



General Sir John Kotelawala Defence University

International Research Conference 2014

*Expanding Developmental Horizons through Education,
Research and Innovation*

Abstracts

21 & 22 August 2014

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KDU INTERNATIONAL RESEARCH CONFERENCE – 2014

*Expanding Development Horizons through Education,
Research and Innovation*

ABSTRACTS

General Sir John Kotelawala Defence University
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Message from the Secretary - Ministry of Defence and Urban Development

I am pleased to contribute this message for the Book of Abstracts compiled for the 2014 International Research Conference of the General Sir John Kotelawala Defence University (KDU).

The KDU renders an increasingly significant service to the field of tertiary education in Sri Lanka, and its annual International Research Conference provides a forum for both local and international academics to deliberate on themes relevant to the country.

The theme for this year's conference, "Expanding Developmental Horizons through Education Research and Innovation" highlights the inseparable relationship between each of these areas, which help countries achieve growth.

The KDU's commitment to the expansion of education opportunities in Sri Lanka and to augmenting the country's research capacity has been widely recognised as having had a positive contribution to national development.

I wish the organizers and the participants of this International Research Conference all the very best for the future.

GOTABAYA RAJAPAKSA RWP RSP psc

Secretary,

Ministry of Defence and Urban Development

Message from the Vice Chancellor – General Sir John Kotelawala Defence University

As the Vice Chancellor of KDU, I take great pride in sending this message to the Abstracts Book of KDU International Research Conference 2014 on the theme, *Expanding Developmental Horizons through Education, Research and Innovation*.

Education and research are part and parcel of a university. However, compared to research in universities in the developed world, there is much to be achieved in terms of the length, breadth and depth of research in universities in countries like Sri Lanka. This is one of the main reasons why countries like ours are highly dependent on other countries, their innovations, technologies and know-how.

In this backdrop, KDU envisioned the need for expanding the country's research landscape and decided to do its utmost to change the mindset of our researchers to involve in research that supersede those focused on mere academic achievements. The objective is to increase research that target significant outcomes that would lead to innovations, patents and commercially viable industrial projects in Sri Lanka. In this pursuit, KDU has taken a few crucial measures such as the introduction of a Deanship for research, establishment of the Institute for Combinatorial Advanced Research and Education (KDU-CARE), and establishing a 24x7 laboratory with cutting edge facilities for researchers to deliver the goods for the country. Further, KDU has in the recent past.

In terms of its role on expanding educational opportunities, KDU is in the forefront. The latest contribution is the introduction of novel courses by establishing new faculties such as the Faculty of Built Environment and Spatial Sciences and the Faculty of Computing at KDU Southern Campus at Sooriyawewa. Further, the significant increment in the number of students enlisted for degree courses itself is an indicator of KDU's contribution to the expansion of educational opportunities in Sri Lanka.

I conclude thanking everyone who worked hard to organize and conduct the conference in the most befitting and productive manner. I also thank the eminent personalities, academics foreign and local, and plenary speakers for their contribution to the success of this conference.

MP PEIRIS RWP RSP USP ndc psc

Major General
Vice Chancellor

Message from the Conference Chair – 2014

I am honored and privileged to pen this message as the Conference Chair of the 07th International Research Conference (IRC) of General Sir John Kotelawala Defence University, held on the theme of *Expanding Developmental Horizons through Education, Research and Innovation*.

I was delighted to see the increasing number of abstracts and papers received by the KDU conference each year and the researchers' motivation and enthusiasm to take part in this annual academic event of mammoth proportions. Providing a great platform to deliver and gather knowledge in a multidisciplinary research environment, the conference is held in six main streams; they being Defence, Medicine, Allied Health Sciences, Engineering, Law and Management, Social Sciences & Humanities. In this year's conference, eight parallel sessions will facilitate more than 150 oral presentations. In addition, 26 poster presentations are displayed at the conference premises. Ensuring wider circulation and exposure, the full papers of presented research projects will be published in the conference proceedings after the conference.

In this backdrop, I would like to invite all researchers to utilize the KDU – IRC to develop their research knowledge and publication skills. Quality of research, writing skills, good research habits, adherence to deadlines are important skills that needs to be and could be improved by proactively taking part in academic forums of this caliber. Continuous engagement in research will help them sharpen their proficiency and potential. At a time when multidisciplinary research conferences are far from being abundant, KDU – IRC will provide a high-quality opportunity for researchers to expand their networks, meet with research experts and share knowledge in respective areas.

Organizing a gigantic task of this nature would be next to impossible without proper leadership and teamwork. I would like to express my sincere thanks to the Vice Chancellor, Major General Milinda Peiris, for the excellent leadership provided during the conceptualization, planning and execution of the conference; to the Deputy Vice Chancellor (Defence and Administration) Brigadier Lal Gunasekara for his invaluable contribution as the steering committee president that ensured the smooth execution of this event, and to the Deputy Vice Chancellor (Academics) Senior Professor Susirith Mendis for his steadfast guidance. All the Deans of the faculties, faculty representatives, presidents and committee members of the organizing committees are also greatly appreciated for their valued contribution. My appreciation also goes out to all the sponsors for the generous financial assistance given us to organize this event on a grand scale. Finally I would like to thank my two secretaries Thilini Meegaswatte and Dilani Perera for their immense commitment and support to materialize today's flourishing pinnacle.

I would like to wish all the success to all authors of this conference and be expecting you to produce more advanced research in future for the betterment of the world.

DR. NAMALI SIRISOMA

Conference Chair

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PLENARY SESSIONS

How to Make Teaching in Health Sciences Simpler, More Effective and Enjoyable

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The quantum of information, research and evidence in medicine and healthcare has been increasing exponentially over the last few decades. Indeed, health professions' education is dependent on this large volume of information with emphasis on evidence and facts. Traditional health professions' curricula focus heavily on content and facts, with didactic teaching being the main mode of delivery. More innovative curricula focus on engaging the learners using a variety of student centred methods, but may still be crippled by overemphasis on facts and teaching "micro-content".

There is a heavy burden placed on learners by the exponential increase in content and information. The average human brain may not be able to deal with this abundance of information. With the inevitable deterioration of retention over time (i.e. the forgetting curve), it is even more important to make teaching/learning simpler.

Therefore, there is a need to identify the essentials – the bare bones – of teaching and learning in order to ensure that learners know the basics, understand key concepts and are able to access the right information at the right time in order to make decisions related to patient care. It is essential to identify strategies to make teaching and learning simpler, enjoyable and more effective.

Potential Role of Sri Lankan Health Sector in Knowledge Economy

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Knowledge economy is one that creates, disseminates, and uses knowledge to enhance its growth and development and it has the highest potential in rapid economic development. Despite being a developing nation in the South Asian region Sri Lanka has a high literacy rate in par with the developed world. Thus Sri Lanka is a country rich in human resources which can explore the possibilities of providing services for highly skilled professionals to international labour market as part of its sustainable economic and social development process.

Foreign employment is the second largest foreign income generating avenue in Sri Lanka and more than 50% of this income comes through **unskilled** labour exportation, mainly from house-maids employed in the Middle East. But this has led to many negative consequences disrupting the family unit and destabilizing the social values of Sri Lanka.

As opposed to the situation in other countries our earnings from skilled jobs has played a lesser role so far. Skilled labour comprises of professional (intellectual labour) or technically skilled people. The percentage of professional labour exportation in Sri Lanka was less than 1% in the year 2005. The professionals mainly contribute to the “**brain drain**” only-the issue of never returners. Most of our best doctors, software engineers, architects, scientists and academics leave for greener pastures and would not contribute much to the national coffers.

Sri Lanka needs to explore ways of using free education as an investment for the country. Professionals have achieved real benefits from the free education system and now in return the country would be able to make use of educated Sri Lankans as an investment.

Skilled labour exportation will safeguard the welfare of the employee as employers are expected to fulfill standard obligations. The revenue generation is several times higher and the knowledge and experience gained by the employee would be useful for the development of the country. Also, Health Tourism is becoming increasingly popular in other countries as a valuable source of foreign currency to the country and Sri Lanka is yet to introduce it as a national policy.

In order to achieve the real benefits of skilled labour exportation especially related to health sector, this concept was presented and proposals made to establish the **FPCC** (Foreign Placement Coordinating Centre) and **Language Centre**. The proposal was accepted in policy and to ensure the implementation of this concept FPCC was established at National Hospital of Sri Lanka. Finally raising awareness among all the recognized stakeholders was carried out successfully.

Keywords: Health, Knowledge, Economy

Overweight/Obesity and Physiotherapy: Not Just WHO's Problem?

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Overweight and obesity is a global health issue. Using Body Mass Index (BMI), a weight for height calculation, (weight (kg)/square of height (metres)) overweight is defined as 25 or greater and obese is 30 or greater. According to the World Health Organisation (WHO) 10% of the World is overweight or obese. In Sri Lanka, 75% of all deaths are due to non-communicable diseases and a noteworthy percentage of the risk of dying is caused by being overweight/obese. Obesity is caused by an energy imbalance between calories consumed and calories expended. Level 1 evidence shows obese individuals consume high energy foods and are inactive. The role of physiotherapy is to prescribe movement, both the practice of daily tasks/activities and exercises to improve fitness levels. 60% of the general population find it hard to meet recommended activity levels, our research has found overweight and obese individuals have their own barriers to being active. These barriers are: Physical- discomfort on exertion, chronic conditions, and the weight itself, Psychological- negative body image, lack of self-efficacy, and emotional conditions (e.g. depression) and Social/Environmental. Overcoming these barriers is key to the success of a physical activity programme. Physical activity is an essential component of weight management by calorie expenditure. Overweight and obesity is a risk factor for numerous other common non-communicable diseases/health conditions: osteoarthritis, diabetes, cardiovascular disease such as stroke, and some cancers (breast, endometrial and colon). Therefore, overweight and obese individuals we treat in practise are likely to have some these co-morbidities. Weight is often a factor for individuals being considered for surgical management of these co-morbidities such as joint replacements, and surgical management of diabetes and the weight itself (i.e. bariatric surgery). Essential elements of a programme that overweight and obese individuals are successful with and adhere to/stick to over at least a year will be presented.

Overcoming the Challenges Presented by Radically Increased Student numbers In Specialist Community Public Health Nurses

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Specialist Community Public Health Nurses (SCPHN's) work with children and families aged 0-19 years and are traditionally known as Health Visitors (0-5 year age group) and School Nurses (5-19 year age group).

These registered nurses were historically very experienced and dually qualified in midwifery, childrens' nursing, mental health nursing or intensive care nursing for example. Following this, a course of study lasting 1 year was undertaken to prepare them to work with individuals, families and communities to promote health and prevent ill health by identifying health needs and supporting families to manage these. The 4 Principles of Health Visiting identified by the annual conference of lecturers in Health Visiting (1974) were re-examined in 1990 by the United Kingdom Standing Conference on Health Visitor Education and it was found that these principles still held true. Health Visiting Education today remains in tune with these principles which are:

1. The search for health needs
2. The stimulation of awareness of health needs
3. Influences on policies affecting health
4. The facilitation of health enhancing activities

The role of the Health Visitor is the focus of this presentation and the acknowledgement by various parties that diminishing numbers of these professionals have contributed to increased levels of child abuse, domestic violence and many other complex family and community problems. The lack of Health Visitor provision has contributed to missed opportunities with regard to early intervention.

Health Visiting once a statutory service has not been able to manage the high workload of complex families in addition to what is now referred to as 'Universal ' work; that is the day to day support for families who have a new baby and/ or children under five. These families might need support with feeding problems, child behaviour management, mental health problems e.g. perinatal depression and many other health needs that were historically identified by early intervention through visiting these healthy families. Problems were identified at an early stage as they arose, through development screening and regular contact.

Further preventable problems have occurred, such as poor dental health, poor growth, late identification of medical problems and poor speech and language development.

It is for this reason the 'Call for Action' (Department of Health 2011) was initiated to double the number of Health Visitors in England by educating 4,200 additional Health Visitors from 2012-2015. The Government commissioned the 'Healthy Child Programme' (Department of Health 2009) as a template for the delivery of a health visiting service throughout the country in order to create early

intervention and support at four different levels: Community, Universal Services, Universal plus, Universal Partnership plus.

The massive increase of SCPHN Health Visiting students attending university rose from approximately 40 students throughout Cambridgeshire and Essex to 140 students, impacted on Practice Teachers and Mentors in the practice setting. There were small numbers of these required prior to this initiative, so education of additional Practice Teachers and Mentors was also necessary. All professionals required 'up skilling' to ensure that students were receiving the most comprehensive evidenced based learning experience. So although at this time a future with many additional health visitors looked very bright; the process itself has been a sizeable undertaking for university academics, Mentors, Practice Teachers and student Health Visitors to embrace.

My own part in this as a Practice Teacher, who then moved into the academic setting as a Senior Lecturer, was to identify the gap in the support for Practice Teachers, student Practice Teachers and mentors. It was this group of professionals who had to react and adjust rapidly to support the vast number of students and develop the changes that had to be made to enable this innovative programme to be successful. As the gatekeepers and facilitators of excellent academic standards and evidence based Specialist Community Public Health Nursing, Anglia Ruskin University has invested in supporting these Practice Teachers and Mentors to ensure high standards are maintained.

This is a presentation on some of the strategies introduced in order to support this process.

Security Challenges in South Asia: Envisioning a Cooperative Security Architecture for the Region

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The countries of South Asia have a shared history, culture, religion and language. Yet, this is the region that is economically least integrated and look at security from the prism of state. The challenges to security in South Asia are both military and non-military in nature. While the military security receives greater attention, non-military aspect of security is largely ignored or given least emphasis. Other than interstate conflicts where the military are likely to be deployed to ensure security; increasingly internal conflicts – both in the nature of ethnic violence and terrorism, are drawing the military to internal security duties. Non-traditional security threats like the issue of migration, economic stagnation that can propel popular dissatisfaction, other issues like environmental degradation; river bank erosion, flooding and other natural disaster etc would require a greater cooperation at the inter-state level to manage common resources which can have ramification beyond the borders of nation-state. Similarly issues like arms smuggling, smuggling of contrabands that help terrorist to finance their terror activities and bolster their fire-power is another dimension of security that transgresses geographical confines of nation state. The porous borders facilitate breaching of borders. At the same time it is the porous border makes a compelling case for cooperation. While the states need to be militarily prepared to defend their territory and engage in confidence building measures that would address mistrust and suspicion and reduces chances of conflict; cooperating on non-traditional security issues is not matter of choice which the State can make. Nature of threat itself is enormous and only through cooperation these challenges can be averted. For example: on the issue of flooding an early warning given by the neighbouring country would help the lower riparian in evacuating people in time. On the issues of smuggling of contraband intelligence inputs provided by other countries would help in better management of internal security situation.

Over the period of time, to address security threats posed by non-state actors cooperation between the countries of South Asia has increased. Countries have taken initiative through bilateral, trilateral, subregional and regional framework to address the security challenges. Similarly to deal with issues of natural disaster, poverty, and environment the countries have stepped up cooperation. There are several initiatives to develop connectivity within the region for economic development and progress. Increasing market access and economic integration to a large extent would address the problem of employment and deal with popular discontentment. Market integration would not be feasible unless accompanied by visa liberalization. Greater integration would lead to lessening of suspicion and mistrust as there would be more interaction between the people at various levels. Unfortunately, the benefits of cooperation are largely ignored as the states remain suspicious of each other's intentions. This paper will dwell on what are the common security challenges this region faces and whether the countries can think of a cooperative security framework to overcome these challenges.

Engineering Education to Innovation and Commercialization

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Education is to look at the world in a meaningful way and to respect the society. In engineering we use it to solve problems to achieve a better quality of life. In developing solutions to technical problems, a professional should initially look at the issue in a simplified and a fundamental approach, and, then develop the proposed solution in a significantly detailed manner, while exploring the global knowledge in the same subject area. If one could add a business dimension to the problem and the proposed technical solution, it could lead to commercialization and wealth creation for a nation as well.

In the above exercise which we sometimes call '*inventing*', subject-educated person should start working on a solution by first applying simple fundamentals to understand the issue and if necessary quantify the engineering aspects of the problem. Presenter has practically learnt that if he is unable to define the problem clearly in a simple manner, inventive solutions are rare to achieve. In the presentation, he will present several simple engineering examples to explain this.

In research and development environments, educated people in developing countries tend to complain that lack of funds and lack of high tech facilities hinder our progress in inventing things. Presenter strongly believes that this need not be the case, and in contrast the most important element in inventions and research is to apply the creative faculties of the brain with simple subject fundamentals in a practical way to address a problem. Once a research team start this creative and detail-minded approach to "*solving a practical problem*" they naturally develop the courage and the justification to convince the management to request for the facilities. In the modern world of management, obsessed with commercial profit making targets, a research team should work with a business approach to justify the resources they require.

In this process, success is generally measured by the intellectual property we generate, and also the commercial products we can create. An organization with an active R & D group should be able to develop a commercial sub-group to take the creativity of the R & D group into the wealth creation domain. Presenter will present some of his New Zealand experiences in this aspect.

In every country there are unique engineering problems, where unique solutions can be proposed by practical R & D teams. Sri Lanka is not different in this aspect and if these unique engineering problems are identified engineering organisations can help the society in wealth creation as well as quality of life improvements.

In the presentation few classic examples in the areas of energy saving, lightning and surge protection, and environment will be used to show how simple engineering gets extended into details with a commercial flavour, while adopting new devices and technologies

Innovation in Energy Pricing and Demand Management

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Pricing any commodity at what it costs to society, is widely considered to be the best signal to customers to practice energy efficiency and demand management. Distorted pricing of commercial energy commodities through ad-hoc decisions and directives, as well through blindly following the historic pricing policies finally give the wrong signals to customers, who are the best decision-makers on how much of which form of energy should be used in their household, transport, commercial and industrial activities. The paper examines the Sri Lanka's case of distortions in the petroleum and electricity pricing policies, pricing structure and price levels, and how energy and economic efficiency is compromised.

Research and Innovation for Energy Sector Development

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The primary energy source potential in South Asia is significant though it continues to be a net energy importing region. The region is estimated to have reserves over 100 billion tons of coal, 6 billion barrels of oil, 95 trillion cubic feet of natural gas and 300,000MW of hydropower. In addition, the potential for development of non-conventional renewable energy sources such as wind power, solar power, small-hydropower and biomass is expected to be substantial. Development of some of these sources such as wind and solar power has been given priority under national programs. However, in general, exploitation of all these clean energy sources for power generation has been slow compared to their technical potential due to many barriers specific to the countries concerned. At the same time, these generation sources are geographically distributed both within the countries and in south Asia region. Also the behavior of electricity demand in different geographical regions differs because of the time differences as well as variation in the type of consumer mix. For instance, a large part of the hydropower generation potential in Sri Lanka is concentrated in the Kelani and Mahaweli river basins in the central region. Wind resources are presently being developed in the North-Western region. Solar power may be spread all over the country with more efficient utilization factor in certain geographical areas. As for the electricity demand, significant contribution comes from the Western province where large part of the country's industrial and commercial activity is confined to. The demand in the rest of the country is largely dominated by household demand and some commercial activities. Further, the climatic conditions in the country vary depending on the geographical area and the season of the year impacting on the demand for electricity. This diversity, while providing a great opportunity to share energy resources through regional integration, also poses challenges when absorbing them into the power systems and their operations.

In this backdrop, it is important to examine how research and innovation in the energy sector undertaken locally would help to further the country's development agenda. Most of the research in the energy sector, as applicable to Sri Lanka, is applied research. These research activities are largely in the areas of (i) policy and regulation (ii) planning (iii) design and technology adoption (iv) system operation and (v) plant operation and maintenance. Development of such research capacity within the country is essential to ensure sustainable and rapid expansion of the energy sector to suite the local needs. Further, such capacity within the country will enhance its ability to export expertise to other countries. One such example is research and development in the small hydropower sector. The development of the micro and mini hydropower sector in Sri Lanka since 1980s has led to innovations in adopting the associated technologies to the Sri Lanka context. It has led to local manufacture of some of the equipment and also some of the Sri Lankan developers venturing into countries in Africa to establish small hydropower plants. Further, there are a few internationally recognized consulting firms in South Asia which can provide expertise to a wide variety of development activities in the energy sector. Each of these activities is associated with some form of research and capacity building within, which brings valuable inputs to the local economies.

Research and innovation are critical to the development of an economy and its contribution in the energy sector is significant considering that energy is a key input in all the economic activities.

Macroeconomic Stability for Sustained Development

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This paper analyses macroeconomic stability as a necessary condition for sustained economic development. While economic development has broader connotations, excessive volatility in key macroeconomic variables such as inflation and GDP growth could hamper the process of development. Using a standard rational expectations-based general equilibrium model, the paper shows that the macroeconomic policymaker faces a trade off in utilising the policy instruments available, and is required to find an optimal balance between macroeconomic stabilisation and economic growth, which is shown as a prerequisite for sustained development. Empirically, econometric analysis using annual data for the period 1970-2013 for a cross section of countries, which includes both advanced as well as emerging market economies, lend support to the view that macroeconomic stability is a key ingredient for sustained development. Econometric evidence obtained by analysing Sri Lankan time series data is also in line with the findings of the theoretical as well as the cross country analyses.

Keywords: economic and price stability, economic growth, macroeconomic tradeoffs

Managing Supply Chains - Beyond the Basics: Use of Operation Research Tools

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Supply Chain Management (SCM) has become an important specialization in any organization and has accelerated into one of the key business issues at present. Competitive advantage to achieve commercial success depends on how the organizations achieve cost and value advantage through the efficiency in managing the supply chain network. Basic SCM concepts are well established and practiced by majority of the organizations. Comprehensive coverage on basic concepts is available in the literature especially in SCM related text books. However, these texts do not elaborate on the planning, design & operation tools that can be used except for listing the possibilities.

Many supply chain managers believe that they know what to do based on their experience and use default solutions and carry on the routine activities. However, due to the uncertainties in the field such as closure of road link, non availability of part of the fleet, delays in getting raw material, sudden increase in demand for a commodity etc. require tools to update the default solutions that may have been established over a period of time, with experience.

Operation research (OR) tools can be used to identify solutions in such uncertain situations and when the resources have limitations. OR tools such as Linear and integer programming, network analysis, dynamic programming, integer programming, game theory, are not something new but application of these established theories for operations became popular only after the World War II. Combining these mathematical models with probability theories such as Markov chains, queuing theory, inventory theory, forecasting, reliability, simulation and decision analysis (probabilistic models) give the supply chain managers an upper hand in developing strategies for operations.

This presentation concentrates on discussing how some of the OR tools that could be used in supply chain management and introduces new developments in the subject area. Further, presentation on finding using user friendly platforms such as GIS and other computer software is also presented.

Expanding Educational Horizons for Sustainable Development

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Sustainable Development should be a process of change that results in protecting the quality of life of the present generation as well as safeguarding the rights of the future generations for such prosperity. Education envisages the total development of a person. Hence, it is a tool for achieving sustainability. Education for sustainable Development (ESD) focuses largely on the major social, economic, and environmental issues that threaten the sustainability of the planet. Many of these key issues were identified at the Earth Summit in Rio de Janeiro and are found in *Agenda 21*. Understanding and addressing these issues are the heart of ESD, and locally relevant issues should be included in any program related to educating for sustainability. Education for Sustainable Development therefore should be a learning journey, open to ongoing improvement and new thinking. Sustainable development practices integrate knowledge, skills and values, and situate knowledge, skills and practices in particular social, cultural and historical contexts. Since sustainable development challenges are both local and global in nature, engaging in sustainable development practices helps to integrate local and global forms of knowledge. In this context, recognizing the importance of education in achieving sustainable development, the United Nations declared the years 2005 – 2014 as a global “Decade of Education for Sustainable Development”. The vision of the decade is to provide opportunities to all human beings to acquire knowledge, attitudes, skills and values necessary for a sustainable future through education. However, Education for Sustainable Development requires changes in the praxis of education. The year 2014 marks the end of the ‘Decade’ and it is timely to reflect on the progress made in catering to this change, the challenges encountered and how they could be alleviated. This paper examines how educational horizons in Sri Lanka could be expanded for Sustainable Development taking into consideration the best practices in ESD in the world.

Keywords: Sustainable Development, Education for sustainable development, best practices

Youth Bulge for Sustainable Development: An Emerging Challenge for the 21st Century Sri Lanka

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The changes that had occurred in the components of population (fertility, mortality and international migration) are reflected in the growth of Sri Lankan population. The population increased from 2.4 million in 1871 to 20.3 million in 2012. The growth rate of the population currently is low (0.7 per cent per annum), yet Sri Lanka adds around 260,000 persons annually to the total population. Sri Lanka's population is set to undergo major changes in its age structure in the coming decades. Age structural transition is a process and a consequence of shifting age structure from a young-aged population to old- aged population.

During the transition each country is expected to report a "youth bulge", a term used to describe a population in which the proportion of the youth (between 15-29 years) is significantly large in comparison to the proportion of very young and the old. A "youth bulge" does not necessarily embark with challenges and difficulties, rather it can help in the stabilisation of a developing state by establishing a highly educated population, facilitating an economic boom and bringing progress in the way of adapting modern technologies. Sri Lanka has many well thought out ideas on youth empowerment that could further strengthen in reaping the benefits of the "window of opportunity" which will be ideal for youth development as well as youth for development.

Apart from experiencing youth bulge, the age structure transition has produced a demographic dividend too, during the period of 1991 to 2030, which is conducive for take-off of the country's economy. The demographic dividend is the potential accruable gain by the society during the period of demographic transition in which there is a high ratio of population in the working age, in compared to the old and young , the dependent age categories (children and elders). The low dependency ratio observed in contemporary Sri Lanka is a result of the past demographic trends. This is an opportunity that needs to be used immediately. If this opportunity is missed, the planners will have to address the consequences of an increasing dependency burden, which would further depress the efforts for economic growth and development.

The mere existence of a favourable demographic dividend would not be effective without a proper environment for economic acceleration. Nevertheless in a congenial environment of political stability, adequate savings, investment potential including the ability to draw FDI, development of human capital, productivity and knowledge-based economy, the optimum utilization of the youth bulge and demographic dividend to gain economic acceleration would materialize. In addition to securing economic opportunities, the state is required to expand opportunities for increased youth participation in governance and civil society that can promote youth voice and participation in productive manner.

The prevailing political stability and peace in the country provides a congenial environment for the accelerated economic development and maximization of a knowledge economy to suit the current national and international demand for a skilled labour force. However it is debatable whether the economic planners in the country have identified the growth sectors of the economy in order to generate sufficient amount of employment for the influx of workers to the labour markets, particularly youth, during the period of the demographic dividend. Sri Lanka has already passed more than half of the duration of its demographic dividend and hence it is a challenging task for Sri Lanka to set the stage for utilising the remaining period of the dividend for economic growth and sustainable development.

Trauma Care and Control in Sri Lanka: The Need for Education and Research

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Trauma is major cause of death and disability throughout the world. In Sri Lanka trauma is the leading cause of admissions to hospitals. It has a significant impact on the morbidity and mortality pattern in this country. However trauma has not yet been recognised as a distinct disease entity, which should have specific and better organised services and prevention programmes. The immense health care costs, disabilities, human suffering and deaths resulting from trauma should receive the attention of health care planners and decision makers and should not continue to be relegated to a Cinderella status and be neglected.

