) with desired quality and high supervision control. Due to the absence of the data of this research, a properly designed masonry wall to British Standard was selected and it was analyzed using SAP 2000 by assigning designed flood load for ULS. The findings of the analysis show that a properly designed masonry wall will collapse due to the additional flood load. So retrofitting of the wall with an additional material was initially adopted with 5 mm and 10 mm thick steel plates, and it was kept back to the wall and analyzed. However, the results were not in a satisfactory level. The damping system was so introduced and a considerable reduction in the values which were close to the designed values was observed. The most suitable retrofitting system which is proposing is .a damping system with the construction of wetland at the site.

## **Keywords**

Code of Practices, Damping, Retrofitting, SAP 2000, Ultimate Limit State (ULS), Unreinforced Masonry (URM).

## **Introduction**

Currently country like Sri Lanka frequently gets into the heavy rainfall, consequently the places near to the river begins getting flooded. There are many places in Sri Lanka, because of the poorly designed drainage system, in which the flooded water retains for a long time resulting in on the failure of masonry structures. For instance, due to “2011 Historical flooding that affected the Eastern” lot of unreinforced masonry structures were damaged. As shown in Figure 1 the area which are highlighted in Red color indicates the flood inundation. So in those areas there is more chance for the failure of URM buildings due to the additional loads induced by flood. Consequently, this is what exactly happened in the eastern province in 2011. So in future, this issue has to be considered in newly constructing buildings as well as the behavior of the existing buildings against flooding should be thoroughly examined by using any means of engineering techniques. At some point, an idea of demolishing and reconstructing the existing structures may arise. But, it would cost more investment of natural resource also, it is not in the line

with sustainable built environment and this is not applicable to the historically significant buildings and to the public buildings (schools, hospitals, government offices, etc.) in some extent. It is so effective to find a suitable retrofitting method to strengthen the URM buildings against flooding in the view of sustainable built environment.

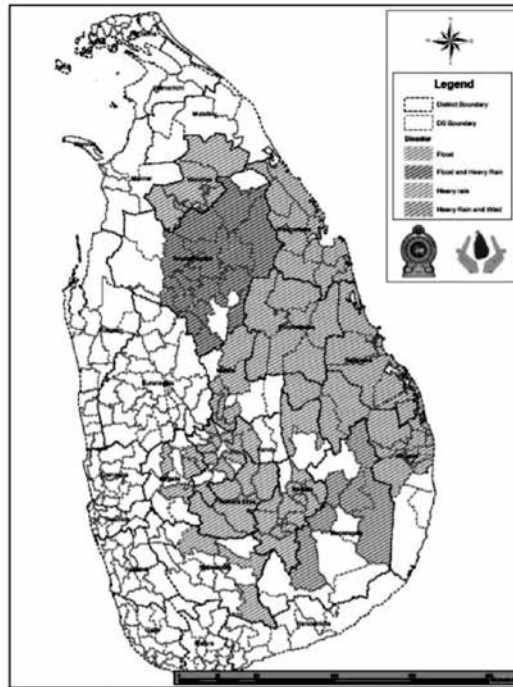


Figure 1: Flood Inundation Mapping. Baticaloa District, Sri Lanka (Disaster Management Center)

The effect of flooding is unavoidable which is threaten to the human life, health, properties etc. and staying away from the life and health issues unavoidable beyond some point but retrofitting the structures would make them to stand against flooding and it would save the human lives; minimize the cost required to repair the damages. The failure in the structure like public buildings (Schools, Hospitals, Government offices, etc.) will affect its day to day operation and it will create an unusual situation until the problem is sorted out. So, it is necessary to relook at the existing structures and which should be retrofitted to withstand against the load due to heavy flooding, also newly constructing structures ought to be designed considering the critical flooding level from historical records.

There are lots of researches are being carried out on masonry structures against seismic loads, whilst researchers are very rare subjected to flooding. The degree of retrofitting depends on the functional requirement of structures, namely in historical buildings like museum each components of the structures should be protected against the failure, therefore high degree of retrofitting is to be adopted for its strengthening. But, in residential buildings the most priority is given for the occupant's lives rather than considering the effect on structural elements, less degree of retrofitting is so chosen compared with historical buildings.

In this research a retrofitting of residential building is taken into account, so that less degree of retrofitting is chosen by carrying out the analysis only for the ultimate limit state due to the importance which is given to avoid the collapse of the building. The main aim of this study is to proposing most suitable retrofitting technique for residential unreinforced masonry wall to the frontal effect of flooding. Calculate the design flood load in the eastern province of Sri Lanka, study the behavior of Unreinforced Masonry walls against flood loads using SAP 2000, propose suitable retrofitting technique for the Unreinforced Masonry Walls against flooding, and suggest further improvement in proposed retrofitting technique considering other factors are identified as the objective of the study.

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# Evaluation on Effective Concrete Cover Distribution Patterns for RCC Slabs to Achieve its Designed Requirements

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## **Abstract**

Corrosion is an immense threat to rebar that affects the strength of the element and durability considerably. The reinforcement bars are protected from the corrosion by providing an adequate thickness of cover. The thickness of the cover depends on the exposure condition, required fire resistance and bondage requirement with concrete. Even though the thickness of the cover is determined properly, mainly due to poor workmanship the thickness of the cover can be reduced or increased in the case of top reinforcement bars. The deviation of the cover may cause severe damage on the element. Generally, in Sri Lanka the concrete covers are provided where the sagging can be observed in the slab net. In this study a two-way spanning slab which was designed according to BS 8110-1:1997 was analyzed using SAP 2000 software package. So the element was analyzed by providing Diamond pattern and Square pattern with different spacing values. According to the analysis it can be seen that the diamond pattern has given the most efficient cover distribution.

## **Keywords**

Adequate concrete cover, Rectangular and diamond patterns, Cover pattern, Durability of concrete, SAP 2000

## **Introduction**

In last few decades the Reinforced Cement Concrete (RCC) has become the widely used structural material in the construction industry. The RCC is a composite material which includes concrete (for compression) and reinforcement steel bars (for tension). The concrete is a proportional mix of cement, fine aggregate (sand), coarse aggregate (Stone) and water. The construction of RCC building is economic since all its ingredients can be found everywhere and easy of casting in any desired shapes. RCC is more durable comparing to other material and also it has a very low maintenance cost.

The reinforcement is mainly steel bars which is fulfilling the tensile character of concrete. Also the steel is bonding with the concrete well. To bear the tensile stress in a RCC element the reinforcing bars are placed at the bottom (for cantilever elements it is right opposite, i.e at the top) that is near to the face of element. The exposure of the steel bars to the environment can cause serious problem on durability of the structure. It is very important to place the reinforcement bars at exact desired position with designed cover. The tying distance and the spacing of covers are two major influencing factors on cover deviation (Maran, 2015)

The biggest threat to the RCC structures is corrosion attack. Corrosion attack of reinforcement is very common effect in the RCC structures due to the poor arrangement of covers to the reinforcement (Tworzewski, 2015) and improper selection of ingredients of concrete material (concrete mix and steel bar). The reinforcement corrosion causes lots of problems in the structure. Some of the affects are load carrying capacity reduces, cracks (in slabs, beams and columns), concrete cover spalling of and etc. All these effects leads the structure to premature demolition or premature large repairs. So here the durability of structure reduces with the corrosion of reinforcement. It is very important to find out and control the factors that stimulate the corrosion attack on reinforcement bars.

This study assesses the most effective cover spacing and distribution pattern among square and diamond pattern cover distribution. This analysis is based on a two-way spanning slab with its length and width is 6.5m X 6.5m and designed according to BS 8110-1:1997.

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# Cellular antenna network optimization based on ‘timing advance profile’ of ‘dedicated mode mobile stations’

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## **Abstract**

Optimization of cellular radio antenna network is a key factor in increasing the performance of any cellular network, especially in Global System for Mobile Communication (GSM), General packet Radio Service (GPRS), and EDGE (enhanced data rates for GSM evolution) network architecture. Cellular antennae networks are generally optimized considering the maximum coverage footprint for both indoor and outdoor to a pre-set radio signal strength level. But the most important factor is making the network, carrying the maximum possible ‘offered traffic’, maintaining a tradeoff between ‘coverage and carried traffic’

With the introduction of ‘electrically tiltable’ cellular antennae, elevation or the antenna tilt is a factor which can be modified even remotely from the network operation and maintenance centre (OMCR). ‘Timing advance’ data for a given cell or a sector can be used to analyse the offered and carried traffic information and their locational distribution in deciding the optimum cellular-antenna elevation (or antenna tilt). The idea of this study is to identify the traffic pockets by analysing the timing advance profile data in any given cell, and optimising the antenna-tilt so that the offered traffic pockets are covered by the main radio beam.

By analysing the offered and carried traffic with their timing-advance profile, using the tools available for radio network performance analysis and few mathematical formulae the very optimum down-tilt value of each cellular antenna can be calculated and implemented either individually using electrical tilting tool or using a centralized ‘network operation and maintenance centre’ (OMCR) as whole for a selected group of cells.

## **Keywords**

Altitude, Antenna, Tilt Azimuth, Antenna beamwidth Cellular Coverage footprint, Cellular Radio antenna, Electrical Tilt, Elevation, Offered Traffic, Radio Signal Strength, Timing Advance, vertical beam-width.

## **Introduction**

Cellular antenna network optimization has four basic components, which are antenna location, altitude, azimuth, and elevation, where the former two are decided at the planning stage, having very minimum freedom of modification at a later stage. Azimuth or the Orientation of the antennae, even though it is a freely modifiable factor, must be considered collectively together with neighboring cellular antennae as it has a great impact on coverage footprint.

Usage of ‘electrically tiltable’ cellular antenna, has made the life easy that the antenna tilt can easily be modified even remotely from the network operation and maintenance centre (OMCR).

‘Timing advance’ is an important scale used by the cellular transceiver station to label the distance of any given mobile station from the transceiver station and the mobile station is informed, that how much in advance the burst must be released by the mobile station, so that it fits into the allocated time slot by a given cell or a sector, despite the radio propagating delay, and vise-versa.

By analyzing this timing advance data for carried traffic, on a periodical basis, based on the cellular traffic pattern of that geographical area, with respect to the sectorial data, the optimum cellular-antenna elevation can be easily calculated using few more information such as the altitude and vertical beam-width of the antenna radiation pattern.

In Time Division Multiple Access (TDMA) systems, especially in GSM networks, timing advance value which is calculated by the base stations and informed to the mobile devices, has a range (in GSM, 0 to 63), where each step indicates a separation distance (in GSM, 550m) from the transceiver station.

Equiv. TA	From (m)	To (m)
TA_0	0	550
TA_1	550	1100
TA_2	1100	1650
TA_3	1650	2200
TA_4	2200	2750
TA_5	2750	3300
TA_6	3300	3850
TA_7	3850	4400
TA_8	4400	4950
TA_9	4950	5500
TA_10	5500	6050
TA_11	6050	6600
TA_12	6600	7150
TA_13	7150	7700
TA_14	7700	8250
TA_15	8250	8800
TA_16	8800	9350
TA_17	9350	9900
TA_18	9900	10450
TA_19	10450	11000
TA_20	11000	11550
TA_21	11550	12100
TA_22	12100	12650
TA_23	12650	13200
TA_24	13200	13750
TA_25	13750	14300
TA_26	14300	14850
TA_27	14850	15400
TA_28	15400	15950
TA_29	15950	16500
TA_30_31	16500	17600
TA_32_33	17600	18700
TA_34_35	18700	19800
TA_36_37	19800	20900
TA_38_39	20900	22000
TA_40_44	22000	24200
TA_45_49	24200	26400
TA_50_54	26400	28600
TA_55_63	28600	33550
TA_64_MORE	33550	...

Fig.1: Timing advance Vs. Distance

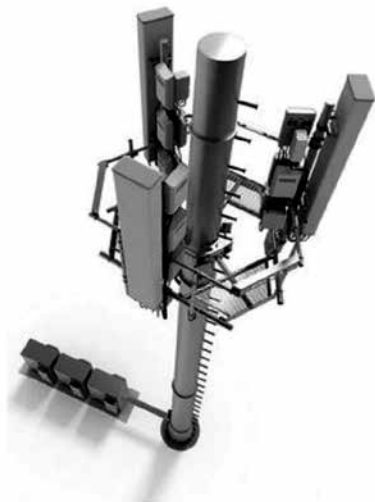


Fig.2: Down tilted Cellular antenna

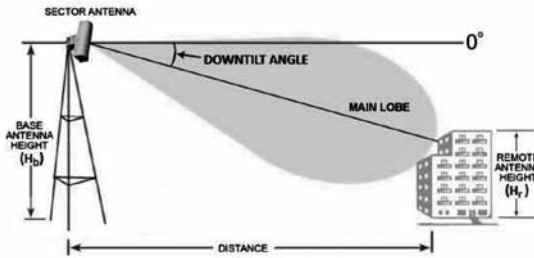
This method will highly be applicable for rural cellular networks where the cellular radii are in the range of 15 - 20 km, than the urban ones, because the radius of an urban cell in general is anyway within 1 km, where the timing advance resolution is nearly half a km.

**Experimental**

A very straight forward equation was formed trigonometrically to calculate the down tilt value for a cellular antenna based on the distance of the mobile station form the transceiver station, in this case assuming all the mobile stations are at ground level.

***Down tilt angle = tan<sup>-1</sup> (Antenna height H , in m / Distance, D in m)***

Where H is the difference between the Cellular antenna height and the mobile station height,



$$\text{Angle} = \frac{\tan^{-1}(H_b - H_r)}{\text{Distance}}$$

Where,

$H_b$  = Height of Base Antenna

$H_r$  = Height of Remote Antenna

Distance = Distance between two Antennas

Angle = Down tilt Angle

Fig.3a: Down tilt angle calculation (Everything RF, 2017)

Fig.3b: Down tilt angle Formula (Everything RF, 2017)

Now the critical task is to calculate the distance. This must be a weighted average value of Distance Vs. Cellular traffic taken from the Radio network performance analysing tools.

It is very obvious that the 'busy-hour' traffic must be considered for this analysis so that the result reflects the most optimum down tilt value demanded by the mobile stations which contribute to the majority of the offered traffic.

Figure.4 is a snapshot of the real traffic taken from a GSM cellular network, on a selected cell during a busy hour, where the inter-transceiver station distance, in this region is 15 -20 km.

The Cellular antennae of this particular transceiver station are at 73 m as this is an umbrella site.

Table.1: Timing advance Vs, Carried traffic, calculation

Timing advance	Busy Hour Traffic (Er)	Antenna Height, m	Distance	Downtilt
0	1.2	73	0	
1	1.1	73	550	7.6
2	1.3	73	1100	3.8
3	0.9	73	1650	2.5
4	0.3	73	2200	1.9
5	1.1	73	2750	1.5
6	1.3	73	3300	1.3
7	1.9	73	3850	1.1
8	2.5	73	4400	1.0
9	3.1	73	4950	0.8
10	5.5	73	5500	0.8
11	3.2	73	6050	0.7
12	2.3	73	6600	0.6
13	1.9	73	7150	0.6
14	1.6	73	7700	0.5
15	0.2	73	8250	0.5
16	0.9	73	8800	0.5
17	0.6	73	9350	0.4
18		73	9900	0.4

It was very obvious that the cellular traffic in this cell reflects a very normal distribution, having the cellular radius corresponds to timing advance 10, having an inner and outer radii with TA 1 and 16.

$$\text{Down tilt} = \tan^{-1} (\text{Antenna height } H, / \text{Distance, } D) = \tan^{-1} (73\text{m} / 10 \times 550\text{m} / 73) = 0.74^\circ$$

This technique is further developed so that by performing similar calculations for inner and outer cellular radii, based on the TA profile, we could calculate the vertical beam-width of the cellular antenna demanded by the offered-traffic

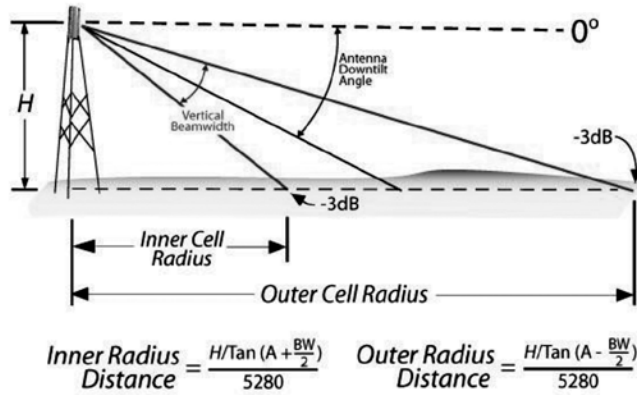


Fig.4: Beam-width calculation [Proxim, 2017]

$$\begin{aligned} \text{Inner Cell: Down tilt} &= \tan^{-1} (\text{Antenna height } H, / \text{Distance, } D) = \tan^{-1} (73\text{m} / 1 \times 550\text{m} / 73) = 7.67^\circ \\ \text{Outer Cell: Down tilt} &= \tan^{-1} (\text{Antenna height } H, / \text{Distance, } D) = \tan^{-1} (73\text{m} / 13 \times 550\text{m} / 73) = 0.42^\circ \end{aligned}$$

$$\text{The proposed Beam width (BW)} = 7.67^\circ - 0.42^\circ = 7.25^\circ$$

This methodology is to be further developed, so that this calculation is repeated for all the cells on a given repetition pattern to optimize all the cellular antennae, using a tilt-changing system.

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## Investigation of *in vitro* anti-inflammatory activity of *Caryota urens* (Kithul)

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### Abstract

Non-steroidal anti-inflammatory drugs (NSAIDs) are most commonly prescribed in modern medicine. They are known to relieve pain, fever and inflammation, but they are associated with several adverse effects. Inflammation is classically described by its five cardinal signs, redness, warmth, swelling, pain and loss of function but recently it is described as a sequence of events occurring in a living tissue after injury. Therefore it would be a timely exercise to explore potential alternative treatment methods with minimum side effects that can be used in treating inflammation. *Caryota urens* (Kithul), also called fishtail palm is one of the native sugar palms in Sri Lanka, which is used to produce sweeteners and fermented beverage. In Sri Lankan ethno medicine, *C. urens* is claimed to possess various health benefits as treating ailments and many other medicinal applications. Therefore, the objective of this study was to investigate the anti-inflammatory activity present in the root of *Caryota urens*. Egg albumin denaturation assay was performed for the aqueous root extract of *C. urens* along with phytochemical analysis to support the investigation. The denaturation was measured at different concentrations of the aqueous root extract and a dose response curve was constructed using the spectrophotometric readings. The results show that the root has anti-inflammatory properties where the highest percentage inhibition of 97% was marked at 22 mg/ml. It showed a dose dependant response with an IC<sub>50</sub> of 2.65 mg/ml. *C. urens* root possesses several phytochemicals such as phenols, flavonoids, diterpenes and saponins which may contribute to the anti-inflammatory activity. This investigation reveals that *C. urens* root possesses potent *in vitro* anti-inflammatory activity.

### Keywords

NSAID, *in vitro*, anti-inflammatory, *Caryota urens*, Egg albumin denaturation assay

### Introduction

The body's immune system is a collection of cells and proteins that are specialised in protecting the organs and organ systems from harmful substances such as microbes, cancer cells, antigens, viruses and toxins (Warrington *et al.*, 2011). The immune system can be divided into two systems; the innate immune system and adaptive immune system. Both these systems work together in order to keep the body healthy (Clem, 2011). Inflammation plays a vital role in the innate immune system, where the body responds to an infective agent, antigen or any physical damage (Clem, 2011). Inflammation is classically described by its five cardinal signs, redness, warmth, swelling, pain and loss of function but recently it is described as a sequence of events occurring in a living tissue after injury, if the injury does not destroy the structure and function of the tissue (Punchard, Whelan and Adcock, 2004). Several diseases and disorders such as autoimmune diseases, neurodegenerative diseases, cancers, cardiovascular diseases

and metabolic syndrome are caused due to inflammation (Murakami and Hirano, 2012).

Non-steroidal anti-inflammatory drugs (NSAIDs) are most commonly prescribed in modern medicine. They are known to relieve pain, fever and inflammation (Meek, van de Laar and Vonkeman, 2010). Though NSAIDs have a very good effect on inflammation they are associated with several adverse effects such as effects on kidney function, blood pressure, liver damage and inhibition of platelet (Ong *et al.*, 2007). Plants have found to be good sources of compounds showing anti-inflammatory (Kasote *et al.*, 2015). Therefore, in order to eradicate the risk of these side effects when treating inflammation, patients should be provided with an alternative, less harmful treatment.

*C. urens* is found in Sri Lanka, where it is locally known as kithul (Everett, 1995). The sap of the palm is used to manufacture sweeteners including, jiggery, treacle and toddy (Ranasinghe *et al.*, 2012). Different parts of *C. urens* has been used in Sri Lankan traditional medicine for several ailments. It has been used to treat seminal weakness and urinary disorders (Charles and Ramani, 2011). Roots have shown to be good tooth ailments (Vaishnavi and Suneetha, 2013).

The main objective of this research is to investigate the *in vitro* anti-inflammatory activity of the root of *Caryota urens* supported by the qualitative phytochemical analysis of root of *Caryota urens*. The method used to investigate anti-inflammatory activity is the egg albumin denaturation assay. The scope of this test is that, only the anti-inflammatory properties that inhibit protein denaturation is quantified, but it was chosen since it does not involve ethical issues and egg albumin is easily available when compared to bovine serum.

### **Experimental**

Aqueous extraction of root was prepared to perform the protein denaturation test. The specimens were ground to form a powder. Phytochemical studies were performed for the aqueous root extract of *C. urens* plant to test for the presence of flavonoids, phenols, alkaloids, amino acids, diterpenes and saponins according to the procedures done by Tiwari *et al.*, 2011. Then for the protein denaturation test concentrations of the aqueous root extract prepared were 28 mg/ml, 25 mg/ml, 22 mg/ml, 18 mg/ml, 15 mg/ml, 12.5 mg/ml, 6.25 mg/ml, 3.125 mg/ml, 1.5625 mg/ml, 0.78125 mg/ml and 0.39062 mg/ml. The 5ml reaction mixture was prepared using 2.8 ml of freshly prepared phosphate buffer saline (pH – 6.4), 0.2 ml of egg albumin which was obtained from hen's egg and 2 ml of the specific concentration of the aqueous root extract. For each specific concentration of the aqueous root extract three series of solutions were prepared (n=3). Negative controls (n=3) were prepared using 2.8 ml of freshly prepared phosphate buffer saline, 0.2 ml of egg albumin and 2 ml of distilled water. The reaction mixtures were then heated in a water bath at 30°C and the temperature was gradually increased to 70°C at which the mixtures were allowed to stand for 5 minutes. After the mixtures were cooled to room temperature the absorbance was measured at 660 nm using the UV/VIS Spectrophotometer. Distilled water was used as the blank. Sample blanks were prepared for each concentration and the absorbance was measured. Percentage inhibition was calculated for each concentration.