The aim of this presentation is to highlight the

1. Rising incidence of trauma in Sri Lanka and the consequent steady increase in mortality.
2. Different causes of trauma and the varying pattern in the urban and rural areas
3. Inadequate facilities currently provided for trauma care and the urgent need for improvement.
4. Importance of health education on the prevention of trauma
5. Recommendations for improving trauma care in Sri Lanka which include training in first aid of the public and health care personnel, accessible ambulance services, establishment of specialized Regional Trauma Centres, notification to ensure clearer understanding of the aetiology and the need to enforce strict legislation to prevent and reduce trauma especially road traffic accidents. Regular monitoring of all of the above is of great importance in achieving continuing success

The National Health Policy of Sri Lanka is to provide adequate healthcare to the entirety of its people. In view of the fact that trauma contributes significantly to the disease burden, health care providers and planners should make provision for better facilities for trauma care and institute trauma prevention programmes for the people of this country. The key to that improvement is education, innovation and research.

Keywords: trauma care, control, research

NIROGI Lanka Project: a Pragmatic Approach to Tackling Chronic Non Communicable Disease (NCDs) in Sri Lanka?

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Carukshi Arambepola

Background:

Reducing premature death and disability caused by chronic NCDs, chiefly cardiovascular risks and diabetes, is the decade long priority of the Diabetes Prevention Task Force established of the Sri Lanka Medical Association. Multi-stakeholder involvement of health policy makers and planners to practicing clinicians, academics and administrators in the state and private sectors is a key feature. The project **National Initiative to Reinforce and Organize General diabetes care In Sri Lanka (NIROGI Lanka)**, with funding from World Diabetes Foundation, was initiated in 2009

Project objectives:

- To initiate a national programme for capacity building in diabetes care by establishing a pioneer cohort of 'diabetes nurse educators' (DENO) in Sri Lanka
- To improve the quality of diabetes care by establishing a health care model of tertiary-primary care partnerships in Colombo by upgrading selected primary care curative sector institutions and monitoring their protocol based patient management, under the supervision of the tertiary care
- To strengthen the community through health promotion in impoverished, overcrowded urban settings that aim at primary prevention, screening and risk reduction

Project outcomes:

- Training of 279 Diabetes Educator Nursing Officers (DENOs) for the state sector hospitals and coordinating the provision of holistic care for diabetes and CVD risk care throughout Sri Lanka; coupled with appropriate training of related health professionals (74 Health Education Nursing Officer and 64 selected private sector Nurse aids)
- Tailor made training of 119 MO/RMOs and 69 family practitioners who function in primary care settings in the western province
- Strengthening laboratory services for managing diabetes and cardiovascular risks at primary care centralised at Maligawatte DH
- Infrastructure development of primary care health services in 6 selected settings that provided service for 109,947 patients (in 18 months) in Western Province through a partnership between the tertiary care and the primary care services. Additionally screening of 25,836 adults was carried out through 526 screening camps in the community and work settings.
- Empowering the community with family participation in Kotte and Kolonnawa through 133 health promotion settings located at workplaces, schools and community centres through capacity building of health workers and Health Promoters that encourages positive behaviour

Final outcome: Disseminated the evidence generated to advocate policy makers to replicate this approach island wide. Invitation by WDF to apply for second phase – which is now mid term and addresses NirogiMaatha (pregnancy diabetes), NirogiPaadha (diabetes foot care) and NirogiDiviya (health lifestyle)

Research Capacity and Infrastructure Development as a Part of Nation Building

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As argued by the World Health Organization, 'there will be no development without health and no health without mental health'. However, there is an enormous inequity in global health as well as research. Less than 10% of research funds are spent on the diseases that account for 90% of the global disease burden. Though 93% of the world's burden of preventable mortality occurs in developing countries, too little research funding is dedicated to health problems in developing countries. In addition, there is a publication divide in medical and mental health research. Only around 8% publications arise from 90% disease burden countries. As a result 'evidence-based practice' in health care is based on evidence from completely different socio cultural backgrounds as local evidence is limited or non-existent.

In the 21st century, knowledge has become power. Inequitable health research capacity has put the 90% of the disease burden countries in a very disadvantaged position. Strengthening health research capacity in developing countries is a critical element for achieving health equity.

However, Sri Lanka has much strength in health and education compared to that of other developing countries. It has a literacy rate over 92.5% in males and 87.9% in females. Many health indices such as crude death rate, maternal mortality rate, and infant mortality rate are comparable with developed countries. Ironically, Sri Lanka lacks an overarching research culture and in terms of measurable research output, Sri Lanka ranks as one of the lowest in the region. As a consequence, medical education relies on the distribution of the existing knowledge generated in 10% disease burden countries.

In this context, working to achieve an overarching local research culture and capacity to generate new knowledge has become a crucially important priority for Sri Lanka. There is landmark high quality collaborative research conducted in developing countries that provide evidence of relevance and value even to the developed world. Establishing capacity and excellence at individual, group, institutional and national level is the way forward. Such a long term research agenda can be helped by strong collaborative research partnerships from the North and South, (a partnership between developed and developing countries), and also South– South collaborations (between developing countries). However, an agenda should be set locally, with a robust ethical and governance framework. Ethics should be considered as a friend of research to promote high quality research while protecting its most important resource the participants. There are many such examples and success stories from the resource limited settings. Establishment of the Institute for Research and Development (IRD) and Sri Lankan Twin Registry, with Institute of Psychiatry (IoP), King's College London, UK as the main partner, are classic examples of research capacity development. The research carried out at IRD has managed to have a global impact and reverse knowledge flow from the South to the North. There is a wealth of experience to share from this initiative.

Keywords: Research capacity, infrastructure development, research culture

The Importance of Local Research in Developing Health Strategy – The Case of Cardiovascular Disease Prevention in Sri Lanka

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Ischaemic heart disease (IHD) is the leading cause of death in Sri Lanka. Age-sex specific rates of IHD mortality are substantially higher than in developed countries, and reducing IHD mortality rates is critical to making substantial progress in countering the NCD epidemic and maintaining improvements in life expectancy. Developed countries have reduced IHD mortality rates primarily by action to reduce smoking, reducing key risk factors such as hypertension and hypercholesterolemia through medical therapy and dietary interventions, and improved quality of care in management of IHD morbidity. These countries have had limited success in using primary prevention to improve other risk factors such as obesity and physical inactivity. Their experience, low levels of smoking and hypertension in Sri Lanka and disease modelling indicate that medical intervention must play a major role in Sri Lanka's response, but national policy shifted only slowly to accept this owing to the role of WHO and other global recommendations in setting national agendas.

Recently, MOH has adopted a policy of mass screening to identify individuals at high risk of IHD mortality, and to provide them with a basic package of antihypertensives and statins. On the sole basis of WHO recommendations intended for developing countries with limited resources, MOH adopted WHO/ISH risk prediction charts to identify individuals at high risk for treatment, setting a 10-year risk threshold of 20% to select patients for treatment. Using Sri Lankan survey data, we model the ability of the current approach and strategy to discriminate between high and low risk individuals, the costs of treatment, and the impact in terms of future deaths averted. We then compare the approach with alternative approaches to screening that do not use the WHO/ISH charts and which set different inclusion criteria for screening and lower risk thresholds for intervention. We find that the WHO/ISH charts perform poorly in relation to alternative screening protocols, and that other strategies would have substantially greater impacts in terms of deaths averted and better cost-effectiveness. We also find that differences in MOH costs mean that the cost-effectiveness of interventions in Sri Lanka will differ substantially from other regional countries, implying that Sri Lanka can adopt more aggressive approaches for any given level of cost-effectiveness. Our results confirm findings elsewhere about problems with use of the WHO/ISH charts, which were never validated prior to publication, and raise significant questions about why prior modelling with national data was not done in Sri Lanka before adopting policies that will entail treatment of a large percentage of the adult population. Although our work points to ways in which current strategy in Sri Lanka can be improved by revising national protocols, they point to a larger problem in the health policy formulation process in Sri Lanka, which is its systematic failure to make effective use of local research and data, and excessive reliance on adoption of international recommendations without adequate scrutiny.

Keywords: Sri Lanka, preventive cardiology, health policy

TECHNICAL SESSIONS

DEFENCE

Land Doctrine for Sri Lanka; in Anticipation of Future Threats to the National Security of Sri Lanka.

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Being an island nation located strategically in a so very important geographical location, Sri Lanka commands much attention in the worlds power projection concerns. Attributed to its location; Sri Lanka's geographical shape, size, the ground configuration together with natural harbours of the country will draw the attention of any nation that has an interest around the Indian Ocean. It's surly not an island to be treated lightly in the context of worlds maritime interests of the sea going nations in general and security concerns in and around the mighty Indian Ocean, in particular. There are records to prove how important Sri Lanka had been in the maritime interests of the sea going nations even in the ancient times. In Silk Route era and even beyond Sri Lanka had been a very important hub or a transit location among sailors and merchants. During colonial expansion Sri Lanka drew the attention of the 3 x major powers at the time; the Portuguese, Dutch and British. Their confrontations over the control of this small island and onward events unfolded in the colonial era clearly demonstrate the strategical importance commanded by Sri Lanka. In World War Two again, Sri Lanka became the Command location of the South East Asian Command (SEAC) of the Allied Forces. Trincomalee harbour housed the maritime assets of the SEAC, the second largest fleet of the Allied Forces. Then during the Cold War, two super powers and their allied interest, their overt and covert undertakings in Sri Lanka once again prove how important Sri Lanka is for these power struggles.

In the contemporary world again and again Sri Lanka is a concern for many a nations. Rising South East Asian nations and their security, energy, resources contribute to this prime concern. Supremacy for power between rising nations and those established power bases will categorically make them exert pressure to exercise command over the control of the Sri Lanka. To survive and exist beside these ever challenging security concerns, Sri Lanka needs a formidable Grand Strategy and a Land Doctrine to shape its defence forces. Policy makers think that there has to be long term understanding executed at operational and tactical level which will be the blue print for the military leaders to organise, train, equip the country's military apathies. A sound land doctrine is a must to be developed and this paper is an attempt to highlight the need for a Land Doctrine for the country and suggest a possible layout for developing such a doctrine.

Survival of a State in the Face of International Hegemony: A Sri Lankan Perspective

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Sri Lanka encounters many challenges due to significance of geographical positioning in the Indian Ocean. As a result of this geopolitical situation time to time this littoral state's tranquility was hampered by the great powers. In the end there were numerous hardships to its citizens and damages to wealth and properties of the country. However, in the recent defeat of the separatist terrorism movement in year 2009 is paving a path towards stability again to the country. It is important to understand that victory was a hardship of all patriotic and peace loving peoples of the country, whatever the ethnic and religious affinities.

Most significant focus at this juncture should be to foresee and to **articulate strategies' for survival as a stable country in the world stage**. To have that, country's security paradigm plays a major role. Analyzing the past and present of the country's history with the contemporary events in the country, region and the world shows the difficulty of facing the mounting hegemony against a small nation.

Keywords: Geopolitics, Security, Hegemony, International Relations, Sovereignty

Critical Analysis on Identifying the Effect of Military Training Simulations on Confidence Level of Soldiers

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Simulations and games grow rapidly and very dynamically with the modern technologies every day. For military simulations, the technologies of those are continuously evaluated and upgraded since it is a key fact for military trainings, analysis, etc. Even though the training simulations were used for soldiers, it was not identified exactly whether these make an effect on soldiers' confidence in the battlefield or it will increase the confidence level of the soldiers. There have been many researches on military training simulations time to time around the world. Mainly defence research centres had done those researches since they have to improve the quality of training. This research was done in order to identify whether military training simulations make an effect on the confidence level of the soldiers when they are really out in their battling. These have been used to train soldiers' way back in the World War II. In the advancement of technology these have become more and more advance and effective on achieving their goals. DARPA (Defence Advance Research Program Agency) and the US Army research institute was the major two researchers on this domain.

The objective of this study was achieved through evaluating the existing background of military simulations and confidence level of soldiers, investigating how military training is done in terms of simulations, evaluating how simulation based training are effective for soldiers, identifying the factors that effect to confidence level of soldier and introducing a model to evaluate the confidence level of soldiers.

According to the conceptual model identified actual experience, experience of others, self-efficacy, mission readiness, persuasion and emotional arousal will affect the confidence level of a soldier. Based on the collected data the model which was proposed to measure the confidence level of soldiers could be justified to acceptable level.

Keywords: Military training simulations, confidence level, soldiers.

Application of Artificial Intelligence (AI) for Counter Insurgency Operations – A special focus on Sri Lanka Air Force

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Objectives

1. To establish a dedicated AI coordination facility for defence services in Sri Lanka
2. To establish a research and development facility in AI for the defence services in Sri Lanka
3. To amalgamate the practical knowledge and the theoretical knowledge of military and Academic scholars in AI

With the military victory of approximately three decade long war in Sri Lanka, it was inevitable that the Sri Lankan defence services had utilized new techniques, strategies and equipment in achieving the world renowned military victory over the most ruthless terrorist organization. However the tactical level battle plans were immensely strategized from the top level management in documenting the experience acquired especially during the Ealam war IV.

The researcher intends to highlight the new concepts in AI that have been developed to achieve such success and to highlight the importance of AI application in Air Warfare. Also the researcher intends to propose to develop a proper research facility and a total command centre for AI and military amalgamation.

The researcher will highlight the AI utilization in the regional and developed countries while emphasizing the limited utilization of AI in Sri Lanka. A special focus will be given to the available but underutilized AI resources in Sri Lanka. In furtherance, the researcher will formulate a basic plan of research facility to be developed in future by the defence services of Sri Lanka.

The researcher also intends to highlight the importance of documenting the experience gathered during the successfully concluded military operations in 2009 and the importance of utilization of AI more than any other information gathering source in post war era.

The researcher also intends to emphasize the significance of real time battle management and simulation in the AI perspective. For this the simulations of DARPA (Defence Advance Research Project Agency) will be considered while highlighting the utilization of computer based interfaces that can be developed to be utilized in Sri Lanka.

The AI application in Sri Lankan context had been always lacking. However consciously or not certain limited applications were considered in experimental level. After observing the promising results the tactical level of operation commanders have extensively used such available applications. The researcher states that a methodical and systematic AI application in certain automations and various military operations will give us a greater prospect. In conclusion the researcher states that a research facility to be established to utilize the AI applications in military in any other developed country and highlights the importance of such facility in automation of such applications in military operations.

Tracked Robotic Vehicle Platform for Defensive and Offensive Warfare

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Electronic warfare has almost superseded other forms of conventional warfare in the world ever since the end of Second World War. Unmanned ground vehicles (UGV) have been in use for more than 50 years and have advanced to a stage where they are part of the standard military reconnaissance nowadays. Western forces and more prominently the US armed forces use variety of remotely operated ground vehicles for reconnaissance, explosive disposal and offensive operations. Some believe the future of modern warfare will be fought by automated weapons systems. The U.S. Military is investing heavily in research and development towards testing and deploying automated UGV systems. The most prominent system currently in use is the Foster Miller Talon UGV which can be armed with number of small weapons systems.

Not long ago, the valiant armed forces of Sri Lanka had to climb up mud bunds for reconnaissance as well to destroy and capture terrorist bunkers. A robot such as Talon is very capable of handling such a mission leaving our soldiers out of harms-way for initial ground assault. With the development of this project, the Sri Lankan armed forces will have the ability to use these remotely operated vehicles for reconnaissance, demining, explosive disposal, and offensive purposes in the battle fields similar to their counterparts in the western armed forces. This will further result in safe guarding the lives of our soldiers and avoiding unnecessary risks in the battlefield. We have developed a complete robotic platform that costs less than Rs. 100,000 consisting of remote video feed, control and a sensor platform that offers the remote viewing and computer vision assisted object detection ability into an extremely robust and durable robotic vehicle. The platform control module which is built around low cost Arduino platform, can easily handle many more sensor units if such capability is required.

During the height of the war in Sri Lanka, we launched this project at the University of Wollongong in Australia in a view to develop the capabilities that would have paved way for its use in the theatre of war. We are glad that the war ended quickly due to the bravery of the armed forces of Sri Lanka, yet, such technology still offers the capabilities that would be vital in day to day operations such as bomb disposal, mine detection and surveillance. One of the golden rules of our mission in building such a robotic platform was to make it as simple as possible with the lowest possible cost. Premaratne *et al.* has taken the view that minimum number of components for the design is warranted which can be manufactured in large scale. This resulted in designing a tracked robot chassis which had only 5 aluminium pieces that can be cut and welded together in less than an hour. The robotic vehicle chassis consists of industrial grade rubber tracks with its mounting wheels or sprockets were attached to the aluminium frame using flange bearings and the main driving mechanism of the tracks were two 24V power-wheel chair motors. These manufacturing steps can be attempted by a group of 3 personnel in less than four hours keeping such a design costs down to a minimum.

Keywords: Unmanned Ground Vehicle, Robotic Vehicle, Computer Vision.

Post Cold War Nuclear Safety Culture in South Asia and its Impact on Security of Non Nuclear Weapon States

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Although one of the desired expectations of ending the Cold War was the total elimination of nuclear weapons, the threat of nuclear weapon heritage still persists. Additionally, the ending of the Cold War has earmarked a new set of problems to the global security sphere and simultaneously has set a new parity status to states who are involved in nuclear related activism. In such an environment, the security threat emanating from the nuclear states could be twofold. One is the threat emerging from the nuclear weapons developed for security purposes and the other is the risk of related to the usage of nuclear material for civilian purposes. In both circumstances, the Safety Culture of a state that covers both attitudinal as well as structural factors relating to organizations and individuals plays a pivotal role in establishing security.

In the South Asian case, the respective nuclear doctrines of India and Pakistan describes Nuclearization as a deterring result of the enmity between themselves. On the other hand, the civil nuclear programmes were defined as a solution for the massive energy demands of their respective countries. The security of the region depends on a large extent to the mechanics of nuclear deterrence within the region. But the possibility of non-adherence to the common mechanics of deterrence by states may result in a large scale security destabilization of the region. Against this backdrop, there are security impacts on the security of the Non Nuclear Weapon States (NNWS) in South Asia who are not involved in the nuclear related activism. The paper intends to apply nuclear optimism and pessimism as a theoretical framework in order to study the third party effect of the nuclear usage of some states in South Asia. It will also use the Nuclear Threat Initiative Index (NTI) as a safety measuring index of state nuclear usage. The paper will mainly depend on a qualitative research technique and will follow an analytical method to study the research question. The author will also touch upon the reciprocity of the issues among National Human and Regional Security aspects of nuclear usage of states.

Keywords: Non Nuclear Weapon States, Safety Culture, Security

Revisiting the 'Conflict Trap': Assessing the Potential Resurgence of an Armed Struggle in Sri Lanka

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Five years on since the military defeat of the Liberation Tigers of Tamil Eelam (LTTE), Sri Lanka is in transition. Having experienced a protracted war for nearly three decades, the country has shifted to a post-conflict nation-building phase following the successful conclusion of the Humanitarian Operations. While post-war peace is often taken for granted, the global experiences witness a relapse of war within a few years of the conclusion of violent conflicts. This phenomenon is stipulated by the 'conflict trap' theory. That is, post-conflict societies run a high risk of sliding back into armed conflict within five years after the conclusion of a war.

Notably, the island nation has not witnessed a single terrorist attack since the decimation of the terror outfit, and any attempts to revive the armed struggle have been successfully thwarted thus far. To this end, the Sri Lankan case defies both the 'conflict trap' concept and the conventional experiences of many post-conflict nations around the world. Against this backdrop, this paper seeks to test the applicability of the theory to the Sri Lankan context. This requires assessing the potential relapse of a large-scale violent arms struggle in the island nation within the conceptual framework. The research purports that a resurgence of hybrid warfare and a terrorist outfit like that of the LTTE is highly unlikely in the current socio-political climate in the country.

The paper will be divided into several sections. First, it will offer an overview of the 'conflict trap', which will serve as a theoretical framework of the research. The subsequent section will explore the different facets within the concept, and analysis will be made in light of its applicability to the Sri Lankan scenario. The conclusion will present the overall research findings. This study will rely on qualitative analysis. Data will be collected from open source secondary sources. Finally, lessons learned from this study may refine the existing knowledge on the 'conflict trap', as well as shed some light to the relevant stakeholders of Sri Lanka's national security.

Keywords: conflict trap, post-conflict Sri Lanka

Universal State or World Government: Will it Ever Happen?

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From earliest days of formation to Homo sapiens this species had been known to have resorted to violent conflict between individuals, groups, tribes and later between states. The last phase had caused the highest volume of destruction as human casualties and the destruction of an environment order. Despite, the valuable effort taken by the United Nations, the human conflict stands at a highly explosive level mainly due to the never regional issues.

There are two other more potentially dangerous threats. Several nations are in the possession of nuclear and chemical weapons and attempts by the UN and other non- governmental organizations such as the Pugwash Conference have not achieved much success on nuclear non-proliferation as well as minimize threats from an extended chemical warfare. Second danger could be the danger of extension of conflict to the newly discovered arena of outer space.

Needless to say the vast majority of people are tired of these endless brutal killings and massive destructions. Will there be peace at least among nations? According to liberalists, the nature of world government is to be associated in particular with those idealists who believe that peace can never be achieved in a world divided into separate sovereign states. Just as the state of nature in civil society that could be abolished by governments, the state of war in international society must be ended by the establishment of a world government for a world peace.

It is this question that is examined from a perspective of the wisdom of some philosophers and intellectuals. These include Arnold Toynbee, Bertrand Russell, Arthur C. Clarke and an entirely different personality, John Lennon the famous musician of the Beatles.

Toynbee discussed a Universal State that will be formed by of a group of nations when their individual cultures will breakdown. Russell's thinking was that for the world to survive there should be a world government. Clarke on the other hand was more positive. He asserted that the United States of the World will emerge due to the information revolution that he predicted. As an artist Lennon is emotionally giving a message of a world without countries. These views will be treated in the paper.

Keywords: World Government, Universal State, Global Peace

Understanding the Nexus between Traditional Security and Human Security through Indo-Bangla Relations

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Security is of profound importance to state and humans alike. The concept of security can be defined as absence of threat. Security was seen primarily in terms of state security and national power, the state as the single actor to ensure her own survival in the International system relying on the state's military might. Yet today security transcends the concept of power and has shifted from solely a state centric traditional security focus to a human focus as Human Security, thus not limiting security to state alone but extends to the citizens of the state, people centric and focusing on eliminating "human insecurities" while attempting at ensuring the human rights aspect as well. It is in this light that this study has been undertaken and seeks to examine the nexus between "Traditional Security" and "Human Security" taking into consideration the geo-political relations between India and Bangladesh. The common view is that traditional security and human security are two separate areas, yet there is also another notion in today's context that traditional security and human security are very much two sides of the same coin, and cannot be eliminated one over the other.

The focus of the study is based on the ambiguity and looks at today's state of affairs in the international system through a "Realists' lens" as opposed to an "Idealists'" understanding of state of affairs. The objective is to examine and establish the nexus between the traditional security and the human security by examining security approaches of India and Bangladesh in the present-day context. Specific - to examine the history of Indo-Bangla relations, to examine the India's approach to security and her attitude towards Bangladesh, to examine whether there is a threat to Bangladesh from India—actual or perceived, to examine as to how Bangladesh is countering the threats posed by India, to examine the Bangladesh's general approach to security, to examine, if the Bangladesh's approach to security could be endured in the face of India's dominating posture.

The study/research would be carried out by analyzing the existing literature by subjecting the existing literature to qualitative analysis, a qualitative in nature. Empirical studies carried out by scholars, organizations such UN and affiliated bodies would be made use of. Qualitative data would be collected from well-informed individuals: such as academics and policy makers. The method of data collection from this group would be semi-structured interviews done on informal basis.

In the light of contemporary understanding security, human security issues in Bangladesh have been subject to extensive investigation within Bangladesh thus research will be focused on to find out the influence of her neighbor India from a strategic affairs perspective. From that perspective this study stand in a unique position and it is believed that the effort would contribute to the existing body of knowledge with a contribution to regional geo-politics and relations among the regional states.

Keywords: Traditional Security, Human Security, Indo-Bangla Relations

Sri Lanka's Defence Relations with Pakistan Post LTTE Conflict

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Sri Lanka and Pakistan have been close friends ever since they won independence from the British. The bilateral relationship between the two countries reached an important juncture in the run up to the East Pakistan War when Sri Lanka allowed over-flight permission and refuelling facilities to West Pakistani aircraft en route to East Pakistan. Pakistan for her part, offered Sri Lanka invaluable military assistance throughout the LTTE conflict and Pakistani help was decisive in the defeat of the LTTE in 2009.

The defence partnership between Sri Lanka and Pakistan is an interesting case in point. The military partnership between the two countries constitutes a key component of the bilateral relationship between the two countries. The Indian factor, the lack of common interests vital to both Sri Lanka and Pakistan as well as Pakistan's military culture have been deciding factors in determining the course of the defence relations.

This study is qualitative in nature and attempts at a descriptive analysis of the problem. Due to the lack of prior research done in this area, interviews were used quite substantially as the main source of information. News items were also used to corroborate interview points in this paper.

This article is subsumed under four main sections. The first section provides an overview to the context of Sri Lanka-Pakistan defence relations. The second section deals with the aspects of defence relations. The third section discusses the nature and the impact of the mutual friendship and comradeship that exist between the two military establishments. The final section brings to light the importance of the defence links to the bilateral relationship between Sri Lanka and Pakistan. This paper also attempts to examine the ways in which both countries could effectively navigate impending obstacles and make the defence relationship enduring and more meaningful in the 21st century.

Keywords: Sri Lanka-Pakistan Relations, Defence relationship

Transforming from Conventional to Unconventional; How Theory of Naval Warfare was applied in Sri Lankan Waters for a Successful Naval Campaign

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Sri Lanka Navy (SLN) had to fight for the Sea Control against a Non State Actor who employed unconventional and asymmetrical tactics in the maritime domain. It was a long battle, with many reversals and successes, yet at the end SLN prevailed in defeating a terrorist outfit of maritime capabilities, some even thought was undefeatable.

The once peace-time Navy evolved to be a fine fighting Navy which extended their naval operations from the coastline to deep blue seas. The transformation of a conventional naval force to meet the threats of asymmetrical nature was a process; where time and experience refined the theory of naval warfare to suit the threat grown at home. The transformation was a remarkable feat, as it culminated at destroying an international network of arms smuggling and trading at sea which could have had consequences globally.

The paper is based on author's research for the Doctorate. The study is to evaluate the uniqueness of asymmetrical warfare at sea against the theories designed for classic naval battles. The research approach is based on interpretivism in an epistemological field; understanding the nature of reality and the social behavior. The findings reveal the applicability of the theory of naval warfare even in an arena of unconventional warfare and the complex and unique nature in applying the theory against unconventional and asymmetric threat.

The paper discusses the factors that influenced SLN to transform from conventional approach to asymmetric approach that minimized the failures and assured the successes of war-winning formula. These factors range from evolving around the enemy tactics, changing from reactive to proactive response, exploitation on enemy vulnerabilities, innovative thinking, leadership attitude to the use of conventional maritime warfare theories and concepts in an unconventional environment. It evaluates the research findings so far with the relevant literature and science. Whilst many navies takes interest in studying the possibilities of such a low-economy yet high-gain warfare, Sri Lanka for three long decades experienced not the possibility but the reality. The maritime doctrines are eager to address various factors of the unconventional and asymmetrical naval warfare, but the reality lies on the one's will to meet the threat, address the threat and finally to become victorious.

Keywords: Maritime Security, Asymmetric Warfare, Theory of Naval Warfare

Sri Lankan Fishermen: A Potential Maritime Security Concern?

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With the end of LTTE terrorism in year 2009, the fisheries industry in Sri Lanka expanded to a greater extent especially in North and other areas. Taking the favourable maritime security environment to the advantage, local fishermen began to yield better fishery harvest from the seas around the island. Regulations in place for fishing prior to year 2009 were strict due to LTTE activities in the maritime domain which led to the implementation of stringent regulatory and surveillance mechanisms to ensure the fishermen are safe, they are not being exploited by LTTE for various atrocities and fishermen are not involved in illegal activities.

With over 62,700 fishing vessels of all types engaged in fishing (both inland and marine sector) at present, Sri Lanka is expected to yield a sizable fishing harvest in a sustainable manner. Firm regulatory measures in place prior to year 2009 have been relaxed in areas such as horse power of engines, fishing hours, fishing areas, inspection of permits etc., to benefit Sri Lankan fishermen. The context in which these regulations relaxed since 2009 is an area which required to be re-scrutinized in relation to the maritime security as this remains as one of the most important factors in determining the security and stability of a country (especially of an island nation). As this is directly linked with the national security, a great deal of attention is required to be paid to all activities taking place in the maritime domain. Number of illegal activities (human smuggling, drug trafficking, IUU fishing etc.) has taken place with the involvement of local fishing boats in the recent past. Effective policing/surveillance of seas and establishing maritime governance can be sighted as key factors in ensuring effective monitoring of fishermen's activities.

Despite the fact that LTTE is militarily defeated and no physical enemy is present, why it is important to monitor activities of Sri Lankan fishermen in the maritime security context? has been formulated as the research problem. The research problem focuses only on the Sri Lankan fishermen's activities in the legal maritime boundaries including areas beyond EEZ. The research methodology adopted in this study is epistemological in nature and takes an interpretivism in a subjectivist philosophical paradigm. Data collection was carried out through secondary data sources; books, periodicals, media reports and published/non-published articles.

The analysis of data highlighted the importance of having an effective surveillance of the fishing activities (including fisheries harbours) both inland and in the marine environment. This will ensure the fishermen are not engaged in illegal activities which lead to jeopardizing maritime security. The immediate requirement of establishing effective surveillance of fishing activities (through centralized systems), supervision of fisheries harbours, requirement of strong regulations for the effective maritime governance, formation of marine domain information gathering network, formulating new laws/regulations and a reviewing the context in which regulatory mechanisms were relaxed are seen as some of the key areas authorities require to draw attention. As the Navy's role in eradicating LTTE maritime terrorism has contributed in making the Indian Ocean a safer and a secure place for maritime activities including fishing, the strategic importance of maritime security cannot be considered lightly. In this context, immediate attention is required to be drawn to maritime security and the activities of local fishing fleet to ensure fishing is not emerging as a maritime security challenge.

Keywords: *Maritime Security, Maritime Domain, Sri Lankan fishermen.*

Total Maritime Surveillance- An Integrated Approach

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The vision of the Navy with regard to Maritime surveillance is to be able to detect, identify and classify all players in maritime domain within Sri Lankan Exclusive Economic Zone. The major threats perceived in this area are human and arms smuggling piracy, poaching, Illegal migration and maritime terrorism.

This paper proposes an integrated approach that aims to achieve the vision of total maritime surveillance using five distinct methodologies. They are Surveillance using Coastal sensors, Surveillance using fleet sensors, Human intelligence, Maritime intelligence (Commercial) and Through data from other government organizations such as SLAF, Police, Fisheries, Coast Guard, Customs, UDA, Survey department etc.

The comprehensive analysis on the capabilities, limitations and challenges in implementing these methodologies will be discussed in the paper. The concept of total maritime surveillance can be formed on five pillars mentioned above, which need to be seamlessly integrated to ensure all maritime threats are fully detected, analyzed and classified so that a suitable response mechanism can be formed by the responding agencies that have the jurisdiction and responsibility at each unique scenario.

In conclusion paper will analyze the realistic operational structure that can be set up to ensure "Total Maritime Surveillance" in Sri Lanka by utilizing an integrated approach.

Keywords: Maritime Domain Awareness, Maritime Surveillance, Integrated approach

The Galle Dialogue and Maritime Security Cooperation: Present Status and Future Possibilities

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Maritime Security in the Indian Ocean Region (IOR) is faced with many problems and issues. These include geopolitical competition, Illegal, Unreported and Unregulated (IUU) fishing, sustainable harnessing of marine resources and people smuggling. Sri Lanka's geostrategic location in the IOR entails that it is both affected by these problems and that it is also in a position to contribute to the solution of these problems. Given the fact that the maritime domain is a space shared by many nations, cooperative approaches are essential for combating most threats to maritime security. The Galle Dialogue is well placed as a mechanism that can be utilized for enhancing maritime security cooperation in the IOR and perhaps even the broader Indo-Pacific region, in terms of both traditional security concerns and non-traditional or emerging challenges in the maritime domain.

In recent years a number of US and Indian scholars have begun to speak of an Indo-Pacific Region. Essentially this regional construct appears to be the maritime avatar of the Asia-Pacific construct which came into prominence in the 1990s. While the older regional configuration of the IOR will to some extent be overlaid by the broader Indo-Pacific construct, the former will also continue to coexist with the latter.

The research questions that this paper will explore are the following: 1) what is the contribution the Galle Dialogue has so far made to maritime security cooperation in the Indian Ocean Region?; and 2) how can the capacity of the Galle Dialogue to contribute to maritime security cooperation in the Indian Ocean and Indo-Pacific Regions be improved?

The paper will employ an interpretive methodology and analyze some of the papers presented at the Galle Dialogue through the lens of maritime security cooperation. Through this exercise it will attempt to come to an assessment of the contribution that the Galle Dialogue has already made to maritime security cooperation and prescribe some measures for improving the capacity of the initiative to continue the same.

At present the Galle Dialogue functions as a forum for disseminating and exchanging ideas on maritime security. As such it has contributed to moderating the geopolitical competition in the US-China-India strategic triangle by providing these three countries with a forum for listening to each other's ideas and understanding them better. Statements made at the Galle Dialogue by all three countries emphasize inclusive international cooperation. Papers delivered at the Galle Dialogue have produced recommendations aimed at curtailing Illegal Unreported and Unregulated (IUU) fishing and a set of principles for the sustainable harnessing of marine resources, as well as emphasized the importance of both coordination between the different agencies of government within countries and cooperation between countries in combating people smuggling. These and other papers delivered at the four editions of the Galle Dialogue held so far constitute an important contribution to the pool of knowledge on maritime security cooperation. To enhance the ability of the Galle Dialogue to generate knowledge on this important subject this paper has proposed the setting-up of Study Groups on geopolitical competition, IUU fishing, sustainable harnessing of marine resources and people smuggling under its aegis. These Study Groups could also generate well

informed policy recommendations for the governments of participating countries. In order to reach out the Indian Ocean community at the regional level this paper has recommended the participation of the Indian Ocean Rim Association (IORA) and the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) in the Galle Dialogue process. It could also secure the participation of representatives from the ARF Unit at the ASEAN Secretariat and the APEC Secretariat to reach out to the broader Indo-Pacific Region. The Galle Dialogue is an initiative that is full of potential and it is up to Sri Lanka's Ministry of Defence and Urban Development and the Sri Lanka Navy to realize it.

Keywords: Galle Dialogue, Maritime Security Cooperation.

The Missing Link in Joint Warfare Practices: A Conceptual Analysis of Military Transformation

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Military services have over the years been far more likely to resist cooperation, and this reality has been expressed in the analysis of strategic thought. Although some critics discussed amphibious warfare and the specific linkages between naval power and land power, eminent strategists such as Clausewitz vehemently ignored naval warfare. Mahan paid only passing attention to the employment of sea power against the land power. Similarly Douhet strongly suggested that air power should be operated independently of other dimensions of war. Joint warfare is arguably a late twentieth century, if not twenty-first century phenomenon. Until the 1986 Goldwater – Nichols Act was passed in the United States inter-service harmony among the tri services was not possible and conducting a “seamless” three-dimensional war was an uphill battle. This revolution in military affairs (RMA) significantly altered the nature of warfare brought by the innovative application of technologies. Combined with dramatic insights in military doctrine and operational concepts, such innovations have fundamentally changed the character and conduct of military operations. The phenomenon of military transformation emphasized by the Post Cold War strategists seems to revolve around four tenets. First, the operations of the three military components -- army, navy and air force – must be fully interoperable in practical and technological terms. Second, rather than the traditional military operation which was confined to a single service, the joint effort must involve contributions of two or more services. Third, the integration of service capabilities into a joint framework does enhance the friendly force battlespace awareness. Final, the battlefield mission should be assigned not according to service but according to the requirement. However, the post Cold War strategic thought has hardly addressed the impact of intercultural harmony on successful network-centric warfare operations. Critics believe that the cultural differences among the army, navy and airforce have often diluted the interoperability of the three. In particular the higher echelons of the three forces argue that the poor cultural collaboration among them during the 2009 internal war in Sri Lanka did handicap the expected levels of joint operability. This paper suggests that without reconciling the frictions among the values, beliefs and assumptions of the three forces engaged in warfare, a successful military transformation would be a forlorn hope. Also, the paper conceptualizes that the formation of a common social glue which unifies the three forces into a compatible network would be a fifth tenet for successful military transformation. The paper is four-fold. Part one is introductory and it deals with a comprehensive literature survey on military transformation. A conceptual model linking the five tenets of joint warfare will be explained in part two. Part three illustrates how the cultural harmony will enhance the jointness in practice. The final part will be devoted for concluding remarks.

Keywords: Military transformation, Cultural harmony, Conceptual remarks

An Assessment on Integration of Single-Sign-On Technologies for Military Environment: A Fit- Viability Model

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With the creation of web-based technologies, single sign-on has emerged as an important and central architecture solution for enterprise applications. As security breaches become increasingly more frequent, Minimizing user access to back-end systems and web applications without impacting legitimate usage is more important than ever before. As more web-based applications are deployed, Single Sign-On (SSO) solutions that have the capabilities to provide authentication, management, access control, and logging across the complete front- and backend e-business chain will become increasingly more important to Information Technology (IT) professionals. Furthermore, arrival of networking and internet has necessitated the use of numerous authentication techniques as password inflation has severely undermined the protection offered by a single password. Writing down and sharing passwords, use of regular passwords and similar practices greatly undermines the security of a network. Password issues also hinder productivity of the workplace and create redundant costs to the organization.

Even though, SSO is a two-edged sword. SSO will degrade the security if it has not being deployed properly and SSO isn't a security panacea in and of itself, it can make positive contributions to an enterprise information security program. Since SSO can have positive impact on the secure systems, establishment of SSO for military environment based organizations can be taken into consideration with the aim of enhancing the productivity and secureness by eliminating the issues in using several usernames and passwords for separate systems. In this research, the feasibility of using SSO technology for military environment was investigated and potential risks were identified in the prevailing system authentication.

The research was conducted using a mixture of quantitative and qualitative methodologies within an overall inductive framework. To elicit quantitative values necessary for the research, questionnaires, and document reviews were used. To elicit qualitative values, interviews, observations and case studies were used. Then, inductive and deductive reasoning were used to theorize the findings appropriately and to generate outcomes.

The feasibility of such integration was analyzed from technical, financial, operational and organizational perspectives and based on the findings; a model has being developed for the integration of SSO technologies for military environment with appropriate security measures using a mix of available SSO technologies, would be productive and successful in military environment.

Keywords: Single-Sign-On, Military Environment, SL Army

Combat Exposure and Cannabis Use: Are they Associated?

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Cannabis also known as marijuana is an illicit psychoactive substance derived from the Cannabis sativa plant. Regular cannabis use is associated with cannabis dependence syndrome. Cannabis users are also more likely to use other illicit drugs. Studies in high-income countries show that the pattern of drug initiation starts with alcohol and tobacco, followed by cannabis use, and then other illicit drugs.

The objective of this study was to assess the prevalence of cannabis use among Sri Lanka Navy (SLN) personnel and to identify any relationship with cannabis use and combat exposure.

This cross sectional study was carried out among representative samples of SLN Special Forces (Special Boat Squadron) and regular forces deployed in combat areas. Both Special Forces and regular forces were selected using simple random sampling. Personnel who had served continuously in combat areas during the one year period prior to end of combat operations were included in the study. Cannabis use was defined as smoking cannabis at least once during the past 12 months. Only personnel who had served continuously in combat areas during the one year period prior to end of combat operations were included in the study. Since there were no females in the Special Forces, females were excluded from the regular forces group. A total of 259 Special Forces and 412 regular navy personnel were recruited to the study.

The sample consisted of 259 Special Forces and 412 regular navy personnel. Prevalence of cannabis use was 5.22% (95% CI 3.53-6.9). There was no significant difference in prevalence of cannabis use among Special Forces personnel compared to regular forces. Significantly higher risk of cannabis use was associated with age 18-24 years [OR 4.42 (95% CI 2.18-8.97)], personnel who were never married [OR 2.02 (95% CI 0.99-4.12)], and an educational level less than GCE O'Level [OR 4.02 (95% CI 1.17-13.78)]. There was significant association between cannabis use and hazardous alcohol use [OR 4.74 (95% CI 2.35-9.54)]. There was no significant association between cannabis use and combat exposure.

Prevalence of cannabis use was less than that reported among military personnel in several other countries. In the absence of data on cannabis use among the general population in Sri Lanka, it is not possible to compare the prevalence rate in a military population with the general population. Among SLN personnel cannabis use was significantly associated with hazardous alcohol use but not smoking. Exposure to combat was not associated with an increased risk of cannabis use. These findings are consistent with the observation that overall substance use is lower in the Sri Lankan Military. Another reason could be that the study was done almost immediately after the war during which the personnel had limited access to these substances.

Keywords: Cannabis, combat exposure, military

Israel Defence Force: a Retrospective Study for Prospective Regional Defence Challenges

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Israel Defence Forces (IDF) comprises of Army Command, Navy, Air Force, Corps, Brigades and Advisory units. The underlying Doctrine is Prepare for Defence and move to counter attack. Military heritage, democratic principles, tradition of Jewish people and value for dignity of human life are the four pillars of spirit of IDF.

The IDF operational concept encompasses both offensive and defensive strategies. Analogous to a 'sword and shield', the crux of the concept is to proactively respond to threats posed at State of Israel and protect its population from criminal activities. This paper seeks to review the strategy and tactics behind the security fence project implemented to thwart physical and missile based attacks from West Bank. Statistics envisage that on implementation of the barrier, the average attacks declined from twenty six to three per year. Furthermore, an impact risk analysis will be carried out with regard to the Iron Dome which counters aerial attacks from Judea, Samaria and Syria. Qualitative and quantitative data analysis is used.

The Operational strategy from a conceptual view point has multiple implications. Minimum disruption for population density, infrastructure, procurement, archeological, environmental and humanitarian concerns, land ownership, continuity and simplicity of maintenance are *inter alia* ramifications of the strategy. Defence techniques are executed in compliance with international law and military justice. State owned subsidiaries and private companies render technology knowhow for operational purposes. The Diplomatic strategy is negotiation and conciliation.

On the basis of aforesaid findings, this paper proposes a potential framework to implement a pragmatic defence intelligence system. Israel Supreme Court on a ruling held that 'Israel is in a difficult war against rampant terrorism. It is acting on the basis of its right to self defence'. Ultimatum is to ascertain how effectively and efficiently 'cannons' speak in establishing *Shalom* (peace) in Israel and the region of Middle East.

Keywords: Defence, Security Fence, Operational Concept

Job Satisfaction and Organisational Commitment of Soldiers in Sri Lanka Army

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This study aimed to explore the relationships between job satisfaction and organisational commitment of the soldiers in Sri Lanka Army. Within the course of this study, it has been discovered that the main factors that create job satisfaction and organisational commitment among the military personnel of the soldiers in Sri Lanka Army are job characteristic, organisational characteristic and workers characteristics.

These variables tested with a questionnaire to reflect all the characteristics mentioned in the explanations of variables and mode of research was survey research method. The sample was consisting 320 military personnel have completed the questionnaire, producing a response rate of 100 per cent.

Data analysis revealed a positive relationship between job satisfaction and organizational commitment, with all other variables as discussed in analysis. These results largely support the hypothesized associations between variables found in research studies derived mainly from samples of Western theoretical scenario. However, contrary to previous studies, the findings suggest that aspirations to work in a military post are associated with high job satisfaction. The main implications for military training, education and practice are that military administrators should work collaboratively to reduce the gap between theory and practice, specifically to improve the quality of military personnel experience. Positive military placement experience is related to high job satisfaction, and so, potentially, to improved retention.

Nation Development by Bridging the Disability Digital Divide in Sri Lanka

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The differently abled population in the country has increased due to the 30 years of humanitarian operations. The Sri Lankan development strategy focuses on rebuild the nation after closing operations in 2009. The development of Information Communication Technology (ICT) sector increases to fulfill the national requirements. The differently abled community experiences difficulties in use of ICT. This is known as the disability digital divide. Therefore this community isolates in the society. Bridging the disability digital divide will be giving equal opportunities for this community.

Objective of this study proposes a framework to develop technology focused educational model to bridge the disability digital divide. It aligns with national development. Therefore this community also can be effectively involving for national development process.

The government strategic plan and Rogers's diffusion of innovation theory consider modeling the technology related educational framework for Sri Lanka. Experimental design categorized into three different areas of technologies including basic level, intermediate level and high level ICT technologies required for national development process.

This study involved literature survey and other data gathering techniques such as group discussions, interviews and site visiting. 314 participants interviewed to propose the framework. Sample selected for this study selected from different communities, different disabled categories and different geographical locations. Data collected on different themes. An ordered logistic regression technique employed to estimate the coefficients of the model.

Findings indicated that the different levels of ICT facilities use by the differently abled community in Sri Lanka. Study indicates that basic level ICT technologies used by the differently abled community are not sufficient to be the part of the national development process. According to the result use of the technology and knowledge on high level ICT applications are less among this community.

The paper proposes an ICT technology education framework to overcome the disability digital divide. By bridging the gap this community could be effectively contributes in the national development process under the areas of port and aviation, highways, health, agriculture and fisheries, tourism, urban development and power and energy sectors.

Keywords: Disability Digital Divide, Sri Lanka National Development

National Security Implications of Climate Change for Sri Lanka Naval Forces

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Current climate change, both natural and man-induced, is one of the most serious environmental problems that will impact the national security of Sri Lanka in 21st Century. Climate change is expected to be increase temperature, more frequent droughts, erratic rainfall patterns, storm surge and rise in sea levels. This is likely to be affecting Sri Lanka particularly its coastal environment, and thus the national security, society and economy as well. Without proactive action, Sea level rise will inundate the low-lying coastal areas in particular and could impact the national security, environment, freshwater resources and economy.

This paper is to investigate what does climate change mean for Sri Lanka naval forces in terms of the national security implications. Study was aimed to examining the national security implications of climate change through strategic lens and how to focus on the operational implications for the Sri Lanka Navy as a result of increasing maritime activities in territorial waters. In addressing its charge, study sustains comprehensive analysis of the issues associated with the national security implications of climate change for Sri Lanka Navy based on current climate change and environment related issues, climate change related national security issues and naval installation vulnerabilities, human dimensions and water resource issues on maritime operation perspectives and Naval services in humanitarian assistance and disaster relief response. In addition, Intergovernmental Panel for Climate Change assessments and other subsequent literatures were examined.

Climate change affects national security of Sri Lanka in many ways. Firstly, damage to the maritime domain habitability by inundating low line coastal areas and increasing extreme weather conditions. Secondly, less and slow adaptation of people in facing climate change reducing the ability to support their families, causing chance to perpetrate unlawful acts and generating cross-border climate change migration security pressures. Lastly, there may be impact of climate change resilience pressures in the Indian Ocean area which may also create climate change refugee problems from India, and place greater demands on marine foods and fresh waters as impacted populations may look to in to the sea to adapt the climate change impacts on land.

A balance of marine environment, social and national security issues, extensive human and infrastructure development are required to develop as a proactive policy measures in response to Sea Level Rise and climate change impacts near and around Sri Lanka. A joint approach linking government national security strategy and multiple agencies with community participation at local level is an important element, which requires improving capabilities and livelihoods as means of equity and sustainability principles. The Sri Lanka naval forces (Sri Lanka Navy and Coast Guard) should begin to consider potential specific force-structure capabilities and training standards for conducting missions arising from, or affected by, climate change, particularly in humanitarian assistance and disaster relief response related missions.

Keywords: Climate Change, National Security, Sri Lanka Naval Forces

TECHNICAL SESSIONS
MEDICINE

Tuberculous Lymphadenitis and Toxoplasmosis in Lymph Node Biopsies Received to THP Laboratory from 2011 to 2013

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Lymph node biopsy is an important investigation which is helpful in coming to a diagnosis when patients present with lymphadenopathy. Tuberculous lymphadenitis and Toxoplasmosis are frequent findings in biopsy results in Sri Lanka compared to developed countries as both of these are commoner in developing countries. Therefore we thought to go through the lymph node biopsy results from 2011 to 2013 in Teaching hospital Peradeniya with a special interest on demographic characteristics of tuberculous lymphadenitis and Toxoplasmosis. However histopathological finding can give only a suggestive diagnosis of Toxoplasmosis, while confirmation needs serological studies. To determine the incidences of histopathologically proven tuberculous lymphadenitis, toxoplasmosis and the other commoner pathologies out of the lymph node biopsies done in THP from 1st January 2011 to 31st December 2013 and to identify the demographic characteristics of the first two conditions.

Lymph node biopsy reports and the request forms from 2011 to 2013 in THP were reviewed. Age, sex, site of lymphadenopathy and the pathological diagnoses were noted and analyzed using SPSS. Out of 293 lymph node biopsy reports, 47 (16%) showed tuberculous lymphadenitis, 16 (5.5%) showed toxoplasmosis, 75 (25.9%) reactive changes and 54 (18.4%) lymphoma. Metastatic deposits were found in 33 (11.3%). With regard to tuberculous lymphadenitis, females (59.57%) were more affected than males (40.43%). A similar pattern was observed in toxoplasmosis with females being affected in 62%. In both of these conditions the commonly affected age group was 21-30. The mostly involved group of lymph nodes was cervical (78% of the TB cases and 100% of the cases of toxoplasmosis). The 2nd commonly affected site was axilla.

The incidences of both tuberculous lymphadenitis and toxoplasmosis are high. There is preponderance in females and the age group of 21-30 yrs and with cervical lymph nodes being the commonest site. However the commonest pathology affecting lymph nodes is reactive changes in this group.

Keywords: Lymph node biopsy, Tuberculosis, Toxoplasmosis.

Knowledge of Hand Hygiene among Medical Students at the General Sir John Kotelawala Defence University

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Hospital acquired infections are a major problem among hospitalized patients. Nosocomial infections are commonly transmitted by the hands of healthcare workers. Medical students are an integral part of the health care team. Therefore, it is important to assess their knowledge of hand hygiene to reduce the incidence of hospital acquired infections. The objective of this study was to compare the knowledge of hand hygiene among the preclinical students and the students with clinical exposure. A self-administered, pre-tested validated questionnaire from previous publications, based on hand hygiene guidelines laid down by the World Health Organization, was used for data collection. The questionnaire was distributed among all the medical students at the General Sir John Kotelawala Defence University. Results were analyzed by comparing the knowledge of the WHO guidelines with the appropriate hand hygiene behaviour of the medical students. The percentages were calculated and compared using the statistical test for proportions. A $p < 0.05$ was considered to be statistically significant. All 177 students to whom the questionnaires were distributed participated in the study. Of the students 132 (74.58%) were males.

There were 104 (58.75%) preclinical students and 73 (41.24%) students who had clinical exposure. Thirty (28.84%) of the preclinical students and 25 (34.24%) of the students with clinical exposure knew that hand washing is the single most event in the prevention of hospital acquired infections ($p = 0.445$). The percentages of the preclinical students who knew the importance of each component of hand hygiene were: the hands should be washed before having direct contact with patients (53.84%), after having direct contact with the patients (67.30%), if moving from a contaminated body site to a clean body site in the same patient (50%), before clean/ aseptic procedures (50.96%), after contact with body fluid/ excretion/ blood/ mucus membranes/ non intact skin/ wound dressings (88.46%), after contact with any object in patient's immediate surrounding (34.61%). The percentages of the students with clinical exposure who knew the importance of each component of hand hygiene were: the hands should be washed before having direct contact with patients (49.31%), after having direct contact with the patients (63.01%), if moving from a contaminated body site to a clean body site in the same patient (31.50%), before clean/ aseptic procedures (87.67%), after contact with body fluid/ excretion/ blood/ mucus membranes/ non intact skin/ wound dressings (94.52%), after contact with any object in patient's immediate surrounding (27.39%).

None of these differences were significant except if moving from a contaminated body site to a clean body site in the same patient ($p = 0.014$) and before clean/ aseptic procedures ($p < 0.000$).

Twenty-two (21.15%) of the preclinical students and 29 (39.72%) of the students with clinical exposure knew the correct duration of hand washing (40 to 60 seconds) ($p = 0.007$).

Seventy-four (71.15%) of preclinical students and 56 (76.71%) students with clinical exposure said they need further education in hand hygiene. Correct duration of hand washing ($p = 0.007$) and knowledge of hand hygiene before clean/ aseptic procedures ($p < 0.001$) were significantly better among students with clinical exposure. The knowledge on other aspects showed no significant difference between the two groups ($p > 0.05$). In general, the hand hygiene knowledge and practice among medical students was not satisfactory. Therefore, further education with regard to hand hygiene is necessary.

Keywords: Hand hygiene, Medical students, General Sir John Kotelawala Defence University

A Community Based Study on Nasal Carriage of *Staphylococcus Aureus*

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Staphylococcus aureus is a major bacterial cause of superficial infection and also a health care associated infection. The emergence of multiple resistances to anti staphylococcal penicillins like cloxacillin, methicillin and other agents has compromised therapy. Methicillin Resistant *Staphylococcus aureus* (MRSA) infection has become a major problem among the hospitals and the communities. Community studies in MRSA colonization are lacking. The aim of this study was to describe the prevalence of Methicillin Sensitive *Staphylococcus aureus* (MSSA) and MRSA nasal colonization in the community and antibiotic susceptibility patterns of these isolates.

This study was a community based descriptive cross sectional study. Nasal samples for *S. aureus* culture and socio demographic data were obtained from 317 adults and children ≥ 2 years of age from the selected two communities over a period of two months. *S. aureus* isolates were identified by routine laboratory methods and antimicrobial susceptibility tests were done by following the CLSI guidelines.

Of the 317 persons, 88(27.76%) were positive for *S. aureus*. Of the 88 isolates, 18 were MRSA and 70 were MSSA. Of the MRSA isolates the sensitivity to Erythromycin, Clindamycin, Linezolid, Ciprofloxacin, Trimethoprim- sulfamethoxazole, Tetracycline and Gentamicin were 5.55%, 33.33%, 100%, 94.44%, 94.44%, 77.77%, 94.44% respectively. Of the MSSA isolates the sensitivity to Erythromycin, Clindamycin, Cefoxitin, Linezolid, Ciprofloxacin, Trimethoprim- sulfamethoxazole, Tetracycline and Gentamicin were 44.28%, 78.57%, 100%, 100%, 72.85%, 95.71%, 84.28%, 81.42% respectively. Inducible Clindamycin resistance was reported 44.44%, 7.14% for MRSA and MSSA isolates respectively.

More than a quarter of the study population were colonized with *S. aureus*. MRSA colonization prevalence was 5.67% (18/317). More than 75% MRSA isolates were sensitive to Ciprofloxacin, Gentamicin, Trimethoprim- sulfamethoxazole, Tetracycline and Linezolid. Therefore, MRSA isolates of this study were more likely to be community acquired. However, further molecular studies are needed to confirm these findings.