The results show that the percentage inhibitions increase with an increase in concentration



and the highest percentage inhibition was 22 mg/ml of 97.12% at 22 mg/ml after which the percentage inhibitions decrease for the following two concentrations. The IC<sub>50</sub> value obtained for the ARE using the dose response curve is 2.654 mg/ml. The results for the ARE show that there is an anti-inflammatory response but this has to be confirmed by performing further trials.

Phytochemical compounds such as flavonoids, phenols, tannins, saponins, terpenoids and alkaloids have shown to have anti-inflammatory effects (Kumar *et al.*, 2014; Ambriz-Pérez *et al.*, 2016). *C. urens* root displayed anti-inflammatory properties which may be due to the presence of phytochemicals such as flavonoids, phenols, diterpenes and saponins.

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## **A study to investigate the possibility of using *Cyclea burmanni* mucilage as a natural drug delivery system**

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### **Abstract**

Drug delivery systems are commonly used in the field of medicine to deliver drugs to different sites. Natural polymers and synthetic polymers are conventionally used to develop drug delivery systems. Since synthetic polymers express potential disadvantages such as toxicity, immunogenicity, non-environment friendly and being expensive, the demand for natural polymers as drug delivery systems is high. *Cyclea burmanni* is a traditional medicinal plant which is used in Sri Lanka and India. Medicinal properties of the plant include antibacterial, anti-inflammatory, antipyretic and anthelmintic etc. Since *Cyclea burmanni* serves tremendous medicinal properties and significant gelling properties, this plant was selected and investigated to check the possibility to be used in drug delivery systems. Rheological parameters such as viscosity, pH, gel to sol transition temperature and gelation time of (5% w/v) water extract of *Cyclea burmanni* were investigated using manual techniques in this study. Gelation time of the water extract of *Cyclea burmanni* was  $9.56 \pm 0.30$  minutes and an inversely proportional relationship was observed between the concentration of water extract and the gelation time. Viscosity range of the (5% w/v) water extract at 24°C was calculated as  $12.283 - 148.950 \text{ kgm}^{-1}\text{s}^{-1}$ . Gel to solution transition temperature was  $97.8 \pm 0.359$  °C and the pH of the extract was  $4.11 \pm 0.041$ . The water extract of *Cyclea burmanni* showed potential gelation time and viscosity which could be considered as suitable rheological parameters for a drug delivery system. High gel to sol transition temperature and low pH of the extract indicate the limited rheological parameters of a drug delivery system. Further studies on monomer toxicity, drug release rate, drug loading capacity and chemical structure of the polymer are required to be carried out.

### **Keywords**

Drug delivery systems, natural polymers, *Cyclea burmanni*

### **Introduction**

A drug delivery system is a system which releases appropriate weight and volume of active ingredient to a target site in order to obtain therapeutic effect (Avachat, Dash and Shrotriya, 2011). Drug delivery systems are extensively used in the field of medicine to achieve high efficacy, targeted delivery, controlled release, less administration times, less side effects and convenient usage (Bhagwat and Vaidhya, 2013). The effectiveness of traditional dosage forms is less in severe global health issues such as cancer, leishmaniasis and extensive burns. Effectiveness of the treatment could be enhanced by introducing drug delivery systems while minimizing the side effects of treatment, releasing optimum drug concentration and supporting the tissue regeneration process etc. (Chávez-Fumagalli *et al.*, 2015; National Institute of Health, 2016; Madaghiele

*et al.*, 2014). Hence, the interest for novel drug delivery systems is high in the field of pharmaceutical sciences. Several types of drug delivery systems such as carrier based drug delivery systems and transdermal drug delivery systems are developed by using polymers (Bhagwat and Vaidhya, 2013). The demand for polymeric materials is high due to favorable and flexible properties of polymers (Agrawal, 2015). Natural polymers and synthetic polymers are conventionally used in drug delivery systems. Since synthetic polymers are considered as expensive, sometimes toxic and non-environmental friendly, demand for natural polymers as drug delivery vehicles is high. Biodegradability, non-toxicity and low cost manufacturing process are the advantages of natural polymers. (Avachat, Dash and Shrotriya, 2011). *Cyclea burmanni* is a Sri Lankan traditional medicinal plant which is generally known as Kehipiththan (කැහිපිත්තං). Medicinal properties of *Cyclea burmanni* include antipyretic, anthelmintic, antidiuretic, anti-inflammatory (Panda, Sahu and Dash, 2003), antidandruff (Hullatti, Gopikrishna and Kuppast, 2011) and antibacterial (Abraham and Thomas, 2012) etc. A water extract from *C. burmanni* forms a firm gel at room temperature (Shyamali, de Silva and Savitri Kumar, 1988). Since *Cyclea burmanni* express tremendous medicinal properties and gelation properties, there is a possibility of using *Cyclea burmanni* in drug delivery systems while serving as therapeutic agent. Therefore this study is to check the possibility of *Cyclea burmanni* to use as a natural drug delivery system.

### Experimental

*Cyclea burmanni* leaves were cleaned and refrigerated. Soon after the refrigeration leaves were dried at 60°C for 60 minutes by using a hot air oven. Leaf parts were grinded by using mortar and pestle until it becomes a fine powder. The powder was filtered by using a mesh and filtered powder was stored in an air tight container. 1:18 (w/v), 1:20 (w/v) and 1:22 (w/v) concentrations were prepared by adding *Cyclea burmanni* powder to distilled water and the stop watch was started at the same time. Then the solutions were stirred and were filtered by using a mucilin cloth. Then each solution was centrifuged at 3500 rpm for 2 minutes. After the centrifugation extraction was added into a glass plate and the sheet test was performed to detect the critical gelation time and temperature.

Empty graduated cylinder and a glass sphere was cleaned and dried at 105°C for 60 minutes. The diameter of the sphere was measured by using a micrometer and volume of the glass sphere was calculated by using  $\frac{4}{3} \pi r^3$  formula. Mass of glass sphere was measured and the density of the sphere was calculated by using  $P_s = m/V$  formula. 1:20 (w/v) *Cyclea burmanni* extract was added to the graduated cylinder and the density of the solution ( $p_f$ ) was calculated. Glass sphere was released at 9th minute and the movement of the sphere was recorded by a camera. The time which sphere was taken to reach the bottom line of the graduated cylinder was measured. This process was carried out at each 1 minute time intervals. The distance between bottom line and upper line of the solution was measured and the velocity of the movement was calculated by using Velocity = distance / time formula. The viscosity of the liquid was calculated by using

$$\mu = \frac{4r^2 g (p_s - p_f)}{9v_s} \text{ formula.}$$

1:20 (w/v) *Cyclea burmanni* extract was added into a boiling tube and it was allowed to form a complete gel. pH value of the gel was measured by using an electronic pH meter. A glass sphere was placed on the surface of gel. A thermometer was placed in the boiling tube and then the boiling tube was heated using a water bath. The moment which sphere starts to sink was considered as gel to solution transition temperature and the temperature was recorded.

An inversely proportional relationship was observed between the concentration of water extract and the gelation time. Gelation times of 1:18 (w/v), 1:20 (w/v) and 1:22 (w/v) water extracts of *Cyclea burmanni* were  $6.18 \pm 0.23$ ,  $9.56 \pm 0.30$  and  $17.16 \pm 0.29$  minutes respectively. The viscosity range from 9 – 19 minute is 12.283 – 148.950  $\text{kgm}^{-1}\text{s}^{-1}$ . The average gel to solution transition temperature of *Cyclea burmanni* water extract is  $97.8 \pm 0.359$  °C and average pH of *Cyclea burmanni* water extract is  $4.11 \pm 0.041$  at 24 °C. Gradual enhancement of viscosity and quick gelation time are considered as suitable rheological parameters in drug delivery systems. Low pH and high gel to solution transition temperature indicates limitations of the extract to be used as a drug delivery system. Monomer toxicity, biocompatibility, drug loading capacity and rate of drug release should be analyzed in further studies prior to develop a drug delivery system. This study concludes that the water extract of *Cyclea burmanni* express several suitable properties and limitations to be used as a drug delivery system.

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## ***Neolitsea cassia* water extract with a starch carrier in controlled drug delivery systems**

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### **Abstract**

Targeted drug delivery systems have become the consequential drug delivery system to treat some of the most punitive diseases that have a poor prognosis and high mortality rates for example diabetes Type II. The usage of natural mucilages are starting to become the cornerstone of targeted drug delivery systems as the ideal natural polymer drug vehicle. The mucilage extracted in the present study from the leaves of *Neolitsea cassia*, were subjected to table top rheology studies to observe basic characteristics of an ideal drug delivery vehicle such as phase transition in gelatinization. Additionally, sago starch acted as the starch carrier for the mucilage of *Neolitsea cassia*. The observed results were sufficient in terms of a viable natural polymer in targeted drug delivery systems, and it showed that the solution to gel and gel to solution to gel temperatures were inversely proportionally to each other. Natural polymers are extensively explored as an alternative to synthetic polymers whose advantages are what this study is based upon. The extracted mucilages are bio-compatible, biodegradable, non-cytotoxic and renewable. With the combination of an appropriate therapeutic agent, these natural polymers will be increasingly popular in the near future of providing the maximum effect of therapeutic agents to diseases and disorders which conventional drug routes could not reach.

### **Keywords**

Natural polymers, *Neolitsea cassia*, mucilage, starch carrier, diabetes, targeted drug delivery vehicle

### **Introduction**

The study of targeted drug delivery systems is essential in understanding the true effect of therapeutic agent on their targets. These systems allow us to deliver therapeutic agents to their full potential in making progress of eliminating some of the most punitive diseases that have a high mortality and poor prognosis. One such disease, and one which this study is based upon is diabetes (Saini *et al.*, 2012).

The incorporation of natural polymers in targeted drug delivery systems have significantly improved their impact on such diseases. Natural polymers are expansively investigated as the ideal drug delivery vehicle when compared to its counterpart, synthetic polymers (Bhatia, 2016). Natural polymers have a variety of advantages over synthetic polymers on which this study lays its foundation (Mogoşanu and Grumezescu, 2014; Ngwuluka, Ocheke and Aruoma, 2014). The most obvious resource for these natural polymers are plants. The plant species are not limited, ranging from terrestrial to marine plants.

Natural polymers have become the cornerstone in targeted drug delivery systems, and the main resource is from natural mucilages. Natural mucilages are biocompatible, biodegradable, non-cytotoxic and renewable. Biocompatibility will surpass the hurdle

of host rejection the body might provide, and biodegradability will allow the polymers to be human and ecofriendly. One of the most outstanding qualities of natural polymers is its relationship between biocompatibility and biodegradability, which is why the study of natural mucilages is essential in targeted drug delivery systems (Rani and Paliwal, 2014).

The natural mucilage focused in this study is extracted from the plant *Neolitsea cassia*. *Neolitsea cassia* or locally known as “Dawul Kurundu” is an endemic plant to Sri Lanka. The bark, leaves and roots of *Neolitsea cassia* have medicinal properties. By tradition, *Neolitsea cassia* has been used to treat gastrointestinal disorders. In 1985, Shayamali and team gave the first indication that *Neolitsea cassia* leaves do produce a mucilage that has a polysaccharide backbone (Silva, Kumar and Aman, 1986). This is significant since with a polysaccharide backbone, an active compound from a therapeutic agent can be attached to it. Within this study, Shayamali and team discover a naturally occurring active compound known as arabinoxylan present in the polysaccharide structured mucilage. Arabinoxylan is known to show prebiotic activity, immunomodulatory and antitumor activity, to decrease cholesterol and decrease the onset of Type 2 diabetes (Izydorczyk and Dexter, 2008). With this active compound paired with an effect therapeutic agent, the possibility of providing relief for Type II diabetes is highly likely. The extraction of *Neolitsea cassia* mucilage was therefore key to proving the importance of natural polymers in targeted drug delivery systems. Certain basic factors such as sol-gel, gel-sol temperatures and viscosity should be present to lay the foundation for *Neolitsea cassia* to be considered a drug delivery vehicle (Mohamed *et al.*, 2008).

### **Experimental**

Initial investigations included the water based extraction of *Neolitsea cassia* mucilage from its leaves, where it is most abundantly found. This method was chosen since it is the method that least affects the active compounds present in the mucilage. The water based extraction method maintained a 1:8 ratio between water and powdered leaves. However, the sol-gel, gel-sol and viscosity factors of the extract were not viable and an addition of a starch carrier was necessary as a strengthening agent. Sago seeds were used to provide a starch carrier (Ramnath *et al.*, 2012). The minimum concentration ratio between the starch carrier and *Neolitsea cassia* mucilage was 1:5.

Using this final solution, the basic factors that would substantiate a drug delivery vehicle such as sol-gel, gel-sol temperatures and viscosity were investigated using table top rheology. When determining the temperature required for the solution to form a gel, the initial temperature was at 74.2 °C, and the final temperature was 37.1°C, which is also known as the critical gelation temperature of the mucilage. Temperature required for the gel to form a solution was investigated and the initial temperature was at 74.0 °C and the final temperature was at 35.8 °C. The results between these two factors were inversely proportional to each other. The viscosity of the gel decreased as the temperature decreased.

These observations show that once the mucilage has been either consumed or topically applied, the mucilage will remain a gel since the average human body temperature is considered to be 37 °C. With these results, it can be proposed that this mucilage can be used as a drug delivery vehicle. An assumption can be made on the target site of the

active compound present in the mucilage, arabinoxylan. Paired with a therapeutic agent, the mucilage of the *Neolitsea cassia* could deliver a more effective and effortless method of decreasing the onset of diseases such as diabetes type II.

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## ***In vitro* anti-inflammatory activity and phytochemical profile of *Dipterocarpus zeylanicus***

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### **Abstract**

Non-steroidal anti-inflammatory drugs (NSAIDs) are one of the most purchased medications all over the world today. With extensive use comes along serious adverse effects. Current exacerbated intake of NSAIDs is in question as it leads to further health deterioration; for instance, gastrointestinal ulcers and cardiovascular invasion. Sri Lanka is a developing country with high population of low income families. The constant rise in reported cases of rheumatism is a concern as purchase of over the counter NSAIDs too increase. The adverse effects of NSAIDs can be reduced by introducing a cost effective and preferably a natural alternative. Especially in a low economy country like Sri Lanka where prolonged purchase of medications is beyond the grasp of the majority of the population, having a cheap alternative drug would be beneficial to the community.

The *Dipterocarpus* species (family-Diptherocarpaceae) is known to exhibit anti-bacterial, anti-fungal, anti-oxidant, anti-AIDS as well as anti-inflammatory activities. The *in vitro* anti-inflammatory activity of *Dipterocarpus zeylanicus*, a plant endemic to Sri Lanka, locally known as “Hora”, was evaluated the by heat induced protein denaturation assay.

The *in vitro* anti-inflammatory activity for *D. zeylanicus*, aqueous bark extract (ABE) of concentrations  $\mu\text{g/mL}$  12500, 6250, 3125, 1563, 781.3, 390.6, was evaluated by measuring the absorbance values of reaction mixtures incubated at  $50^{\circ}\text{C}$  for 15 minutes at 660 nm (Spectrophotometer - Optizen 3200UV). Diclofenac sodium was used as the reference drug which had an  $\text{IC}_{50}$  value of  $310 \mu\text{g/mL}$  ( $R^2 = 0.8414$ ,  $p > 0.05$ ). The crude plant extract had an  $\text{IC}_{50}$  value of  $1880 \mu\text{g/mL}$  ( $R^2 = 0.9146$ ,  $p < 0.05$ ) showing Diclofenac sodium has a higher potency and significantly similar dose- response relationship to ABE.

A phytochemical screening was conducted for ABE that displayed positive results for flavonoids, alkaloids and diterpenes-phytochemicals responsible for having anti-inflammatory activity.

It can be concluded that the use of decoction of the bark of *D. zeylanicus* for the treatment of inflammatory diseases like rheumatism, sinusitis and pneumonia in traditional ethnomedicine is possibly effective and has a scientific rationale.

### Keywords

*In vitro* anti-inflammatory activity, *D. zeylanicus*, Diclofenac sodium, non-steroidal anti-inflammatory drugs, heat induced protein denaturation assay, phytochemicals.

### Introduction

Chronic inflammation is the starting point of a downward spiral leading to prolonged rheumatism, cardiovascular conditions and even cancer (Korniluk *et al.*, 2017). Rheumatic fever is the precursor to a much neglected, fatal condition- rheumatic heart disease (RHD). RHD is a notable burden raising morbidity and mortality rates of the youth in developing countries, taking more than 250,000 lives worldwide (Marijon *et al.*, 2012). Suppression of inflammation requires long term use of synthetic anti-inflammatory drugs- aspirin or steroids. Non-steroidal anti-inflammatory drugs (NSAIDs) are one of the most purchased medications all over the world today. Current exacerbated intake of NSAIDs is in question as it leads to further health deterioration; for instance, gastrointestinal ulcers and cardiovascular invasion (Crofford, 2013; C Sostres, Gargallo and Lanás, 2013).

For more than 6,000 years the use of plants as medicinal herbs has been the basis for “Ayurveda”, traditional ethno medicine (Aggarwal *et al.*, 2011). Use of herbs for treatment is not only a cheaper and safer alternative to synthetic medications, but it is also considered a form of appreciation to nature that relaxes the patient and helps psychological recovery (Behere *et al.*, 2013). The ability for herbs to have medicinal properties is due to primary and secondary metabolites of active phytoconstituents.

*D. zeylanicus* belonging to the *Dipterocarpus* species is a plant endemic to Sri Lankan. According to studies, the bark of *Dipterocarpus* holds most active constituents and carries claims to be effective in the treatment of inflammatory diseases such as rheumatism, pneumonia and sinusitis (Aslam, Ahmad and Mamat, 2015; Yang *et al.*, 2013).

### Experimental

Bark of *D. zeylanicus* was collected from Mattegoda (6°48'05.6"N 79°58'37.5"E) and air dried until weight of sample was the same for three consecutive days. A decoction of *D. zeylanicus* bark was prepared by boiling 60g of sample in 1920 mL distilled water and reduced to 240 mL solution. The aqueous bark extract (ABE) was freeze dried, 250mg of sample was dissolved in 20 mL distilled water and serial dilution prepared with half dilution concentrations (µg/mL) of 12500, 6250, 3125, 1563, 781.3, 390.6. Diclofenac sodium (2.5 mg) was used as reference drug with half dilution concentrations (µg/mL) of 2500, 1250, 625, 312.5, 156.25 and 78.125. Distilled water served as the negative control. Reaction mixture with 2 mL specific concentration, 2.8 mL freshly prepared phosphate buffered saline and 0.2mL of (hen) egg albumin were made. Three repeats were conducted for each concentration. Incubation of reaction mixture was done at 50°C for 15 minutes, samples were allowed to cool to room temperature before carrying out spectrophotometry at 660nm.

The absorbance values obtained were used to calculate the percentage inhibition using the following formula -

$$\% \text{ inhibition} = [(\text{absorbance of sample} \div (\text{average absorbance of negative control} - 1)) \times 100\%$$

(Chandra *et al.*, 2012)

Statistical analysis of the data was done by using GraphPad Prism 6 software. This software was used to generate a curve with nonlinear regression for transformed specific concentration values (x) and normalized percentage inhibition values (y). The error bars, IC<sub>50</sub> value and R<sup>2</sup> value were obtained automatically using this software.

Solution with approximately 2 mg of freeze dried sample was prepared to conduct qualitative analysis of phytoconstituents following -

Alkaloids - Dragendorff test, glycosides- Fehling's test, Terpenoids test and saponins- Froth test (Uddin *et al.*, 2012). Flavonoids- alkaline reagent test, phenol- ferric chloride test and triterpenes- Salkowski's test (Tiwari *et al.*, 2011). Tannins- ferric chloride test (Yusuf *et al.*, 2011) and diterpenes- Copper acetate test (Parekh, Karathia and Chanda, 2006).

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# Investigation of *in vitro* anti-inflammatory activity of *Cassia tora*

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## Abstract

Inflammation is a cell mediated protective response against infection or a tissue injury which is characterized by swelling, heat, redness, pain and loss of function. Non-steroidal anti-inflammatory drugs (NSAIDs) are the most widely used anti-inflammatory drugs, which are associated with adverse effects in the gastrointestinal, cardiovascular and renal systems, mainly due to drug to drug interactions. NSAIDs bring about these analgesic and anti-inflammatory effects by inhibiting the COX pathway. The most commonly used NSAID worldwide is diclofenac. *Cassia tora*, commonly known as sickle pod, is a medicinal plant used for the treatment of skin, hepatic, asthma and inflammatory joint diseases.

Therefore, the present study was carried out to analyse the *in vitro* anti-inflammatory activity of the aqueous leaf extract of *Cassia tora* with the increase demand for a novel, harmless, effective, naturally synthesized alternative as an anti-inflammatory drug. Protein denaturation assay was performed for aqueous leaf extracts (ALE) using diclofenac sodium as the standard. ALE of *Cassia tora* has a dose dependent response with an IC<sub>50</sub> value of 2.056 mg/ml and diclofenac sodium has an IC<sub>50</sub> value of 773.0 µg/ml. Phytochemical screening was carried out in order to determine the phytochemicals responsible for these properties and the results showed the presence of phenols, flavonoids, proteins and diterpenes, where phenols, flavonoids and diterpenes have been known to possess anti-inflammatory activity. This investigation concluded that *C. tora* leaf possesses anti-inflammatory activity.