Keywords: *Staphylococcus aureus*, Methicillin resistant *Staphylococcus aureus*, community- acquired

Evaluation of Random Donor Platelets Produced from Buffy Coat Stored for 24 Hrs At Ambient Temperature: A Better Alternative to Eight Hour Limitation

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Whole blood derived platelets are made from platelet rich plasma (PRP) method or buffy coat method. In India majority of RDPs are prepared by PRP method. However, Buffy coat method offers the advantage of less platelet activation and fewer WBC contaminations. Presently in India RDPs are prepared within 8 hour of whole blood collection, whereas, in Europe this time limit is up to 24 hours.

Our aim was to evaluate the platelet count, WBC contamination, platelet CD 62 P expression, and biochemical parameters of RDPs prepared from buffy coat within 8 hours and within 24 hours of collection.

We prepared 40 units of RDP by the buffy coat method from whole blood stored at room temperature within 8 hours of collection (Fresh BC), & another 40 units from buffy coat stored at 22°C for less than 24 hours (Stored BC). We analyzed the platelet counts, CD62P expression, WBC counts, glucose levels, pH, PO₂, PCO₂ in both the groups of RDPs, 24 hours after respective preparation.

The platelet counts from stored BC were higher in fresh BC. CD 62P expression was low in stored BC compared to fresh BC. There were no differences of pH, pO₂, pCO₂ and glucose levels in fresh BC and stored BC. WBC contamination was more in fresh BC.

Our study stored BC contained higher platelet counts, less WBC contamination and less platelet activation. We conclude that RDP prepared from stored BC is the better method for RDP production

Assessing the Validity of the Threefold Conversion between Hemoglobin and Hematocrit for the Determination of Anemia in Pregnancy

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The worldwide prevalence of anemia is higher among pregnant women. Anemic status is determined by the measurement of Hemoglobin (Hb) or Hematocrit (Hct). Hct (%) is usually defined as three times the value of Hb (g/dl). But the crude relationship between the two measures may be modified due to several factors such as; age, sex, season of survey and disease conditions. This study was therefore undertaken with the intent of assessing the validity of the 3- fold conversion between Hb and Hct to assess anemia in pregnant women.

The Hb concentrations (Drabkin's method) and Hct (Microhematocrit method) values from 70 pregnant mothers, aged 18-30 years, in their first trimester of pregnancy, from the ante-natal clinics of Teaching Hospital, Mahamodara (both hospital clinic and university; obstetrics and gynecology clinics) were analyzed. Pregnant mothers who had a previous history of anemia or treatment history (iron deficiency or folic acid/ vitamin B₁₂ deficiency) and pregnant mothers already diagnosed with hemoglobinopathies such as thalassemias or sickle cell syndromes were excluded from the study. The relationship between the concurrent measures of Hb and Hct was defined by linear regression analysis and the validity of the 3- fold conversion was assessed.

As defined by CDC (Centers for Disease Control and Prevention) criteria, hemoglobin cut-off used to define anemia during the first trimester of pregnancy is 11 g/dl and the corresponding cut-off for Hct is 0.33. According to that the prevalence of anemia as defined by both Hb and Hct levels was 17% in this study population. Almost 59% of the microhematocrit values wrongly estimated Hb using 3- fold conversion. Sensitivity and specificity results obtained from this study were below the reliability of clinical measurement. Regression models show that the association between the cut-offs of Hb and Hct is not dependant only on a simple conversion factor and correlation coefficient results are inadequate to conclude that there is a significant relationship between the two variables. A significant difference was observed between the values obtained using the two methods ($t= 7.182$, $p < 0.001$).

The relationship between Hb and Hct is not exactly 3 in pregnant women and there is no simple conversion factor between the two measures. Since the Drabkin's method still has the advantage of being an international standard, this study argues for the consistent use of Hb rather than Hct in the assessment of anemia in pregnancy.

Keywords: Hemoglobin, Hematocrit, Three-fold conversion

Outcome of Pregnancy Complicated by Infective Endocarditis: A Review of Published Literature over Last Three Decades

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Infective endocarditis (IE) is a rare complication during pregnancy but it associates with high maternal and foetal mortality. Our aim was to study maternal and foetal outcomes in published cases of IE during pregnancy.

A PubMed literature survey was done using “pregnant” “pregnancy” and “endocarditis” as the key words. All case reports published between 1981 and 2010 in English language were reviewed to study patient demography, causative organisms, pre disposing factors, methods of treatment and clinical outcomes.

A total of 41 case reports (43 pregnant women with IE) were reviewed. Mean age was 28 (± 4.75) years. IE was diagnosed in their first, second and third trimesters in 5%, 31%, and 43% respectively while 21% of the cases were diagnosed during puerperium. Prior history of valve disease was known in 30%. Commonest causative organisms were Streptococcus (51%) and Staphylococcus (29%) species. Mitral, aortic, tricuspid valves were involved in 53%, 33% and 25% cases respectively. Valve replacement surgery was done in 50% patients (18% before delivery). Maternal mortality was 9.30%. Foetal mortality was 7% (all were due to abortions). Maternal complication rate was 79% [most common complications included thromboembolism in 21%, septic embolism in 23% cardiac failure in 21%, obstetric complications in 16% and nosocomial infections in 7%]. After sorting of maternal complications by three decades (1981-1990, 1991-2000, 2001-2010) it was revealed that rates of thromboembolism and septic embolism have significantly increased and the rate of cardiac complications have reduced in 2001-2010.

Pregnancy complicated by IE is associated with significant morbidity and mortality for both mother and foetus. Extreme care is necessary for pregnant women who were diagnosed with IE and should be managed in a tertiary centre with multidisciplinary specialist care.

Keywords: Pregnancy, endocarditis

HIV/AIDS Risk Reduction and Prevention among Drug users through Behavioral Interventions in an Urban Setting

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Drug use is a major risk factor in spreading HIV infection. Drug users (DUs) might trade sex for drugs or for money to buy drugs and/or vice versa. Drug use can reduce a person's commitment to use condoms and practice safer sex. Often, substance users have multiple sexual partners. This increases their risk of becoming infected with HIV or another STI. Therefore, changing drug-related behaviors contributes to eradication of transmission of HIV.

A behavior change (BC) model, which directly address BCs than merely conducting awareness/training workshops was implemented in Negombo, a tourist destination located in west coast of Sri Lanka where dwellers are vulnerable for drug use and sex trade. BC intervention tools used included low-cost community camps, group, ex-user and one-to-one discussions, brainstorming sessions to demystify myths about drug use and HIV while strengthening target groups. Conducted a rapid situation and response analysis, prior to commencing interventions. Interventions concentrated more on 10 specific spots in Negombo. 350 DUs, their families, peers, 170 regular sex partners (RSP) including commercial sex workers (CSW), and neighbors were targeted through interventions.

As a result, of BC model 80 quitted drug use, 59 reduced use, 29 changed their behaviors, 21 work as peer educators, 37 directed to STD clinics. 59 relapsed. The interventions with RSP resulted in following; 32 supported DUs to quit, 35 were educated on safer sex practices, 13 requested for condoms.

BC model resulted in BCs in DUs, RSP, families and in their localities going beyond awareness and education. DUs and RSPs reduced individual risk behaviors, promoted and practiced safer sex practices (ex: condom use), motivated to get medical assistance for symptoms and suspected exposure to STDs and if engaged in risky behavior, to be tested. Changing behaviors related to drug use itself results in HIV risk reduction and prevention.

Keywords: HIV/AIDS, Behavior change, Drug Users

Can Clomiphene Citrate Improve the Quality of Seminal Fluid Parameters in Idiopathic Asthenoterato Males?

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Male infertility is a rising problem worldwide. Idiopathic male infertility is responsible for 31% of all male infertility. Among them 44% is due to Idiopathic Oligo Astheno Teratozoospermia (iOAT) syndrome. The role of medical treatment in managing iOAT syndrome is controversial. But there are accumulating evidence of the efficacy of Clomiphene citrate on treating iOAT syndrome.

The objective was to determine the efficacy of Clomiphene Citrate therapy in improving seminal fluid parameters of a group of male patients with iOAT syndrome. A comparison study was done using retrospective data.

This study was conducted in the Reproductive biology laboratory of the Faculty of Medicine, Galle. Total of 356 medical records were screened and 52 patients presented with iOAT syndrome, treated with clomiphene citrate were selected using the exclusion and inclusion criteria. The pre-treatment and post-treatment seminal fluid analysis of the patients were compared using the paired t- test. All the patients were given clomiphene citrate 50mg per day in divided doses for minimum of 3 months. Post-treatment seminal fluid analysis were done at the end of the 4th month of commencing the treatments.

Sperm concentration, sperm total count, normal morphology, motility and viability are improved significantly ($p < 0.001$). The improvement of the volume is not significant ($p > 0.001$)

Clomiphene citrate improves the sperm concentration, total count, normal morphology, motility and viability in a group of selected male patients with iOAT syndrome but the volume.

Keywords: Clomiphene citrate, iOAT, Male infertility

Hypocholesterolaemic effect of Okra on cholesterol induced Wistar rats

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Okra or Lady's fingers (*Hibiscus esculentus*) which belongs to the Family Malvaceae is a mucilaginous vegetable frequently included in the diet of Sri Lankans. There is currently great deal of interest in the hypoglycaemic effect of various vegetables. It has been reported that the cholesterol lowering effect of *H. esculentus* in Senegalese adult men. *Abelmoschus esculentus* (L.) Moench., synonym of *H. esculentus* which is available in all over the world, popular and has been claimed to have various health benefits and include anti – diabetic properties. According to our studies it shows that okra fruit possesses hypoglycaemic activity and the anti-hyperglycaemic compound present in okra fruit is heat labile.

The aim of this study was to investigate the hypocholesterolaemic effects of the water extract of okra fruit on Wistar rats. Weanling male Wistar rats (100g – 150g) were separated in to groups (test and control) with 8 rats in each group. Hypercholesterolaemia was induced by giving a diet containing 10% butter (Highland), 90% WHO recommended rat and mice feed pellets and water *ad libitum* for 28 days. Induction of Hypercholesterolaemia was verified after 28 days by measuring fasting (12-14hrs) blood cholesterol levels. These animals were used as positive control and for the test groups.

The negative control animals were fed on WHO recommended rat and mice feed formula and water *ad libitum*. The positive control group and the test groups were given hypercholesterolaemic diet continuously while the test groups were orally feeding the water extract of okra (with 500 and 1000mg/Kg dose) for 7 days. After one week the rats were fasted (12-14hrs) and anesthetized and blood was collected from tail vein for determination of fasting serum cholesterol levels. All the results were compared by using the Student's t-Test in Microsoft Excel.

Administration of water extract of Okra at the dose of 500mg/Kg showed significant reduction ($p < 0.05$) in the level of serum cholesterol in Wistar rats. Therefore okra can be used as a vegetable with hypoglycaemic and hypocholesterolaemic properties.

Keywords- Okra, *Hibiscus esculentus*, *Abelmoschus esculentus*

In Vitro Lipase, Cholesterol Esterase and Cholesterol Micellization Inhibitory Activities of Ceylon Cinnamon (*Cinnamomum Zeylanicum* Blume)

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Hyperlipidaemia is a group of metabolic disorders characterized by the elevated levels of serum triglycerides and cholesterol. Globally, the prevalence of this condition is increasing rapidly probably due to modern sedentary and stressful life style and increase consumption of high fat diet. Hence, there is an imperative need for development of antilipidemic agents preferably from natural sources. In this connection this study was initiated to investigate antilipidemic potential *in vitro* (lipase, cholesterol esterase and cholesterol micellization inhibitory assays) using bark of Ceylon cinnamon (*Cinnamomum zeylanicum* Blume). This is indigenous to Sri Lanka and use as a spice in several countries. Further according to some Sri Lankan traditional physicians the bark of this plant is claimed to possess antilipidemic effects by inhibition of lipid digestion and/or absorption.

95 % ethanolic and 1:1 dichloromethane: methanol (DCM:M) extracts were prepared from authenticated bark of Ceylon cinnamon and were freeze dried. Different concentrations of freeze dried samples were used in testing of antilipidemic effects. (ethanolic and DCM:M bark extracts for anti-lipase 3.75 - 600 µg/ml: n = 3; cholesterol esterase 3.125 - 100 µg/ml: n = 4 and cholesterol micellization 1, 0.5, 0.25 mg/ml: n = 6).

The results revealed that both extracts of *Cinnamomum zeylanicum* possess moderate lipase inhibitory activity (ethanol bark IC₅₀ 301.09 ± 5.73 µg/ml and DCM:M bark IC₅₀ 297.57 ± 11.78 µg/ml), high cholesterol esterase inhibitory activity (ethanol bark IC₅₀ 30.62 ± 1.67 µg/ml and DCM:M bark IC₅₀ 34.39 ± 0.91 µg/ml) and moderate to high cholesterol micellization inhibitory activity (mean percentage inhibition of cholesterol solubility in micelles in ethanolic bark and DCM:M bark 98.09 ± 1.25 and 73.94 ± 1.95, at 1 mg/ml; 69.48 ± 1.99 and 62.15 ± 2.37 at 0.5 mg/ml and 49.48 ± 1.90 and 19.36 ± 4.57 at 0.25 mg/ml respectively). Further, anti-lipase and anti-cholesterol esterase activities were dose dependent ($r^2 = 0.99$ & 0.98 for anti-lipase and anti-cholesterol esterase activities of ethanolic bark and DCM:M bark respectively). These are novel findings.

In conclusion, this study reports *in vitro* lipase, cholesterol esterase and cholesterol micellization inhibitory activities of Ceylon cinnamon. This is a novel finding having therapeutic potentials. Further, this study provides scientific evidence for the claimed that Ceylon cinnamon has lipid digestive and absorptive inhibitory activities. It also indicates the potential of using this bark as a functional food for hyperlipidaemia.

Keywords: Ceylon cinnamon, bark extracts, lipid lowering

Acetylcholinesterase inhibitory and antioxidant activities of *Caesalpinia bonduc* L. bark

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The growth in the aging population has increased the number of patients with Alzheimers disease (AD) worldwide. AD is characterized by the progressive decline of memory leading to emotional dysfunction. A depleted level of the neurotransmitter acetylcholine is a common observation in the AD patients. Acetylcholine esterase (AChE) inhibitors prevent the action of AChE enzymes and slow down the hydrolysis of acetylcholine at the synaptic cleft. This mechanism is the most promising symptomatic therapeutic approach for the treatment of AD. Oxidative stress and reactive oxygen species have been associated with the development of a variety of neurodegenerative diseases including AD and cancer, ageing and cardiovascular diseases. The naturally occurring enzyme inhibitors and antioxidants play an important role in a drug discovery program for such diseases.

Caesalpinia bonduc L. (Fabaceae) is a medicinal plant used widely in traditional medicinal systems in the Asian region of the world. Pharmacological studies have reported antioxidant, anti-inflammatory, anti-malarial, antimicrobial, antidiarrhoeal, antidiabetic, antitumor, antithelmic, antifilarial, hepatoprotective and GST inhibitory activities for the extracts of *C. bonduc*. It is also reported to contain phytoconstituents such as alkaloids, flavanoids, glycosides, saponins, tannins and terpenoids. This study was conducted to determine the AChE inhibitory and antioxidant activities of total ethanolic extract of bark of *C. bonduc*.

Air-dried and powdered bark of *C. bonduc* was extracted with ethanol by cold extraction technique. AChE inhibitory activity was measured according to a modified Ellman method. Antioxidant activity of the ethanolic extract of the *C. bonduc* bark was evaluated using, 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical-scavenging, ferrous iron chelating (FICA) and ferric reducing antioxidant potential (FRAP) assays. All assays were carried out in triplicates using Spectra Max 96 well microplate-reader. Ethanolic extract of bark of *C. bonduc* exhibited moderate AChE inhibitory activity with an IC₅₀ value of 190.76 ± 2.8 µg/mL while the IC₅₀ of the Galanthamine, a clinically used inhibitor was 0.46 ± 0.02 µg/mL. Bark extract showed good DPPH radical scavenging activity with an IC₅₀ value of 83.69 ± 0.14 µg/mL, in comparison with that of Trolox (IC₅₀ 4.50 ± 0.0 µg/mL). Lower ferrous ion chelating effect was detected for the bark extract with an IC₅₀ value of 3450.6 ± 235.19 µg/mL with comparison to that of EDTA (12.74 ± 0.2 µg/mL). The FRAP assay resulted the mg Trolox equivalent/gram of extract of *C. bonduc* as 233.6 ± 0.14 mg. The results indicated that the ethanolic extract of bark of *C. bonduc* showed AChE inhibitory, DPPH radical scavenging, FICA and FRAP activity. Therefore the *in vitro* assay data indicates the potential of the extract for further AChE inhibitory and antioxidant bioactive studies including activity-guided fraction of bioactive plant metabolites.

Keywords: *Caesalpinia bonduc*, Acetylcholinesterase, Anti-oxidant

Evaluation Of The Effect Of The Water Extract Of Dried Flower Of *Aegle Marmelos* On Na^+/K^+ Atpase Activity In Liver, Erythrocytes And Small Intestine Of Diabetic Rats

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The water extract of *Aegle marmelos* (Beli mal Drink) is a popular beverage used by Sri Lankans with many medicinal benefits and the hypoglycaemic and anti-inflammatory effects of this beverage have been scientifically validated. Under many pathological conditions alterations in Na^+/K^+ ATPase activity in tissues are observed and these may lead to many metabolic changes during diseases. The present study evaluated the effect of the water extract of dried flowers of *Aegle marmelos* on Na^+/K^+ ATPase activity in liver, erythrocytes and small intestine of diabetic Wistar rats. Experimental diabetes mellitus was induced in rats by the intra-venous administration of Alloxan monohydrate (40 mg/kg) and rats with a serum glucose concentration of > 7.00 mmol/L were selected for the experiments.

Normal and diabetic control groups received distilled water whereas the Diabetic test group received a 500 mg/kg dose of test extract. After ½ h, each rat was euthanized to collect blood samples as well as the livers and small intestines. The Na^+/K^+ ATPase activity in membrane preparations of liver, erythrocytes and small intestines, was determined in terms of liberation of inorganic phosphate during enzymatic ATP hydrolysis. The Na^+/K^+ ATPase activity in the liver plasma membrane was reduced significantly ($P < 0.001$) by 49.4 % in diabetic rats compared to normal rats. It was increased significantly ($P < 0.001$) by 44.3 % in diabetic rats after administration of the test extract compared to Diabetic control rats. The Na^+/K^+ ATPase activity in the small intestine was increased significantly ($P < 0.01$) by 41.5 % in diabetic rats compared to normal rats. It was further increased significantly ($P < 0.01$) by 24.4 % in diabetic rats after administration of the test extract compared to Diabetic control rats. The Na^+/K^+ ATPase activity in the erythrocytes was reduced significantly ($P < 0.001$) by 29.3 % in diabetic rats compared to normal rats. It was increased significantly ($P < 0.001$) by 35.2 % in diabetic rats after administration of the test extract compared to Diabetic control rats.

The treatment with the test extract caused a significant increase in Na^+/K^+ ATPase activity in all three tissues compared to Diabetic control rats and this showed the test extract has an acute effect on the Na^+/K^+ ATPase activity in tissues of diabetic rats. The water extract of dried flowers of *Aegle marmelos* is a herbal beverage which can be used to reverse the short term complications of diabetes associated with impaired Na^+/K^+ ATPase activity in tissues.

Keywords: Na^+/K^+ ATPase activity, Diabetes, *Aegle marmelos*

An Epidemiological Study of Dengue Fever in Dehiwala Medical Officer of Health Area during 2011 & 2012

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The present study examined the relationship between weather pattern and trend of dengue fever. It also assessed the incidence of dengue fever according to gender and Public Health Inspector (PHI) areas in 2011 and 2012 by using the notification register & the weekly return of communicable diseases (WRCD) of the Dehiwala Medical Officer of Health (MOH).

The sample consisted of 1842 confirmed cases of dengue fever. Variables were weekly confirmed dengue cases, weekly rainfall, weekly mean humidity, weekly mean temperature, PHI areas, and gender.

Findings suggested that the occurrence of confirmed dengue cases were positively correlated with, the rainfall 7 weeks preceding the registration of cases. There was no significant correlation between humidity and temperature with the confirmed dengue cases. Findings also revealed that females had higher incidence than males, and one PHI area (Badowita) reported the highest incidence for both years.

We recommend that notification data of Dengue fever be analysed at MOH level to forecast outbreaks and intensify preventive measures.

Keywords: incidence, rainfall, gender

Military Training Improves Lipid Profile

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Life style changes due to industrialization and urbanization has led to many health issues. Non-communicable diseases are one such category. Hyperlipidaemia leading to atherosclerosis causes significant contribution to morbidity and mortality in many countries including Sri Lanka. Lack of physical exercises is a recognized contributory factor for hyperlipidaemia. Low plasma levels of high-density lipoprotein (HDL) cholesterol, and elevated low-density lipoprotein (LDL) cholesterol and triglyceride (TG) are important independent risk factors for atherosclerosis. Physical exercises have many health benefits including alteration of plasma lipids that favour the prevention of atherosclerosis.

Physical exercise is an essential component in military training. No studies have been carried out in Sri Lanka to investigate whether the physical exercise during military training improves plasma lipid levels. Hence, this study was carried out to investigate the effect of military training on lipid profiles of officer cadets recruited to the General Sir John Kotelawela Defence University. The study sample consisted of age and sex matched four groups; control group had no formal exercises, military training for 6 months (E6M), military training for 18 months (E18M) and military training for 30 months (E30M). The non-exercised (NE) group consists of 30 fee levying students enrolled in KDU who were not undergoing formal physical exercises. E6M, E18M and E30M groups consist of 30 officer cadets in each group who had formal physical training.

Venous blood samples (5 ml) were drawn by a medical officer after 12 hours of overnight fast following informed consent. The samples were centrifuged immediately at 1500xg for 15 min to separate plasma. Total cholesterol (TC), HDL-cholesterol (HDL) and triglycerides (TG) were estimated in plasma using enzymatic techniques and colorimetric determination. LDL-cholesterol was calculated by using a standard equation. One way ANOVA was done to find the mean difference between different groups and Post Hoc test was run to determine the level of significant within groups.

Mean TC values for NE = 181 ± 7.6 mg/dL, E6M = 178 ± 5.3 mg/dL, E18M = 168 ± 7.1 mg/dL and E30M = 145 ± 8 mg/dL and P value for TC of different groups was 0.01. Post Hoc test showed a significant difference between NE and E18M ($p=0.011$) as well as between NE and E30M ($p=0.029$). Mean values of LDL for NE, E6M, E18M and E30M were 129 ± 9.9 mg/dL, 128 ± 5.8 mg/dL, 120 ± 7 mg/dL and 85 ± 9 mg/dL. P for the means was 0.000. Post Hoc showed significant difference between NE and other groups ($p=0.008 - 0.001$). Mean TG values for NE, E6M, E18M and E30M were 96 ± 5.4 mg/dL, 55 ± 3.1 mg/dL, 40 ± 3.3 mg/dL and 60 ± 3.3 mg/dL. $P=0.000$ in one way ANOVA. Post Hoc showed significant difference between NE & E6M ($p=0.008$) and NE & E30M ($p=0.000$). The concentrations of HDL-cholesterol were 40 ± 6.5 mg/dL, 39 ± 1.3 mg/dL, 44 ± 1.7 mg/dL and 56 ± 5.9 mg/dL in NE, E6M, E18M and E30M respectively ($p=0.006$). Comparison of NE HDL with other groups (Post Hoc) showed significant difference in E18M ($p=0.013$) and E30M (0.009).

Military training conducted at the General Sir John Kotelawela Defence University for the officer cadets has altered lipid profile favouring the healthy pattern by decreasing LDL-cholesterol, triglycerides and total cholesterol and increasing HDL-cholesterol. Further studies are needed to find the contributory factors for healthy pattern of serum lipids during military training.

Keywords: exercise, HDL-cholesterol, LDL-cholesterol, triglycerides, total cholesterol

Knowledge, Attitudes and Practices (KAP) among Blood Donors from Southern Sri Lanka

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Introduction: Behaviour of the blood donors plays a major role in maintaining continuous blood supply for the transfusion services worldwide. At the same time it is a challenge to obtain safe blood from the donors. The objective of study was to assess the knowledge related to indications and transfusion transmitted disease (TTI), to evaluate attitudes of the donors for re-donation and to determine the donors' practices to direct others for blood donation.

Methods: Cross sectional descriptive study was conducted among blood donors coming to the blood bank in the largest tertiary care center at southern province, Sri Lanka which caters multi ethnic community. A self administered, anonymous questionnaire was distributed before and after the donation. Statistical analysis was done by using SPSS software.

Results: This study included 339 donors (age range = 18 - 57 years, mean age = 30 years (SD 7.8). Majority of them were males (98.2%), unmarried (48.9%), Sinhalese Buddhist (99.4%) and had post secondary education (92.9%). 75.2% of them previously donated (repeat donors) and 83.5% had their first donation before 30years. The age at first donation of the repeat donors negatively correlated with education ($r -0.157$ $p < 0.05$) and number of donations ($r -0.199$ $p < 0.01$). Donors who had donated more than five donations (regular donors) started donation significantly earlier than donors who had less than five donations (occasional donors) (21.9 vs. 24.4years $p < 0.01$). 99 % of the donors knew at least one indication for blood transfusion. Low knowledge was recorded related to sexually transmitted diseases (STD) and high risk sexual behaviour which can lead to TTI. 75.22% of the donors stated that mass media significantly contributed to gain knowledge on TTI but only one donor was motivated by mass media for donation. The most frequently reported reasons for giving blood were 'social responsibility/obligation' (53.6%) and "to help a person" (24.7%). The most commonly reported motive for donating blood were 'self motivation' (69%) and 'friends' (24.7%). There was statistically significant between new donors and repeat donors for main motive for blood donation ($P < 0.04$). Four donors had minor post donation complaints. 64.6% of the donors have stated they are willing for re-donation. The main reason given for no re-donation was "no benefit for self". 71.4 % of the regular donors and 48.3% occasional donors have directed others for blood donation ($p = 0.001$).

Conclusion: Young, educated donors and low female contribution reported here is similar to other countries. Low mass media motivation and low knowledge related to STD needs further evaluation. Willingness for re-donation and low post donation complication are encouraging findings. Potentiality of donors for recruiting others for blood donation is a novel finding of this study.

Keywords: Blood donation, Sri Lanka, KAP

Provision of Mental Health Services through Community Partnership

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The World Health Organization signalled the urgent need for provision of community mental health services at its Global Forum for Community Mental Health (Geneva, 30-31 May 2007). This project was innovated to utilise the already available state services to provide better mental health services through community partnership. Project was carried out in the catchment area for admissions for Unit 06 of National Institute of Mental Health (NIMH), Angoda from the Colombo District.

The aim of this project was to minimize treatment gap that is present in provision of mental health care services. Deinstitutionalization of the mentally ill is also intended.

A community mental Health team is established under the Consultant Psychiatrist consisting of Medical Officer-Mental Health (MOMH), Community Psychiatric Nurse (CPN), Psychiatric Social Worker (PSW) and Occupational Therapist. The community is involved in planning, implementation, monitoring and evaluation of the programme. Community meetings were held in selected areas. Community Volunteers were recruited and a training done. The Volunteers went into the community and started active case detection. Upon new case detection the team consisting of above, visited to evaluate and plan treatment. The satellite clinics established are used to provide treatment and where necessary Depot injections are provided monthly at home. All patients are reviewed periodically by the MOOMH. CPNN and PSWW ensure tracking of all follow up patients with the aid of the volunteers. Volunteers themselves are assembled periodically for feedback and appreciation.

Feedback from the community and clients indicate satisfaction. Clients are functioning in the community while on treatment and unnecessary admissions have been prevented. Community Volunteers are bringing in new clients to NIMH and other clinics for receiving of treatment.

Such a community partnership in provision of mental health care is greatly serving to reduce the treatment gap.

POSTER PRESENTATIONS
MEDICINE

An Anatomical Study of the Jugular Foramen and its Variations in Dried Adult Human Skulls in Sri Lanka

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The Jugular foramen (J. Fr) is a bony aperture located in the base of the skull permitting for the passage of neurovascular structures & a well known area for pathological lesions such as Glomus tumors, Schwannomas, metastatic deposits etc. Wide ethnic variations in the size, relations and bridging bony tissue in the foramen have also been reported. Most of the neurosurgeries done for such lesions are approached by drilling the bone around the J. Fr for adequate exposure and therefore the need for the familiarity with detailed anatomy of this region become greater.

48 J. Fr of 24 dried adult human skulls were studied regardless of the male & female sex, for its anteroposterior & mediolateral diameters of J. Fr and J. Fs, height of J. Fs (If domed), presence of a dome, septations, presence of a separate opening for Inferior Petrosal Sinus (IPS) within the J. Fr & laterality were measured by using a standard manual vernier caliper (minimum reading 0.02mm) & a divide. Scalded photographs were taken.

The mean, Standard deviation ((SD), range of each dimension and percentage of presence a dome/ septation and IPS were computed. Comparisons between right & left J. Fr/ J. Fs and J. Fr & J. Fs on the same sides were done using Student's t-test.

The jugular foramen was present bilaterally in all skulls studied. The mean mediolateral (ML) diameter of the J. Fr was 16.02(±2.46) mm in right side and 15.46(±2.68) mm in left side, the mean anteroposterior (AP) diameters of J. Fr were 8.28(±1.70) mm on left side and 6.84(±1.76) mm on right side. The anteroposterior (AP) diameter of the J. Fs depicted a significant difference from AP diameter of the J. Fr (t value 0.01 on both left and right sides), but mediolateral diameters did not. There was a significant difference in the heights of the fossae on either side; t-test 0.41(t<0.05). Bilateral & unilateral septation of J. Fr were found in 3 skulls (12.5% of 24 skulls) & 6 J. Fr (25% of 24 skulls) respectively. The prominent dome was noticed bilaterally in 7(29.16%) & unilaterally in 14(58.3%) skulls; out of unilateral prominent dome, 12(50%) were seen in right side. A separate opening for IPS was observed in bilaterally in 3 skulls (12.5%) & unilaterally in 7(29.16%) skulls.

The mean dimensions of the J. Fr were larger in the right side than in the left side and is compatible with previous regardless of local variations. J. Fr is morphometrically different from J. Fs at least from the AP diameter and should be considered as two distinct anatomical structures rather than J. Fs as a section of J. Fr. The rest of the variations are possibly due to constitutional, racial, sexual or genetic factors and supports previous established data of J. Fr in Sri Lankans. Knowledge of the observed variations is important for neurosurgeons, ENT surgeons, radiologists & Anthropologists.

Antioxidant Activity of Ingredients of Mathumeha chooranam used in Mathumeham (Dibetes mellitus)

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In the Siddha system of Medicine, various 'chooranams' are used to treat 'Mathumeham' (Diabetic mellitus). Among the 'chooranams', the Different verities of 'Mathumha chooranams' are used in Siddha system. 'Mathumeha chooranam' is prepared from *Terminalia chebula*, *Phyllanthu sembelica*, *Murryake onigii*, and *Gymnema sylvestrae*. This 'chooranam' is widely used in North and Eastern Province of Sri Lanka Siddha Hospitals and Dispensaries. The Objective of this study was to determine the antioxidant activity of the 'Mathumeha chooranam' and its ingredients. The cold and hot water extracts (10g in 10ml) of the dry powders of the from skin of the seeds of *Terminalia chebula*, unripe fruits of *Phyllanthus embelica*, leaves of *Murryake onigii* and *Gymnema sylvestrae*, and 'Mathumeha chooranam' were tested for their Total Antioxidant Content (TAC) by measuring Ferric Reduction method.

Among the 'mathumeha chooranam' and its four ingredients, *Terminalia chebula* contained the highest TAC in cold as well as in hot extracts [10.13 (± 3.1) and 12.83 (± 2.4) $\mu\text{g}/\text{mg}$ of dry weight] followed with 'Mathumeha chooranam' [4.6 (± 1.16) and 5.6 (± 0.91) $\mu\text{g}/\text{mg}$ of dry weight], *Phyllanthus emblica* [4.38 (± 1.72) and 6.3 (± 2.05) $\mu\text{g}/\text{mg}$ of dry weight], *Murryake onigii* [0.506 (± 0.372) and 0.696 (± 0.336) $\mu\text{g}/\text{mg}$ of dry weight] and *Gymnema sylvestrae* [0.359 (± 0.262) and 0.759 (± 0.665) $\mu\text{g}/\text{mg}$ of dry weight]. The cold and hot aqueous extracts of the dried powder of the ingredients of the 'mathumeha chooranam' and its ingredients contains antioxidant activity. When compared with the cold extracts of 'Mathumeha chooranam' and its ingredients with hot extracts, hot extracts contained higher antioxidant activity than cold extracts.

Keywords: Antioxidant activity, 'Mathumeha chooranam', Ferric Reduction method, 'Mathumeham', Siddha Medicine

Anti-Glycation and Glycation Reversing Potential of *Salacia reticulata* L. (Kothalahimbutu) Root, Stem, Leaf and Twig Extracts

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Glycation is a series of complex reactions between reducing sugars and proteins. This reaction ultimately produces multitude of detrimental advanced glycation end products (AGEs). Formation and accumulation of AGEs in the human body have been implicated in the development and progression of several diabetic complications, neurological diseases such as Alzheimer's disease, osteoarthritis, inflammatory arthritis and aging. Thus, glycation inhibitors and glycation reversing agents offer a potential strategy as therapeutics for diverse diseases. *Salacia reticulata* L. is a scientifically well documented traditional anti-diabetic plant. However, anti-glycation and glycation reversing potential of this plant has not been studied. Present study reports *in vitro* anti-glycation and glycation reversing potential of *Salacia reticulata*.

Freeze dried hot water extracts of *Salacia reticulata* root, stem, leaf and twigs were used in this study. Different concentrations (7.8, 15.6, 31.2, 62.5, 125 and 250 µg/ml) of root, stem, leaf and twig extracts (n=3 each) were subjected to anti-glycation and glycation reversing assays *in vitro*. Rutin was used as the positive control.

Root, stem, leaf and twig extracts of *Salacia reticulata* showed significant ($P<0.05$) anti-glycation activity in a dose dependent manner. IC_{50} values for anti-glycation activity of root, stem, leaf and twig extracts were 13.06 ± 0.69 , 27.29 ± 0.93 , 144.53 ± 1.12 and 171.90 ± 0.88 µg/ml respectively. Root extract showed significantly high ($P<0.05$) anti-glycation activity compared to other extracts and rutin (IC_{50} : 21.88 ± 2.82 µg/ml). Glycation reversing potential of different parts of *Salacia reticulata* too showed significant ($P<0.05$) and dose dependent relationship. EC_{50} values of root, stem, twig and leaf extracts were 101.60 ± 11.57 , 116.67 ± 0.64 , 180.53 ± 7.41 and 264.40 ± 9.30 µg/ml respectively. Potency of different parts of *Salacia reticulata* for anti-glycation and glycation reversing activities were root > stem > leaf > twig and root = stem > twig > leaf respectively.

It is concluded that all parts of *Salacia reticulata* possess both anti-glycation and glycation reversing activities. However, root and stem were the most biologically active parts of the plant. Findings of this study also clearly showed that leaves and twigs, which can be repeatedly harvested in short cycles unlike root and stem can be used as a good natural source with anti-glycation and glycation reversing activities. Therefore, all parts of this plant may play an important role in prevention and management of glycation associated diverse chronic diseases. Further, this is the first study to report anti-glycation and glycation reversing potential of this plant.

Key words: *Salacia reticulata*, anti-glycation, glycation reversing

Antihistamine Effect of Bee Honey in Wistar Rats

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According to the Ayurveda classic *Ashtanga Hridaya*, written around 500 AD, honey can be used to treat many diseases. Eight types of honeys are mentioned in Ayurvedic authentic texts. Out of these eight honeys, the variety produced by honey bees is the most commonly referred to and is the type of honey consumed by humans. Honey produced by other bees and insects has distinctly different properties. Anti-inflammatory, anti-pyretic and anti-nociceptive effects of bee honey were established in Wistar rats in our recent experimental studies. In the present study, our aim was to evaluate the antihistamine potential of bee honey in Wistar rats, in order to elucidate one mechanism of anti-inflammatory action.

The antihistamine effect of bee honey was compared with distilled water and chlorpheniramine controls in 3 groups of Wistar rats (n=6 in each). One hour after drug and bee honey administration, these rats were subcutaneously injected with 50 µl of 200 µg/ml of histamine dihydrochloride into the skin where the fur had been shaved, and 2 minutes later the area of the wheal formed was measured and percentage reductions in wheal area were calculated.

The results of the study showed the bee honey induced an inhibition of wheal formation in the test group (31.0%) which was not statistically significant ($p > 0.05$). The chlorpheniramine treated group showed 40.0% reduction in wheal formation when compared to the negative control group and it was statistically significant ($p < 0.05$).

This study reveals that antihistamine effect is not a mechanism of anti-inflammatory activity of bee honey.

Keywords: Antihistamine, wheal formation, Wistar rats

Prevalence of *Escherichia Coli*, *Salmonella* and *Staphylococcus Aureus* on Different Cuts of Retail Chicken Meat in Badulla District

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Food safety is a global challenge for most developing countries. Food borne diseases are mainly caused by *E.coli*, *Salmonella* and *S. aureus*. And foods originated from animal are more susceptible for spoiling. Undeveloped slaughter facilities, large number of small scale retail businesses, lack of rules and regulations and lack of knowledge are barriers for the hygienic chicken meat production at retail outlets. Thus, the present study aimed at evaluating the *Escherichia coli*, *Salmonella* and *Staphylococcus aureus* contamination on different cuts of retail chicken meat from Badulla district.

Twenty retail shops were randomly selected from seven secretary divisions in Badulla district. Two whole chicken samples were collected from each retail shop and transferred to the laboratory under refrigerated condition. 25 g of chicken meat samples from different cuts (breast, back, thigh, wings and whole) were taken. Each meat sample was pre enriched with 225 ml of buffered peptone water and placed in incubator at 37 °C for 24 hours. Loops full of pre enriched samples were streaked on Eosin Methylene Blue agar, Brilliant Green agar and Manitol Salt agar to isolate of *E.coli*, *Salmonella* and *S.aureus* respectively. Inoculated plates were incubated at 37 °C for 24 hours. Presumptive colonies on each agar plate, sub cultured on nutrient agar plates and incubated at 37 °C for another 24 hours. Presumptively positive colonies of *E.coli*, *Salmonella* on nutrient agar plates were biochemically confirmed with Simmons Citrate agar and *S.aureus* by catalase test.

Prevalence of *Salmonella* in thigh, breast, back and wing cuts were 28.92 %, 20.48 %, 19.28 % and 13.25 % respectively. Prevalence of *Salmonella* in whole chicken sample was 18.07 %. No significance association was observed for the prevalence of *Salmonella* with different chicken meat cuts ($P > 0.05$). Prevalence of *Escherichia coli* in thigh, breast, back and wing cuts were 18.99 %, 26.58 %, 26.58 % and 11.39 % respectively. Prevalence of *Escherichia coli* in whole chicken sample was 16.46 %. There was a significance association between chicken part and the prevalence of *Escherichia coli* in retail chicken meat in Badulla District. Contamination rates of *S. aureus* in different cuts of retail chicken meat were thigh (20.99 %), breast (25.93 %), back (24.69 %) and wing (11.11 %). A significant association was observed in prevalence of *S. aureus* in different cuts of chicken carcass taken from the retail outlets of Badulla district ($P < 0.05$). The highest occurrence of *Salmonella* was reported in Badulla division (19.28 %). Incidences of *Escherichia coli* (24.05 %) and *S. aureus* (18.52 %) were significantly high in Bandarawela division. Prevalence of *Salmonella* in retail chicken meat in Badulla district is in high level and contamination of *E. coli* and *S. aureus* indicate the improper handling and storage of raw chicken meat and poor level of hygienic condition in retail outlets.

Keywords: Prevalence, Chicken, retail market

Respiratory Health Problems of Rice Mill workers in the Ampara Divisional Secretariat Division

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Ampara district is one of the major paddy cultivating areas in Eastern province of Sri Lanka. Rice milling is one of the major occupations in the district which is done in various production scales. Rice mill workers are exposed to a considerable amount of dust during their work. Not using protective equipment and poor work environmental conditions subject the workers to respiratory health problems. Cough, phlegm, chest tightness and wheeze were found as common among rice mill workers. Very few research have been conducted in Sri Lanka to investigate the respiratory health of rice mill workers despite it is one of the major occupations in paddy growing areas. This study aims at determining prevalence of respiratory symptoms and lung function measurements of rice mill workers in the Divisional Secretariat Division of Ampara.

A descriptive cross sectional study was carried out. The study group consisted of 38 male rice mill workers selected from the Divisional Secretariat Division of Ampara while the control group comprised of 30 male workers from the same area engaged in paddy harvesting activities. Study group comprised of workers who have had more than three years of work experience with no chronic respiratory disease prior to working in the mill. Workers who did not have any occupational dust exposure including pesticide exposure were considered as the control. Two groups were matched for age, height, weight and ethnicity.

An interviewer administered questionnaire and a validated British Medical Research Council Questionnaire on Respiratory Symptoms were used to identify respiratory symptoms. Spirometry including forced vital capacity (FVC), forced expiratory volume in the first second (FEV₁), ratio of FEV₁ and peak expiratory flow rate (PEFR) was performed on each individual during the morning. SPSS version 17 was used to analyse the results. To compare the prevalence of respiratory symptoms identified between the two groups Chi square test was used. Spirometry values of both groups were compared using independent samples t-test.

Mean ages of the SG and CG were 43.95±9.14 (\bar{x} ±1SD) and 44.27±9.35 (\bar{x} ±1SD) years. Mean height of the two groups were 166.39±4.75 cm (\bar{x} ±1SD) and 167±3.91 cm (\bar{x} ±1SD) respectively. Mean weight were 66.2±5.1 kg (\bar{x} ±1SD) and 66.5±5.2 kg (\bar{x} ±1SD) for the SG and CG respectively. The prevalence of breathing difficulties (39%), wheezing (39%) and chronic cough (37%) was significantly higher among the rice mill workers than the control group (p<0.05). However the difference of the prevalence of chronic phlegm and chronic bronchitis were not significant between the two groups. Mean values of FVC and PEFR were significantly lower among the rice mill workers than the control group (p<0.01). However, mean FEV₁ values and FEV₁ ratio were not significant between the two groups. Obtained results indicate that rice mill workers are prone to acquire mixed type of restrictive and obstructive respiratory diseases than the general community. Reason may be the irritant effects of the long term exposure to heavy amount of respirable dust by the rice mill workers.

Keywords: occupational health, respiratory symptoms, rice mills

Hobsen's Choice on Disaster Ethics

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This study investigates the chaotic situation of a disaster and its effects on the medical ethics. Medical ethics are developed for years from days of Hippocrates, hence it is a relatively old subject, although the post second world war era gave rise to much discussion, research and development of the concept. Disaster was very common thing that happened throughout the history of the human being. But the disaster medicine is a new specialty that is coming up but the whole concept is about a decade old. Hence the ethical issues related to disasters and disaster medicine must be a topic that should be researched and discussed.

Respect for autonomy, principles of beneficence and non-maleficence are the basic pillars of medical ethics. The priority of these principles may change with different circumstances, such as in disasters, which sometimes may lead to challenges that are quite different from usual medical practices. These basic principles were observed in the three phases of disaster namely pre-disaster phase, disaster phase and post disaster phase. In public health, there is generally a conflict between autonomy of the individual and the desire to protect and promote the health of the population. Disasters put the medical practitioner more vulnerable to hazards due to the hazardous working environment that causes extraordinary additional stresses which normal environment practitioner may not usually undergo. Hence disasters may lead to ethical challenges that are different from usual medical practices. In addition, disaster situations are related with public health ethics more than they do with medical ethics, and accordingly may require stronger effort to achieve a balance between individual and collective rights.

Disasters vary considerably with respect to their time, place and extent; therefore, ethical questions in these situations may not always have 'one-size-fits-all' answers. On the other hand, embedding ethical values and principles in every aspect of health-care is of vital importance in disasters. For the very reason; reviewing legal and organizational regulations, developing health-care related guidelines, protocols and disaster recovery plans by taking potential ethical dilemmas into account, establishing on-call ethics committees as well as adequate in-service training of health-care workers for ethical competence are among the most critical steps to take in pre-disaster phase. These measures should be taken both at the local level as well as the country level. In conclusion, it is only by making great efforts before disasters, that ethical challenges can be minimized in disaster responses.

Keywords: beneficence, non-maleficence, Disaster medicine

TECHNICAL SESSIONS
ALLIED HEALTH SCIENCES

Knowledge and Attitudes on Food and Drug Allergies among Hospitalized Adult Patients in Teaching Hospital Karapitiya

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Prevalence of drug and food allergies is increasing and no known cure, so community awareness of signs, symptoms and treatments of allergic reactions is vital. General public has to play a big role in taking care of children with allergies as it has become a major health concern worldwide. In the west as well as in South East Asia prevalence of allergic diseases has reported to be increased.

To evaluate the knowledge and attitudes on food and drug allergies among hospitalized adult patients.

a cross sectional study was carried out among randomly selected 120 hospitalized adult patients in teaching hospital, Karapitiya. Data collection was done using a pre tested structured interviewer administered questionnaire during the period of two months in 2013. Knowledge of sign and symptoms, common drug and food allergens, treatments available and preventive actions was assessed using both open ended and close ended questions .Overall score was categorized in to three groups (Poor, average and good). Attitudes were assessed using five statements.

Out of 120, 62% (n=74) were males and 32% (n=46) were females in the study sample. The overall knowledge was 18.17 ± 3.9 of SD out of 37. Nearly 75% (n=87) knew that allergy should be treated promptly. But only 50% (n=60) was able to identify allergy as a fatal condition. Further Itching (109, 90%), raised bumps on the skin (112, 93%), itching on the tongue (94, 78%), wheezing (64, 53%), sneezing (56, 46%), were identified by considerable percentage of patients. Only 4 people out of 120 were able to select all the major allergens correctly. At the same time more than 80% believed that allergy has a cure. Most of the subjects selected pineapple (113, 94%) tomatoes (112, 93%) shellfish 108, (90%) and Fish (84, 70%) as common food allergens and 46 % (n=56) identified penicillin as a drug allergen. Only 15% of patients had heard of histamine blockers are taken as a treatment. More than 80% of participants gave correct response for attitudes which shows positive attitudes. The need of training programmes was highlighted.

Awareness on allergies is not satisfactory. Several important aspects of allergies such as sign and symptoms, major food and drug allergens, treatments available and preventive actions need to be improved. Pattern of allergies may be different when compared to the west. The demand for advanced health education programmes and training programmes has become a need.

Keywords: Knowledge and Attitudes, Drug and Food Allergies, Teaching Hospital Karapitiya

How Can We Learn to Work Together? Perceptions in Teaching / Learning Methods of Inter Professional Education (IPE) Amongst Pre-Registration Students from Different Health Professions in Sri Lanka

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Inter-professional education (IPE) is important in developing good working relationships between different health professionals. One of the key determinants of successful IPE is identifying the teaching / learning methods that could be effectively employed in IPE. The aim of this research was to explore perceptions on teaching / learning methods of IPE among pre registration students in different health professions in Sri Lanka. A cross sectional study was conducted with the students who have had prior clinical training for a period of 1 year (as they would have experienced inter-professional practice and inter-professional learning opportunities by then), from 8 health professional groups i.e. Medicine, Physiotherapy, Nursing diploma, Nursing degree, Medical Laboratory Sciences (MLS), Pharmacy, Audiology, speech & language therapy, at different educational institutions. A total of 686 students were invited to complete a self-administered questionnaire, and we received a high response rate of 84.83%. A variety of teaching/learning methods have been discussed in IPE literature including lectures, demonstrations of procedures, small group discussions, role-plays/ simulations, ward rounds, and work-based learning. Students rated their perceived effectiveness of these methods for IPE. The data was entered and analyzed using SPSS. ANOVA and Scheffe post-hoc test was used to compare the responses of different health professions groups. All student groups identified all methods as 'somewhat effective'. However, all groups rated clinical teaching methods higher than classroom-based methods. Students perceived that ward rounds and work-based tasks in wards are 'effective to a large extent' for achieving the aims of IPE while lectures were rated the lowest. Perceptions on classroom-based methods were more varied (F statistic >20) than on clinical teaching methods (F statistic <10). Medical, MLS and audiology students rated low values for classroom-based methods compared to others, while all groups rated higher values for ward-based methods. This study suggests some focused approaches for IPE in Sri Lanka, including the need for focused clinical training.

Keywords: Inter professional Education

Diabetic Neuropathy among the Patients in the Diabetic Clinic of the Colombo South Teaching Hospital

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Diabetic neuropathy is a common complication of diabetes mellitus. Although approximately half of patients with diabetic neuropathy do not have symptoms, initial symptoms may include paresthesiae (prickling, tingling or heightened sensation) and burning sensations (especially at night). Peripheral neuropathy is associated with an increased risk of developing foot ulceration and lower extremity amputations. Prevention and early diagnosis of diabetic neuropathy is important at the hospital diabetic clinics, because early interventions can prevent hospitalization, disabilities due to foot ulcers and amputations, while preserving quality of life.

The aims were to determine the proportion of diabetic neuropathy among the diabetic patients presenting to the diabetic clinic of the Colombo South Teaching Hospital; to assess their knowledge on prevention of foot disease and to determine the association between the glycemic control and diabetic neuropathy.

A descriptive cross-sectional study was done on 384 subjects diagnosed of Type 2 diabetes mellitus (T2DM) in the diabetic clinic of the Colombo South Teaching Hospital. A validated Michigan Neuropathy Screening Instrument (MNSI) was used for data collection. Diabetic neuropathy was confirmed by a positive score of two of the following three tests namely, MNSI Questionnaire, Diabetic neuropathy Index and Monofilament test. Foot care practices among the patients were assessed by a questionnaire. Glycemic control was assessed by using the fasting blood glucose level and the post prandial blood glucose level. Glycaemic control was set at a Fasting blood glucose level of 126 mg /dL and a post prandial blood glucose level of 180mg/dL. Data analysis was done using the SPSS 16.0 version.

Among the 384 study subjects 300 (78.1%) were female. Most of the study population 320 (83.5%) were more than 51 years of age. 175 (45.6%) of the study population had diabetic neuropathy according to the neuropathy diagnostic criteria. The mean duration of diabetes in neuropathic and non-neuropathic subjects was 3.5 ± 0.8 years and 3.3 ± 0.9 years respectively ($p < 0.05$). There was a significant association between diabetic neuropathy and the duration of diabetes ($p < 0.05$). Both the mean MNSI and the DNI mean scores were high in the neuropathy group (6.5 ± 2.2 SD) when compared to the non-neuropathy group (4.3 ± 1.5 SD) respectively. The mean score of the Monofilament test was significantly lower in the neuropathy group compared to the non-neuropathy group ($p < 0.05$). Statistically significant association was found between neuropathy and the PPBS (Pearson correlation coefficient 0.182, $p < 0.05$). Only 37% of the study subjects had good foot care practices although they were regularly instructed at the clinic.

The data reveal a high frequency of diabetic neuropathy in this clinic based study. Therefore all diabetic patients should be screened annually for neuropathy in Sri Lanka as recommended by the guidelines of the American Diabetic Association. Health education programs emphasizing foot care are essential to help early diagnosis and treatment of neuropathy, promote better foot care practices, and prevent the onset of more serious neuropathic complications.

Keywords: Diabetic neuropathy, T2DM, Michigan Neuropathy Screening Instrument

Awareness, Associated Factors, Practices and Myths Regarding Acne among the Students of University of Sri Jayewardenepura

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Acne is one of the most common multifactorial skin conditions beginning in adolescence and often resolving spontaneously but remains as a significant problem in discuss within the society.

This study was conducted as a descriptive cross sectional study to describe the awareness of acne, its associated factors, practices and myths regarding acne among the students of the main four faculties of University of Sri Jayewardenepura. Here, an interviewer administered questionnaire was used to a sample of 250 students, aged 20 to 30, selected by stratified random sampling method.

Out of 250 students 170 (68%) had self-reported acne as far as they had identified the features and most were having acne for more than one year. Whiteheads was the commonest feature of acne (55.6%), secondly the papules (46.4%) and then the pustules (34.8%). Most students agreed that foods with fat and oils cause more acne (90.4%), followed by chocolates (33.6%), spicy foods (11.2%) and fast foods (2.6%). Lack of sleep also had a great impact on acne (74.4%). Commonest practices were washing the face twice a day with an antibacterial soap or cleanser (76.4%) followed by avoiding touching the face with fingers (50.8%) and avoid squeezing the acnes (46.4%). Students strongly believed that dirty and excessive oily skin cause acne (80%) when 60.8% believed that by frequent washing of the face, acne can be cured.

Even though most students were aware about the commonest features of acne, their awareness regarding its associated factors was not satisfactory. Myths regarding acne are enduring even among university students who supposed to be more logical and practical. This may be due to their inadequate knowledge regarding acne and health education programmes on acne are needed to improve their awareness on this.

Keywords: Awareness, acne, associated factors, myths, university

Health Care Seeking Behaviours among Students of University of Sri Jayewardenepura

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Identifying common health care services used by the students and factors affecting health care seeking behaviours will be of benefit to improve the university health care system. This study focused on describe health care seeking behaviours among students of University of Sri Jayewardenepura and to identify the factors affecting health care seeking behaviours. This was a descriptive cross sectional study conducted among 384 student's undergraduates of University of Sri Jayewardenepura, Sri Lanka. Pre tested, self-administered questionnaire which included types of common health care seeking behaviours were used for data collection. Data was analysed using descriptive statistics including percentages. SPSS software was used for the analysis.

The majority of participants were female (61.5%). The sample prevalence of health conditions for which treatment was obtained included - Physical condition (66.2%), Psychological conditions (16.4%), Social & relational conditions (15.4%) Sexual conditions (0.5%) and Problems with drugs alcohol & smoking issues (1.5%).Prevalence of common treatment methods were, Western/Allopathic (75.6%), Ayurvedhic/ Local (19.7%), Homeopathy (4.1%), Self-medication (55.5%), Home preparation (44.2%) Spiritual method (17.7%), other methods (5.9%). While 71.9 %of students of sample using university medical centre, 62.3 % of them had obtained treatment from private dispensaries, 47.3 % of sample obtained treatment from government hospitals and 35.0 % of students had asked help from friends, parents teachers or trusted person. Majority (over 63%) of students of each faculty had used western medicine for their health conditions while second largest proportion (55.5%) of students seek treatment by self-medication (over the counter medication).The main factors considered by the students who obtaining treatment were (more than 54.2%) about availability of facilities (52.4%), quality of medicines (57.8%), availability of expert doctors (59.5%), protection of their privacy (58.1%), how much disease may affect to studies (53.2%). Only some students had considered about cost of treatment (28.2%), and availability of transport facilities (25.3%). Beliefs, religious or cultural factors had affected their health care seeking behaviours minimally (about 3.0%).