## Keywords

NSAIDs, anti-inflammatory, *Cassia tora*, protein denaturation assay

## Introduction

Inflammation is defined as a response of complexity which occurs when the body encounters a harmful stimuli or an injury. It occurs in order to eliminate the harmful substance of heal the affected tissue (Arif Ullah *et al.*, 2014). There are four cardinal signs of inflammation which include redness, swelling, heat, pain and loss of function (Punchard, Whelan and Adcock, 2004). These signs occur mainly due to actions of cytokines and other pro-inflammatory mediators on blood vessel such as vasodilation (Charles A Janeway *et al.*, 2001).

The most widely used treatment for pain and inflammatory conditions are non-steroidal anti-inflammatory drugs (NSAIDs) (Adebayo *et al.*, 2015). NSAIDs bring about these analgesic and anti-inflammatory effects by inhibiting the COX pathway, thereby inhibiting production of prostaglandins (Lionberger and Brennan, 2010). The most commonly used

NSAID worldwide is diclofenac. These have adverse effects mainly in the gastrointestinal tract, cardiovascular system and renal systems. It has been found that most of the cases with adverse effects are due to a drug to drug interaction between NSAIDs and other medications that the patient is on such as aspirin, alcohol and antidepressants. (Moore, Pollack and Butkerait, 2015) In order to eradicate these side effects, the production of a natural and safer anti-inflammatory agent is in demand.

Cassia tora Linn is a dicot legume which grows as a wild dry soil weed in both high elevations up to 1800 m and low lying coastal areas (Dubey and Sawant, 2015; Mishra *et al.*, 2017). The habitat of this plant is mostly identified in South-East Asia and the South West Pacific region countries such as India, Sri Lanka, West China and tropics (Mishra *et al.*, 2017). Pharmaceutical reviews have revealed that Cassia tora linn exhibits anti-inflammatory, antioxidant, antiplasmodial, larvicidal, antimutagenic and anticancer activities (Ayo, 2010).

It is widely used as a medicinal plant in Ayurveda Unani and in Chinese medicinal systems for the treatment of diabetes, asthma and inflammatory joint diseases, leprosy, dyspepsia, constipation as a laxative, ringworm, bronchitis ophthalmic, skin diseases, and as a liver tonic in hepatic disorders and as a cardio tonic in cardiac diseases (Bhandirge *et al.*, 2016; Awasthi *et al.*, 2001; Sirappuselvi and Chitra, 2012).

This study was carried out to quantitatively determine *in vitro* anti-inflammatory activity of the leaves of the medicinal plant, Cassia tora. Egg albumin denaturation assay was carried out to investigate the percentage inhibition of albumin protein denaturation by the Cassia tora ALE. Inflammation is mainly caused due to denaturation of proteins, which may be because they act as auto-antigens causing diseases such as rheumatoid arthritis (Leelaprakash and Dass, 2011; Sangeetha and Vidhya, 2016). Furthermore qualitative phytochemical analysis is carried out to investigate the phytochemicals that could be responsible for this activity.

### **Experimental**

200 g of freshly collected Cassia tora leaves were washed and cleaned under running tap water and air dried for days until a constant weight of leaves was observed. Then 60g of coarsely crushed samples was weighed and boiled in 1920ml of distilled water using the bunsen flame approximately for five hours till the solvent volume reduced to 240 ml. The resulting dark brown aqueous leaf extract was filtered through double layered muslin cloth and the filtrate was freeze dried and stored under -200C in an air tight container until use.

A stock solution of 12.5 mg/ml was made dissolving 250 mg of powdered product obtained from the freeze dried aqueous extraction of Cassia tora leaves in 20 ml of distilled water. 12.5mg/ml, 6.25mg/ml, 3.125mg/ml, 1.5625mg/ml, 0.78125mg/ml, 0.39062 mg/ml solutions were made by series of two folded serial dilution using the stock solution 2500 µg/ml, 1250 µg/ml, 625 µg/ml, 312 µg/ml, 156.25 µg/ml, 78.125 µg/ml were the concentrations prepared for the positive control, Diclofenac sodium. Reaction mixtures were made adding 2.8ml of freshly prepared phosphate buffer saline (PBS) (pH - 6.4), 2 ml of the sample from each concentration of aqueous leaf extract and 0.2 ml of egg albumin extracted from hens egg. Three negative controls were made

adding PBS, egg albumin and distilled water. The prepared reaction mixtures were then kept in the water bath with a starting temperature of 30°C which gradually increased upto 70 °C and the mixtures were left for 5 minutes. The samples were then removed and cooled. For each concentration of the aqueous leaf extract and diclofenac sodium sample blanks were prepared. The absorbance of each reaction mixture was measured using the UV/VIS Spectrophotometer at 660nm. Percentage inhibition was calculated for each concentration.

The anti-inflammatory activity of the aqueous leaf extract of *Cassia tora* leaves expressed dose response anti-inflammatory property with an IC<sub>50</sub> value of 2.056 mg/ml while diclofenac sodium, which was used as the control of this assay, showed a dose response with an IC<sub>50</sub> value of 773.0 µg/ml. Qualitative assessment of the phytochemicals present in the leaf extracts of *Cassia tora* ALE were carried out and the results showed the presence of flavonoids, phenols, saponins, proteins and diterpenes. The correlation between the phytochemical compounds with the anti-inflammatory activity has been well defined where the phenols, flavonoids and diterpenes revealed an effective anti-inflammatory activity.

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# A study to investigate the potential of using *Gracilaria verrucosa* water extract as polymer based drug delivery agent

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## Abstract

In the last decades, the demand for novel drug delivery methods have increased radically steering the biomedical researchers to develop drug delivery vehicles that have higher biocompatibility, biodegradability and efficacy of drug transportation. The currently available conventional drug delivery methods are reported to cause more harm than good. This has lead the researches to explore the possibilities of utilizing naturally occurring bioactive components derived from gels and mucilage of terrestrial and marine plants in developing targeted drug delivery systems. The present study was conducted with the objective of determining the phase behaviours and gelling abilities of *Gracilaria verrucosa* water extract prepared using 1:200 algal to water ratio. And table top rheological procedures were implemented for the purpose of determining critical gelation temperature, gel to solution transition temperature, pH and viscosities at varied temperatures. The results obtained indicated that the aqueous solution attained gel point close to the human body temperature at 37°C and the gel was observed to melt at 65.50°C, the pH was determined to be close to the neutral value and the viscosity was observed to increase with decreasing temperatures. Based on the results it could be briefly concluded that the *Gracilaria verrucosa* extract possesses favourable rheological parameters to be used as a polymer based drug delivery vehicle, with further improvements.

## Keywords

Drug delivery vehicles, Natural polymers, *Gracilaria verrucosa*, Critical gelation temperature, Rheology

## Introduction

Mortality rates caused due to inefficient conventional therapeutic agent systems have increased drastically in the 21st century gaining possible epidemic status (Mercola, 2011). With the introduction of targeted drug delivery systems the potential of decreasing this rate is a possible outcome.

Targeted drug delivery systems act as the interphase between the drug and the body. And increases the concentration of drug transported to a particular target site, which intensifies the therapeutic efficacy of the drug. They are designed to release controlled doses of active ingredient for prolonged period of time, hence maintaining a constant level of tissue drug level necessary to elicit the desired action, thereby decreasing the requirement for regular frequency of drug administration (Fahmy *et al.*, 2005; Rani and Paliwal, 2014).

The utilization of biodegradable and biocompatible natural polymers in drug delivery systems have improved gradually over the past due to their favourable drug delivery properties and furthermore to overcome the drawbacks of currently available synthetic polymers (Bhatia, 2016). The growing demand for natural polymers in the field of drug delivery has amplified the need for research and development of novel, therapeutic standard natural polymers (Ngwuluka, Ochekepe and Aruoma, 2014). This paper examines the feasibility of using *Gracilaria verrucosa* water extract as a potential drug delivery candidate.

*Gracilaria verrucosa* also referred to as 'Ceylon moss' or 'Thin dragon beard plant' is a type of Rhodophyta belonging to the family Gracilaraceae (Madlener 1977 in Guiry and Guiry, 2017). It is naturally observed in the coastal areas of Sri Lanka, significantly distributed around the North Western, North Eastern and South Western coastal belts of the island. The bioactive components extracted from *Gracilaria verrucosa* have been discovered to possess a wide range of medicinal properties such as antioxidant, anti-hypersensitive, anti-tumour, anti-fungal and anti-diabetic activities (de Almeida *et al.*, 2011). These medicinal properties would be an added advantage if *Gracilaria verrucosa* extract is employed in polymer based drug delivery systems.

### **Experimental**

Chemically processed, dried *Gracilaria verrucosa* was acquired from the National Aquatic Resources Research and Development Agency (NARA) in Sri Lanka. *Gracilaria verrucosa* extract was prepared by using 1:200 algal to water ratio in a simple hot water extraction method. The extract was then filtered and used to determine the basic rheological properties of the gel; conventional table top rheological procedures were implemented for this purpose. Sol-gel transition temperature was measured by sheeting and sphere method. And the critical gelation was noted to occur at 37°C, close to the average human body temperature. The melting point of the gel was observed at 65.5°C, a sinking ball method was employed to analyse the gel-solution transition temperature. A previously calibrated CyberScan pH meter was used to measure the pH of the *Gracilaria verrucosa* extract. The average pH was determined to be 6.35 at room temperature, which is close to the neutral pH value. And finally the viscosities of the extract was evaluated at seven different temperatures using the falling sphere method. Ten repeats were performed for each temperature in order to maintain the accuracy of the final average viscosity. Viscosity of the *Gracilaria verrucosa* extract was observed to be inversely proportional to the temperature; the extract viscosity remained constant above 40°C and below the critical gelation temperature, the viscosity increased gradually with time.

Based on the observable rheological parameters and taking the limitation of the study into consideration, *Gracilaria verrucosa* water extract appears to have favourable properties to be used as a potential polymer based drug delivery vehicle in targeted drug delivery systems. However further studies are necessary to improve it for practical usage.

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# An Assessment of iodine exposure in Sri Lanka

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## **Abstract**

The main objective of the study was to find out whether commercially available salt packets for sale to the public is iodized adequately within the Sri Lankan Standards Institute (SLSI) specifications and the stability of iodine at different conditions and determine iodine exposure at the consumer level.

Survey was conducted to obtain details about salt consumption among 100 households. The concentration of iodine was determined quantitatively using iodometry titration technique as per the protocol for the most commonly used 6 salt brands. Thereafter, the stability of iodide as exposed to air, heat and stored in different storage bottles were measured. Evaluation of exposure was done based on the data collected from the survey and the data obtained from the experiments conducted.

Results revealed that all of the salt products have excess iodine that is above the fortification level of 15–30 mg/kg in Sri Lanka. Based on the assessment of exposure, it appears that the iodine consumption among the Sri Lankan population may be causing excessive intake of iodine. The incidences of IIH among the public may have to be investigated more thoroughly.

## **Key words**

Micronutrient, Iodine Deficiency Disorder (IDD), Iodine Induced Hypertthyroidism (IIH),

## **Introduction**

Iodine is an essential trace element that perform many vital functions within the human body. Iodine is used by the thyroid gland in the production of thyroxine (T<sub>4</sub>) and triiodothyronine (T<sub>3</sub>), hormones that regulate many important biochemical reactions, including protein synthesis and enzymatic activity, and thus are critical determinants of metabolic activity. (Jonklaas *et al.*, 2014)

Inadequate iodine intake by human body causes the insufficient synthesis of thyroid hormones, resulting in hypothyroidism and Iodine Deficiency Disorders (IDD). (Rubin *et al.*, 2008) According to Zimmermann and Boelaert (2015), IDD contains a collection of functional and developmental abnormalities mainly endemic goiter. While excessive iodine intake from food and water can also have adverse chronic health effect such as Iodine Induced Hyperthyroidism (IIH), thyroiditis, goiter, and thyrotoxicosis. Therefore goiter can be a symptom of both hypothyroidism and hyperthyroidism and both excessive and insufficient intake of iodine causes the thyroid related diseases, thus are harmful to the human body. (Preedy, Burrow and Watson, 2009)

As pointed out by Fernando *et al.*, (1989), many developing countries have been reported to be endemic to goiter including Sri Lanka. The official blog of Department

of Nutrition, Medical Research Institute, (2011) states that from 1940's onwards goiter had been identified as a common problem in Sri Lanka. There was a goiter belt across Western, Sabaragamuwa, Central, Southern and Uva provinces. During this period Goiter prevalence was 40% and different actions had been taken to reduce the goiter occurrence. According to the study conducted by Fernando *et al.*, (1989), iodine deficiency was reported to be the main cause of this endemic goiter. In response to these findings and the goals set by the World Summit for Children in 1990, the Sri Lankan government initiated and implemented the Universal Salt Iodization programme in 1995. (Department of Nutrition, Medical Research Institute, 2011) According to the Food Act (2005), a minimum of 50ppm of iodine at factory level and 25ppm at the household level was made essential

Salt is an excellent carrier for iodine, as it is consumed at considerably constant, well defined levels by all individuals within a society, independent of economic status. According to the WHO (2007), the recommended iodine intake for the adults should be 150 µg per day and recommended iodine intake for pregnant women is 200 to 250 µg per day. Hence to provide 150 µg daily requirement of iodine for each person, the salt iodine concentration at the point of production should be 20-40 mg per 1 kg of iodized salt. The recommended iodine intake is also known as Recommended Dietary Allowances (RDA) that states the average daily level of iodine intake sufficient to meet the nutrient requirements of nearly 97.5% healthy individuals. (World Health Organisation, 2007) That recommended level was estimated, under the assumptions of 20 % loss of iodine from production site to household, 20 % loss when cooking and 10 g of salt as average salt intake per capita. (Hetzel, 2002)

According to Prodhan *et al.*, (2014), the actual availability of iodine in salt depends on its form of fortification, environmental and other factors. On exposure to sunlight, air, salts iodized as iodide loses a considerable amount of iodine while the salts iodized with iodate has shown no losses. Even when heating, the salts containing potassium iodate may retained a high percentage of their original iodine content while the salts iodized with potassium iodide had lost a considerable amount of iodine. Therefore this study was carried out to find out whether commercially available salt packets for sale to the public is iodized adequately within the Sri Lankan Standards Institute (SLSI) specifications and the stability of iodine at different conditions and determine iodine exposure at the consumer level.

### **Methodology**

A cross-sectional survey was conducted among 100 households selected from multistage cluster sampling method, as the entire population of Sri Lanka is inaccessible. Questions for the questionnaire was designed to meet the goal of evaluation of iodine exposure among Sri Lankans. Verbal consent of the families was acquired first for their participation and then the pretested Questionnaire was administered in every selected household in their convenient language in printed form. It was also circulated around web through surveymonkey.com via email and social media. The respondents were asked ten questions regarding salt purchasing and consumption habits, salt storage, awareness of iodized salt, and iodine deficiency diseases.

Based on the survey results, six different brands of most commonly bought commercial

iodized salt packets from different grocery stores was purchased for the study. The iodate contents of iodized salts was measured in five trials by iodometric titration, according to the procedure given in SLS 79: 1987 (2001). A blank determination was also carried out using 10 g of analytical grade NaCl as a control and in place of the sample, following the same procedure as mentioned above.

Saturated salt solutions were used to study the variability of iodine when exposed to air. First, the first 03 salt products of highest iodine concentrations were chosen. Then saturated salt solutions was prepared by dissolving 10 g of salt from the three salt packets with highest iodine concentration in 25 ml of distilled water. Then all the samples was kept exposed to air inside the laboratory to mimic the conditions under which salts are usually stored at home for use for the average number of days of usage of a salt packet according to the data obtained from the survey. The iodide contents of each were measured initially before storing and after 1 hour, 6 hours and 24 hours and 72 hrs. was determined and iodine loss percentage was calculated. Iodine contents of all situations were measured by iodometric titrations as mentioned in SLS 79: 1987 (2001). The same method was repeated while changing the temperature and the container.

The results as listed in table 1 shows that all of the products have exceeded the recommended iodine fortification level of 15-30 mgkg<sup>-1</sup> of salt according to the FOOD ACT, No. 26 OF 1980. As illustrated in chart 1.8, salt brand D has the highest iodine content of 72.00±3.2 mgkg<sup>-1</sup>, which is two folds greater than the expected level. The decreasing trend of iodine content of the six salt brands is D>C>B>F>E>A. All products contained iodine in excess of the recommended level 15–30 mg/kg of salt ( $p < 0.025$ ,  $\alpha = 0.05$ )

**Table 1 Total iodine contents of different commercial iodized salts in Sri Lanka.**

SALT BRAND	IODINE CONTENT PER KG	STDEV
A	40.7	± 1.0
B	56.6	± 2.5
C	59.4	± 0.7
D	72.0	± 3.2
E	45.2	± 0.7
F	52.9	± 1.3

According to the survey results, commonly practiced storage methods were glass jar with lid, plastic jar with lid and aluminum jar with lid. Therefore saturated salt solutions prepared using salt brands with highest salt content were stored in glass jar, plastic jar and aluminum jar with lids and were tested for change in iodine concentration over period of 3 days. The data obtained gave a decreasing trend of iodine in the three containers for all three brands was Aluminum > Plastic > Glass. According to the results obtained, the average iodine loss increases when the temperature rises and the highest percentage loss was observed in salt brand C when heated to both 50°C and 100°C. While lowest % loss was observed in salt brand D when heated to 50°C, which was only 4.6% but

when heated to 100°C it iodine loss% increased more than two folds of the previous percentage (11.1%). All the solutions were kept in water-bath and stirred continuously to ensure an even spread of temperature throughout the solution in the flask.

As consequence, there is a need for proper monitoring of the salt iodization island-wide to achieve an acceptable and optimal iodine status among the population. Chronic exposure to high iodine concentrations only could possibly cause iodine induced immune phenomena. Daily average iodine intake per capita and iodine loss during domestic cooking were calculated to be 14 g salt/day and 16.54 % loss respectively. Based on the assessment of exposure, it appears that the iodine consumption among the Sri Lankan population may be causing excessive intake of iodine. The incidences of IIH among the public may have to be investigated more thoroughly. Depending on the outcome, the health authorities may want to recommend appropriate level of salt addition during cooking so that long-term health effect can be avoided.

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## Development of a polymerase chain reaction method for rapid detection of *Dirofilaria repens* from canine samples

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### **Abstract**

Dirofilariasis is caused by the filarial nematode of *Dirofilaria repens* in which the parasite is mostly described within canine population and additionally within human population at present. The present trends of emerging zoonosis is due to spread into new geographical regions throughout the world with considerable epidemiology. Therefore, the current study was carried out to develop a Polymerase Chain Reaction (PCR) amplification method in order to use in rapid detection of *D. repens*. Two study areas where numbers of incidents reported during the past history were selected to obtain canine blood samples. Amplification through PCR method was performed with *D. repens* specific primers to identify *D. repens* DNA in the canine blood samples. Primer concentration, Taq Concentration, and MgCl<sub>2</sub> concentration were optimized in the presence and absence of the internal control. Using the optimized concentrations of reaction component and other parameters, satisfactory PCR results were obtained by amplifying a *D. repens* specific DNA band visualized following agarose gelelectrophoresis. These results demonstrate the utility of an optimized PCR assay to detect *D. repens* in canine blood samples and confirmed that the PCR method can be taken as a good rapid detection method to diagnose the disease caused by *Dirofilaria repens*.

### **Keywords**

Dirofilariasis, Nematode, *Dirofilaria repens*, Polymerase Chain Reaction (PCR), Knott's test.

### **Introduction**

Dirofilariasis is a parasite borne infection caused by *Dirofilaria*. The infection found to be an emerging zoonosis which may be mainly within human, dogs, wild canines (such as wolves and foxes) and raccoons depend on causative vector (Czajka *et al.*, 2014). Disease can be found in several types according to the site of infection and the transmission where the parasite of *Dirofilaria*, is a roundworm with an elongated cylindrical body which is categorized under the taxonomy stated in Table 1.0 as the current study based on *D. repens*. Even though the adult worm can be detected with naked eye, Initial stages such a microfilariae stage cannot be studied through naked eye and a use of microscope is essential (Ramirez *et al.*, 2013; Aoki *et al.*, 2011).



**Table 1** Scientific Classification of *Dirofilaria repens* (Paily *et al.*, 2009).

<b>Kingdom</b>	<b>Animalia</b>
<b>Phylum</b>	<b>Nematoda</b>
<b>Class</b>	<b>Secernentea</b>
<b>Order</b>	<b>Spirurida</b>
<b>Family</b>	<b>Onchocercidae</b>
<b>Genus</b>	<b>Dirofilaria</b>
<b>Species</b>	<b>repens</b>

It is well found that, *Dirofilaria* consist of nearly 40 species where some of the species are considered to be the potential causative organisms which causes *Dirofilariasis*. According to Reddy, 2013, at least six types of *Dirofilaria* species which has the potential to cause accidental infection in human which includes *D. immitis*, *D. repens*, *D. striata*, *D. tenuis*, *D. ursi* and *D. spectans* (Reddy, 2013). Moreover, out of those six species, it has reported that two species are emerging in the disease are *D. immitis* and *D. repens* (Simon *et al.*, 2012). Furthermore, the above two types of *Dirofilarial* nematodes are responsible for causing human *dirofilariasis* (Popescu *et al.*, 2012).

Matured worms of *dirofilaria* can elicit inflammatory responses which can induce clinical manifestations which can be sometimes asymptomatic (Nimir *et al.*, 2011). In literature, the cases reported with *Dirofilariasis* found to be limited as it was a rare disease condition and at present, it is found that the cases are being increasingly revealed highlighting it as a case for consideration as an emerging outbreak in many areas of the world. *Dirofilaria* shows a high prevalence in the areas of the countries in Africa, Asia and Europe. Moreover in Europe, Mediterranean region has the more prevalence as it is highly endemic which induce the maturation of infectious larvae in mosquitoes in warm temperature conditions (Czajka *et al.*, 2014).

Addition to the above records, recent investigations reveals that cases associated with human *dirofilariasis* and canine *dirofilariasis* are found to be present within the country regions such as Austria, Poland and Czech Republic (Sulesco *et al.*, 2016). The probable reasons to the spread into other regions could be due to climate changes, translocation of dogs between the regions and also may be due to migration of infected people (Simon *et al.*, 2012; Saevik *et al.*, 2014). According to Harizanov *et al.*, 2014, Sri Lanka also considered to be a country showing *Dirofilariasis* is zoonotic disease (Harizanov *et al.*, 2014). Hence the development of a rapid diagnostic techniques for diagnosis of *Dirofilariasis* is essential. Accordingly this study was carried out to optimize a sensitive Polymerase Chain Reaction (PCR) method to detect *Dirofilariasis* in Human Population using canine blood samples.