Findings show that there are several kind of health care seeking behaviours among university students. They are different from each other by treatment methods and places where treatment was obtained or how they are obtained help or treatment. Health care seeking behaviours of students are depending on several factors related to their studies, economic background, cultural factors and their privacy.

Keywords: Health care seeking behaviours, University students, Sri Lanka

Testicular Radiation Dose during KUB Radiography

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Radiation based medical imaging plays a major role in diagnosing various kind of diseases and in detecting unknown medical conditions. Ionizing radiation can cause tissue changes starting from cellular level. Genital organs are highly sensitive to ionizing radiation. Hence they are more vulnerable to get biological damages following exposure to ionizing radiation. KUB (Kidney, Ureter, Bladder) radiography is a commonly performed radiographic examination where the abdomen is exposed down up to the pubic symphysis thereby a significant scatter radiation is likely to be received by the testes being superficially placed organs in the close proximity.

The objective of this study was to estimate the testicular radiation dose during routine KUB examinations.

Seventy five adult male patients who underwent routine KUB radiography examinations in Teaching Hospital Kurunegala (KTH) were taken into consideration. The Electronic Pocket Dosimeter (EPD) was used to measure the individual testicular radiation dose. A recoded questionnaire was used to record the patients' demographic data and the relevant radiographic parameters. Further the patient thicknesses of the abdomen at the level of the umbilicus were measured. Correlations were evaluated using Pearson correlation test.

According to the results mean testicular radiation dose with KUB radiography examinations was 28.76 μ Sv while maximum testicular dose was 88 μ Sv and minimum testicular dose was 5 μ Sv in a single examination.

The surface radiation dose during KUB studies ranged from 5 μ Sv to 88 μ Sv which is very much less than the dose required to cause significant health hazard permanently or temporarily. However, since repeated exposures can have additive effects, the dose should be minimized as much as possible. The radiation dose shows a positive correlation with the BMI, weight, body thickness mAs and kV. However the relationship appears stronger with kV than other variables. Therefore practice of low kV when possible and use of gonad shields would be reasonable measures to minimize testicular radiation dose further.

Keywords: KUB radiography, Ionizing radiation, radiation dose

Assessment of Evidence Based Practice (EBP) among graduate Radiographers

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Evidence-based practice (EBP) offers the integration of the best research evidence with clinical knowledge and expertise and patient values. EBP is considered to be an essential component of clinical service delivery in health care. The aim of the study was to assess the knowledge, attitude and practice about EBP among graduate radiographers.

A descriptive cross sectional study was carried out using an interviewer administered questionnaire among all (20) graduate radiographers who practice at National Hospital Sri Lanka. Data regarding demography, current EBP activity, perceived EBP skills, recognition of EBP terminology and search strategies, beliefs and attitudes to EBP and local barriers to EBP were obtained. Most survey items included four and five response options (4 and 5-point Likert scales). All data analyses were done using SPSS statistical software version 14.0 (SPSS Inc, Chicago, USA). P-value<0.05 was considered as statistically significant.

A response rate of 100% was obtained. 60% of them were females. 60% of them mentioned that EBP is new to them, 65% of participants were reading research literature related to clinical practice on a monthly basis. 50% of participants rated their knowledge and skills in EBP as “fair”. 65% of participants agreed with the statement regarding the value of EBP, and that such an approach improves patient care. 75% of them reported that “insufficient time” was the primary barrier to the application of EBP in their clinical practice. Most of them (92%) did not understand the terms “systematic review” and “validity”. 75% of them were able to understand the basic terms used in research methodology. Female radiographers were able to score well compare with males (P=0.032). Also, we found that radiographers’ knowledge about EBP did not show any significant difference with their experience (P=0.112).

Knowledge, attitude and practice about EBP among graduate radiographers were poor. Hence, this is time to introduce the term “Evidence-Based Radiography” in Sri Lanka. Sample was inadequate because of less number of graduate radiographers are practising in Sri Lanka. Further research is needed to compare these results with other radiographers.

Keywords: Evidence Based Practice, Radiography, Research

Perceived Stress and Associated Factors among BSc Nursing Undergraduates in University of Sri Jayewardenepura, Sri Lanka

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Nursing education in the university has huge difference from school education. The transition of students from school to university makes them get adjusted to considerable changes. Switch on to new medium of instructions, adhere to university subculture, facing new teaching learning and assessment methods, unfamiliar clinical environment with various risks and hazards, increased workload with deadlines and time pressure make them vulnerable to experience various physical, psychological and social pressures. Consequently, students can potentially experience various types of stress which can affect their health and academic achievements. Despite ample evidence reported in worldwide about stress among nursing undergraduates, we could not find any evidence in local literature.

A descriptive cross sectional study was performed using a self-administered questionnaire to determine perceived stress levels and associated factors among nursing undergraduates at the University of Sri Jayewardenepura. The questionnaire consisted of standard Perceived Stress Scale and personal and academic characteristics. The SPSS statistical package (version 16) was used to perform descriptive statistics, Chi-square test and binary logistic regression analysis.

Eighty seven undergraduates representing all four batches voluntarily participated in the study. Study group consisted of 62 (71%) female and 25 (29%) male students. The age of the participants was range from 21 to 40 years and mean age was 24.7 (SD=3.4 years). Mean perceived stress level was 21.57 (SD=5.921). Nearly half of the students (52.9%) had high perceived stress levels indicating that half of this population at high level of vulnerability to compromise their health. Most common stress related symptoms were easily feeling tired (75.9%), restless (69%), poor sleep (32.2%) and chest tightness (29.9%). High level of stress were significantly associated with *peer competition* (OR=2.5, 1.4-10.9), *too many assignments* (OR=3.9, 1.4-10.9), *inadequate support in clinical area* (OR= 3.2, 1.1-8.9), *unrealistic expectations of the family* (OR= 4.0, 1.2-13.5) and *lack of guidance and counselling* (OR= 4.8, 1.97-12.165).

The logistic regression was performed to assess the influence of factors on the likelihood that undergraduates would report high stress. The full model containing five independent variables was statistically significant [χ^2 (5,N=87)=24.08,p<0.001] and *unrealistic expectations of the family* and *lack of guidance and counselling* were the significant contributors to the stress. The strong predictor of reporting high stress was the former recording on odd ratio of 5.2 which indicates that undergraduates who had unrealistic expectations of the family, approximately five time more likely to report high stress than those who did not have unrealistic expectations of the family.

Almost half of the nursing undergraduates experience high level of stress due to various personal and academic related factors. *Unrealistic expectations of the family* were the strongest predictor of high stress followed by *lack of guidance and counselling*. These findings will be useful for lecturers, administrators and parents to facilitate the undergraduates in the teaching learning process by mitigating potential predictors of high stress.

Keywords: Perceived Stress, Undergraduates

Experience of Public Health Midwives as Nutrition Counsellors for Mothers/ Care Givers on behalf of the Children Aged 6-36 Months, In Eastern Province of Sri Lanka

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In spite of Infant and Young Child feeding counselling and other measures are carried out by Public Health Midwives (PHMs), many children cannot access them because of their poverty or pecuniary embarrassment, poor knowledge and many other reasons, causing a higher prevalence of under nutrition among the children aged 6-36 months, in eastern province.

This study aimed to explore the essences of the lived experience PHMs as primary care givers to the children and nutrition counsellors to mothers/ Care givers.

The methodology of the study was interpretive phenomenology informed by Heidegger. There were three Focus Group Discussions (FGD) conducted from July to December 2013, in Batticaloa and Kalmunai health districts, involving six PHMs in each FGD. Altogether, eighteen PHMs participated in the in-depth experiential conversations using an FGD guide. The discussions were video and audio recorded and transcribed. Thematic analysis and interpretation were carried out according to van Manen (1990). The researchers used the hermeneutic process of re-reading and the hermeneutic circle for identifying the themes of the study.

The following major themes have emerged through the interpretation process. The themes are, (1) habit of fast food, (2) busy life of mothers/care givers and (3) lack of knowledge among mothers/care givers (4) lack of health care personnel. A sub theme critical financial situation was also emerged under the theme busy life of mothers/care givers and another sub theme interference of mother-in-laws in child nutrition was emerged from within the major theme, lack of knowledge among mothers/care givers.

Conclusion: The results reveal the poor awareness among general public on both breastfeeding and the complementary feeding practices. The standard of Nutrition counselling by Public Health Midwives and regular follow-up would be upgraded considering the grievances of the PHMs.

Keywords: lived experience, nutritional awareness, interpretive phenomenolog

Job Satisfaction among Nurses in Teaching Hospitals Karapitiya and Mahamodara

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Nurses play an extremely important part of patient care. They also assume various roles such as patient educator, counsellor, health care facilitator and patient advocator. But most of the nurses remain as dissatisfied professionals in the world today. Nurses' job satisfaction directly affects the quality of patient care. There are intrinsic factors (stress management, educational level, etc.) as well as extrinsic factors (performance appraisal, wages, etc) that affect job satisfaction.

Assess the job satisfaction related to intrinsic factors and extrinsic factors in Grade 2A Registered Nursing Officers (RNO).

A cross sectional study was conducted using Grade 2A RNOs in teaching hospitals Karapitiya and Mahamodara. A purposive sample was selected including 50 nurses from Mahamodara and 300 nurses from Karapitiya. Data collection was done by a self administered questionnaire. Questions on stress management, educational level & self satisfaction were included to assess job satisfaction related to intrinsic factors while questions on performance appraisal, wages and job recognition were included to assess job satisfaction related to extrinsic factors. Both close ended and open ended questions were used in the questionnaire and a scoring system was used to measure job satisfaction over intrinsic and extrinsic factors.

From the sample of 350 only 227 nurses responded to the questionnaire including 205 female nurses (90.31%) and 22 male nurses (9.69%). According to the scoring system used the mean score related to extrinsic factors was 36.91 ± 8.22 out of the total score of 65, the mean score related to intrinsic factors was 9.33 ± 2.37 out of the total score of 19. The mean overall score was 46.24 ± 9.55 out of the total score of 84. The nurses were placed under three groups (highly satisfied, averagely satisfied and poorly satisfied) with the overall score they have taken and it is found out that nearly 13% of the nurses are highly satisfied, 81 % are averagely satisfied and 6% are poorly satisfied. Nearly 83 % of the nurses are not satisfied with their wages, 67% on working overtime, 57% on supportive measures and 59% with the performance appraisal from their supervisors while 63% of the nurses are satisfied with the recognition they get as a nurse in public. There were no significant differences between the age and job satisfaction related to wage ($\chi^2=2.55$, $p=0.466>0.05$) and to the age and performance appraisal from supervisors ($\chi^2=0.69$, $p=0.876>0.05$).

The job satisfaction was average among the study population. As majority of the nurses are not satisfied with their wages, on working overtime, on supportive measures and on their performance appraisal it may lead to poor quality of patient care. Relevant authorities have a responsibility to enhance job satisfaction of nurses by a proper management plan.

Keywords: RNO, Intrinsic factors, Extrinsic factors

Knowledge regarding Methicillin Resistant *Staphylococcus aureus* (MRSA) among Second, Third and Fourth Year B.Sc. Nursing Students at Three State Universities

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Methicillin Resistant *Staphylococcus aureus* (MRSA) infections are becoming more prevalent in clinical settings specially where there are limited resources and staff. This results in increased morbidity and mortality, and increased health care costs. Nursing students are at high risk of being exposed MRSA due to their limited experience. Nursing students' noncompliance with infection control precautions has its effects not only on patients, but also on nursing students themselves.

A descriptive cross- sectional study was conducted among 252 undergraduate B.Sc. Nursing students at universities of Sri Jayewardenepura, Ruhuna and Peradeniya. A validated self-administered questionnaire was used for data collection. Specific questions to assess the knowledge regarding MRSA were included. Knowledge was categorized as poor, good and excellent. Data analysis was done in the SPSS Version 16.0 and Chi square test was used to determine statistical significance.

Among the total participants of 252 students, nearly 45 % were from University of Ruhuna, 28 % were from University of Sri Jayewardenepura and 27 % were from University of Peradeniya. The majority were females (71.1 %) and 28.9 % were males. The majority of the students had used more than one type of media to get information regarding MRSA and these included lectures, written materials and discussions with hospital staff members. Internet, research articles etc. were used by 27.4 % students.

Out of the 252 participants, the majority had good knowledge (63.1%) regarding MRSA whereas only a few participants had excellent knowledge (6 %). Nearly 61 % of female students and almost 69 % of male students had good knowledge regarding MRSA. There was no significant association between sex and the knowledge level ($p=0.065$). The majority of fourth year students (70.5 %) had good knowledge compared with other academic years. Nearly 38 % of second year students and 37 % third year students had poor knowledge regarding MRSA. There was a statistically significant association between academic year and knowledge level regarding MRSA ($p=0.00$). According to hospital where students attend for their clinical practice, there was a significant difference of knowledge level ($p=0.019$).

According to the findings of this study, the majority of the B.Sc. Nursing undergraduates of universities of Sri Jayewardenepura, Ruhuna and Peradeniya possessed good knowledge about Methicillin Resistant *Staphylococcus aureus*.

Keywords: Knowledge, MRSA, undergraduate nursing students

The Effectiveness of Assisted Thera-Band Resistance Exercises on Improving the Swing Phase of Gait in Hemiplegic Patients

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Hemiplegic patients typically present with an inability to perform ankle dorsiflexion & knee flexion during the swing phase of their gait cycle. This results in the circumduction of the affected lower limb with limitation of their walking abilities and daily functions. Improving their dorsiflexion of ankle & knee flexion in their gait circle is a main key role of their rehabilitation.

This study aimed to compare and measure the effects of thera-band elastic resistance gait training with conventional physiotherapy gait training.

This study used a randomized control interventional study design. Sixty (n=60), 3 to 5 months post-stroke male patients, aged between 45 - 55 years were recruited. These 60 patients then randomly assigned to either the control or the intervention group. Patients were then assessed according to the Wisconsin gait scale (WGS) at baseline. The control group was involved in conventional gait training while the intervention group was involved in thera-band resistance gait training. All study samples were assessed again after two months.

All of them scored greater than the median WGS score (>28) at baseline. There were significant differences ($P<0.01$) within the control and intervention group following gait training programs. The intervention group showed greater mean change (mean change 10.7700, standard deviation SD 4.596) than the control group (mean change 1.6967, SD 1.4534). Mean difference between both groups was significant [mean change -9.0733, ($P<0.01$)].

Both the conventional gait training and thera-band resistance gait training were effective for hemiplegic patients in improving their independence during activities of daily living. However, the findings from this study suggest that assisted thera-band resistance gait training program may be superior to the conventional gait training to become recover in a shortest time period.

Keywords: Stroke, Hemiplegia, Gait-training.

Prevalence of Musculoskeletal Pains among Three Wheel Drivers in Galle Municipality area of Galle District in Sri Lanka

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Background: The number of three wheelers on the roads in every part of the country has increased during past two decades in Sri Lanka. Though this occupational group is at risk of developing various health problems, there is no reported evidence that estimated the prevalence of any health problems in this population. One study has assessed the stress level of this population. Therefore we decided it would be worth to investigate prevalence of work related health problems in this population. Therefore findings of this study will shed lights on musculoskeletal problems of the three wheeler drivers.

Objectives: To describe the prevalence of musculoskeletal pains and associated factors for musculoskeletal pains among three wheeler drivers in Galle Municipality area of Galle District in Sri Lanka.

Materials and Methods: The study was performed on a sample of 250 three wheeler drivers selected using cluster sampling in Galle Municipality area who volunteered to participate in the study by signing the informed consent form. A self developed, pretested questionnaire was administered in a personal interview during the working hours for each participant. The questionnaire explored the variables such as demographic and personal characteristics, work related risk factors, physical health, psychological health and social factors. Data were analyzed using descriptive analysis and chi-square test

Results: Analysis was based on 201 participants (Response rate 80.4%). Most commonly reported work related musculoskeletal pain was low back pain 30.3% followed by 17.4% shoulder pain, 11.4% Neck Pain, 10% Knee joint pain, 9%, Wrist joint pain and 5% Elbow joint pain respectively. Having history of accidents significantly associated with low back pain (OR=2.13, 95% CI=1.13-3.99), shoulder pain (OR=2.32, 95% CI=1.10-4.88), neck pain (OR=3.150, 95% CI=1.29-7.63), and wrist pain (OR=4.90, 95% CI=1.75-13.75). Lifting heavy goods of passengers has significantly associated with wrist pain (OR=4.18, 95% CI=1.53-11.38).

Conclusion: Low back pain was the most common musculoskeletal pain among three wheeler drivers. Previous accidents have great impact on musculoskeletal health of the study population. Measures need to be taken to prevent accidents among three-wheeler drivers and musculoskeletal health of the three wheel drivers need to be further investigated and paid due attention.

Key Terms: Musculoskeletal pain, Back Pain, Shoulder Pain

Learning Style Preferences and Their Correlates among Physiotherapy undergraduates

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Degree courses for Allied Health Sciences commenced in Sri Lanka in 2005. The BSc Physiotherapy Degree programme was established in Allied Health Sciences Unit (AHSU), Faculty of Medicine, University of Colombo in 2006. The course is in its dynamic stage with continuing curriculum development, review and evaluation. The student population is diverse with regards to language, religion, experience, culture, level of preparedness and learning styles. In the background of this diversity it would be beneficial to both students and academics to identify student learning preferences in order to enhance student centered learning.

The aim of this was to determine learning styles among BSc. Physiotherapy undergraduates using a constitutionally based method and to determine the difference according to the gender academic year and academic performance.

All undergraduates (n= 114) studying at AHSU, Faculty of Medicine, University of Colombo were recruited. Data were collected via a self-administrated VARK Questionnaire. Data was analysed using standard statistical tests.

Of 114 respondents there were 51 males and 63 females. Among Physiotherapy undergraduates 23.7% multimodal learners, 22.4% predominantly kinesthetic learners, 16.2% predominantly aural learners, 17.5% predominantly reading learners and 20.2% predominantly visual learners. There is no significant relationship between learning style and gender ($p > 0.05$), learning style and academic year ($p > 0.05$) and learning style and academic performance ($p > 0.05$). Majority of final year undergraduates are kinesthetic learners whereas the majority of first year undergraduates are reading learners.

According to the results most of the physiotherapy undergraduates are multimodal learners 23.7% and kinesthetic learners 22.4%. First year students were predominantly reading learners whereas final year learners were predominantly kinesthetic learners which may be because during the course students have adopted to the course requirements. However follow-up study needed to confirm. There was no significant relationship between learning style and gender, learning style and batch and learning style and course performance.

Keywords: learning styles, physiotherapy undergraduates

In-body Stray Neutrons Produced in Carbon and Proton Radiation Therapy

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It has been revealed that a significant amount of secondary neutrons are produced during carbon and proton radiation therapy. Thus, the study of secondary neutrons due to their high linear energy transfer can be considered as of vital importance. Therefore, the objective was to study the secondary neutrons production just from the patients (water phantoms) for ¹²C and proton beams. Furthermore, the study ventures to discover the manner in which the stray neutron equivalent dose per therapeutic dose (H/D) vary with distance for different energies for ¹²C and the possibility of identifying a simple relationship to calculate H/D at different distances for different energies. Although there is no simple dependence of H/D Vs Depth inside the body, a higher H/D from ¹²C beams compared to Proton beams was discovered. This particular study was conducted utilizing FLUKA Monte Carlo simulation package.

Keywords: Carbon and Proton radiation therapy, Stray neutrons,

Awareness of the warning symptoms and risk factors of stroke and related health seeking behaviours among adults in Ransegoda-East in Matara District

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Stroke awareness among rural dwellers is very low according to the previous studies. Identifying the warning symptoms and risk factors of stroke and health seeking behavior is very important to reduce morbidity and mortality of stroke among rural dwellers. This study was aimed at describing awareness of stroke warning symptoms, risk factors and related health seeking behaviours among residents in a selected rural area.

A cross-sectional descriptive design was employed. An interviewer administered questionnaire was pre-tested and used to collect information from 200 adult residents of Ransegoda-East area of Matara District, Southern province of Sri Lanka. Systematic random sampling was carried out using the electoral register. Data analysis was conducted with SPSS version 16.0 and Chi square test was done at 0.05 level of significance. Awareness was categorized as “poor” and “good”; good awareness of risk factors was considered as the ability to name ≥ 5 risk factors and make ≤ 1 error; a good awareness of warning symptoms was considered as the ability to name ≥ 3 symptoms and make ≤ 1 error.

questionnaire was administered to a total 197 adults in the area and only 22 (11.2%) had good awareness of stroke warning symptoms and only 13 (6.6%) participants had good awareness regarding stroke risk factors. The most frequent response for health seeking behaviors (48.7%) was that the individual should be taken to the nearest hospital, when their symptoms of stroke. More than two third (73.1%) could not identify “Brain” as the affected organ.

The overall awareness regarding stroke was found to be inadequate. There is a need to increase public education programmes focusing on warning symptoms and risk factors of stroke.

Keywords: Stroke warning symptoms, Stroke risk factors, Health seeking behaviours

POSTER PRESENTATIONS
ALLIED HEALTH
SCIENCES

Analysis of Radiological Request forms for Radiological Examinations in Conjunction with Optimization of Exposure Parameters

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Radiology request forms (RRFs) are essential communication tools used by medical officers to refer patients for radiological investigations. All RRFs should be adequately and legibly completed to avoid misunderstanding. When performing radiological examination exposure parameters (EPs) should be within the standard level to maintain patient care and high accuracy of diagnosis.

This descriptive cross sectional study carried out in one of teaching hospital in Sri Lanka. 450 RRFs and optimizations of EPs were assessed by care full observation while performing the radiological examinations within three months of period of time. A field was taken as completed when appropriate element was written in the field. A blank field was given 0 score; completed field was given a score of 1. Ten fields were assessed in each RRFs (Name, Age, Sex, Date, Ward, Clinic & OPD No, BHT No, Clinical History Region & Nature of examination, Referring Physician's Name and Referring Physician's Signature). 6 fields were assessed for optimization of EPs (Exposure Factors, Film focal distance (FFD), Collimation, Grid, Focal Spot Size, and Number of views)

Data analysis revealed 360 out of the 450 RRFs were completed fully. It was 80%. Commonest unfilled fields were Clinical history (4.89%) patients' sex (4.44%) in RRFs. Properly set EPs were observed in 434 request forms out of 450 while performing examinations. It was 96.44%. Focal spot size (5.56%) and FFD (5.11%) were high percentage of improper used fields.

Study has revealed satisfactory completion of RRFs and optimization of EPs for radiological examination purposes, while 20% of RRFs were not filled completely. 9.77 out of 10 fields were filled adequately in RRFs. 5.76 out of 6 fields were used properly when examining the patients. Unfilled and improper fields should corrected by radiology department.

Keywords: Radiological request forms, Exposure parameters, and Film focal distance.

Knowledge Regarding Risk Factors for Oral Cancer among Adult Residents in Thelumpitiya Area, Kegalle District

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Identifying the risk factors for oral cancer is very important for prevention of oral cancer among rural dwellers who are at significant risk. This study focused on assessing the level of knowledge among residents in selected rural communities of Thelumpitiya area of Kegalle District, Subaragamuwa province.

This was a cross-sectional descriptive design, utilizing a validated questionnaire to collect information from 260 adult residents of the study area about cancer knowledge and risks associated with betel chewing and alcohol consumption who consented to participate. Data analysis was conducted with the computer software SPSS version 16.0 and Chi square tests were carried out at 0.05 level of significance.

The results showed that there were more males (57%) and average age was 58 years. Among the participants, majority (82%) is married and 39% have passed the GCE A/L or attained higher education. Less than 13% received education up to grade five and only 5% had non-formal education. Majority of their (59%) monthly income were more than Rs. 10,000. Sixty five percent of the respondents were unable to recognize risk factors for oral cancer, while 54% were unable to identify what constitute modifiable risk factors (such as tobacco use, alcohol consumption and betel chewing) associated with oral cancer. A significant proportion (95%) demonstrated poor knowledge of what constituted non-modifiable risk factors (family history, genotype and age). Regarding risk behaviors associated with oral cancer, 86% of the subjects had identified betel chewing with tobacco and lime, cigarette smoking (67%), use of smokeless tobacco (79%) as risk factors for oral cancer. When asked about, Only 19% of subjects had identified family history, 39% genotype, 12% age and 4% race as non-modifiable risk factors related to oral cancer. Majority of male (54%) and female (78%) had poor knowledge on risk factors for oral cancer ($p < 0.05$). The level of knowledge regarding risk factors for oral cancer showed significant association with educational attainment ($p < 0.05$).

Findings show that knowledge regarding risk factors for oral cancer among rural population was poor and that there was a positive significant association between knowledge and educational level. Therefore, this study strongly recommends strategically designed health education programmes in order to increase the level of public awareness on risk factors for oral cancer.

Keywords: Betel-chewing, oral cancer, risk factors

Knowledge and Practices Regarding First Aid among School Teachers in the Kurunegala Zonal Educational Division

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The aim is to describe knowledge and practices regarding First Aid among school teachers in the Kurunegala Zonal Educational Division. Specific objectives of this study were to describe the level of knowledge regarding first aid among school teachers, to determine the association between demographic characteristics and first aid knowledge of the teachers, and to identify common incidents that the teachers have to practice first aid.

A descriptive cross sectional study was carried out using a sample of total 384 school teachers of the four randomly selected schools in the Kurunegala Zonal Educational Division. A simple random sampling method was used to select the sample and Self administered questionnaires were used to assess knowledge on first aid. The questionnaire had been divided in to two sections. Section A was focused on demographic information of the participants, practices and about general information. Section B focused on knowledge of the first aid on common school time incidents.

Most of the participants, 332(86.5%) were female and 52(13.5%) participants were male. Only one fourth (24.0%) of the participants had received first aid training. 94 (24.5%) participants had “very good knowledge” while, 152 participants (39.6%) had “Good knowledge” and 106(27.6%) participants had “Average knowledge” on First Aid. While only 32(8.3%) participants had “Poor knowledge” regarding first aid. The mean average knowledge level on first aid was 68.56% amongst the participants however; the mean knowledge level on emergency management was only 50.52%. Chi-square test was used to assess associations between knowledge level on first aid and the different demographic characteristics. There was no statistically significant difference in knowledge level when comparing gender and educational status. Statistically significant association was found in knowledge level when comparing age groups, work experience and previous first aid training. The mean knowledge level on first aid was less in the 21-30 year age group, when compared to the other groups ($p=0.003$). The mean knowledge level on first aid was less in the group with less than 5 years work experience ($p=0.002$). Participants who had prior training in first aid had better mean knowledge level than those with no training ($p=0.002$). In current study only 24.0% had previous first aid training. The results shows that most of the participants (82.5%) with previous first aid training were had good or excellent knowledge levels. 322 (83.9%) participants claimed that the commonest incident when they had to administer first aid was fainting, while 46 (12%) said blunt injuries.

Over 90% of participants had at least an average knowledge level on first aid. The level of knowledge on emergency management needs to be improved. The findings also indicate the need of first aid training programme for school teachers.