### **Methodology**

Two study areas where numbers of incidents reported during the past history (Nugegoda in the District of Colombo and Karapitiya in the District of Galle) were selected to obtain canine blood samples. The presence or the absence of *D. repens* species in the samples were initially observed through two histological confirmatory methods, namely; Thick

Blood Histology method and Knott's test as confirmatory techniques in diagnosis. Out of the total of 31 samples, 18 samples showed the presence of the *D. repens* species in thick blood film histology. Furthermore, Out of the total of 31 samples, 27 showed the presence of the species in the Knott's test. It was found that, Knott's test is much more sensitive with respect to Thick Blood Histology. Therefore, the positive samples for *D. repens* confirmed from the histological application were used in the development and optimization of PCR method. DNA was extracted from positive blood according to the guideline protocol provided by CEYGEN BIOTECH, Sri Lanka. Amplification through PCR method was performed with *D. repens* specific primers to identify *D. repens* DNA in the canine blood samples. Primer concentration, Taq Concentration, and  $MgCl_2$  concentration were optimized in the presence and absence of the internal control and therefore, upon the changes made in the concentrations of the components in the master mix was able to obtain a satisfactory results showing the presence of bands in the agarose gel after electrophoresis. These results demonstrate the utility of an optimized PCR assay to detect *D. repens* in canine blood samples and confirmed that the PCR method can be taken as a good rapid detection method to diagnose the disease caused by *Dirofilaria repens*. Furthermore, future studies can be done in order to develop more sensitive methods using other PCR applications in rapid detection of such disease conditions caused by parasites, fungi, viruses and bacteria.

# Development of a loop mediated isothermal amplification method for rapid detection of *Dirofilaria repens* from biological samples

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## Abstract

Dirofilariasis is a vector borne parasitic disease caused by a nematode *Dirofilaria repens*. Disease itself has become an increasing zoonosis covering a waste geographical area where the condition is mostly found within canine population. Furthermore, disease is found to be within human population due to the vector mode of transmission. Following research was carried out to modify a Loop Mediated Isothermal Amplification (LAMP) method in the process of rapid detection of *D. repens* causing the potential zoonosis. Therefore the optimization of the method LAMP was done by using canine blood samples from suspected dogs through veterinary clinics and collected blood samples were performed with histology. Histology was followed by using Thick Blood Film where the whole blood was directly drawn on the slide which was then stained using Giemsa stain for histological detailing marked 18 positive out of 31 samples. Moreover, the Knott's test was performed to detect *Dirofilaria repens* in the canine blood sample collected in which 27 samples marked positive out of 31 samples. Knott's test was concluded as a high sensitive method of histology where the positive samples were used in further application. DNA extraction was done for a total of 31 samples where the purified samples were mixed with the master mixture. LAMP reaction occurs at two different temperatures where it uses *D. repens* specific primers in the process of amplification. Four primers used in the amplification bind to six different regions in the genome where the amplified products are made at the end of the reaction. The amplified products were mixed with sybr green dye to detect the color change for positive results. The products mixed with sybr green was then loaded on an agarose gel with the presence of a gel loading dye and electrophoresed. Upon Agarose Gel Electrophoresis, results were found to be positive for all five samples where the bands were observed approximately at 280 base pairs with the help of 100 base pair ladder. Therefore, finally with the presence of positive results, the current study was concluded with the result that of Loop Mediated Isothermal Amplification method can be used as a rapid detection method for *Dirofilaria repens* from biological samples. Furthermore, the method can be used to identify the Dirofilariasis in human where the same method protocol can be used.

## Keywords

Dirofilariasis, *Dirofilaria repens*, Loop Mediated Isothermal Amplification (LAMP), Knott's test

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# Analysis of Vitamin C concentration in fresh and commercially available orange juices using iodometric titration method

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## Abstract

Vitamin C is an important component of the body which takes part mainly in immune response and body building functions, but it cannot be synthesized by the human body and needs to be taken externally. Citrus fruits like oranges being rich in vitamin C can be consumed to maintain the daily needs of the vitamin. The labels of the package may be misleading as the companies may underestimate or overestimate the actual content. Therefore, this project was done to identify whether there is a significant difference in the vitamin C concentrations of the natural oranges and the orange beverages in the district of Colombo, Sri Lanka.

A survey was conducted to obtain details about the mostly consumed orange flavored drinks in the market and five brands were selected for the study. Iodometric titration was used to determine the concentration of vitamin C in freshly prepared and five commercial fruit juice samples and twenty readings were taken for each sample. The highest amount of vitamin C that was found was about 0.28 gml<sup>-1</sup> for a commercial fruit juice. It was about 0.12 gml<sup>-1</sup> for fresh juice. The variation of the concentration of ascorbic acid in the juices used varied in the order Brand C > Brand D > brand E > Natural oranges > Brand A > Brand B. Though the results showed that there is a significant difference between the Vitamin C concentration in natural oranges and beverages, it cannot be distinguished on whether the natural oranges or the beverages have the highest amount of vitamin C because the amount of Vitamin C added depends on the manufacturer, in the beverages.

## Keywords

Vitamin C, Iodometric Titration, Natural Oranges

## Introduction

Vitamin C being a water soluble and colourless compound is one of the main components required in small amounts by human beings as it takes part in important functions of the body like body building and immune response (Ajibola *et al* 2013 & Rahmawati and Bundjali, 2012). But interestingly, the human body doesn't have the ability to synthesize this vitamin; thus, it has to be taken externally. Depending on whether the body has too little or too high vitamin C, the body can undergo health conditions like suppressed immune responses and formation of kidney stones. For this purpose, the Food and Drug Administration (FDA) of UK has recommended to consider the recommended Daily allowance of Vitamin C for each type of person based on factors like gender, age and special conditions like for smoking, pregnant women and lactating women separately as shown in table 1.

Fruits and vegetables are a rich source of Vitamin C, out of which citrus fruits like oranges have a greater concentration of vitamin C and it can be consumed to maintain the daily needs of vitamin C. In today's market, not only fresh oranges but commercial orange drink bottles along with the labelled concentration of vitamin C are available. The labeled concentration is useful to estimate the amount of drink a person can drink for a day,

which will help to maintain a healthy life. But sometimes the companies that produce these orange juices add lower or higher amounts of vitamin C from its label.

Therefore, in this study, an analysis was done to identify whether there is a difference between the concentrations of vitamin C in natural oranges and commercial orange beverages in the Colombo district in Sri Lanka. This is useful for identifying the reliability of customers to these orange juices to fulfil their recommended daily allowance of vitamin C.

### Experimental

Carrying out a survey, the mostly consumed orange beverages were found in the market of Colombo and five brands were selected. The brands were named as A, B, C, D and E. Out of these commercial products, Brands A, B and C were ready to drink beverages while Brand D was a concentrated orange nectar and Brand E was a powder. The Brand D was diluted before use and Brand E was prepared according to the instructions indicated on the package while Brands A, B and C were not modified before use. The iodine solution was prepared using potassium Iodate and Potassium iodide in the presence of Sulphuric acid. The natural oranges were blended and the juice was extracted. A volume of 25 ml of these orange juices were titrated by the method of iodometric titration using 1% starch as the indicator and twenty readings were taken for each sample. The method was validated using a standard vitamin C tablet. The readings obtained were analyzed using One-Way ANOVA using the SPSS software.

It was found out that there is a significant difference between the ascorbic concentration of natural and commercial orange beverages ( $p=0.00 < 0.05$ ). The highest amount of vitamin C was about 0.28 gml<sup>-1</sup> which was found in a commercial fruit juice and the natural oranges had a vitamin C concentration of about 0.12 mgml<sup>-1</sup>. The variation of the concentration of ascorbic acid in the juices used, varies in the order Brand C > Brand D > brand E > Natural oranges > Brand A > Brand B. Thus, it cannot be commented on whether natural oranges or the beverages have more ascorbic acid, because each brand has its own concentration. It was noticeable that brands A and E have less concentrations than the labelled concentration of ascorbic acid while Brand C and D have concentrations higher than the labelled ascorbic acid concentration. Therefore, as the study clearly

Table 1: Daily Recommended Allowance of Vitamin C (USA.gov,2017)

Age	Male	Female	Pregnancy	Lactation
0–6 months	40 mg	40 mg		
7–12 months	50 mg	50 mg		
1–3 years	15 mg	15 mg		
4–8 years	25 mg	25 mg		
9–13 years	45 mg	45 mg		
14–18 years	75 mg	65 mg	80 mg	115 mg
19+ years	90 mg	75 mg	85 mg	120 mg
Smokers	Individuals who smoke require 35 mg/day more vitamin C than nonsmokers.			

signifies a difference, in future this study can be done by not limiting it to one fruit, but to a vast range of fruit juices as it will give a broader knowledge, as well as the use of latest technical instruments like HPLC or voltammetry for further developments.

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## The *in vitro* evaluation of Antibacterial and Antifungal activities of ripe fruit extracts (pericarp and seed) of *Bunchosia armenniaca* (Cav.) DC

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### Abstract

Plants are rich sources of phytoconstituents that has the ability to contribute biological activities. Indigenously prepared crude extracts of medicinal plants have been used as medications to treat infections caused by pathogenic microorganisms by people of various ethnic origins for many centuries in folkloric medicine. The research in discovering new and innovative antimicrobial compounds from plants has received increased concern due to the global rise of antimicrobial resistance. The present study aims to evaluate the *in vitro* antimicrobial potential of pericarp and seed extracts of ripe fruits associated with a native South American plant specimen known as *Bunchosia armenniaca*. The antibacterial and antifungal activities of aqueous and ethanolic crude extracts with concentrations ranging from 1000 to 125 mg/ml were determined against bacterial pathogens of *Staphylococcus aureus*, *Escherichia coli*, *Bacillus subtilis*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, *Streptococcus pyogenes*, viridans group streptococci and fungal pathogens of *Candida albicans* and *Aspergillus fumigates* by performing the agar well diffusion assay. The pericarp extract did not exhibit any antimicrobial activity while the aqueous seed extract was only active against *Escherichia coli* which indicated a mean inhibition zone diameter of 16.2 mm at its highest concentration. The minimum inhibitory concentration of the seed extract was 250 mg/ml. The qualitative phytochemical analysis indicated the presence of flavonoids, phenols, tanines, alkaloids, phytosterols and saponines in both aqueous crude extracts. The findings of this investigation justifies that seeds of *Bunchosia armenniaca* ripe fruit has the ability to function as a novel, potent antibacterial therapeutic agent against multi-drug resistant *Escherichia coli*.

### Keywords

Antibacterial activity, antifungal activity, folkloric medicine, *Bunchosia armenniaca*, qualitative phytochemical analysis, *in vitro*, agar well diffusion assay, minimum inhibitory concentration.

### Introduction

Medicinal plants are valuable, indispensable and potentially renewable sources of natural products that have made significant contributions towards the enhancement of human health. The use of herbs in folkloric medicine and their medicinal importance have been recorded since antiquity (Abeyasinghe, 2010). Medicinal plants are rich and diverse sources of biologically active phytochemical compounds known as secondary metabolites. Some of these secondary metabolites can induce promising antimicrobial activity and therefore, represent a new antimicrobial agent (Khanam, Wen and Bhat,



2015). The level of antimicrobial potential can vary from one anatomical region to another of a plant. Most synthetically produced antimicrobial drugs are derivatives of naturally occurring antimicrobial compounds. Recently, a great deal of interest has been shown by scientists towards research that focus on the isolation of antimicrobial compounds from natural sources like plants due to the global rise of antimicrobial resistance and worrisome side effects caused by synthetic antimicrobial drugs which have become major public health issues (Hakemi *et al.*, 2015). According to the World Health Organization (WHO), even as of today, about 80% of individuals that reside in developing countries rely on traditional herbal medicine for their primary health care needs (Aneja, Sharma and Joshi, 2012).

The following study aims to investigate and evaluate antibacterial and antifungal potentials of ripe fruits and their seeds associated with a tropical plant specimen found in Sri Lanka called *Bunchosia armenniaca*, also known as “the peanut butter fruit”. *Bunchosia armenniaca* is species of shrubs that belongs to the family Malpighiaceae (Lim, 2012). These evergreen perennial shrubs originated from South America, where they can be predominately found in Amazonia, Atlantic Forest and Pantanal (Queiroz *et al.*, 2014). This species of *Bunchosia* can grow up to 5 m in height (Lim, 2012).

Currently, there are no reports of *Bunchosia armenniaca* being applied in orthodox medicine. However, recent literature indicates that according to a research conducted at the Federal University of Santa Catarina in Brazil found that leafs of *Bunchosia armenniaca* has excellent antibacterial and anti-inflammatory activities (Queiroz *et al.*, 2014). A research recently carried out locally indicated that ripe fruits of *Bunchosia armenniaca* have the ability to induce potent antioxidant activity. Studies indicate the presence of a wide variety of phytochemical compounds like flavonoids alkaloids, tannins, saponins, triterpenoids, steroids, phenols and glycoside in the extracts of *Bunchosia armeniaca* fruits and leaves (Premathilaka and Silva, 2016). It has been justified that flavonoids predominantly act as compounds responsible for mediating antibacterial activity in these plants (Queiroz *et al.*, 2014).

The evaluation of antibacterial and antifungal activities of plant extracts can be performed by using the *in vitro* technique known as the agar well diffusion assay which is the hallmark for determining the susceptibility of bacteria and fungi to a particular plant material. This assay will be implemented to probe antimicrobial action by observing the zone of microbial growth inhibition and its size (Kusuma *et al.*, 2014).

### **Experimental**

Reddish fully ripe fruits of *Bunchosia armeniaca* were freshly plucked and collected from a garden tree situated at Avissawella region of Colombo district, in Sri Lanka (GPS coordinates: 6°57'11"N 80°13'06"E) in October 2016. Samples of the whole plant and fruits were sent for taxonomic authentication to the National Herbarium of Peradeniya in Sri Lanka.

Fruits were gently rinsed with distilled water and their pericarp was separated from seeds. The pericarp and seeds were separately grinded and freeze-dried at (- 40°C) for 24 hours. About 30 g of powdered pericarp and seeds were separately dissolved in 30 ml of sterile distilled water which is considered as the pure aqueous stock solution with

a concentration of 1000 mg/ml. The stock solution was incubated at room temperature for 24 hours. The incubated aqueous stock solution was sieved through a muslin cloth and filtered with Whatman Grade 1 filterpaper and followed by 0.45 µm membrane filter. The filtrates were stored in air tight containers at 4°C for further use. The pure aqueous stock solution was serially diluted to obtain different concentrations of 500 mg/ml, 250 mg/ml and 125 mg/ml.

Another 30 g of freeze-dried and powdered pericarp and seeds were separately macerated in 100 ml of 95% ethanol at room temperature for 48 hours with occasional shaking. The macerated solution was sieved through a muslin cloth and filtered with Whatman Grade 1 filterpaper. The ethanol content of the filtrate was removed using the rotary evaporator under vacuum at 40°C for about half an hour. The dried filtrates were reconstituted with 30 ml of 20% dimethyl sulfoxide (DMSO) which is considered as the pure ethanolic stock solution with a concentration of 1000 mg/ml. The reconstituted filtrates were further subjected to filtration through a 0.45 µm membrane filter and stored in air tight containers at 4°C for further use. The pure ethanolic stock solution was serially diluted to obtain different concentrations of 500 mg/ml, 250 mg/ml and 125 mg/ml.

A total of nine microbial specimens were used in this experiment. Three Gram-positive bacteria that include *Staphylococcus aureus* (ATCC 25923), *Streptococcus pyogenes* (clinical sample), viridans group streptococci (clinical sample) and four Gram-negative bacteria that include *Escherichia coli* (ATCC 25922), *Bacillus subtilis* (clinical sample), *Pseudomonas aeruginosa* (ATCC 27853), *Klebsiella pneumoniae* (clinical sample) were collected from Medical Research Institute of Sri Lanka. Two fungal specimens that include *Candida albicans* (clinical sample) and *Aspergillus fumigates* (clinical sample) were collected from Lanka Hospitals Diagnostics (Sri Lanka). All microbial specimens were prepared in suspensions that were adjusted to 0.5 McFarland turbidity standards which correspond to a microbial cell count of  $1.5 \times 10^8$  CFU/ml.

The *in vitro* agar well diffusion assay was used to evaluate the antibacterial and antifungal activities of the fruit extracts. The antibacterial assay was performed on Muller-Hinton agar and the antifungal assay was performed on Sabouraud dextrose agar. Muller-Hinton agar was supplemented with 5% sheep blood in case of *Streptococcus* spp. 1 ml of the 0.5 McFarland bacterial or fungal suspensions were transferred to 24 ml of Muller-Hinton agar and Sabouraud dextrose agar respectively and poured in to petri dishes of standard size in order to obtain an uniform agar depth of 4 mm. After pouring, the agar medium was allowed to solidify and the plates were inverted and left to dry for about 15 minutes. A sterilized steel cork borer of 8 mm in diameter was used to punch wells on the agar surface. All extracts were brought to room temperature prior to be used in the antimicrobial assay. An aliquot containing 100 µl of the extract from the 1000 mg/ml pure stock solutions were inoculated to the wells. Another aliquot containing 100 µl of sterilized distilled water or 20% DMSO were inoculated to another well and considered as the negative control for aqueous and ethanolic extracts respectively. The antibiotic disk gentamicin 10 µg and antifungal drug disk voriconazole 1 µg were used as positive controls in the antibacterial and antifungal assays respectively. The plates were allowed to stand for about 1 hour at room temperature for pre-diffusion of the extract in to agar and incubated at 37°C for 24 hours for bacteria and at 25°C for 48-72 hours for fungi. Likewise, antibacterial and antifungal assays were carried out to determine the

minimum inhibitory concentration for different concentrations. All antimicrobial assays were conducted in triplicates. The diameter of the zone of inhibition for each well and disk were read and measured in “mm”. A sample from the zone of inhibition produced for different concentration of 1000 mg/ml, 500 mg/ml, 250 mg/ml and 125 mg/ml were aseptically pre-elevated and separately plated on fresh agar plates and observed for the formation of bacterial or fungal colonies after overnight incubation.

The aqueous seed and pericarp extracts of *Bunchosia armeniaca* ripe fruit were qualitatively screened for the presence of bioactive secondary metabolites like flavonoids, alkaloids, phenols, phytosterols, saponines, tanines by the application of alkaline reagent test, Wagner’s test, Liebermann–burchard test, Salkowski’s test, froth test and Braymer’s test respectively.

Neither aqueous or ethanolic extracts of pericarp exhibit any observable antibacterial or antifungal activity while the aqueous seed extract was only active against *Escherichia coli* with bacteriostatic action which indicated a mean inhibition zone diameter of  $16.2 \pm 0.03$  mm at its highest concentration of 1000 mg/ml. Moreover, none of the ethanolic extracts exhibit any observable antibacterial or antifungal activity. The minimum inhibitory concentration of the aqueous seed extract was 250 mg/ml which produced a mean inhibition zone diameter of  $13.2 \pm 0.04$  mm. The qualitative phytochemical analysis test revealed the presence of flavonoids, phenols, tanines, alkaloids, phytosterols and saponines in both aqueous crude extracts. Queiroz *et al.* (2014) noted that flavonoids were the primary phytochemical compounds that mediated antibacterial activity of *Bunchosia armeniaca* leaves. Being polyphenolic secondary metabolites, these flavonoids have the ability to induce bacterial growth inhibition by mainly involving the traumatisation of bacterial DNA.

In conclusion, the present finding of this study justifies that seeds of *Bunchosia armeniaca* ripe fruit has narrow spectrum or semi-narrow spectrum activity with bacteriostatic action against bacteria and qualifies as a decent candidate to be recognized as a novel antibacterial agent with potent therapeutic ability to treat infections caused by multi-drug resistant *Escherichia coli*. Further studies are recommended to determine the antibacterial mode of action of lead phytochemical molecules associated with seeds and the antibacterial effect of crude extract of *Bunchosia armenniac*a seeds on animal models.

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# Evaluation of Farmers' E-Learning Systems Adoption

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## Abstract

Internet-based learning systems (e-learning) are being used for different target groups for teaching and learning purposes. But their adoption requires a solid understanding of the user acceptance processes. The technology acceptance model (TAM) has been used to test the acceptance of various technologies and software within an e-learning context. However, there is a limited research for testing e-learning adoption by farmers. Therefore, this research aims to evaluate e-learning adoption by farmers by developing a model. A model of e-learning adoption of farmers is proposed based on the TAM model.

## Keywords

Technology Acceptance Model (TAM), E-learning, Farmers

## Introduction

Most of the previous studies have examined the concept of e-learning with different target groups, and little attention has been paid to the investigation of such concept with the target group as farmers. Therefore, this research will investigate the adoption of e-learning among farmers. More specifically, the study intends to investigate the factors affecting the adoption of an e-learning system among farmers. The contribution of this study is focused in developing models which could be used in future studies to better explore the issue of e-learning adoption of farmers. The target e-learning system used in this research is e-learning program developed from University of Colombo Institute for Agro-technology and Rural Sciences (UCIARS), Sri Lanka for grass-root-level users such as farmers. In 2009, the development of online Agro-technology Diploma leading to a Degree was initiated and to this day it has continued to be one of the leaders in the use of web-based technologies for farmers in Sri Lanka. In order for e-learning applications to be successful, it needs reliable ways to measure its success. Diverse dimensions of e-learning system success construct must be defined both conceptually and operationally for evaluating the e-learning system success. The development of empirically confirmed model that characterizes the dimensions of an e-learning system success construct can be an important assessment to both researchers and practitioners for developing e-learning systems for farmers. It can allow researchers to identify various characteristics of e-learning system success for farmers and investigate the contributory between the success of e-learning systems and its drivers. Practitioners can use it in the post-implementation phase as an assessment mechanism to review whether the anticipated outcomes and benefits of e-learning systems are realized. Based on above facts, development of comprehensive, multidimensional model for measuring e-learning

systems success in agricultural context is a valuable investment. Therefore, This study examines the factors that influence farmers' adoption and use of e-learning systems and tests the applicability of the technology acceptance model (TAM) in the context of farming community.