Keywords: First aid, knowledge, practices

Knowledge on Complementary Feeding Among Mothers Attending Child Welfare Clinic at Boralesgamuwa MOH and its Correlates

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Complementary feeding is an essential element in the care of young children. Childhood malnutrition remains a common problem in much of the developing countries. Nutritional problems among infant and young children are a major public health issue in Sri Lanka also. Inappropriate feeding practices due to lack of knowledge identified as a main causative factor for this problem. According to the Demographic and Health Survey data 2006, in Sri Lanka, among the under 5 children 21.1% are underweight, 14.7% are wasted and 17.3% are reported stunted. Despite high level of literacy rate and achievements in economic growth, the nutritional status of children is not satisfactory. This study aimed to assess the level of knowledge on complementary feeding and associated factors among mothers of children aged between 6 months to 18 months attending Boralesgamuwa MOH area.

A descriptive cross sectional study was conducted in the child welfare clinic at Werahara, Diwulapitiya and Boralesgamuwa MOH during July to September 2011 and study population consisted of 185 mothers having babies aged between 6 to 18 months. Systematic sampling method was used to select mothers and information was collected using an interviewer administered questionnaire. Ethical clearance was obtained from Ethical Review committee, Faculty of Medical Sciences, University of Sri Jayewardenepura and prior permission was obtained from MOH Boralesgamuwa informed consent was obtained from participants before data collection. Each correct answer for knowledge questions were assigned marks and were added up to obtain the final score. The level of knowledge was categorized as poor, moderate and good, according to the cumulative score for knowledge. Data analysis was done using Microsoft word 2007 and SPSS statistical software package. Chi-square test was used to determine the association between the level of knowledge, attitudes and selected variables.

Majority of mothers were aged less than 35 years and were housewives. Almost half of the mothers had studied up to Ordinary level and were from nuclear families. The results revealed that 77.3% of mothers had satisfactory level of knowledge on complementary feeding whereas 22.7% mothers had poor knowledge. Significant association were found between level of knowledge and educational status of the mother ($p<0.000$), parity ($p<0.001$), level of income ($p<0.001$), source of information ($p<0.001$) and clinic attendance ($p<0.001$). However, level of knowledge was not significantly associated with age of mother, employment and type of family.

Mother's educational status, parity, income level, source of information and clinic attendance play a vital role in increased receptivity to knowledge and awareness related to nutritional requirements of their infants.

Keywords: Complementary feeding, level of knowledge, mothers

TECHNICAL SESSIONS

LAW

The Possibility of Adopting the Proportionality Test as a Balancing Tool between Development Needs and Individual Rights: A Critical Review in respect of Recent Development Projects in Sri Lanka

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In 2014, Sri Lanka has closely marked five years since the conclusion of the armed conflict. During the same period, considerable economic and social progress was hindered because Sri Lanka is assertively reshaping its development as a modern economic and industrial hub. Prioritising the vision which is “Emerging Wonder of Asia”, it has designed and implemented several mega projects to expand infrastructure facilities. As a welfare State, it is necessary to develop such type of facilities and create a better living environment for its citizens. That is the ultimate responsibility of the government under the social contract created between citizens and the government. Achieving this goal, it has completed several mega development projects such as Colombo- Katunayake Expressway, Southern Expressway and Maththala Airport. Some of are still under completed.

However, the adverse impact of this is that physical displacement and alienation of local communities from related process and it leads to violate their human, social and economic rights. This paper advocates for reviewing the possibility of adopting “Proportionality Test” as a balancing tool between development needs and individual rights. In a situation where public interest exists and individual rights are at a risk in the same time the benefit that they gain from this development should be proportionate to violating rights.

Proportionality facilitates more intense scrutiny of government decisions compared to other traditional grounds of judicial review. Therefore, this principle of proportionality requires a reasonable relationship between an administrative or legislative objective and particular legislative or administrative means. In this regard, the major function of the administration is that of adopting and implementing effective policies to realize collective goals through programmes of state actions. Inevitably, when the executive does so, the interest of individuals may be adversely affected. In this situation, proportionality would be an effective principle to examine the effectiveness of action taken by the executive and administration ensuring that the executive’s interference to the individual’s interests is necessary and proportionate.

In this backdrop, the objective of the research is to promote applicability of the doctrine of proportionality where the confronting context of individual’s rights is at a risk in development projects. Mainly, it is intended to test the hypothesis that the proportionality test can be used as a tool of balancing between development needs and individual interest. In order to prove this hypothesis, the researcher wishes to find out the scope and applicability of the doctrine in Sri Lanka. Effort will also be made to look at the applicability of proportionality as a ground of judicial review in English Law and usefulness of this doctrine in a hypothetical situation. The qualitative approach of analysing the existing literature on the subject has been employed by the author in this paper.

Keywords- Proportionality Test, Individual Interest, Development Projects

Protection of the Female Domestic Migrant Workers: Role of the Law

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Female Population as a percentage of the total in Sri Lanka was last reported at 50.66 in 2011. With the introduction of the open economy concept to the country in 1977, new means of earning were integrated into the (traditional) economic process that existed. As a result, Sri Lankan females got more opportunities to enter into the economic process under the unskilled labour category especially in Middle Eastern Countries such as Jordan, Kuwait, Lebanon, Qatar, Saudi Arabia and UAE. From 1977 to date there has been a gradual increase in women who leave the country to obtain domestic jobs in the above mentioned countries. Today Sri Lankan females migrate at a large scale as domestic workers to Middle Eastern Countries as well as Western Countries especially to European Countries making it the highest and most stable source of foreign currency inflow to the country. In 2011, the total foreign remittance received from migrant workers was increased by 25% which was 5145 million USD and the female migrant domestic workers should be appreciated for their contribution of 75% out of the said amount. Though it contributes to the economic stability of the country it also leads to create many social issues which seriously effect the Sri Lankan society. Family breakdown, increase in the offence of incest and increase juvenile delinquency are some of the issues. More critically These females have to face many problems such as lack of social and occupational security, lack of recognition, wage discrimination and difficulties in access to justice. This could be considered as serious violation of their rights as humans and employees. The empirical data reveals that during the last three decades there were many instances reported that Sri Lankan female domestic workers had to undergo a wide range of hardships including refusal of payments, violating the term of employment contract, physical and mental abuse, sexual harassments, rape and torture that lead to disability or even death. Sri Lanka as a member State to many international treaties which declared standards to protect the civil and economic rights of the people should have a responsibility to adopt a strong policy, international agreements and national laws which align with the international standards to ensure the protection of the rights of these workers. Though Sri Lanka has enacted some national laws and adopted a policy the rights of the female domestic migrant workers are still violated massively. Therefore the present study intends to critically evaluate the contemporary national laws and existing policy in relation to the protection of the rights of Sri Lankan female domestic migrant workers and make suggestions to strengthen the prevailing policy and laws. This objective will be achieved by testing the following hypothesis; the gap between the international standards and the national laws and the weak policy adopted by Sri Lanka lead to violate the rights of the female domestic migrant workers. Relevant information from books, treaties, statutes, journal articles and websites are referred as secondary source and information and statistics gathered by relevant authorities are used as primary sources to complete this research.

Keywords: national laws, international treaties, and rights of female domestic migrant workers

Gender Stereotypes in South Asia: Legal Perspective by U.N. Based Human Rights Mechanisms

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Stereotypes on gender have long been deeply rooted as societal norms in the culture. However, the global phenomenon is that in any given time, or in several instances of women's lives, either in their professional lives or in their personal lives, gender stereotypes cause them to be victimized.

U.N. Convention on the Elimination of all forms of Discrimination against Women (CEDAW) can be recognized as the cornerstone of protection of women's human rights. South Asian region and Sri Lanka were commonly subjected to Women's Committee's comments on achieving substantive equality through taking steps to eliminate gender stereotypes in its Concluding Observations. In light of the aforesaid phenomenon; it is timely to recommend Women's Committee to adopt a General Recommendation on eliminating Gender Stereotypes.

The main objective of the research is to seek whether an effective legal framework will be able to address prevailing gender stereotypes that hinder substantive equality of women. The secondary objective is to apply relevant legal measures in the aforesaid model to eliminate such Gender Stereotypes in order to achieve substantive equality.

The scope of the research is an analysis of the jurisprudence of international human rights law on gender stereotypes. To establish the aforementioned facts, the author adopts the desk research method in the paradigm of legal research methodology to examine the theoretical framework by reviewing of secondary data. The author limits herself to U.N. Human Rights mechanisms on gender and women's human rights law.

Keywords: Gender Stereotypes, Women's Human Rights Law, CEDAW

Trends in Collective Bargaining Coverage and Union Membership Level in Sri Lanka

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Collective bargaining is a powerful weapon in the labour field as the 'Contract of employment' is a negotiation between two unequal parties. In a contract of employment employer is the powerful and decision making party and that party always tries to draft the contract in favour of their own benefits. In a particular situation the other party, employee is in a vulnerable situation and normally these contracts create in a favourable manner. So it is very difficult to identify these contracts as voluntary contracts. Trade unions as agents or representatives of the employee have to play a main role in such a situation with handling the collective bargaining on behalf of their members. But in the last decade with changes of social, Economic and political culture with influence of inter-war and post-war experiences trade unionism shows significant changes and emerging trends with their behaviour as an instrument to protect labour rights. Among several changes this research focused on the decline of active registered trade unions and cancellation of registration.

This is a qualitative research mainly based on literature review done together with the preliminary survey. As the main sources in this research it based on the Registrar office of trade unions in Colombo. Registrar and assistant registrars of trade unions in-depth interviewed as key formants. And there also several focus group discussions with Trade union leaders in several sectors. Instead of that telephone interviews were conducted with trade union members of cancelled trade unions. Participatory method also done with participating some trade union meetings as an observer. Secondary data was gathered from journals, books, reports and internet and statistics from the Labour Department and ILO.

According to the statistics of the labour department of Sri Lanka on 2013, while 8394 trade unions have been registered with the registrar office of trade unions only 2192 trade unions can be find in active mode. All the other trade unions have been cancelled by the registrar of trade unions based on several reasons. So this research basically focuses on this critical situation and tried to clarify the reasons for this negative trend. And finally some solutions were gathered to protect trade unionism in Sri Lanka as a final output of the research.

Keywords: Collective Bargaining, Trade Unions, Emerging Trends

Contract of Employment in Sri Lanka: A Contract like Any Other, But a Contract Not like Any Other

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Contract of employment is a contract relating to employer and employee relationship. The traditional common law considered it as a contract made with free will of the parties. It paved the way for exploitation of employees by their employers because of the unequal bargaining power between the parties. The 'welfare' character of the State has made the State to intervene into the contractual relationship between employers and employees to protect the interests of the employees. The interventions made by the State to redress the unequal bargaining power between the parties have eroded the sanctity of 'contract' in a contract of employment and made the State as invisible third party in employment contracts. The objective of this paper is to discuss the extent to which the State has intervened to redress the unequal bargaining power between the parties in a contract of employment, and the effects of those interventions. For the purpose of this research, the provisions of the labour legislation, decided cases and books have been analyzed. The findings show that the State intervention to protect the interests of employees has led to enactment of multitude of labour legislation. The labour legislation provides the terms and conditions of employment, establishes labour courts with just and equitable jurisdiction, promotes collective bargaining and gives legal effect to collective agreements. The provisions of the labour legislation form skeleton to a contract of employment as most of the matters relating to terms and conditions of employment are governed by these legislation. The matters that are not covered by the legislation could become terms of a contract of employment. However, these terms also would be tested in the touchstone of 'just and equitable' by the labour courts. The labour courts have power to create contracts in the absence of formal contracts, create new rights and obligations between parties and disregard unfair contractual terms to award just and equitable reliefs. As the Industrial Disputes Act gives legal effect to collective agreements, collective agreements also override the contracts of employment. These interventions and the consequent developments have replaced the traditional common law contracts of employment with just and equitable contracts of employment. Hence, it could be argued that a contract of employment is a contract like any other, but a contract not like any other!

Keywords: State, contract, legislation.

Right to intervene or not to be intervened: The Impact of International Humanitarian Interventions on State Sovereignty from an International Law Perspective

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International interventions based on humanitarian purposes are not uncommon in the contemporary world. They may take the form of military or non-military in nature but the end result would be the erosion of territorial sovereignty of states, which is an established doctrine of international law. Such interventions are justified by some claiming that exceptional measures may be needed in superseding the sovereignty of states to prevent an overwhelming humanitarian catastrophe and to rebuild societies after such damage. Nevertheless, some have vehemently objected interventions asserting such endeavours as undue interferences on the internal affairs of a sovereign state.

The central research problem of this paper is whether there is an established right in international law either to intervene or not to be intervened. This problem requires the examination of present-day international interventions ostensibly based on humanitarian purposes, whether to be allowed as of a right of the interveners or to be rejected as of a right of the state subjected to such attempts. The secondary question examined in this paper is whether the emerging concept of 'Responsibility to Protect (R2P)' is able to reconcile these competing rights effectively based on international law principles. This is a library based research. Scholarly work and secondary data will be used to analyse the issues and to reach at a conclusion.

One of the foremost principles of international law is the inviolability of the territorial sovereignty of individual states. Under international law other states must respect this territorial sovereignty. Nevertheless, when a state perpetrates egregious violations of human rights and humanitarian norms another state may violate the state's territorial sovereignty in order to protect the rights of people. In such situations, states should not use sovereignty as a shield to hide blatant violations of international law. On the other hand, powerful states may use interventions, by exploiting humanitarian grounds, to achieve their larger political, economic and other strategic purposes. Therefore, having well established legal principles to govern the intervention regime is essential. It is important to examine whether newly introduced 'R2P' concept has the capacity to provide a legal basis to maintain a balance between the paradoxical views on the issue.

Recent developments in international law suggest the need for a reconceptualization of its traditional concepts and doctrines to better address the current issues from a legal perspective. Non-intervention was a well-established principle in the aftermath of the Second World War and it has been reflected in the provisions of the Charter of the United Nations. Nevertheless, after the Cold War era the need of intervention based on humanitarian purposes emerged profoundly due to the mass atrocity crimes perpetrated by or allowed by Sovereign States against their own citizens. As a result, different viewpoints on the issue of interventions should be balanced through a legal regime though such an endeavor is lacking at present. 'R2P' cannot be considered a rejoinder since it is more of political in character than legal. It is the obligation of states, individually as well as mutually, to develop such a legal regime within the international law framework to achieve international peace and stability without jeopardizing the individuality and solidarity of sovereign states.

Keywords— humanitarian intervention, use of force, sovereignty of states

Protection of Rights of the Sri Lankan Migrant Women Workers: A Critical Analysis of the Domestic and International Legal Regime

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Since Sri Lanka is a third world country foreign employment plays a major role in utilizing the foreign currency towards the country. The rate of migrant women workers in Sri Lanka is very high and they are highly vulnerable in the form of the protection. Violation of their rights can be seen in the form of physical, emotional, sexual and economics. Domestic legal regime governing this issue includes the fundamental rights jurisdiction, labor rights jurisdiction and Bureau of foreign employment Act No. 21 of 1985. The international jurisdiction compromise with the International convention on the protection of the rights of all migrant workers and members of their families and the CEDEW convention. Despite all this protection there are incidents which reflect that all what have been done are not sufficient in order to protect the rights of the women migrants.

Research Problem- Whether the available protection granted by the domestic and International legal regime for Sri Lankan women migrant workers is sufficient to protect their rights.

The objective of this study is to critically review the current domestic and international context relating to the protection of the women migrants and in order to realize whether such protection is sufficient to protect the rights of the Sri Lankan women migrants.

This study is based on the qualitative research method where the research will extensively examine the relevant provisions of the national and international legal instruments and national policy on migrant workers. The data collection was done through the library research and internet data bases. The primary sources of this work include relevant Acts, International conventions. Research reports, journal articles, books and newspaper articles are also analysed as the secondary sources.

Keywords- women migrant workers, women's rights, Domestic legal context, International legal regime

The Education for Sustainable Development (ESD) Concept and the Sri Lankan University System: The Way Forward

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Education for Sustainable Development (ESD) is a concept which presents a new vision for education for the achievement of development that includes economic growth, social development and environmental protection, with culture as an underlying element. The ESD concept has its source in Agenda 21, a non-binding document for voluntary action adopted by 178 governments at the conclusion of the United Nations (UN) Conference on Environment and Development held in Rio de Janeiro in 1992. In 2002, the General Assembly Resolution 57/254 declared 2005-2014 as the UN Decade of Education for Sustainable Development (DESD), with UNESCO appointed to develop an International Implementation Scheme (IIS). At the Rio+20 Summit in 2012, the UN Conference on Sustainable Development, 180 world leaders, including the Sri Lankan President, reaffirmed their commitment to Agenda 21.

This research is library-based. Key documents in the field of international environmental law (abovementioned) as well as significant expert studies, such as the 2008 Report of the International Commission on Education for Sustainable Development Practice (ICESDP) convened by the Earth Institute at Columbia University will be analyzed. This research analyzes the ESD concept as applied and developed during the Decade of ESD, but goes beyond the theoretical foundations to suggest possibilities (including action plans) for the future directions that could be taken by the Sri Lankan university sector with regard to ESD.

Education for Sustainable Development (ESD) is a multi-disciplinary approach which calls upon educators and learners to become motivated to critically evaluate and develop new visions of a sustainable future. Chapter 36 of Agenda 21 identified four major *thrusters* of ESD, the most relevant for the purposes of this research is included in the second *thruster*: the need for reorienting existing *university education* to include more principles, skills, perspectives and values related to social, economic and environmental sustainability. This links with the first of the seven strategies suggested by the UNESCO IIS for institutional frameworks, that of *vision-building*: to “envision what it means to live within environmental limits...and work sustainably”. The practical action that is needed for this vision to become reality needs specialists who are willing to understand the interactions between different fields of knowledge and who can use it successfully for sustainable development. The ICESDP supports the need for higher education that develops “strong *management skills* as well as practical knowledge across a range of disciplines including the *social, natural and health sciences*”. This research highlights where Sri Lankan universities can improve in the area of opportunities for multi-disciplinary studies, as well as in multi-disciplinary research for SD.

Sri Lanka is heading towards developmental horizons far beyond what was dreamed of a few years ago. Planning and implementing Education for Sustainable Development (ESD) strategies successfully would mean that the most suitable professionals could be trained within our education system to face the challenges of maintaining sustainable development well into the future. This is an area that requires further co-operation between different specialized fields in our university system, in place of the traditional isolation of disciplines.

Keywords: Education for Sustainable Development, University Education, Multi-disciplinary, Strategies.

The Crisis of Low Conviction rate in Sri Lankan Criminal Justice System, A Critical analysis of the Root-causes

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The function of the “Criminal Justice System” is to deliver justice for all, by prosecuting suspects before the competent courts based on evidence and convicting them if they proved to be guilty while protecting the innocent. Generally the “conviction rate” which is the percentage ratio of number of convictions out of the number of criminal cases brought within a particular jurisdiction in specific time period would show the degree of efficiency and effectiveness of that criminal justice system.

Throughout the last few years Sri Lanka has been experiencing very low criminal conviction rate which ranging from 4% to 6%. Does it mean that majority of suspects are innocent? Meanwhile the crime rate of the country is relatively high. This situation has endangered the social life of the general public, adversely affect to the national economy and ultimately tarnish the good will of the country.

As a common law country Sri Lanka has been implementing the “Adversarial method” of litigation which gives priority to the procedure than finding truth. A neutral judge has taken a decision by considering the submissions of conflicting parties. The accused is presumed to be innocent until proven guilty with proof of beyond the reasonable doubt. In Sri Lanka, police or the attorney general department conduct the prosecution while under the inquisitorial method judge prosecute the accused in trial with the view of conviction. So under the common law tradition prosecution has to undergo with tedious task to convict the accused.

In order to ensure that the situation in Sri Lanka is understood in the light of the international developments in this regard, further this study engages with selected jurisdictions such as India, USA, Japan and UK. This paper discusses some of the critical issues which may arise in proving the case in a court from the perspective of the prosecutor under four categories relating to investigation, prosecution, and legal procedural factors.

This research would base on secondary sources including reference of statutes, text books, electronic data bases, journals etc. In order to ensure that the situation in Sri Lanka is understood in the light of the international developments in this regard, further this study engages with selected jurisdictions such as India, USA, Japan and UK.

Keywords: Conviction rate, Criminal justice system.

Need or Greed? An Analysis of White Collar Crime in the SriLankan Context

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White Collar Crimes are a significant type of criminal behaviour which renders the traditional notions of criminal justice inadequate to define the causes of this crime. This paper seeks to analyse the areas in which the crime causation theories have failed to provide with an adequate explanation to address the root causes of white collar crimes. The main objectives of the criminal justice system are not limited to traditional notions of victim-offender justice.

The contemporary development of criminal justice has refocused on repairing the harm done to the society at large. Hence in order to meet the laudable objectives of the criminal justice system it is essential to develop a theory of crime causation which enables development of legal and social policies to supplement the system.

White collar crimes are a distinctive type of crimes that do not involve any physical harm or injury to an individual, the victim suffers an economic loss which would sometimes be more adverse in the impact. At the same time these types of offences damage the economic fabric of the society and might hamper the development process. Hence in a country like Sri Lanka which has economic development at the forefront of its agenda, the impact of these crimes is destructive and destabilising.

This paper seeks to analyse the judicial attitude of the Sri Lankan courts in terms of white collar crimes and how the judiciary has interpreted the crime causation in respect of white collar crimes, or the inadequacy thereof any attempt by the judiciary to develop a body of jurisprudence in this regard. Since judiciary is one of the main actors which is involved integrally with the criminal justice system.

The research methodology intended to be adopted is one based on secondary data collection, involving an analysis of the theories of crime causation as propounded by various authors in criminology. In order to analyse the Sri Lankan system statues and judicial decisions would be referred to, especially in respect of assessing the jurisprudence developed by the judicial decisions or the lack thereof.

Keywords: white collar crimes, crime causation theories, criminal justice, judicial decisions, penal code

The Substantial Requisite of Stabilizing Rights for Academic Works; Intellectual Property Law Reflections

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Intellectual Property (IP) rights are recognized as a regime which had been established by law to safeguard the creativity of mankind, in the atmosphere of fast moving global economy. In the present context, all most all the IP rights holders are not hesitated to stand over their rights, in a case of infringement or in a situation of imminent infringement. Academia is a very significant, respected group in an every society, who contribute to the enrichment of the knowledge and philosophy in their respective discipline. The problem of this study is focused on whether there is any level of different treatment available for the academia in enjoying copyrights, comparing to the other copyrights holders, since the most frequently their studies been funded by the state institutions. Objective of this study is to, clarify the legal possibilities, measures available for the academia in order to obtain equal enjoyment of their rights comparing to other copy right holder categories. The study is largely based on qualitative approach which analyzes the contemporary legislations and relevant documentary sources in the area. The study reveals that, some provisions of the prevailing legislation, Intellectual Property Act No. 36 of 2003 and the Articles of the Constitution of Democratic Socialist Republic of Sri Lanka have indicated some of the substantial and/or technical barriers in enjoying copy rights, since they are remunerated and facilitated by the state entities to explore new knowledge. Further, the study recommends and highlights the necessity of introducing and adopting European equitable judicial approaches coupled with international standards, to minimize the exiting debate on theoretical imbalance of enjoying copyrights, in order to celebrate the creativity and compassion of this special group of intellectuals.

Keywords- Intellectual Property, Academic work, Copyrights

Cultural Sensitivity and the Negative Impacts of Non-Education of Sex among Teenagers of Sri Lanka

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Sri Lanka is a highly culturally sensitive country. Thus talking of sexuality in public is believed to be forbidden. Further sexual education is not done at schools unlike in the European countries. But it is questionable whether being an extremely culturally sensitive country serves favourably for the current developing and changing nature of the world.

This paper will discuss on the problem that whether being extremely culturally sensitive have barred elders from teaching sexuality to the children and whether having a proper knowledge on sexuality at the proper age would protect the teenagers from using unethical sex behaviours.

It is mainly objected to inquire whether non education of sex at the proper age would lead the path to experiment sex in unethical means. Further the paper intends to evaluate whether the extreme cultural sensitivity of the Sri Lankans have resulted non-education of sexuality openly, investigate whether educating adolescents of sex will make them clearly aware of what sex is, examine whether educating of sexuality will change the current position of youth where they tend to seek for unethical means to experiment on sex, expound the importance and effectiveness of teaching of sex in the school education, suggest to introduce sex education in a proper way in the schools.

The study is conducted using both quantitative and qualitative methodologies. Questionnaires were used to collect primary data, along with the interviews conducted on the selected samples from teenagers from 13 years to 19 years of age group, Principals, teachers and parents. Secondary data collected from books and newspapers along with the web based journals.

Today, unlike in the times of yore, there are instances where we hear male sexually abusing male and female sexually abusing female. Furthermore, despite the age from the school child to the extreme elders, there are reports of sexual abuse cases. Nevertheless educating of sexuality will change the mindset of the teens and will change the present situation.

Keywords: Teenagers, Cultural Sensitivity, Sexual Abuse.

Cyber Crimes within Social Networks and Efficacy of Domestic Legislations to Combat against Them

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As every coin has its two sides, Internet, also contains positives and negatives both. But for all the good it does to us, internet has its dark sides too. Out of all the newest and possibly the most convoluted trouble in the cyber world is Cyber-crime. Cyber crime is an umbrella term that covers a wide array of attacks and scams. Cyber-crime generally refers to criminal activity where a computer or network is the source, tool, target, or place of a crime. In recent times most of the above bizarre crimes are committed via Social Networks. For instance, Face book impersonation, Face book pornography, Blackmailing on Facebook, Hacking of passwords & stealing of information are some of them.

In the domestic scenario throughout the last few years Sri Lanka has been experiencing relatively high rate of cyber-crimes supervised under Face book and other social networks. This situation has endangered the social life of the general public, adversely affect to the life of individuals and ultimately tarnish the image of the country. In order to mitigate there are several legislations passed by parliament recently the problem remains whether they are functioning effectively and whether the general public is aware of the existing laws.

Sri Lanka is having a high risk in near future in this regard and for the time being this threat has not been a complicated one. But with the availability of resources and with the developing technology over time, there is a potential of being. But our government comparatively or totally haven't acted in an effective manner to mitigate these risks.

Information on this regard will be based secondary sources like reference of statutes, text books, electronic data bases, journals etc. In order to compare the situation in Sri Lanka with other countries this study further engages with selected jurisdictions of India, USA and China.

Even though the present Sri Lankan legislation has implemented some legislation they do not specifically cover Cyber Crimes done via face book to meet the global standards whereas the other legislation in the world has mostly addressed. The conclusion stresses the fact that the existing legislation and litigation is not merely sufficient to overcome these ever increasing crimes while the prevailing ones are unknown to the society and further new security measures in addition to the existing ones to override the hackers and strengthen the computer systems from possible cyber-attacks in order to ensure the safety of the society should be implemented.

Keywords: - Cyber Crimes, Social Networks, Domestic Legislations

Enforcement of an International Commercial Arbitration Award through the Government-Sponsored Courts in the Form of a Foreign Judgment: A Survey of Positive Elements

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The existence of effective and appropriate dispute resolution mechanisms is an integral part of international business activities; the lack of which can arguably undermine the development of international business. In order to meet the need of having an effective dispute resolution mechanism, international commercial arbitration (ICA) has been specifically designed for the resolution of disputes which arise out of cross-border business to business transactions as a private dispute resolution mechanism. One striking element of this mechanism is that it requires support from government-sponsored national courts (national courts) for its effectiveness and efficiency. One such area is the enforcement of international commercial arbitration awards (ICAA) through national courts. Currently, there are two avenues of enforcement of ICAA: First, a foreign arbitral award can be enforced through the national courts of a country where enforcement of ICAA is sought. Second, such an award can be enforced by confirming it as a foreign judgment in the enforcement country. Unfortunately, the second avenue which entails different categories of foreign judgments has arguably been neglected by governments and private stakeholders of international trade due to limitations in the second avenue.