### **Experimental**

In order to investigate the determinants of the e-learning adoption and e-learning outcomes among farmers, a research model based on TAM was proposed and tested with farmers to answer the research question How to improve farmer's adoption of e-learning system and what are the factors driving e-learning adoption. In order to answer the questions, this study proposes a model depicting twelve hypotheses as in figure 01. The sample was the student farmers of UCIARS who had experience in using e-learning platform in their studies. Web survey research method was adopted for collecting data. The survey ran for approximately four weeks and 230 farmer students answered for the survey. A Confirmatory Factor Analysis (CFA) was conducted to develop the measurement model. By using this technique, the reliability and validity of the measurements were examined using model fit indices adapted by (Hair *et al.*, 2010). Then, the path coefficients and the statistical significances were examined by testing the structural model. To examine the causal relationships among all constructs, the proposed structural model was tested using SEM.AMOS and part of the Statistical Package for the Social Sciences (SPSS) software were used to conduct the CFA and SEM.

Twelve hypotheses were tested collectively using the structural equation modeling (SEM) approach (Bagozzi *et al.*, 1991), performed using AMOS 21. The path significance of each hypothesized association in the research model and variance explained (R2 value) by each path were examined, and Fig. 1 shows the standardized path coefficients and path significances. Out of twelve, eleven hypothesized associations were strongly significant at  $p < 0.05$ .

The model developed adapting the framework by incorporating e-learning adoption antecedents (including quality aspects, image, job relevance, facilitating conditions, computer self-efficacy, perceived ease of use and usefulness), e-learning adoption behavior (including e-learning use) into a model. E-learning adoption behavior of this study is significantly determined by e-learning use. E-learning use is jointly determined by perceived usefulness ( $\beta = 0.542$ ,  $< 0.001$ ) and perceived ease of use ( $\beta = 0.342$ ,  $< 0.001$ ) and those two variables jointly explained 60% of the variance of e-learning use ( $R^2 = 0.60$ , coefficient of determination). Perceived usefulness of e-learning system among farmers is jointly determined significantly by System Quality ( $\beta = 0.282$ ,  $< 0.001$ ), Information quality ( $\beta = 0.373$ ,  $< 0.001$ ), Service quality ( $\beta = 0.351$ ,  $< 0.001$ ), Image ( $\beta = 0.432$ ,  $< 0.001$ ) and job relevance ( $\beta = 0.512$ ,  $< 0.001$ ) and these variables together explained 65% of the variance of usefulness of e-learning system among farmers. Perceived ease of use e-learning system among farmers is jointly determined significantly by System Quality ( $\beta = 0.480$ ,  $< 0.001$ ), Information quality ( $\beta = 0.220$ ,  $< 0.01$ ), Service quality ( $\beta = 0.210$ ,  $< 0.01$ ) and Facilitating conditions ( $\beta = 0.403$ ,  $< 0.001$ ) and these variables together explained 67% of the variance of perceived ease of use of e-learning system among farmers.

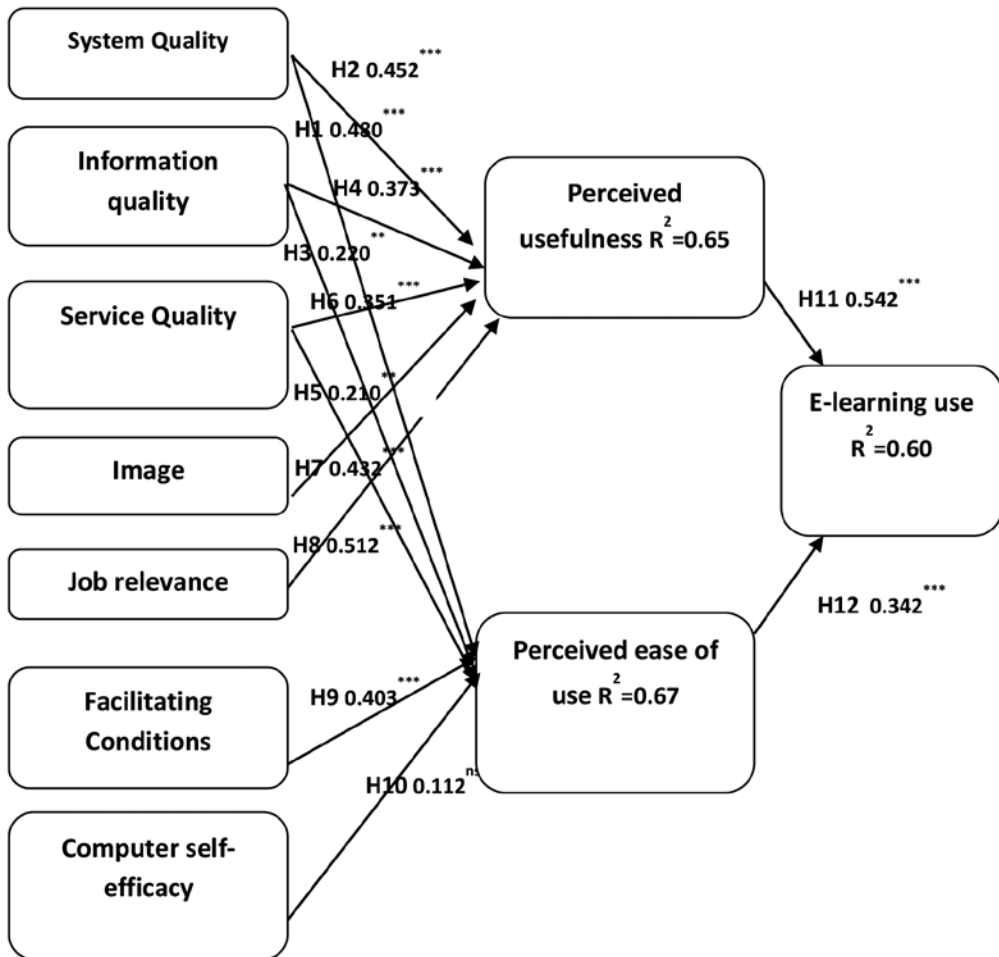


Figure 01 Hypothesis testing results

(Note: \* $p < 0.05$ ; \*\* $P < 0.01$ ; \*\*\* $p < 0.001$ ; ns: non-significant)

E-learning adoption determinants such as system quality, information quality and service quality are directly and significantly influenced for both perceived usefulness and perceived ease of use supporting the hypotheses of H1 to H6. The study considered image as an important factor for e-learning adoption since farmers is more likely to have improved their social status by following this e-learning program (Vidanapathirana 2012). The study revealed that there is a significant positive direct influence of image on perceived usefulness of e-learning systems for farmers supporting H7 (there is significant and positive impact of image on farmer's perceived usefulness of e-learning systems). The job relevance construct consisted of multiple items on the respondent's perception on the relevance of e-learning on their jobs.

The study result confirmed that the perception on job relevance was significantly correlated to perceived usefulness supporting H8 (there is significant and positive impact

of image on farmer's usefulness of e-learning systems), having strong effect ( $\beta=0.512$ ). The study revealed that the facilitating condition was significantly correlated to perceived ease of use supporting H9. However computer self-efficacy is not significantly influenced on perceived ease of use of the system. Introduced model can be used for implementing and adopting e-learning system for users such as farmers. Further more to expand the theoretical validity of the literature, re examination of this model with different target groups such as the community like farmers and different system application will be important.

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# Testimony aids for children in adjudicatory process of Sri Lanka

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## **Abstract**

The impact of crime on the people affected by it can be profound. Witnesses may suffer from physical, mental, emotional, and financial harm, from which some may never recover. Injuries may be threatened or inflicted upon witnesses or their families, and threats may even be made against lives. The cooperation of victims, and witnesses is crucial to achieving successful prosecutions of criminal offenders, and dismantling organized criminal groups. Yet one of the challenges faced by many criminal justice systems in the investigation, and prosecution of crime, is obtaining such cooperation. By virtue of child's age, and developing levels of maturity, children require that special measures be taken to ensure that they are appropriately assisted, and protected by Criminal Justice Processes. The use of CCTV, and screens has many benefits for child witnesses. Despite the documented benefits, the use of screens, and CCTV has been contentious. CCTV may not permit the jury to see the size of the child, and so it may leave the jury unaware of the vulnerability of the child as against the accused. This transnational challenge highlights the need for a higher degree of international cooperation.

## **Keywords**

Children's Testimonies, Courtroom, Judge, Jury

## **Introduction**

Child witnesses are particularly fearful of confronting the accused when they come to court. For many child witnesses, this may be the first time they have seen this person since the disclosure of the alleged offences. The inquiry was told of instances where the accused attempted to intimidate the child witness by making threatening face or gestures in court. Problems such as these are not limited to child victim witnesses in criminal trials. The same stress can affect children who witness other criminal events, and child witnesses in various civil proceedings. In recognition of these problems many States, And Territories allow children, and other vulnerable witnesses to give evidence by CCTV or from behind a screen. In Western Australia, Canada, Tasmania, and the ACT, CCTV is the presumed method by which child witnesses give evidence in some criminal proceedings. Other jurisdictions allow CCTV or screens for child witnesses upon the application of a party if the child is shown to be a "Special Witness".

This research high intend to evaluate the adequacy of the prevailing testimony aids for children in adjudicatory process of SriLanka. I further wish to suggest how law should improve most substantially, and procedurally in aiding children in their testimony in the Sri Lankan adjudication process. I intend to base my suggestions upon the analysis carried out regarding statutory provisions covering to subject matter in relate the existing countries.

As compared to many other nations including United States, and Canada are progressive in its use of aids for children's testimonies as shown in its development of policies prescribing their use throughout the country. These aids include the utilization of a support person during testimony, witness screens to shield testifying children from seeing accused persons in the courtroom, and Closed Circuit Television Testimony. Canada has urged other nations to follow their lead, and adopt these progressive aids, as evidenced by their sponsoring of the United Nations. Canadian law reflects the belief that child victims, and witnesses are especially vulnerable while giving testimony, and must be guaranteed the right to testimonial aids in order for justice to be served, and other nations should heavily consider following suit to secure these rights for vulnerable population.

### ***A support person***

A support person is someone permitted by the judge to sit or stand close to a witness under 18 years of age while they testify. Canadian law requires the prosecution or witness to apply to the court for this concession, and the judge is obligated to accommodate unless they believe it would interfere with the administration of justice. Support persons are used to reduce testimony related stress, and yield higher quality evidence from child witnesses, simultaneously serving both the needs of the witness, and the court. Child victim specialists, and appropriate family members may serve as support persons for the child witness. However, the support person cannot be a witness in the same trial unless the judge grants a special exemption. A judge may order that the support person, and child do not communicate during the testimony, in which case the support person is there to merely serve as a comforting physical presence. Support persons are now a common testimonial aid for child witnesses in Canada.

For example, in Edmonton, support persons were requested in 88% of child abuse cases, and permitted in 86% of trials. In Toronto, children utilized a support person for 64% of their testimonies.

A witness screen is an aid to shield a testifying child from seeing the accused in the courtroom. The most common device is a one-way screen where the witness sees only the screen itself. Other arrangements include configuring the courtroom so there is a physical barrier to block the child's view of the accused during their testimony or using a screened off area designed for sensitive testimonies. Canadian child witnesses were first allowed to use witness screens in 1988.

### ***CCTV recorded testimony***

Legislatively available since 1988, Canadian courthouses also utilized Closed Circuit Television (CCTV) for child witness testimony. CCTV is utilized in one of three forms:

1. A CCTV system integrated into the infrastructure of the building at the time of design, and construction.
2. A CCTV system retrofitted into the building or,
3. Portable systems brought in as needed.

Advances in technology have led to improved CCTV systems that are more user friendly with decreased costs. The availability of portable systems means this aid may be used from nearly anywhere in Canada.

***Video recorded testimony***

That is, testimony videotaped earlier, and played at trial without the child taking the stand, is used more regularly.

For the aforesaid reasons, testimony aids for children in adjudicatory process of Sri Lanka should enhance in order to safeguard the rights of children, and also to create a more effective system to ensure upholding of justice in Sri Lanka.

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# 21st Century Great Game and its actors: India's interests in Central Asia and Its repercussions in South Asia

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## Abstract

In 2012 June India launched a "Connect Central Asia" policy which embodies India's ardent concern over Central Asian states. This paper will show how this policy would undermine the regional stability of South Asia since Pakistan's natural fear on Indian involvement in Central Asian region. As Robert D. Kaplan points out "India's history is the story of invasions from a north-westerly direction" under these circumstances troubled state in Central Asia Afghanistan has become a crucial strategic point for New Delhi. This research work is based on literature review regarding the subject matter and this paper will ultimately trace a comprehensive analysis on the repercussion of rising Indian role in Central Asia and how it would create a new "Great Game" in the region.

## Keywords

Central Asia, Great Game, India, Pakistan

## Introduction

For many of the readers who have read Rudyard Kipling's "Kim", word "Great Game" provides a sense of nostalgia which reminds of the historic encounter took place during the British Raj in later part of 19th century and early 20th century. The Anglo Russian rivalry over the hegemony of Central Asia created a storm in tea cup from late 19th Century to early 20th Century which officially ended in 1917. In the days of East India Company in India, British interests were purely confined to financial based such as opium industry and many of the British officials saw the Imperial Russian presence in Caucasus and Central Asia as a threat for their dominance in the region. Peter Hopkirk has aptly described the nature of the rivalry between Imperial Russia and British over Central Asian region and he further argues how British East India Company used its officers to explore the way to borders in Northern India and manipulate the local tribes. Especially the geographic uniqueness of Central Asia and its strategic position as a buffer zone stimulated both British and Russian interests to stay tune to the game. However as Peter Hopkirk coins in his book "The Great Game-On Secret Service in High Asia" the phase of the rivalry between two nations came to a diplomatic end when Anglo-Russian Treaty in 1907, but even after that the "New Great Game" epoch began to loom as a crucial factor in early 20th Century politics<sup>1</sup>. During this period British paid a heavy concern over Russian activities in Central Asian region, because British felt the Imperial Tsarist Russia would one day go for an onslaught to India by using Central Asia as a passage and that assumption had feared the English bureaucratic mind since India happened to be the

1 Peter Hopkirk, The Great Game-On Secret Service in High Asia, (Kodansha America,1992), 214.

glorious jewel of the Empire. As the old Gibbonian quote goes on “History is indeed little more than the register of the crimes, follies and misfortunes of the mankind” this colonial memory of “Great Game” has been reawakened from its slumber in the history and today in the 21st century the “New Great Game” narrates a different story through its age long historic saga in Central Asia.

### ***Nature of New Great Game in 21st Century***

Unlike its old type the nature of Great Game has been changed with many ups and downs occurred in the past century. Especially it is important to trace the historic events which took place after the British departure from the region, because the understanding cold war context is highly necessary to understand the nature and players of “New Great Game” in 21st Century. When British took off the Union Jack from India, they did it with creating two nation’s states in the sub-continent called India and Pakistan. Post India’s relationship with Central Asia was highly nurtured by New Delhi’s closeness with Kremlin and it played a crucial in Indian attitude towards the region. Historically India’s past has been intertwined with Central Asia since the day of yore. For an instance, land silk route used to be an important line of diplomacy in the past where not only trade took place, but many of the intellectual ideas, war strategies were exchanged. This geographic intimacy between the two regions began to sharpen after British left from the region. But it never took place in a rapid manner, instead of India’s presence in Central Asia developed under the Soviet influence till the collapse of USSR in 1991. After its defeat by Chinese in Indo-Sino war in 1961, India realized the importance of keeping its hawk eye on Central Asia, because the unique geographic position of Central Asia could have made pivotal impacts in Indian soil. However the necessity of playing a “New Great Game” never emerged till the beginning of present century and Indian power was not in a highest position in world politics, but the collapse of Soviet Union and Delhi’s favorable attitude towards Washington had played the cards of the game. It is a fact beyond dispute the USA has shown a pragmatically positive attitude towards Indian power in South Asian region recently. International Relations scholar Ivan Campbell argues that by allowing India to expand its wings around Central Asia, Washington eventually expects to implement a strategy that this New Silk Road would link India with Central Asia and then it will be a path to the west<sup>2</sup>. The US involvement in the region was highly galvanized by its operation in Afghanistan after September 11 attacks; it finally set up the ground for the US to enter, but its interests in the Central Asian affair is highly under covered by the Indian presence. According to Stephan Blank “Washington’s presence allows India to play or at least aspire to a greater Central Asian role than it could achieve on its own”. For many Security strategists this a scrumptious game played by the USA after using India as its proxy<sup>3</sup>. Nevertheless the motives of Indian desire over its “near abroad” has deeply upset India’s biggest nemesis in South Asia, Pakistan and also the Chinese too feel quite uneasy before this new “Great Game” of the 21st Century. By looking at the nature, it becomes a palpable fact to realize that unlike the old “Great Game” of the British Raj, this wouldn’t be an old fashioned game between two parties. But the contemporary political context in Central Asia and the world has completely changed its nature.

2 Ivan Campbell, India’s role and interests in Central Asia, Safer world, October 2013, 8.

3 Eugene Rumor, Richard Sokolosky, Paul Stronsky, U.S Policy towards Central Asia, Carnegie international peace studies journal, January, 2016: 13-16.

### ***It's Actors and Their Roles***

Robert De Kaplan states in his writing that India's history is the "story of invasions from a North-Westerly direction", under this circumstance for philistine Indian eyes Central Asia becomes a source of threats than opportunities. It is a known factor that after the humiliating defeat by Chinese in 1962, Indian-China relationship continues doldrums and both countries have adopted a skeptical attitude towards each country. When looking at the annals of history, it is a pretty interesting factor to recognize that Indian interests in Central Asia was relatively less before the collapse of Soviet Union and the region was shadowed by Russians as it used to be in the 19th Century. But the in the advent of post-cold war era both the Indian and Chinese interests of Central Asia sprang out and especially both the cultures do share various affinities towards Central Asia. When it comes to Afghanistan and Iran, India does have a closer role and China has its odds from the remote Central Asian states like Azerbaijan, Turkmenistan. Besides having such socio cultural affiliations with China and India, it is a pivotal fact to remember that in this 21st Century Great Game no Central Asian state is expected to play the role of a "Pawn". But they rather are independent actors that have a narrow margin to maneuver against their Russian, Chinese and Indian neighbors but are still independent in their foreign policy decisions. More importantly Central Asian states do not have same allegiance to either China or India, it differs from the above mentioned socio cultural affiliations. However, despite its blooming importance Central Asia continues to be a peripheral region in terms of security. For China the stability of Turkmenistan will be extremely important with the growing unrest in Xinjiang and on the contrary the Afghan peace becomes more relevant with India to keep its thumb in Kashmir from Islam extremism. Both countries have been grappling with the Islamic extremism in certain ways and it creates a heavy concern over the security in Central Asia. Afghanistan remains the fragile state in Central Asia which has so many security loopholes and especially its instability became worsen after the NATO departure from Afghanistan in 2014. Ostensibly security matters a lot for India to work with the Central Asian region.

Apart from the security concern it is clear enough the other interests loom before the region and actors of the "New Great Game" have set up themselves to play the uncanny game. In 21st Century energy security has become a paramount fact in deciding the power of a nation state. Securing an assured and uninterrupted supply of energy is must for India's economic wheels in motion. According to the current data analysis India's present energy sources are mainly coming from abroad, especially from the "chop and changed" Middle East region. Central Asia has god given richness in natural resources and Caspian Sea grants off shore hydro carbon to the region. 4 percent of natural gas and 3 percent of the world oil reserves have confined within this part of the world. Kazakhstan, Turkmenistan, and Uzbekistan possess most of these resources. Being a nuclear power India strives to increase its uranium assets and Central Asia provides a fabulous space for such a task. For an instance India owned Oil and Natural Gas Cooperation (ONGS) has planned to invest in Kazakhstan, which possess the world most fertile oil fields. Ironically India is not the only actor who shows an ardent interest in the rich energy resources of the Central Asian region. China too has a flare over the energy sources in Central Asia and Chinese have been investing in the region by

4 Jean-Francois Huchet, "India and China in Central Asia: Mirroring their bilateral relations", *China and India in Central Asia A New Great Game?*, ed. Marlene Larulle, Sebastien Peyrouse (Palgrave Macmillan Company, 2010), 102.

keeping a good tally with India.

In order to keep the good faith many of the Central Asian states attempt to uphold a cordial relationship with both the countries, but factually each one has its own allegiances. As the given paragraph mentioned both China and India having their own cards in the region and geo political security and energy security have become the larger ostensible interests in India and China. But it is not a prudent fact to isolate “New Great Game” as a geo political encounter between two emerging super powers, because by looking at the depth of the game one could see the spider web of Great Game has crossed the Atlantic Ocean and penetrated the walls of White House.

### ***Geopolitical Relations of India in “New Great Game”***

International Relations analyst Ivan Campbell has pointed out in a magazine which was published in 2013 October how India has started its recent developments in Central Asian region through strengthening the formal foreign relationship<sup>5</sup>. It was in 2012 January that New Delhi launched its “Connect Central Asian Policy”, this intended to build a stable and strong relationship with India and the fellow states in Central Asia. Campbell argues the ulterior motive of creating such a harmonized stability meant for a wave of expansion of Indian influence over Central Asia, eventually it would seek fortune for India such as supplying energy security as well as India investments in Central Asia would tie Indian influence over the region. Moreover the geopolitical relations between India and other states in South Asia, especially Afghanistan and Pakistan will become more significant regarding deciding the nature of “New Great Game”.

It is not an exaggeration to mention the fact that existence of Pakistan always has been the nemesis of modern Indian history. These two nations have fought three times with each other and India's access to Central Asia becomes trivial, because Pakistan's geography always hinders direct India approach to the region. On the other hand the much troubled state in Central Asia, Afghanistan plays a crucial role in this context. For some Indian minds still Afghanistan is an integral part of the Indian subcontinent, but its instability always has shocked the policy makers in New Delhi, because if Afghanistan's rule again falls back to Taliban or any other Islamic militia, it would be a severe blow on India's national interests. However in the recent past India has shown a progressive interest in Afghanistan's politics, even in the previous government of Karzai and current rule of president Ghani. In the point of matter India now strongly back the rule in Kabul as a bulwark against Pakistan as India used to be during Najibulla's era. By looking at Indian factor in the politics of Afghanistan one cannot forget the US recent past with the same country. Present circumstances are clear enough to understand that Washington expects New Delhi to play the Viceroy's role in Afghanistan after the departure of American military in the region. US international relations analyst Robert D Kaplan has aptly shown the new American interest in India to play a larger role in the Central Asia. He states “As the USA and China become the great power rivals, the direction in which India tilts could determine the course of geopolitics of Eurasia in the 21st Century. India and other words loom as the ultimate pivot state”<sup>6</sup>. But this Indo American alliance in the 21st century Central Asian politics leads to a further chaotic situation in Pakistan,

5 Ivan Campbell, India's role and interests in Central Asia, Safer world, October 2013, 13.

6 Robert Kaplan, Monsoon : The Indian Ocean and the Future of American Power( RHUS, Reprint edition,2011), 265.



which used to be the strongest ally in South Asia for the US, when New Delhi dined with Kremlin in the period of Cold War. The inevitable outcome of such an alliance is Pakistan is approaching more towards the China. The recent Chinese involvement in establishing China-Pakistan Economic Corridor (CPEC) is a reflection of this scenario. There is no doubt this China's new Silk Road will rapidly alter the regional dynamics of trade, developments and politics.

### ***Repercussions in South Asia***

India's new interest in the Geopolitics of Central Asia has longer consequences in South Asian politics. Being the key access to South Asia Central Asian region has a greater importance in South Asia despite its number of socio cultural differences. Especially the relevance of the context has to be understood according to the hegemonic role played by India in South Asia. It is a fact beyond dispute that India has improved a tremendous political and economic strength in the recent past and especially its ties with the USA makes ponderable impacts in the regional affairs. Once Undersecretary to the US State Department Nicholas Burns predicted "Within a generation many Americans may view India as one of our two or three strategic partners" This new tendency has critically changed the fate of South Asia today and "New Great Game" looms as a new dimension of Indo-American alliance<sup>7</sup>. The first half of this paper has dealt with the question how American attempt to meddle with the "Geo Politics" of Central Asia through using India as its proxy, and it is certain enough that such a companionship in Central Asia will make Chinese uneasy, at the same time it can boomerang upon India in South Asia as a form of Chinese- Pakistan axis. As this paper illustrated Chinese will use states in South Asia to hinder Indian plan to approach Central Asia and in such an event Pakistan will be an ideal ground for Chinese. Moreover it further tries to expand its stable relationships with Nepal and other South Asian countries, in such an event India will get encircled by pro Chinese states in the home ground. For both the states do have a civilizational romance with the Central Asia with its old myth called "Silk Route", which had left many influence over the history of both countries. Under these circumstances China will continue a mechanism to pressurize India from South Asian block to Prevent Indian power rise in Central Asia. Staunch Chinese involvement in Pakistan and Nepal could be taken as ideal examples to prove this contention. Moreover China shows an interest in the maritime activities in the Indian Ocean, especially during the regime of Mahinda Rajapakshe of Sri Lanka, China involved in serious projects in Sri Lanka to revive the "Maritime Silk Route" in Indian Ocean by investigating a huge amount of finance over constructing Hambatota International harbor in the Deep South part of Sri Lanka. Indian International Relations analyst N. Manoharan argues "If China wishes it can always turn these projects to India's disadvantage in a conflict situation"<sup>8</sup>. These factual circumstances are enough to assume that India's interest in Central Asia can boomerang upon them in the home ground because Chinese becomes more sceptical on India's presence in Central Asia and then in order to balance the situation they would befriend with all India neighbours and it will spontaneously lead to a greater power imbalance in the region. On the other hand the U.S concerns about the rise of Chinese power in the Central Asia as a ponderable factor in their diplomacy. The scale of potential Chinese investments projects in Central Asia

7 Nicholas Burns, *American Interests in South Asia: Building a Grand Strategy in Afghanistan* (Aspen Institute; The First Edition, 2011), 45.

8 N. Manoharan, "Beijing and India-Sri Lanka Relations", *Journal of Institute of Peace and Conflict Studies* New Delhi (xvi), (2013): 6-14.

betrays an ambition for expanded economic influence over the region. It was in 2013 that Beijing declared they would provide \$64 Billion in infrastructure deals in the region. These plans were followed in 2015 by Chinese president Xi Jinping's announcement of the ambitious Silk Road Economic belt initiative, also many Western scholars have already predicted the Shanghai Cooperation Organization (SCO), which comprises China, Russia and all the states of Central Asia except Turkmenistan has credible potential to become a powerful regional entity like European Union in the coming years. By nature the U.S is reluctant to bear such a situation and it has been evident its recent policy changes towards Central Asia that Washington will succour and accept Indian presence in Central Asia as a strategy against China. But its longer consequences will last for a long time while making a political unrest in South Asia.

### **Conclusion**

This paper has traced the historic analogy of 21st Century 'Great Game' since its inception of the post-cold war era. India's new approach towards Central Asia CCAP has more expectations such as energy security, geographic strategies etc. However New Delhi's launched campaign on Central Asia in 2012 will envisage many challenges to implement in Central Asian soil as this paper pointed out in the above mentioned arguments. The eccentric nature of this "New Great Game" is unlike its old model which existed between the British raj and Tsarist Russia; the new encounter will entangle number of states together in action, as Marlene Laruelle rightly pointed out "The fellow states of Central Asia will not play the role of mere Pawn States. They rather be actors in the game". The question arises when India tightens her role in such a fervent manner in Central Asia, its repercussions can penetrate the boundaries of South Asia too. As this paper has analysed Indo American affinity with regard to the spreading influence in Central Asia can always create a clamour in Chinese psyche and in order to prevent further Indian expansion near their home frontier China will increase its cooperation with Indian neighbours strongly, ultimately this dilemma of power lead to an inevitable regional crisis of South Asia. As Chanakya aptly said in his famous treatise on statecraft it is always the failure of diplomacy which leads to the war. This maxim is heavily applicable to the context in Central Asia. In the grand old days of old "Great Game" in the Raj, Anglo-Russian rivalry was all the time tamed by the good diplomacy and mutual negotiations and it is still early enough to predict the outcome of the "New Great Game" in 21st Century.

# Presidential Powers Are Determined By Respective Constitutions

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## **Abstract**

This research paper analyses how presidential powers differs to country to country in accordance with the constitutions so enacted. The yard stick called constitution demarcates, decides stipulates and implements in the exercise of governance. The constitution restricts and controls absolute power.

## **Keywords**

Presidential powers, constitutions, constitution of Sri Lanka, constitution of U.S.A., governance, balance of power, executive orders.

## **Introduction**

The magnitude of constitution differs to country to country depending on the size of the population and ethnicity. The Indian constitution is the largest and the constitution of the Monaco is the shortest. The features of the constitution are manifold. The constitution of the country is the supreme law. A well enacted constitution strengthens the hands of judiciary and determines the rule of law and thus installs democracy in its authenticity. The constitution of a country should embody and enforce fair, just and universal rules of social conduct to enable citizens to live at peace with one another in positive and productive collaboration. Constitutions sets condition on which the power can be used constitution limits absolute power and establishes boundaries between the state and the individual forbidding the state to trespass into certain areas reserved for private action.

## **Analysis**

For this purpose let us conduct a comparative analysis to distinguish the similarities and differences between the constitution of Sri Lanka and the United States of America and the presidential powers assigned accordingly. The main features between the United States and Sri Lanka is the presence of a codified (written constitutions) whereas the United States constitution was formulated in 1787 Sri Lanka did not become independent until 1948. The constitution was not written until 1972 and then again 1978. The constitution of the 1978 is the current law of the land. Within each constitution the separation of powers between the executive, legislative and judicial branches of government laid down the functions of the president whereas reading each constitution it is apparent that the system of governance in Sri Lanka and the United States differs whilst both governments have a president at the helm of power. Sri Lanka is a semi-parliamentary system while the United States is the presidential system of governments. Within a semi-parliamentary system the president and prime minister are both active in administering the state. However, the powers divided with the president and prime minister differs between countries. Whereas Sri Lanka has president and prime minister, the United States is composed of a presidential system; the president serves as the head of the state.

As laid out in Article 30 of the 1978 constitution there shall be a president of the republic of Sri Lanka who is the head of the state, the head of the executive and of the government and the Commander-in-Chief of the armed forces.

A derailment of democracy and the invocation of dictatorship has been avoided by meticulous intervention by repealing the 18th amendment and by the introduction of 19th amendment.

Similar to Sri Lanka the President of United States as the chief of state, chief executive and commander in chief. As the chief of state the President stays as the symbolic leader of the country while as the chief executive the president essentially runs the government under his leadership. He is to make sure the laws are being enforced, appoint officials, grant pardons and make executive orders while also overseeing the efforts of several departments and agencies. When comparing the two governments the major difference is the term limit of the presidents. Listed in Article 2 section 1 of the U.S. constitution the president should hold his office during a term of four years with vice president. No president can serve longer than two terms. Furthermore, another distinction between the two written constitutions is the right to veto legislations. Within Article 1 section 7 of the United States constitution every bill which shall have passed the House of Representatives and senate shall before it comes law be presented to the President of the United States.” The president thus has the ability to veto any bill he feels unfit, however the veto can be overridden by two thirds vote of the house of representative and senate. Just as the president of Sri Lanka has the right to address and send messages to parliament the United states President shall from time to time give to the congress information of the state of the union and recommend to their consideration such measures as he shall judge necessary and expedient as listed in the Article 2 section 3 of the U.S. constitution. Strictly within U.S. constitution (Article 1 section 8) congress has the power to declare war instead of the president. However, today the president has had unilateral authority in going to war abroad- Similarly to that of the powers written into Sri Lanka’s constitutions. In 2011 president Obama’s unilateral decision to launch missile strikes against Libya without congressional approval questions the constitutionality of Obama’s act. The war powers act of 1973 was enacted to improve the accountability on the executive branch to ensure that the collective judgment of both congress and president will apply to the introduction of the United States armed forces into power or the president.

### **Conclusion**

The Sri Lankan Constitutions has been constituted with none of the check and balance which U.S. model of executive presidential contained. The vital separation of powers among the legislative, executive and judiciary was not maintained (A tribute goes to late Dr. N.M.Perera because of his reference of his prophetic warnings of 1978 constitution and its undermining of democratic constitutions). Whereas, such a powerful country as United States enjoys its superiority in its democracy. It is because of the presence of balance of power even the executive orders of President Donald Trump’s travel ban on religious discrimination was challenged in courts and the same was blocked which demonstrate democracy.

# Emerging Challenges in Medical Negligence: A Critical Analysis of Sri Lankan Law

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## **Abstract**

Every time a patient visits a doctor for his ailments he does not enter into any written contract but there is a contract by implication and any lack of proper care can make the doctor liable for breach of professional duty. Certainly there is a breach of legal duty if the person exercising the skill does something which an ordinary man would not have done or fails to do that which an ordinary prudent man would have done in a similar situation. The injury occasioned by such negligence is liable to be compensated; it is for the court to decide whether the compensation awarded is reasonable and fair according to the facts and circumstances of the case. Medical negligence cases have directly affected clinical freedom and as a result doctors tend to take defensive actions before they treat a patient. In Sri Lanka people are not that much aware about medical negligence even terrible incidents have taken place. There may be an occasion when the patient has died after the treatment and criminal case is filed of allegedly causing death by rash or negligent act. There is an ambiguity on the standard of care required to be exercised by medical practitioners to discharge possible criminal liabilities arising out of their commissions or omissions. Even though there is protection given to accidents caused during performance of lawful acts and acts not intended to cause death and done for the person's benefit by his consent and in good faith still the fear of criminal liability is there along with the performance of the duty. This paper will discuss about how far the patient safety can be ensured through law reforms for the reduction of medical negligence.

## **Keywords**

Medical Negligence, Duty of Care, Compensation

## **Experimental**

Medical profession is regarded as the one of the noble professions in the world. The legal duty that a doctor has towards his patients becomes a service that he provides in return for money. The reason that doctor's job is considered as a service because, at present doctors treat patients only in return of money; therefore wherever there is a transaction of money the relationship of the two persons involved becomes a relationship of trader and consumer; so the patient automatically becomes a consumer and therefore the right of the consumer should be protected. Consumer Protection Act No 01 of 1979 of Sri Lanka provides that; "In every contract for the supply by a trader in the course of a business of services to a consumer there is an implied warranty that the services will be rendered with due care and skill and that any materials supplied in connection with those services will be reasonably fit for the purpose for which they are supplied". The Article 25 of the Universal Declaration of Human Rights (1948) recognized right to health as a human right, Article 6 of International Covenant on Civil and political Rights (1966) stipulates that every human being has the inherent right to life and this right shall be protected by law, Through Article 12 of the International Covenant on Economic Social and Cultural

Rights (1966) recognizes the right of everyone to the enjoyment of the highest attainable standard of physical and mental health.

The medical practitioners tend to show their acts of negligence as human errors. Generally it is considered that the doctors do not breach the standard of care practice accepted by a responsible body of medical men skilled in that particular act. Since this approach does not support the patient's interest later courts acted actively evaluating rights of all the parties. Tindal C.J has stated that "Every person who enters into a learned profession undertakes to bring to exercise of it a reasonable degree of care and skill". Since the world speaks more about human rights; right of a patient has also taken into high concern in the present. In the Sri Lankan context even though the Right to Life and Right of Patient's are not expressly brought out through the constitution; impliedly each citizen owns the right. Although there are patients who suffer from medical negligence in Sri Lanka they do not go to courts because of their low knowledge. A premature baby became blind due to providing excess oxygen by an inexperienced doctor and the inexperience of a practitioner is not a defence to an action for medical negligence. Case of Prof. Priyani Soysa is a landmark case that the Supreme Court of Sri Lanka has established that; Sri Lankan Courts must act within the framework of the core norms of the Aquilian Action and the Actio Injuriarum of Law of Delict until legislative changes are introduced. In the arena of medical negligence number of lives have been lost also because of the negligence of pharmacies and paramedics. Therefore it must not only focus on the negligence done by the doctors because other factors of health care must also be considered.

### ***Recommendations & Conclusion***

Steps should be taken to guide the health sector properly and a medical inquiry must be conducted which will be fair to the doctor and patients. Although this will be a sound solution to avoid the possibility of medical negligence this is not practiced anywhere properly. The lack of resources in hospitals, poor discipline and human resource structure, lack of medical professionals with knowledge are some of the major reasons for medical negligence. As there is a vast knowledge gap between doctors and patients; patients should be given a chance to ask questions regarding the medical treatments and they should be given an opportunity to involve in the decision making process about their lives and through this relationship it will lay a platform to know the patient's injuries which will result to reduce the number of litigations. As the actions for a medical negligence are time consuming, costly and some are lack in transparency; it will only leave the aggrieved party frustration, financial loss, and these procedures will add more misery to the relatives of the victim also to an extent of losing a loved one. A system of no fault compensation along with an Alternative Dispute Resolution (ADR) system will be helpful for patients who are rich and poor as well as educated or uneducated. Hence the Right to life, patient's right and patient's autonomy are not expressly recognized through the Sri Lankan Constitution; these have to be recognized as fundamental rights through the Constitution and it is the responsibility of the legislature, judiciary, as well as the media to respond in a positive manner to the problems associated with medical negligence claims.

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# Corporate Governance of Banks: A Critical Analysis of the Impact of Statutory Framework of Sri Lanka

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## **Abstract**

In Sri Lanka there are twenty five licensed commercial banks including local and foreign incorporated banks. Further, Corporate governance of banks is very significant in Sri Lanka due to many reasons. It takes a special attention of the State, depositors and investors. Effective corporate governance of banks is an essential and integral part of the socio-economical stream of a country. Banks play an essential role in the financial stream of Sri Lanka, as well as globally. There are plenty of Statues which promulgated for the protection of financial diversification of banks, and mainly governed by the Banking Act No. 13 of 1988. In addition to that Regulations issued by the Securities and Exchange Commission and the Companies Act No. 07 of 2007 regulate the corporate sector, thereunder. However due to poor risk diversification mechanisms of the banks, many failures were emerged during the past two decades. The objective of this research is to examine the lacunas and the salient features of the corporate governance which are not fulfilled by the existing statutory framework. Therefore Acts, Case Law and International Regulations will be carried out as primary sources and Journal articles, text books and Institutional framework will be carried out as secondary sources of this research. This research will express whether the corporate governance of Sri Lanka is in line with the international standards, what are the immediate actions to be implemented to fill up the loopholes and the necessity of reforms for the Corporate Governance Statutory Framework.

## **Keywords**

Securities and Exchange Commission, Promulgated, Diversification, Institutional Framework, Immediate Actions.

## **Methodology**

This research was carried out using the qualitative method of research. It is used because the selected research problem had to be discussed by understanding, describing and comprehensively elaborating the corporate governance system applicable to the banks in Sri Lanka. Further, the failures in corporate governance which has contributed for the recent banking scandals need an adequate observation on the corporate governance functions in Sri Lanka.

## **Introduction**

Corporate governance laws of Sri Lanka have been reformed since 1990, however many laws were emerging from 1978 open economical infrastructure. It should be observed that, the first failure was the Pramukha Savings and Development Bank issue and the second failure was the Seylan Bank issue. However, recently there are certain issues and failures at the treasury bonds issuance of Central Bank. This indicates that there is a failure in the system of corporate governance relating to banks in Sri Lanka. Therefore



this research will evaluate the recent banking scandals and the system of corporate governance in Sri Lanka. Thereby a proper legal mechanism is needed to control and monitor the banks and its functions.

As per the modern corporate principles, there is a separation on ownership and the management at the corporate governance. Basically there are three generic corporate governance problems that may arise in business firms specially in banking sector, viz, conflicts between owners of the business and managers those who have hired by the owners, the conflicts between majority shareholders and minority shareholders and the conflicts between the business firm and the third parties with whom the firm contracts.

As per the verdict of Treasury Bonds Issue in Sri Lanka, a strong corporate governance structure should mitigate the conflicts of interests between and among different stakeholders of the company and will safeguard their interests of the each stakeholder. In the case of *Gough v Commonwealth* [1994] Banks have played an integral part in society for many years and they are the cornerstone in the economies and backbone of the people.

There are certain unique characteristics of banks which mandate them to adopt proper mechanisms of Risk Management which can be explained in following aspects. Basically equity of the banks is smaller than its liabilities. IN that sense banks make a balance between the depositor and the borrower by mitigating the conflicts of interests. Then the loss of public trust and confidence could be lead to banking financial crisis, and therefore banks are highly depended on the public faith and confidence. In addition to that, banks raise their funds not mainly through the shareholders but through the depositors. This places a special fiduciary duty on the banks towards its depositors. Further, the failure of one bank may result in the failure of other banks and other non-bank firms, as they are inter connected, thus can have systemic consequences on the national economy. In the case of *United States v Philadelphia National Bank* (1963), it was held that, when a bank makes a loan by crediting the borrower's demand deposit account it augments the nations credit supply, thus the banks can have an effect on Cost of Money, Liquidity, Inflation, Interest Rates, Exchange Rates, Gross Domestic Product and every constituency of the economy.

The cost of irresponsible lending by the banks is usually borne by the depositors, tax payers, government and the entire society at large. Banks play the role of the Agents of the payment system domestically and internationally therefore proper functioning and governance of banks are important to the stability and soundness of the payment system which is a prerequisite for an efficient macro-economy.

There are certain examples at the region of Asia, viz, the Asian Financial crisis in 1997 and the sub-prime mortgage crisis in 2007, and the adverse effects of irresponsible lending by the banks is clearly explained the consequences of each incident in large scale. However, the said lesson significantly states that, by addressing all characteristics, issues and vulnerabilities of the risk management a proper mechanism to be made for the corporate governance.

According to the majority rule which laid down in the case *Foss v Harbottle* (1843) the decision of the majority shareholders will prevail over minority shareholders and

the minority shareholders are required to accept the decisions made by the majority shareholders. It creates a shareholder regime that exists in Sri Lanka as in most of the other developing countries is known as controlling shareholder regime. In this manner the large block holder controls the corporation by owning a majority of shares.

Other way round, the next reason for the failures in the corporate governance in Sri Lanka is the minimum involvement of the minority shareholders. Even though they are provided with the mechanisms to protect their rights they are reluctant to resort to such mechanisms as the legal cost is very high in corporate matters in Sri Lanka. Third but the next main reason for the failures at the corporate governance is the disregard of apparent non compliances and breaches of statutory provisions and regulations. This occurs due to the political infrastructure in Sri Lanka. Further, the differences of theory and the reality of the auditing and accounting practices, there are certain failures at the corporate governance.

According to the annual reports of the Central Bank the boards of directors of the companies are consisted with family members and friends who lead to have maximum control over the minority shareholders. Further, the whole mechanism of the company is thereby governed by the aforesaid family controlled board. In the controlling shareholder regimes the majority shareholders may take such various steps to retain the power within them.

However, by eliminating the political influence the failures at the corporate governance may be avoided. Specially the political influences on the affairs of the banks shall be eliminated and the banks shall be allowed to operate independently. By empowering minority shareholders, the excessive powers held by the majority shareholders shall be controlled, checked and balanced in such a manner that they will not be able to abuse their dominant position. The bank supervisor, Central Bank of Sri Lanka shall conduct workshops, seminars and training programs to increase the awareness among the directors shall increase board performance. Further, making the court proceedings speedy and less time consuming , preserving the independency of the auditing process and enhancing disclosure and transparency the corporate governance shall function smoothly without failures.

### **Conclusion**

Sri Lanka has an adequate legal regime for the corporate governance of banks which is in line with international standards. However this legal platform doesn't make any sense due to the unbearable political, social and traditional culture in Sri Lanka. Thereby some groups of people are inherent with immunity before the law. The recent banking scandals in Sri Lanka such as the Treasury Bond Issue at Central Bank, can be attributed to the failures in the implementation of corporate governance laws. Therefore the corporate governance structure relating to banks shall be reformed to go in line with social, political and cultural realities of the country.

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# **The Significant features of 19th amendment of the Constitution in the context of the Sri Lankan Politics**

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## **Abstract**

This research paper contains about the significant features of 19th Amendment to the Constitution of Democratic, Socialist, and Republic of Sri Lanka. It talks about the background of Sri Lankan politics and the concept of good governance. It has been discussed about the changes done to the executive presidency, the duties imposed to the president and reintroduction of independent commissions.

## **Keywords**

Constitution; Members of Parliament; President; Good Governance; Nineteenth Amendment; Law

## **Introduction**

Sri Lanka is a multicultural and multi religious country of around 20 million populations. The people of Sri Lanka have been experiencing the political, economic, social and private life based on the rights and duties enshrined in the Constitution of their respective periods. However, the constitution of any country should reflect the terms of the social contract.

The call for constitution amendments of the Sri Lankan constitution was made by the important segments of the people, with the view of democratizing the society and to create the conditions for good governance. The necessity of good governance was felt by the people, as the lack of transparency and accountability.

This issue of good governance was raised and made as the main political promise and catchphrase by the then presidential candidate (present president Maithripala Srisena). Maithripala Srisena as the main presidential candidate promise to bring the nineteenth amendment to the Constitution with the view of realizing the promise of establishing good governance.

This document has been discussed further about the features of 19th Amendment, changes done for the executive presidency by the 19th amendment to the constitution. It has imposed additional duties to the president to perform. Another important aspect of the nineteenth amendment is the reintroduction of independent commissions. These commissions could at least by theory act as the guard to protect the rights of the people. However, these commissions are not independent absolutely as the Constitutional Council, which is the main body which has the power to appoint or recommend the members to these commissions is not free from political influence, as the seven out of its ten members are politicians.

However, despite these weaknesses in terms of overall merit, the reintroduction of the

independent commissions could be regarded as very positive and progressive steps towards liberating the main state institutions from the political expediency.

The imposition of the duty to promote national reconciliation and integration on the president is another needful and demanding requirement in the context of nature of Sri Lankan society. Whatever the gain the people of Sri Lanka has received through the nineteenth amendment should be consolidated by realizing their purpose.

# Rule of Law: An Imperative Tool of a Democratic Country to Influence Economic Development

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## **Abstract**

Studies show that the rule of law is correlated with the economic growth and that the best way to achieve sustainable economic development is to have the systems and institutions governed by the rule of law. Additionally, the rule of law has also over the recent past gained international support where it is in fact promoted through international financial organisations and institutions. According to Alan Greenspan, the former Chairman of the Federal Reserve Bank of the United States of America, the rule of law is considered to be the single most important contributor to economic growth (Bingham, 2011). The main issue that this research attempts to determine therefore is how rule of law can positively impact on economic development of a nation. In this research more emphasis was placed on how institutional reforms that promote rule of law can affect economic development. This research also addressed the adverse effects of not having a system of governance administered through rule of law and finally seek to recommend measures that need to be adopted to promote economic development through rule of law.

## **Keywords**

Rule of Law; democracy; economic development; institutions

## **Introduction**

‘It is better for law to rule than one of the citizens...so that even the guardians of the law are obeying the law’; Aristotle.

Rule of law is generally considered to be one of the ideals of political morality that essentially refers to superiority of law over individuals or politics. Although some philosophers such as Joseph Raz opine that rule of law must be distinguished from democracy, human rights, and social justice, justice and rule of law has for decades considered to be intrinsically interrelated to one another. According to A.V Dicey, rule of law means that ‘no man is punishable or can lawfully be made to suffer in body or goods except for a distinct breach of law established in the ordinary legal manner before the ordinary courts of the land’, ‘no one is above the law, and ‘all are subject to the same law administered in the same courts’. Rule of law therefore comprise of both formal and procedural rules that govern the individuals of a state. Despite several other definitions, rule of law essentially means that the people in authority must exercise their powers according to the law. As such a society based on rule of law will promote inter alia economic development of a country, mainly because Rule of law is considered to be an important element in developing government policies and practices. Lord Neuberger, President of the Supreme Court of the United Kingdom and lead judge in the Judicial Committee of the Privy Council, in his lecture entitled Justice in the Age of Austerity (15 October 2013) stated that: “..the rule of law can mean different things. At its most basic, the expression connotes a system under which the relationship between the government

and citizens, and between citizen and citizen, is governed by laws which are followed and applied. That is rule by law, but the rule of law requires more than that. First, the laws must be freely accessible; that means as available and as understandable as possible. Secondly, the laws must satisfy certain requirements; they must enforce law and order in an effective way while ensuring due process, they must accord citizens their fundamental rights against the state, and they must regulate relationships between citizens in a just way. Thirdly, the laws must be enforceable: unless a right to due process in criminal proceedings, a right to protection against abuses or excesses of the state, or a right against another citizen, is enforceable, it might as well not exist". This therefore shows the importance of rule of law for a democratic state.

### **Methodology**

The study of this research was analytical and qualitative in nature. In order to achieve the research objective, analysis of the existing literature in relation to rule of law was analysed in detail. As such all relevant academic literature in relation to rule of law was analysed to ascertain as to whether rule of law is an imperative tool for economic growth in a democratic country.

### **Conclusion**

In order to have economic prosperity, a country must first strive to establish a legal system that protects its citizens by assuring fair treatment and by creating public policies that protects their rights such as their individual rights, property rights and contract rights. It is essential therefore that the actions of both the contracting parties and the government are predictable to promote more investment so that the citizens and/or the investors have more confidence in the system that their rights will be protected by an independent judiciary.

As per Lord Phillips (the former President of the Supreme Court of the United Kingdom) "The rule of law requires that the courts have jurisdiction to scrutinise the actions of government to ensure that they are lawful. In modern society the individual citizen is subject to controls imposed by the executive in respect of almost every aspect of life. The authority to impose most of these controls comes, directly or indirectly, from the legislature. The citizen must be able to challenge the legitimacy of executive action before an independent judiciary." As such rule of law is important to protect the rights of individuals against the arbitrary powers of the officers in authority. Also Michael Kirby (Justice of the High Court of Australia 1996–2009) in *Judicial Integrity* (speech delivered January 2012) stated: "... The strengthening and improvement of the judiciary is important, given that it contributes, in a marked way, to secure economic growth". Rule of law therefore is essential to provide the required stability in a legal system to promote investment by providing reassurance to citizens and the investors.

It is also submitted that an independent and effective judiciary is a vital factor for economic development of a country. "studies from Argentina and Brazil show that firms doing business in provinces with better performing courts enjoy greater access to credit. New York and Mexico shows that larger, more efficient firms are found in states with better court systems" (Kenneth, 2006). These observations therefore show that an independent judiciary is a vital factor for economic growth of a nation.

As such and in order to provide an essential framework for economic development though rule of law, the laws must be certain, transparent, predictable and enforceable by an independent and competent judiciary as lack of confidence in the law enforcement authorities, limited access to justice and lack of fair and effective dispute resolution mechanisms may undermine the economy of a nation. In as much as a comprehensive institutional reform that promotes economic development is important for a nation, the attitude of the individuals and government to respect the rules are also equally important for good governance and economic development.

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# Survival of Kandy before three European nations

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## **Introduction**

"Kingdom of Kandy first appeared as a separate entity in Sri Lankan history during the reign of Parakramabahu VI of Kotte Kingdom in Sri Lanka of 15th century A.D" (Dewaraja, 1985, p. 120). Initially kingdom of Kandy happened to be a sanctuary for all the rebels who were hostile to the rule of low country Sinhalese kingdoms like "Kotte" and "Sitawaka", but the real strength and its sui generis nature was exposed when Kandy was at bay by the Western invaders (Dewaraja, 1985, p. 120 - 121) (Wickremesekera, 2004, pp. 133,145). In that point resistance against Western invaders who came with renaissance military technology such as gun powder and cannon balls turned into be a Herculean effort, but Kandy could hold its helm till 1815 (Schrikker, 2007, p.15). This paper intends to trace down how Kandy survived against all odds and what reasons strengthened its resistance militarily and strategically. In order to provide a proper analysis this paper discusses the time period of western invaders Portuguese, Dutch separately. Besides the fact of tracing the historiography of Kandyan resistance against Portuguese and Dutch powers this study intends to examine how Kandy was finally subjugated by British in 1815, which finally set the last nail in the coffin of Sinhalese sovereignty in the island (Vimalananda, 1970, p. 30).

## **Kandyan affairs with Portuguese**

It is not an exaggeration to mention here the resistance envisaged by Portuguese in their Kandyan expedition was the most humiliating experienced by Portuguese in the East. Portuguese historian Fernao de Queyroz in his "The Temporal and Spiritual Conquest of Ceylon" has admitted the resistance shown by Kandyans for Portuguese was an infallible one (Queyroz and Perera, 1992, pp. 55 - 66 ). In the question of how Kandy faced a highly developed military forces of Portuguese army, the first pivotal factor to concern is the natural fortification provided the first advantage to the native Kandyan soldiers (Queyroz and Perera, 1992, pp. 60 – 61). It was well known factor that Portuguese soldiers were militarily always ahead of the natives in terms of the technology and conventional war fares. Though Portuguese soldiers were quite capable of fighting in the plain lands their ability to fight in the hill areas was absolutely limited (Ibid, 61). By nature kingdom of Kandy was protected by its intrinsic natural landscape. The territory of Kandyan kingdom had covered from heavy mountains in its surroundings and it was further strengthen by "river Mahaweli". In the initial stage of their attempts, Portuguese considered the conquest of Kandy would be a less troublesome task as they conquered the Maritime Provinces in the island but their early military attempts were failed with strong onslaught made by Kandyans in the late 16th century. Battle of Danture in 1594 was the first one Sinhalese recorded a massive victory over Portuguese and in this first encounter Portuguese learnt how nature would be so devastative to them (Perera, 2007,

p. 197). In their first campaign in Kandy, Portuguese led a force about 20000 men under Pero Lopez de Souza and 45 elephants more supporting troops from Goa and cannon balls were used in this expedition (Queyroz and Perera, 1992, p. 488). In the beginning of the warfare Portuguese could enter Kandy without much resistance and kandyans strategically abandoned the city without any resources to Portuguese and they burned the city before they retreated (Wickramasinghe, 2004, p. 16). When Portuguese force took hold of the city their situation became pathetic in the monsoon season with the spread of diseases and raining (Ibid, 154). The natural fortification of Kandyan kingdom did not allow Portuguese reinforcement to reach their troops in Kandy on time; instead of kandyans resistance force led heavy guerrilla warfare against Portuguese soldiers. This resistance campaign reached its culmination on 8th of October in 1594 in the historical battle in Danturai, where Kandyans could massacre the Portuguese forces which resembles what exactly happened when Napoleon invaded Moscow in 1805 (Perera, 2007, p. 197 - 198). Indeed historian Paul .E. Pieris has argued Portuguese warfare in Kandyan kingdom mainly got unsuccessful due to two main reasons. Firstly Kandy geography was completely a novel experience for Portuguese whereas they had heavy pressure from nature apart from the Guerrilla tactics of Kandyans (Pieris, 1983, pp. 356 - 376). In every invasion they led against Kandyan kingdom they could successfully capture the land in the first round. But the greater debacle befell them in terms of holding the territory for a longer period (Ibid). Every Portuguese captain general tried to surrender the territory from the very first unsuccessful campaign of Pero Lopez de Souza till 1638. In the correspondence made by one of ruthless Portuguese captain generals called Don Geranimodu Azawedu, he has stated "I carried continuous war into that kingdom, attacking it twice a year with the entire body of troops with the aim of making its life ebb away, by killing off the inhabitants or capturing them by destroying its food supplies and driving the cattle away into our conquered territories So that it is with this regime of war that kingdom is to be bled to death, until it is entirely depopulated and laid waste and in such manner that the life of no male of fourteen years or above is spared" (Goonatilake ,2012, p.5). This carnage went on for decades and the project of annexing Kandy was finally abandoned only after two Captain Generals had lost their heads in the endeavor. Secondly Paul. E. pieris has argued though Portuguese were militarily developed in their weaponry and technology, their military organization in Sri Lanka was a weak one to defeat Kandyans (Perera, 2004, pp. 65 – 66). In that context Portuguese mainly relied on the recruited mercenary soldiers in the low country of Sri Lanka, but when Portuguese reached the Kandyan territory those mercenary soldiers always changed their allegiance to Sinhalese king in Kandy (Perera, 2004, pp. 65 – 66). It became detrimental towards Portuguese war success in Kandyan expedition, because when Portuguese were surrounded by all the troubles in Kandyan territory their mercenary soldiers deserted the army with weapons to join the Sinhalese forces in Kandy (Perera, 2004, pp. 65 – 66).

According to military historian Bruce Vandervort the new weapon technology always became a myth in the colonial warfare (Vandervort 2012). He states "New weapons were slow to arrive on the periphery and when they did, they were often incompatible with the environment in which colonial wars were fought or the kind of warfare being waged" (Vandervort, 2012, p. 92). In the point of matter this theory was applicable to Portuguese experience in Kandy. It is true that Portuguese weapon technology was far advance than Kandyan Sinhalese machinery but that weapon did not fit enough to the

geographic conditions of the Kandyan territory. In the chronicles of Rebeiro (Portuguese army commander) it has been reported when the heavy rain hit Kandy those gun power and canons got ineffective to work in the battle field (Ribeiro and Pieris, 1999, p. 20). On the other hand Kandyans were witty enough to assimilate the western military technology into their resistance. As an example first Sinhalese king who could defeat Portuguese was Vimaladharmasuriya I I was earlier trained by Portuguese in Goa and finally he deserted the Portuguese after acquiring sufficient military knowledge and formed the resistance front against Portuguese (Pieris, 1983, pp. 334 -355). On the other hand the successors of Vimaladharmasuriya I I started to adopt and imitate Western military technology in certain ways (Wickremesekera, 2004, p. 145). Robert Knox who was a prisoner of Rajasinha II had reported how Sinhalese king in Kandy kept Scottish mercenary gunmen and encouraged those Europeans to marry native women in order to keep them in his service (Bakel *et al.* 1994, p. 197). Apart from that Kandyans always maximally utilized the local knowledge against the gigantic European military tactics (Silva 2011). In some occasions those captured canons and guns were remanufactured by Sinhalese craftsmen in their own standards (Wickremesekera, 2004, p. 145). In the case of weapon technology Kandyans aptly understood the effectiveness of improvising their own arms and immunes in par with Portuguese. The historical references made by Portuguese historians like Queyroz and Ribeiro have affirmed how effective when Sinhalese soldiers used short swords against the conventional fencing technics of Portuguese (Ribeiro and Pieris, 1999) (Queyroz and Perera, 1992).

A modern historian who has extensively written about Kandy's wars with Portuguese Dr. Tikiri Abeyasinghe has commented in his book "Study of Portuguese regimentos on Sri Lanka at Goa archives" (Goonatilake, 2012, p. 3 - 7). For four decades the Portuguese desire to annex Kandy had been nearly counterbalanced by Kandy's will to survive, and the Portuguese capacity to strike by Kandy's ability to resist. On every occasion the Portuguese attempted to tilt the scales in their favour, in 1602-1630 or 1638 - they had failed" (Dewaraja, 1985, pp 121 - 122). In modern understanding of a mind of a historian or an International Relations theorist one can simply say that this situation was akin to what described by historian Arnold Toynbee as "stimulus of blows" (Dewaraja, 1985, p. 122). In Toynbee's interpretation blow," there are sensational instances in history where military power had been stimulated by successive contests with neighbors. Kandy did not respond by being aggressively militaristic, but the heaviness of the blow evoked in the Kandyans a proportionately powerful psychological reaction, an abhorrence of foreign rule, a characteristic which they displayed on several occasions till all resistance was clamped down by the British in 1818" (Dewaraja, 1985, p. 122)

Another important fact regarding the new knowledge built by Kandyans in their extraordinary resistance before British was the way Kandyan kings maintained their geographic position without letting it to be spoiled by the novelties of time. As an example Kandyan kings had a deliberate policy of discouraging building roads and bridges which finally became the savior of Kandyan kingdom for a long period. In the historical annals of Sri Lanka the kingdoms which existed before Kandy had more sophistication in terms of infrastructure facilities within the main city. For instance today's ruins and monuments of "Anuradhapura" and "Polonnaruwa" are the evidence that demonstrate how Sinhalese kingdoms had been in its heyday. But under 300 years of constant struggle against Portuguese, Dutch and English, Kandy did not have the full pledge pleasure of

nourishing herself as a conventional kingdom. Instead of it turned into be a bastion of natural fortification surrounded by untouched forests and those adoption were willingly accepted and adhered by her people. Dr. Lona Devaraja ( Sri Lankan historian who had specialized in Kandyan history ) states “It has often been said that the inaccessibility of the mountain kingdom, the ravines, swamps and rivers, the malarial mosquitoes and the blood sucking leeches that proved vicious under European armour had preserved Kandyan independence” (Dewaraja, 1985, p. 123). It was a “deliberate policy of the Kings to discourage the building of roads and bridges and the clearing of forests so as to make the kingdom even more unapproachable to intruders” (Ibid). In fact most of the nations in Africa and Asia had used the tactics that would stun the European invader. There are many examples such as how mighty British army of Lord Chelmsford was annihilated by Zulu tribe of Africa in battle of Isandlwana in 1877, where Zulu’s favorite tactic was the izimpondo zankomo (“horns of the buffalo”), where the older warriors of the Zulu force engaged the enemy from the front while the younger warriors circled around both flanks and attacked (Peck 2014). In the context of Kandyan kingdom Kandyans firstly attacked the good carriages, animals and local coolies of the invader with the intention of cutting down the supply to the enemy. In most of the time their tactic was successful when Portuguese forces were left without food and other essential supplies.

### ***Dutch Era***

Kandy’s strategic position with Dutch was shaped by different events and it was mainly culled by the diplomatic negotiations between Sinhalese king in Kandy and Dutch in Colombo. On the other hand it was Dutch who benevolently appeared to assist the Kandyan king Rajasinghe II to expel Portuguese from the Maritime Provinces when Kandy was in the doldrums after fighting for 40 years with Portuguese (Codrington, 1994, pp. 133 -135). In the relationship with Dutch, both the parties hardly went for fight with each other except the fact that Kandy was attacked by Dutch in 1766 during the time of King Kirti Sri Rajasinha. But Dutch never had the true need to gain the control of whole Kandyan kingdom, because unlike ambitious Portuguese who believed they were on holy quest to convert pagans into Christianity, Dutch interests were mainly confined to the commerce and trade (Codrington, 1994, 133 -155).

### ***How British finally nailed Kandy***

As it was stated in the beginning, another important motive of this paper is to analysis how Kandy reached its end by the last and deadliest attack from the British which was mightier and more strategic from both previous invaders (Sivasundaram, 2007, p). It was in 1796 British conquered the whole maritime provinces of Ceylon from Dutch and the rule of English East India Company continued till Maritime Provinces became a crown colony of the British Empire in 1802 (Wickremaratne, 1973, pp. 31 -33). As a matter of fact it is an interesting factor to examine how kandyan kingdom confronted by British forces. In an article written by Cambridge based historian Sujit Sivasundaram , author argues the topographic knowledge of Kandyans helped them to survive before British for few years but British too went for reverse engineering when they developed the skills of the Kandyan warfare and their technology in certain ways (Sivasundaram, 2007, p. 925). As an example after taming the last Kandyan resistance for British in 1818 in most brutal way British immediately built up a new road system to Kandy from Colombo and went on to cut down the surrounding forests which provided a natural canopy for Guerrilla war fares of the Kandyans (Sivasundaram, 2007, pp. 926 -931).

But it important fact to remember even before Kandy fell into British hands, the first military expedition led by British in 1803 under the leadership of Gen. Mcdowell became a catastrophe for British mainly due their lack of awareness of the geography of Kandyan kingdom and the interesting factor is the same method used by Kandyan kings against Portuguese in 17th century lasted till 18th century Kandyans to resist for British attacks (Wickremaratne, 1973, pp. 38 -41). It is not the fact that Kandyans were the most brilliant soldiers in the world, but what made them unique was their adaptation of geographic spaces and guerrilla military strategies in action. In 1803, when British waged war with Kandyans, the lack of accurate maps proved perilous. Major Arthur Johnston of the Third Ceylon Regiment has described how those dark forests and abrupt attacks of Kandyan forces in the wilderness of Kandyan terrain (Sivasundaram, 2007, pp. 932). He states "In these thick forests, even in the brightest moon –light it is extremely difficult, and often impossible, for one not perfectly acquainted with the track to discern the footpath "(Ibid). In the cause of military technology Kandy had developed and duly adopted the Western technology by the time British intervened its territory. Kandyan kingdom's army was a palpable reflection of a pre modern Asian army and in fact a large standing army was not feasible due to the lack of money. Instead of keeping a regular force Kandy maintained voluntary force which was consisted of peasantry while having a small number of foreign troops as a permanent army. In the case of weapon technology Kandyans had the gun powder technology and according to Robert Knox's narratives there were European residents in Kandyan kingdom who operated the guns (Wickremesekera, 2004, pp. 141,145). Apart from that Kandy's own invention called "Kodithuwakuwa" played a crucial role as fire weapon against the British (Wickremesekera, 2004, p. 145). Indeed it was an indigenous product and became an ideal substitute for artillery (Ibid). The officers who were in charge of "Kodituwakku" were known as "koddituwakku karayao"(Ibid, 141). This weapon as an indigenous product proves how those western military technologies had been absorbed by Kandyans in an innovative way in the process of resistance.

However in evaluating the reasons to the decline of Kandy as the last sovereign kingdom in Sri Lanka, one should understand Kandyan kingdom's decay and its subjugation to British in 1815 was not a result that came out of the blue. Yet its roots had traced back to the middle of 18th century in that period kandy was in a greater dilemma when her last Sinhalese king Sri Vira Parakrama Narendra Sinha died childless in 1739, which created a vacuum in the throne. Finally this led to the creation a new dynasty in Kandy and those rulers hailed from South Indian Nayakkar dynasty which crated a heavy unrest among the Kandyan Sinhalese nobles (Dewaraja, 1985, p.127). They were Tamil speaking; Hindus and this further agitated the Buddhist monks in the Kandyan kingdom. In the analysis given by Dr. Lorna Devaraja, Buddhist monks in Kandy were typical land lords in Weberian sense and their opposition towards Tamil speaking knew rulers became a strong factor to lose the grip of Kandyan kingdom (Ibid). In addition to that, British too had adhered to the traditional warfare and as a practical method of defeating the Guerrilla tactics of Kandyan hill country; they used experienced soldiers on mountain warfare. As an example when 1815 Britain successfully captured Kandyan kingdom with the fullest support of Sinhalese nobles, most of the British soldiers happened to be soldiers from Ireland or some Scottish regiments of British army and those soldiers were trained to fight in mountain campaigns (Bakel *et al.* 1994, p. 198) (Dewaraja, 1985, p.133). Another tactful method used by British on subduing the resistance of Kandy was using espionage through low country Muslims. It was a master minded plan by

Oxford educated British officer John Doyly (Senaratne, 2013). He was a bureaucrat like William Jonnes in India, a person who was deeply infatuated with the local customs. Being a Latin and Greek scholar from Oxford Doyle felt passionate to learn Sinhalese and oriental languages like Pail, Sanskrit (Ibid). His approach to manipulate Kandyan chieftains against the last king accelerated the decay of Kandy. In fact Doyly's spies could infiltrate into the terrain of Kandy as merchants and gathered valuable information. With these circumstances Kandy could resist for no more and ultimately nailed by British in 1815 with the full pledge support of Kandyan Sinhalese nobles under the impression that they would be given the rightful throne to govern themselves. But it only became a fallacy and three hundred years of constant existence despite all those mighty attacks of the Western nations reached its bottom end before the realistic plans of British both militarily and strategically.

### **Conclusion**

This paper has discussed the routines of kandyan resistance till it fell unto British hands, furthermore the military strategy, local knowledge and above all how geographic position became a paramount factor in deciding the fate of a war has been depicted in this study. Kandy's survival and its down fall have laid down certain lessons to the military affairs in several ways. Firstly it has proven a wrong perception on colonial wars as a one sided battle which always crushed the natives. But Kandyan experience proves the story had gone the other way around since Kandyan kings and soldiers duly adopted the military technology and tactics according to their needs. Many of the illustrations have been provided in this paper to prove it. Secondly Kandy rebuts another myth of superiority of weapon technology of Europeans. The examples given in this paper show how those mighty weapons became futile when westerners were encircled by guerrilla warfare and unconquerable forces of nature. This has been accepted by war historian Bruce Vandervort in by quoting a British colonel called Charles Callwell. He states "in most of the colonial wars real foes were climate, disease and distance, lack of food and water" (Vandervort , 2012, p. 71). Indeed this example was well manifested on the soil of Kandy. Thirdly kandyan resistance and its survival prove the gravity of an unconventional warfare could be detrimental upon any powerful nation. What exactly took place in Kandyan kingdom against western forces has not gained the attraction of war historians and scholars. Especially the knowledge possessed by Kandyans and their unique resistance to three mighty western nations should be well researched.

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# **A Study of Influencing Factors Believe in Horoscope Reading Among Young Women in Sri Lanka**

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## **Abstract**

The purpose of this study is to identify the influencing factors towards believing horoscopes by the young ladies in Sri Lanka. The researcher has found out the most critical factor which influencing women's life. People surround in countries believe in astrology, but mostly Sri Lankans' are addicted in believing it due to a number of reasons. As a result of that Astrologer plays a vital role in lives of communities in Sri Lanka especially among women's world. Due to the negative predictions of horoscopes, many young ladies are suffering with their lives. Hence it seems that these predictions directly affect to number of crucial occasions in lives. Hence the researcher needs to find out the main factors which are basically affected to women's lives in Sri Lanka. Meanwhile to see, does it affect to their behaviors significantly. A quantitative research method was used to conduct the study; hence the selection of primary data has done based on a questionnaire survey among 50 ladies in random basis. Further the study was basically depends on the review of literature. The research findings have been analyzed to see the results and then discussions through final conclusions, suggesting to helpful in educating future women's while equip with modern positive minds for a better life.

## **Keywords**

Customer behavior, influencing factors, horoscope believes.

## **Introduction**

Astrology is a broadest sense which read the general and specific human behavior through the influence of stars, planets and other celestial objects. People in many countries strongly believe that they were influenced by these objects. Most of them define that astrology as scientific studies but there is a question behind where it's never found evidence for the claims astrologers make. However astrology arises from 2<sup>nd</sup> millennium BC which was first originated by Babylonian astrology. Since that many cultures were developed and strongly attached with importance to astronomical events. In this way astrology and horoscopes are subjects from ancient time which influencing various aspects of human history, world views, languages and many elements of social culture.

Compare to other countries, Sri Lankan civilians from the Tamil and Sinhala communities believe horoscopes in significant manner. However not only house wives most possible examples made different professionals' beliefs to aware horoscope predications; Politicians, doctors, actors etc. In this situation astrologer plays a vital role in the field of astrology. It was noticed that there is an increasing trend on believing horoscope reading among young generation especially ladies in Sri Lanka. As shown these believe affect to choosing marriage partners, starting a new job, starting any other work at auspicious



time etc. Even though we have reached to new technological areas, still the cultural beliefs and norms are practice in people behaviors. Hence it must be investigated why these people's personalities might have something to do with it.

### **Objectives**

1. To identify the influencing factors believe in horoscope reading among young ladies in Sri Lanka.
2. To find out the most critical factor believe in horoscope reading among young ladies in Sri Lanka.
3. To find out whether these horoscope predications directly affect to their behaviors or not?
4. To find out the recommendations to prevent it.

### **Experimental**

The survey was quantitative which the sample size was 50 females, selected randomly by the researcher. All participants were completed an astrology awareness questionnaire exceptionally, with in a weeks' time. Further secondary data were supported for the study by means of research articles, published literature via journals, marketing professional's internet and non-internet sources of libraries and etc. The collected data were recorded and analyzed using MS Excel 2010 and SPSS IBM 20.

The questionnaire was designed under three parts. The first part has been made up of five questions to determine the demographic information of the respondents. The second part emphasis to identify the factors on believes in horoscope which is basically aligned with research topic on likert scale. Part three remains for respondents to make free answers of their thoughts regard with their believes. The study reported were basically focused age category below 30 years because astrology columns are far more often targeted at young ladies than matured ladies who often read them than matured female do in future.

As per the study, the outcome of the questionnaire proved that the reliability test was in an acceptable level by giving assurance of internal consistency of all scales. As per Adorno (1974), two most common topics covered in horoscope reading which the predications are directly affect to peoples decisions; money and love. In this context, the findings proved that, most of females have altered their behaviors according to what they read in horoscopes. Hence such effects are vital because they could potentially limit their relationships, personal growth etc in most intimate aspects of lives. For an instance the biggest problem was based on love. Most of them were delaying their marriages due to horoscope predications or unmatched attuned with their spouse. Therefore it seems that the predications generates dependence and helpless and unbalance in future plans.

The present study highlighted the influencing factors believe in horoscopes are, culture, past experience, others experience, own believes, attitudes of family, mass media experience, inquisitive, religious effects, unbelievable predications, horoscope behind a logic with true outcome. The most critical influencing factor was the culture. With the cultural norms most of young ladies drives towards to believe in horoscope predications in Sri Lanka.

There are number of suggestions for future improvements. The present study was basically limited to discover the factors affecting believe in horoscope among young ladies in Sri Lanka. The researcher expects to discover number of objectives using similar data in near future studies. A bigger sample needs to utilize and it expects to target total women's (different age category) in Sri Lanka. Hence the current study will be continued with more analytical aspects combine with SPSS IBM 20 software with hypothetical tests; ANOVA, Regression analysis, Correlation Analysis etc.

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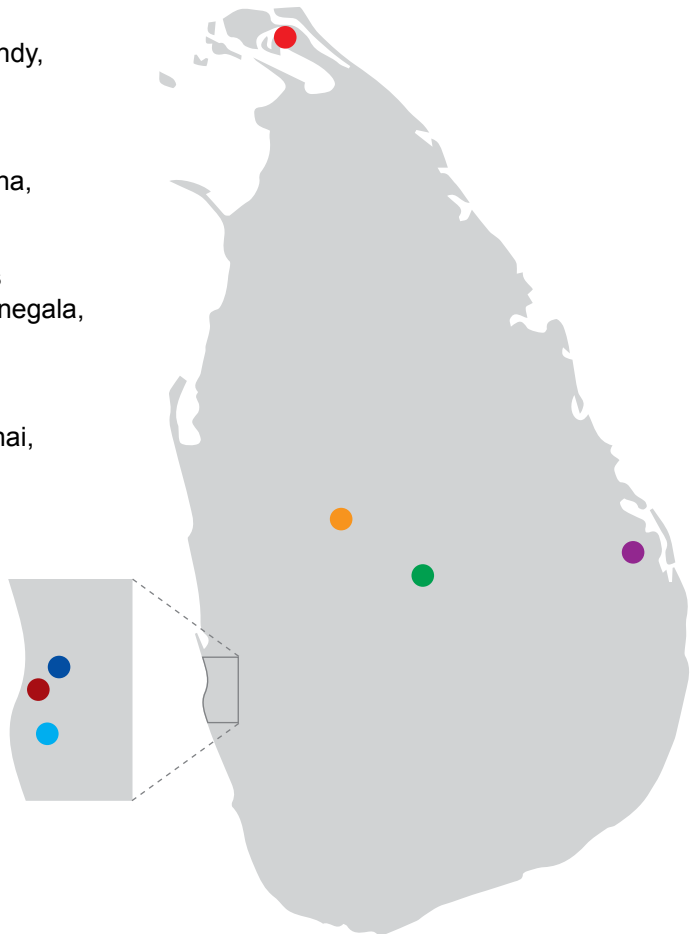
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### *In the Middle East*

**BCAS Qatar Centre**  
36, Al-Ain St, Hilal,  
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## BCAS ANNUAL RESEARCH SYMPOSIUM 2017 - GLANCE PROGRAMME

Time	Session 01	Session 02
8.30 am - 9.00 am	<b>REGISTRATION</b>	
9.00 am - 9.15 am	Investigation of <i>In vitro</i> anti-inflammatory activity of <i>Caryota urens</i> (Kithul) - <i>ST Ramu, TN Adikari and WSM Fernando, British College of Applied Studies (City Campus); General Sir John Kotelawala Defence University.</i>	Impact of urban and rural identity of undergraduates in University of Sri Jayewardenepura on learning English as a second language - <i>DNP Amarasooriya, British College of Applied Studies (City Campus); University of Sri Jayewardenepura.</i>
9.15 am - 9.30 am	A study to investigate the possibility of using <i>Cyclea burmanni</i> mucilage as a natural drug delivery system - <i>MKD Rodrigo and KMGP Premadasa, British College of Applied Studies (City Campus); General Sir John Kotelawala Defence University.</i>	Testimony aids for children in adjudicatory process of Sri Lanka - <i>SADA Ranasinghe, British College of Applied Studies (City Campus).</i>
9.30 am - 10.00 am	<b>KEYNOTE ADDRESS - PROF REIMA SUOMI UNIVERSITY OF TURKU, FINLAND - PLANNING HEALTHY CITIES</b>	
10.00 am - 10.30 am	<b>NETWORKING</b>	
10.30 am - 10.45 am	<i>Neolitsea cassia</i> water extract with a starch carrier in controlled drug delivery systems - <i>DR Rathnayake and KMGP Premadasa, British College of Applied Studies (City Campus); General Sir John Kotelawala Defence University.</i>	21st Century Great Game and its actors: India's interests in Central Asia and It's repercussions in South Asia - <i>P Amarasinghe and D Atapattu and P Joshi, Faculty of Legal Studies, South Asian University New Delhi; Department of International Relations, South Asian University New Delhi</i>
10.45 am - 11.00 am	<i>In vitro</i> anti-inflammatory activity and phytochemical screening of <i>Dipterocarpus zeylanicus</i> - <i>Z Shabbir, WD Ratnasuriya and R Pathirana, British College of Applied Studies (City Campus); General Sir John Kotelawala Defence University.</i>	Presidential Powers Are Determined By Respective Constitutions - <i>K Ratnam, British College of Applied Studies (City Campus).</i>
11.00 am - 11.15 am	Investigation of <i>in vitro</i> anti-inflammatory activity of <i>Cassia tora</i> - <i>T Chathuranga, WD Ratnasuriya and R Pathirana, British College of Applied Studies (City Campus); General Sir John Kotelawala Defence University.</i>	Emerging Challenges in Medical Negligence: A Critical Analysis of Sri Lankan Law - <i>CB Alahakoon, British College of Applied Studies (City Campus).</i>

Session 03	Session 04
<p>Digitalization – concept analysis - <i>R Suomi, University of Turku, Finland.</i></p>	<p>Impact of time management on academic achievement - <i>KASJ Arachchige, British College of Applied Studies (City Campus).</i></p>
<p>Student Informational SMS and E-MAIL Retrieval/Push System - <i>SHM Shafeer, British College of Applied Studies (Kandy Campus).</i></p>	<p>Relative Importance of Exchange Rate in Determining Vehicle Demand: A Special Reference to Non-luxury Vehicle Market in Sri Lanka - <i>S Gopikrishna, ARF Thafani, British College of Applied Studies (City Campus).</i></p>
<p>Restraining Power Consumption of Home Electrical Appliances by the Application of Digital Electronics - <i>MRR Mohamed, British College of Applied Studies (Kandy Campus).</i></p>	<p>Impact of Work-related stress on employee productivity - <i>K Sanjeewa and A Shimaz, British College of Applied Studies (City Campus).</i></p>
<p>An Internet of Things system for a smart Pantries in Sri Lanka - <i>M Shri Wathsan, British College of Applied Studies (Kandy Campus).</i></p>	<p>Factors influencing the frontline employee turnover in the Travel and Tourism Industry in Sri Lanka - <i>TRT Halpandeniya, British College of Applied Studies (City Campus).</i></p>
<p>Artificial Vision of text reading, face recognition and object recognition - <i>AS Perera, British College of Applied Studies (Kandy Campus).</i></p>	<p>Identify and analyze the factors affecting the employee satisfaction (Case study on Selected Tertiary Education Institutes in Sri Lanka – Employee Turnover) - <i>RMN Perera and S Ubayakumara, British College of Applied Studies (City Campus).</i></p>

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Time	Session 01	Session 02
11.15 am - 11.30 am	A Study to investigate the potential of using <i>Gracilaria verrucosa</i> water extract as a polymer based drug delivery agent - <i>L Vaishnavee and KMGP Premadasa, British College of Applied Studies (City Campus); General Sir John Kotelawala Defence University.</i>	Corporate Governance of Banks: A Critical Analysis of the Impact of Statutory Framework of Sri Lanka - <i>WWASP Fernando, British College of Applied Studies (City Campus).</i>
11.30 am - 11.45 am	An Assessment of iodine exposure in Sri Lanka - <i>S Farood and WSM Fernando, British College of Applied Studies (City Campus).</i>	The Significant features of 19th amendment of the Constitution in the context of the Sri Lankan Politics - <i>B Ratnayake, British College of Applied Studies (City Campus).</i>
11.45 am - 12.00 pm	Development of a polymerase chain reaction method for rapid detection of <i>Dirofilaria repens</i> from canine samples - <i>AD Jayawickrama and P Premarathna, British College of Applied Studies, General Sir John Kotelawala Defence University.</i>	Rule of Law: An Imperative Tool of a Democratic Country to Influence Economic Development - <i>KC Hapuarachchi, British College of Applied Studies (City Campus).</i>
12.00 pm - 12.15 pm	Development of a loop mediated isothermal amplification method for rapid detection of <i>Dirofilaria repens</i> from biological samples - <i>KDD Samankumari and P Premarathna, British College of Applied Studies (City Campus); General Sir John Kotelawala Defence University.</i>	Survival of Kandy before three European nations - <i>WS Eellepola, D Attapauttu and P Amarasinghe, Faculty of Legal Studies, South Asian University, New Delhi; Department of International Relations, South Asian University, New Delhi.</i>
12.15 pm - 12.30 pm	Analysis of Vitamin C concentration of fresh and commercially available orange juices using iodometric titration method - <i>F Rizkha and WSM Fernando, British College of Applied Studies (City Campus).</i>	A Study of Influencing Factors Believe In Horoscope Reading Among Young Women In Sri Lanka - <i>CD De Silva, British College of Applied Studies (Mount Campus).</i>
12.30 pm - 1.30 pm	<b>NETWORKING WITH LUNCH</b>	



Session 03	Session 04
<p>Study on efficiency of a Mobile Application to Locate Destination Bus Station for travelers who travel from Kandy - <i>G Arunath and M Nuzarath, British College of Applied Studies (Kandy Campus).</i></p>	<p>Impact of traditional business due to the emergence of online business in Sri Lanka - <i>S Ahamed and TFM Ashiq, British College of Applied Studies (City Campus).</i></p>
<p>Online Portal/Service for Player Profile Cricket - <i>DLU Weerasinghe, MS Dharmage, KASJ Arachchige, British College of Applied Studies (City Campus).</i></p>	<p>Exploring the investment pattern of Sri Lankans' and the effect on the economy <i>A Ahmed and A Shimaz, British College of Applied Studies (City Campus).</i></p>
<p>An effective Intrusion Detection/Prevention System (IDPS) implementation for an academic environment with specific requirements - <i>G Kalinga, KASJ Arachchige, MM Rasheed, British College of Applied Studies (City Campus).</i></p>	<p>Improving sales through incorporating enhanced features in automotive: Special references to Micro Holdings - <i>M Mumthaz and TFM Ashiq, British College of Applied Studies (City Campus).</i></p>
<p>An information hub with easy accessibility for Sri Lanka - <i>KASJ Arachchige, B Karthiban, British College of Applied Studies (City Campus).</i></p>	<p>A Study of Service Quality on Student Satisfaction of a Private Higher Educational Institution With Reference to ABC Campus In Sri Lanka - <i>CD De Silva, British College of Applied Studies (Mount Campus)</i></p>
<p>Virtual administrative support service system to XYZ Higher Education institute - <i>KASJ Arachchige, MRD Ahmed, British College of Applied Studies (City Campus).</i></p>	<p>Intrapreneurship - As a strategy for the Retention of Millenials - <i>JS Sebastianpillai, British College of Applied Studies (City Campus).</i></p>

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Time	Session 01	Session 02
1.30 pm - 1.45 pm	The <i>in vitro</i> evaluation of Antibacterial and Antifungal activities of ripe fruit extracts (pericarp and seed) of <i>Bunchosia armenniaca</i> (Cav.) DC. - MK Dassanayake, British College of Applied Studies (City Campus); General Sir John Kotelawala Defence University.	Comparison of design finding for steel portal frame amongst British and Euro code - M Geethanjali, British College of Applied Studies (Mount Campus).
1.45 pm - 2.00 pm	Evaluation of Farmer's E-learning System Adoption - NP Vidanapathirana, R Suomi, K Hirimburegama, SAP Nelka and SL Nawarathna, University of Colombo Institute for Agro-technology and Rural Sciences, Sri Lanka; University of Turku, Finland; University of Colombo, Sri Lanka	A Suitable Engineering Technique to Strengthen the Unreinforced Masonry Walls for the Flood Load - V Seron and ACM Suhothi, British College of Applied Studies (Mount Campus).
2.00 pm - 2.15 pm	Increasing productivity in plant cultivation by minimizing additional man-hours in pit digging process - T Rangamaarachchi, British College of Applied Studies (Kandy Campus).	Evaluation on Effective Concrete Cover Distribution Patterns for RCC Slabs to Achieve its Designed Requirements - MM Sajidh and ACM Suhothi, British College of Applied Studies (Mount Campus).
2.15 pm - 2.30 pm	Smart Agriculture System Using IOT - MAM Fayaz and TA Saboordeen, British College of Applied Studies (City Campus).	Can Contractor's Reach The Expected OH / Profit Percentage At The End Of The Project? - SAS Weerasekara, British College of Applied Studies (Mount Campus).
2.30 pm - 2.45 pm	Portable Secure Network Link Monitor - G Kalinga, KASJ Arachchige, MLM Aqueel, British College of Applied Studies (City Campus).	What are the consequences in implementing the concept of Lean Management in the Construction Industry in Sri Lanka? - KGJ Tennakoon, British College of Applied Studies (Mount Campus).
2.45 pm - 3.00 pm	Cellular Antenna Network Optimization based on 'Timing Advance Profile' of 'Dedicated mode Mobile Stations'- KM Musthafa, British College of Applied Studies (City Campus).	
3.00 pm - 3.30 pm	<b>KEYNOTE ADDRESS - PROF RANIL DASSANAYAKE</b> <b>UNIVERSITY OF COLOMBO, SRI LANKA - GENOMICS - MOLECULAR</b> <b>DIAGNOSTICS OF DISEASES AND PERSONALIZED MEDICINE</b>	

Session 03	Session 04
<p>'WHO AM I' - Centralise National Information Repository on Registration of Birth, - TA Saboordeen, <i>British College of Applied Studies (City Campus)</i>.</p>	<p>Impact of Service Quality on the customer satisfaction (Students) in the higher education sector in Sri Lanka - <i>KASJ Arachchige, British College of Applied Studies (City Campus)</i>.</p>
<p>Virtual shopping mall - <i>I lyngaran, British College of Applied Studies (City Campus)</i>.</p>	<p>Assessing roles, contribution and challenges for women in the IT industry in Sri Lanka - <i>KASJ Arachchige, British College of Applied Studies (City Campus)</i>.</p>
<p>An intelligent recruitment system - <i>I lyngaran and BM Fathima Nasmiya, British College of Applied Studies (City Campus)</i>.</p>	<p>The positive and negative impact of ICT on Students' Academic Performance - <i>KASJ Arachchige, British College of Applied Studies (City Campus)</i>.</p>
<p>'SMART GRID' - Electricity &amp; Water Meter Reading &amp; Management System Using IOT Technology - <i>TA Saboordeen, British College of Applied Studies (City Campus)</i>.</p>	<p>Performance oriented job portal for the job seekers and the job posters - <i>KASJ Arachchige, MSYP Karunaratne, British College of Applied Studies (City Campus)</i>.</p>
<p>'USE IT OR WASTE IT' - Municipal Solid Waste Collection System Using IOT Technology - <i>TA Saboordeen, British College of Applied Studies (City Campus)</i>.</p>	<p>The benefits of Virtualized Internet Infrastructure Implementation for an Academic Institute - <i>KASJ Arachchige and MIM Irfan, British College of Applied Studies (City Campus)</i>.</p>

## Notes



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