The primary objective of this paper is to explore the possibility of enhancing enforceability of a foreign judgment delivered after confirming a foreign arbitral award (FJCFAA) as another avenue for the international trading community who rely on the resolution of their commercial disputes via international commercial arbitration. The main argument put forward in this paper is that the enforcement of FJCFAA can be made effective by bringing required amendments to the problematic areas of the existing legal framework. It must be noted that the paper is limited to identify supportive elements embedded in the related existing legal framework and literature. The rest of the discussion on the examination of problematic areas of the existing legal framework will be presented in another paper as the second part of this paper. The methodological approach adopted is a qualitative one which is supported by a documentary analysis research method, given the purpose of the research undertaken.

Keywords: Dispute resolution mechanism, international commercial arbitration, government-sponsored courts and international commercial arbitration awards and foreign judgments.

Corporate Social Responsibility with Special Reference to Environment

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Corporate Social Responsibility (CSR) is the continuing commitment of companies to behave ethically and to contribute towards economic development while fulfilling economic, social and environmental responsibilities towards the stakeholders. However, the escalating number of instances where environmental pollution and public nuisance is caused through company activities throws a question mark before their CSR policies in relation to the environment.

This paper is based on the findings of a research conducted on analysing the extent to which the responsibilities towards environment envisaged in the concept of corporate social responsibility have been dealt with by the corporate sector in Sri Lanka. Data collection was done through literature survey and meetings and interviews with company officials and experts on the subject. For comparative purposes, international examples from Denmark and Australia were taken into account.

It was found out that though only a limited number of companies have focused on their corporate social responsibility towards a clean environment, most of the companies have ignored it, in the Sri Lankan context. Inadequate compliance with environmental regulations, absence of a state policy and legal provisions on CSR especially on environmental reporting, lack of appreciation, encouragement and research on CSR and not integrating environmental CSR into the core business activities of companies were found as the reasons for this result.

Introduction of a state policy on CSR which includes CSR on Environment and introduction of an action plan for the implementation of this policy, introduction of a system of Environmental Reporting by companies, encouraging companies to integrate Environmental CSR into their co-business activities, introduction of systems that encourage Environmental CSR activities by companies, especially to appreciate such activities, making state entities also responsible for the society and environment as same as the private entities, encouraging research and development activities on environmental CSR and eco friendly industrial practices and technology were identified as the methods in which the compliance with environmental CSR in Sri Lanka can be improved.

Keywords: CSR, Environment, Companies

Significance of the Principle of Environmental Justice in the Protection of Environment: Sri Lankan Experience

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Concept of Environmental Justice is a recently identified International Environmental Law Concept. The rationale for the concept 'environmental justice' is that people, regardless of their race, colour, nation or origin or income are able to enjoy equally high levels of environmental protection. It helps us to understand that unequal power relations in society result in the abuse of people and their environments. But there are some issues in concerning environmental justice in the capitalized society. This is a very novel principal in environmental law arena and currently this principal has been used by the courts in different countries. American courts took the initiative in introducing the principle. In Sri Lankan Superior Courts have been discussed the features of this principle under some other different environmental principals. But still there are some practical issues with regard to the direct applicability of the principle of environmental justice. Therefore, establishing and adopting the principle of environmental justice is restricted. Therefore, author seeks to find the validity of the principle of environmental justice in order to protect the environment. And further to assess the status of the applicability of the principle of environmental justice through Superior Court case interpretations in Sri Lanka. This research will be conducted as a literature review based on the secondary sources including statutes, text books, electronic data bases, journals etc. Special reference will be made to the Sri Lankan case Law. This research will be an analysis of the jurisprudence of Environmental Law principles as well. Principle of environmental justice is an emerging trend and Sri Lankan environmental law need to get the influence of the said principle. At the moment because of the novelty of the principle, still its applicability is very low in Sri Lanka. However, this is an utmost importance in protecting environment as whole. Moreover, up to some extent Sri Lankan superior courts have involved in applying the principle through Court interpretations.

Keywords: Environmental Justice, Discrimination, Sri Lanka

Climate Change and Rising Sea Level: Need for an International Regime for Displaced People and Geoproperty Rights

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Sea was at an inconceivably low level in the ancient world. The migratory routes traversed by the humans were over hard grounds all around. Suddenly the sea level rose. It was a strange phenomenon for the ancient people. They could not figure out the reason. The sea level continued rising for a long period. The people reflexively drew back to higher grounds. Today, the sea level is again rising. People know the reason. But they do not have a place to retreat or means to recover their losses. The world is delimited by territories fortified by sovereign laws. This paper is centred on this fact. Individuals, groups and national governments will lose geoproperty if their countries are inundated by the rising sea water. When the low lying entities submerge underwater, the high ground countries will face a different kind of overflow—refugees from the sunken world. There will be many collateral issues. One of them will be the sudden spurt in the unlawful act of human trafficking and smuggling. Among the various geopolitical entities, only Maldives and Kiribati have started raising alarms at the international level. Every one heard it, but no one played heed to their plight. People can be displaced internally or externally. The nations that go underwater will generate externally displaced people who will have to relocate elsewhere. The nations that may face migratory influx should be compensated for accepting such refugees. Can it be by transfer of titles of the sunken world? It is too early to mention. An international regime, as coherent as the Law of the Sea or as an adjunct to it, may be able to protect the interests of the people who lose their nations and properties and of the nations who provide them refuge under humanistic consideration.

Keywords — Global warming and climate change, Geoproperty, Human trafficking and smuggling, Refugee status

Public Interest Litigation for Environment Protection in Sri Lanka - A Comparative Overview with Developments in India

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“Injustice anywhere is a threat to Justice everywhere - Martin Luuther King”

Environment problems and Human Rights are two side of a coin. Common concerns on Environment such as water pollution, degradation of marine and coastal resources, loss of coastal habitats and deforestation are include human rights concerns as well. The concept of Public Interest Litigation was originated from fundamental rights which are derived in Human rights. According to the general law, Public Interest Litigation means litigation for the protection of the public interest. It gives the power to public but the person filling the petition must prove to the court that the reason for filling is purely public interest. Even though litigation for group rights is rare in Sri Lanka, with effect of India which initiated the trend, we admitted it in to our domestic legal system.

This article seeks to review the Public Interest Litigation cases on Sri Lanka and compare it with the developments of India in this regard. Existing substantive legal provisions for Public Interest Litigation for environment protection is not wide enough like India, where it has constitutional protection for environment protection by having Article 21 of Right to Life. According to the case law of *Sriyani Silva Vs Idamalgoda* , the right to life is guaranteed in Sri Lanka by implied interpretation only.

Therefore this article will attempt to give recommendations as suggesting fundamental right provision for right to life in Constitution etc... As the Public Interest Litigation for environment protection covers the interest of entire citizens of country it is the country's responsibility to do the meaningful needful in this regard.

Keywords: Public Interest Litigation, Fundamental Right, Environment Protection

Biodiversity and Bio-Piracy: With Special Reference to Sri Lanka

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Sri Lanka is a small island, 65,610 km² in area situated close to southeast corner of the peninsula of India and rich with high level of biodiversity. The significant feature of the biodiversity of Sri Lanka is high portion of endemic species among fauna and flora. According to the Convention on Biological Diversity, biodiversity means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part and this includes diversity within species between species and of ecosystems. Hence bio-piracy means commercial development of naturally occurring biological material such as plant substances or genetic cell lines, by a technological advanced country or organization without fair compensation to the people or nations whose territory the materials were originally discovered.

Thus, Sri Lanka as a biodiversity hot spot as well as a developing country has faced challenges to protect its fauna and flora from commercially developed countries and multinational companies by pirating it. Therefore this research be discussed the existing legal framework which is available and which is not adequate to address bio-piracy as *sui generis* concern and steps which can be taken to prevent this issue.

Further the whole question is that is Sri Lanka has adequate legal framework to prevent bio-piracy over the biological resources in the country itself. The circumstances such as less of technological infrastructures, lack of knowledge and a precise framework to protect traditional knowledge among indigenous people of Sri Lanka and basically greediness for money there is a trend among the people to sell endemic fauna and flora to developed countries or Multinational Companies for experiments led country for bio-piracy.

The objective of this study is to identify a *sui generis* legal framework to protect genetic resources in Sri Lanka and to determine *in-situ* and *ex-situ* conservation on biodiversity to prevent bio-piracy in Sri Lanka.

Methodology of this study will be mainly based on the literature review in area of law relating to Intellectual Property and Environmental Laws. Both procedural law and substantive law aspects will be addressed and the analysis will be based on academic and judicial expressions on Genetic Piracy in Sri Lanka.

Keywords: Bio-diversity, Bio-piracy, Traditional Knowledge

Significance of Access to Justice and Legal Aid: An Analysis of Concepts and Contemporary Adjustments

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Law is considered as a set of rules which regulates human conduct. When considering the final outcome of implementing such rules, 'justice' is overwhelmingly important. If there is an incapability of getting access to justice, the fact which states the laws enforced in that society have reached the above mentioned final outcome is hardly acceptable. In the long run, since justice being impalpable to the society, people attempt to circumvent the law and outrageously satisfy their needs. Therefore, getting access to justice is of vital importance.

Legal aid is simultaneously important to expand access to justice. Legal aid generally means providing people who are craving for legal assistance with free legal consultation and representation. This assistance paves the path to social justice as well. Legal aid was formerly limited for free representation in the courts by the lawyers and for criminal matters. Civil matters and free legal consultation were not taken into account within the sphere of 'legal aid', both nationally and internationally.

Due to multifarious social, political and economic changes took place in the world the concepts of 'legal aid' and 'access to justice' faced drastic changes during the past few decades. India and United States of America have immensely dedicated to add a practical value to these concepts.

Sri Lanka has also taken several measures to open the doors of justice, which are in progress but require some contemporary adjustments. The recommendations for the development of access to justice can be introduced considering some of the examples provided in the international sphere. The above discussion is based on library research and internet research. Legal aid and access to justice are equally important to suffice social justice. Therefore, discovering new dimensions and identifying both practical and conceptual significance of those concepts are indeed a timely response to the demand for social justice.

Keywords: access to justice, legal aid, social justice

Executing Police Powers during Demonstrations: Legal Challenges in the Sri Lankan context

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Upholding peace and order in the society is the prime duty and responsibility of the police force. Besides, this is the main objective to execute a police force in a country. In the present context, this main objective has become a challenge to the police officials due to various circumstances. Unlike military forces, the mission of advocating peace and order by police officials has amounted to a challenge because they are directly involved with the civil life of the people. This was particularly evident in the incidents that recently occurred in Sri Lanka, where police officials executed their powers during demonstrations which amount to unlawful assembly. This had eventually evolved into riots, resulting in the death of the policemen as well as civilians.

In this regard, the objective of this research is to critically evaluate the legal challenges faced by the police officials in Sri Lanka to execute their Powers in order to advocate peace and order in the society during a demonstration. This research consists of several facets. First is to assess the legal rights of the demonstrators within the framework of fundamental rights- whether it is justifiable for the demonstration to transform into a riot. Additionally, this research will examine the legal framework for the police force to intervene in demonstrations. In other words, is the police given power to dismiss a demonstration at its initial stages, or only when it evolves into an unlawful assembly or a riot? Moreover, do the police use their official power beyond the purview of the existing legal framework? This research thus delves in examining the challenges faced within the practical scenario rather than the theoretical procedures of both the police and civil majority. Identifying these challenges would minimize the abuse of police powers and to ensure further civil trust to the police force.

This study will be based on a qualitative research method which basically entails to critically analyze applicable legal standards, practical experiences of the police officials, views of the experts, demonstrators and ordinary citizens in order to understand the problem and to find possible answers. These reforms are to be introduced to our country, in order to expand developmental horizons through education, research and innovation to the police force to overcome many challenges in the future.

Keywords: Police power, demonstration, legal framework

Rooted in Lanka's Own Soil: Finding our very own path to Transitional Justice

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This paper will look at the notion of Transitional Justice. It will attempt to find out if Transitional Justice can be classified as a Human Right. It will explore ways and means of how Transitional Justice could be realized in Post War Sri Lanka.

It will consider the suitability of the Four Pillars namely Criminal Justice, Truth Seeking, Reparation and Institutional Reform.

Also, the application of the Joinet Principles namely restitution, compensation, rehabilitation, satisfaction and guarantee of non-repetition will be explored with regard to Sri Lanka.

The experience of other countries is to be studied and shared through the medium of the research. Examples of South Africa, Nepal, Columbia, Peru, Germany, Rwanda, Sierra Leone and other Jurisdictions will be looked at. Namely, Truth-telling Commissions, Criminal Justice in the form of Prosecutions, Victims' Rights and Reparation.

The current trends in Transitional Justice will be explored.

The role of Civil Society in promoting Transitional Justice will be discussed. Afghanistan and Congo will be taken as case studies.

The paper will also probe into whether true democratization could be achieved without trials. In this regard the methods employed in Uruguay and Argentina will be studied and discussed.

Finally, the road to Sustainable Peace will be mapped out with the promotion of democratic ideals: Truth, Dignity and Justice.

Keywords: Sustainable Peace, Justice, Dignity

Protection of the Rights of Copyright Users with Special Attention to Visually Handicapped People under Sri Lankan Intellectual Property Regime

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Today, the validity of intellectual property has been trumped the validity of all kinds of movable and immovable property. Due to its importance, a specific international organization which was known as World Intellectual Property Organization (WIPO) has been established. Among various types of intellectual property right, the significance of copyright has been recognized by almost all countries in the world. Thus, many international instruments like Bern Convention; Trade Related Aspects on Intellectual Property Rights (TRIPS) Agreement, 1996 WIPO Copyright Treaty, etc. has been formed.

However, the current world has gradually recognized that the rights of a copyright user have not been sufficiently protected. In Sri Lanka too, though there are number of specific section in Intellectual Property Act to protect the rights of copyright owner, author, as well as the rights of performers, producers, even broadcasting organizations, etc. the rights of a copyright user cannot be seen.

Thus, due to this unfortunate situation, though the work is so eminent, the accessibility to that work is sometimes problematic. For instance, it seems that the current intellectual property law has forgotten the rights of visually handicapped users. It is needless to mention about their limited access to books, audio-visual works, etc.

The equality clause (Article 12) of the Constitution of the Democratic Socialist Republic Sri Lanka has implied the protection of disabled people's rights without discrimination. Thus, according to my view, it is high time to amend the Intellectual Property Act in Sri Lanka including the rights of copyright users. In this article, I hope to build the foundation in achieving this aforementioned purpose by analyzing the importance of right to accessibility to a copyright work.

For the purpose of this article, I did a field survey in combination of both quantitative and qualitative research methods. I collected information from visually handicapped peoples by using questionnaires. Anyway, here, I mainly attempted to find details in the variety of their age, the level of their education, income and vision. In addition to that, I collected information qualitatively from legal professionals and academics on Intellectual property law by the form of interview. However, for convenience, I have limited this research to Colombo area.

Due to using very small sample for the field survey, the importance of library research cannot be disregarded. I found primary and secondary sources by using the library of University of Colombo, as well as the internet.

Anyway, I purport in this article to reflect the importance of the rights of a copyright user and give my recommendations for a positive movement. Ultimately, I want this article to be an effective foundation to protect the rights of copyright users, especially the visually handicapped people's rights.

Protection of Digital Databases: Sri Lanka as a Reference Point

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Economic development in Sri Lanka has relied heavily on foreign and domestic investment. Digital databases are a new and attractive area for this investment. This paper argues that investment needs protection and this is crucial to attract future investment. The paper therefore proposes a digital database protection mechanism with a view to attracting investment in digital databases to Sri Lanka.

This paper examines various existing protection measures whilst mainly focusing on the sui generis right protection which confirms the protection of qualitative and/or quantitative substantial investment in the obtaining, verification or presentation of the contents of digital databases. In digital databases, this process is carried out by computer programs which establish meaningful and useful data patterns through their data mining process, and subsequently use those patterns in Knowledge Discovery within database processes. Those processes enhance the value and/or usefulness of the data/information. Computer programs need to be protected, as this paper proposes, by virtue of patent protection because the process carried out by computer programs is that of a technical process - an area for which patents are particularly suitable for the purpose of protecting.

All intellectual property concepts under the existing mechanisms address the issue of investment in databases in different ways. These include Copyright, Contract, Unfair Competition law and Misappropriation and Sui generis right protection. Since the primary objective of the paper is to introduce a protection system for encouraging qualitative and quantitative investment in digital databases in Sri Lanka, this paper suggests a set of mechanisms and rights which comprises of existing intellectual protection mechanisms for databases.

The ultimate goal of the proposed protection mechanisms and rights is to improve the laws pertaining to the protection of digital databases in Sri Lanka in order to attract investment, to protect the rights and duties of the digital database users and owners/authors and, eventually, to bring positive economic effects to the country. Since digital database protection is a new concept in the Sri Lankan legal context, this paper will provide guidelines for policy-makers, judges and lawyers in Sri Lanka and throughout the South Asian region.

Keywords: Digital database, Investment, Intellectual Property Law.

Does Sri Lankan Patent Regime adequately incentivise Local Innovations? A Critical Analysis

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‘Innovators are those who see what everyone sees, but think of what no one else thinks’.

RA Mashelkar

The second decade of the twenty first century is witnessing the rise of global innovation competition. In a knowledge-based economy in which knowledge is used to generate wealth, intellectual property (‘IP’) is considered as a tool for technological and economic development. The term ‘innovation’ is broadly used to mean the creation of better or more effective products, processes or technologies that are accepted by markets and societies. Patent protection is granted for inventions and is designed to promote innovation. The current Sri Lankan patent regime falls far short of the potential benefits envisioned by the lawmakers; namely, promotion of the innovation potential and creation of an innovative culture in the country. The country is still in the initial stage of technological ladder and the industrial sector has suffered over the years due to marginal technological capabilities. Analysing the innovation landscape through the prism of patent statistics of well over a decade suggests that Sri Lanka is a patent granting country, as opposed to a patent producing one. Recent scholarly investigations suggest that there is reasonable nexus between a patent regime and the technological progress of a country. Against this backdrop, this research investigates whether the existing patent regime is adequately focused to promote local innovation viewed through the lens of empirical evidence.

This research was carried out primarily as a library-based research. In so doing, primarily and secondary sources were used. Furthermore, legal research and analysis of the domestic legal framework has been carried out with support of empirical evidence.

The findings of this research suggest that Sri Lanka has fallen far behind in terms of patents, technology and innovation, when compared with her neighbors, and emerging economies in East Asia. The poor patent filing is perhaps the single most obvious indication of a shortage of home-grown creativity. The patent applications filed in recent years remain dominated mostly by foreign patent applications. Thus, empirical evidence supports the view that not many firms in Sri Lanka are enthusiastic about filing patents. The survey evidence shows that patenting propensity among Sri Lankan SMEs is relatively low. In essence, the Sri Lankan patent system remains under-appreciated and under-utilized. From an innovation policy perspective, even though many factors could influence the innovation landscape of the country, including education policies, a country’s technological absorptive capacity, its general institutional base to promote domestic research and development, the patent regime is a vital instrument in promoting innovation and Sri Lanka has probably not paid adequate attention to this important aspect in its economic development drive.

Keywords: Intellectual Property, Patents, Innovation.

The Impact of Tax Avoidance in the context of Economic Development in Sri Lanka: A Critique of Income Tax and Tax Avoidance

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The tax is a compulsory contribution to the support of government levied on persons, property, income, commodities and transactions, now at a fixed rate mostly proportionate to the amount on which the contribution is levied. This description tells us very little, beyond the fact that taxes are compulsory. According to this criterion one may add that taxes are imposed under the authority of the legislature levied by a public body and that they are intended for public purposes. From this income, State could have prevailed severe financial difficulties in the country.

Tax avoidance and Tax evasion are very similar words which could be more affected to the Tax on Income. Tax avoidance is a crucial situation in the tax system, because Levy of income tax has social effects too besides its effect on economic life and the development of the community. Highly progressive rates of tax on individuals which provide the money for various welfare functions of the state have significant social consequences. Affect the social structure of the community to a substantial extent, though these factors cannot be evaluated in exact terms.

In the Act of Inland Revenue No. 10 of 2006, sections 103, 202 and 204 have given the literal meaning of the Tax avoidance and evasion. According to the meanings of these two words the meaning of Tax Avoidance is the legal exploitation of the tax regime to one's own advantage or attempt to reduce taxes through lawful means and Tax evasion means an effort to avoid the payment of Taxes by illegal. In such cases, Rajaratnam V CIR¹, Dawoodbhoy V CGIR² and Abeyasinghe V Gunawardena, CIR and Others³ also interpreted the issues relating to Tax Avoidance and Tax evasion. To create an effective system of taxation and analyse the concept of Income in Taxation, a nation must make choices regarding the distribution of the tax burden, which will pay taxes, how much they will pay and how the taxes collected will be spent., income tax is useful for conducting welfare activities of the government. Mainly, it engages public purpose as it is from public and referred for public welfare activities, salaries of public servants and debts. Imposition of tax directly affects the sum available for spending by the private sector of the economy, and raising or lowering of the general rates of tax even marginally, can have marked deflationary or inflationary effect. The tax may encourage or discourage particular types of activity in the country and specially the development of economy in the country. Therefore it should be better to pay tax and do the duty as tax payers and citizens of the country.

In this context, this paper argues that the existing legal framework applicable to define the concept of income and Tax avoidance. This argument is supported mainly referring to the relevant Sri Lankan legal authorities with one other related country. Thus the objective of this paper is threefold; first is to explore the scope and objectives of these legal frameworks; second is to identify their deficiencies and third is to make appropriate recommendations to improve the exiting legal frameworks. The methodology adopted in this research paper entails two research methods: literature review and comparative legal analysis.

Keywords - Income Tax, Tax Avoidance, Economic Development

¹ 1969- 73 NLR 128

² 1978- 79 SLR 1

³ 4SLTC 1996 2SLR 336

Power Sharing, Economic Development and National Security- Sri Lanka's Crisis of Executive Convenience

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'Stability' through national security and economic development is arguably a dominant model for governance in the contemporary world order. In transitional societies such as Sri Lanka the claims made on the basis of 'power-sharing' and 'internal self-determination' are often understood as seeking to undermine this dominant model and its many uses. Those who advocate this dominant model rest their case on several misguided arguments which rest on a rather narrow understanding of the question of stability in transitional societies. In brief they show a particularly hostile attitude towards political accommodation at a transitional stage claiming them to be an unwarranted distraction and a costly exercise which should not be the key focus. Further they argue that it undermines the need for a strong centre representing strong decision making ability and that it increases the dangers of secession.

In Sri Lanka this was essentially the case in the period after independence. Successive governments were obsessed with the idea of stability through economic development that, for half a century they turned a blind eye to the real claims of the politically isolated communities which resulted in a thirty-year internal strife.

The author seeks to assess through qualitative data analysis the accuracy and the validity of the key arguments posed in support of stability through development and national security as a dominant model of governance in light of the Sri Lankan political experience after independence and similar events in jurisdictions elsewhere. The author attempts to argue based on secondary data that that objectives of political accommodation of claims relating to self-determination and the like and that of development and ensuring national security in transitional societies are not necessarily at variance in order to propose an alternative model for Sri Lanka based on the celebrated principles of good and responsible governance.

Keywords: power sharing, Constitutional Law, responsible governance

Threats to On-line Privacy

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The further development of the World Wide Web is threatened by the lack of online privacy and efforts to destroy net neutrality, says the father of the Web, Sir Tim Berners-Lee. He believed the world had to think about privacy "from a completely different point of view" in future, because the threat to personal privacy will be so great. Consumer awareness about privacy is increasing, particularly among Internet users. Sooner or later, if it is not happening, consumers will demand that their privacy be respected by business. This may require some modification to business practices and customer service and may involve costs not previously incurred. Even American big business has accepted that privacy is a concern, which must be addressed. All the public surveys conducted by and for big business in America showed a lack of confidence that consumer's personal information would be protected if they entered into transactions on the Internet. Privacy concerns have been clearly identified as a barrier to the development of e-business. This paper discusses the barriers to effective E-business and the legal protection for data Privacy in Sri Lanka.

Keywords: Privacy, E-Business, Surveillance

Promoting Entrepreneurship and Protecting Copyright of Authors: Revisiting to the Traditional Meanings of Originality and Authorship of Copyright law

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In this paper, it is argued that even today's changing face of *objectives* of copyright protection and its underlying rationale have a direct bearing on some issues of copyright law. For example, from the very inception of the evolution of copyright law, it was thought that the primary purpose of recognition of this right is to protect the rights of *author* or *creator* of a work rather than that of securing the rights of the person who "has made arrangements to complete the work by way of *organizing* matters and providing necessary financial assistance." This phenomenon is yet accepted in copyright law and even further advocated by writers highlighting that copyright is a way gives property rights in relation to *mental labor* or *intellectual creative labor*. In other word, arguably it is the basic doctrine of copyright law that **copyright rests on creativity rather than investment!**

Despite following the same principle in application and enforcement of copyright law, trends of modern copyright law is much more favorable in determining and securing the rights of these *investors* or, in other word, as commonly known, *entrepreneurs* rather than that of the rights of real authors or creators. This situation is obviously reflective in some copyright concepts such as copyrights of employer, joint ownership/authorship or co-authorship, concept of moral rights etc.

This paper analyzes the dominating nature of copyright ownership of enterprises/ investors and private organizations over the traditional copyright ownership of *actual creators* of works and recommends necessary limitations to be imposed upon entrepreneurs in acquiring full copyright ownership by analyzing the concept of joint authorship and moral right under copyright law. It further emphasizes the importance of providing a broad definition for the idea of originality in the context of the present copyright law development in Sri Lanka.

Keywords: copyright, originality, authorship, entrepreneurship

TECHNICAL SESSIONS
MANAGEMENT
SOCIAL SCIENCES &
HUMANITIES

Strategy for Winning Medals at Elite Competitions in Athletics for Sri Lanka

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Sri Lanka can look back on a glorious tradition in participation at international competitions in athletics. What keeps Sri Lanka away from reaching the victory podium? The objectives of this paper is to study various aspects of historical, social, theoretical and economic contexts involving elite competitions and to determine the courses for the lack of sustainable performance at elite level athletics in Sri Lanka. It is focused on identifying a strategy for development of athletics by adapting the existing systems that have led other nations to win medals. The literature review show that this subject is a global sporting arms race, where a country has to do something remarkably special to yield success. The Methodology used will be the SPLISS (Sports Policy Factors Leading to International Sporting Success) Model which is a conceptual framework. The nine 'pillars' of the model determine the gaps in scientific research on the relationship between elite sport policies and international sporting success. The method for data collection was identified as qualitative interviews. The interview questions are highly structured and serve for a deeper exploration, understanding of the underlying issues behind the phenomenon. The data has been synthesized to provide an easy understandable analysis and displayed in the form of SWOT, to reflect and include a comparison within and in between interviews and combine separate descriptions to formulate a coherent interpretation. The Sri Lankan scenario when summarized under the 'Traffic Lights' system, six pillars falls under 'Green', two pillars categorized as 'Yellow' whilst the remainder specified under 'Red'. In order to develop a strategy in a Sri Lankan context to achieve sustainable performance at elite level, the National Federation should firstly strive to boost up the pillars that blink 'Red' and 'Yellow' and then make all the pillars 'More Greener' by optimum utilization of the available financial and other resources. Sri Lanka could consider Asian Games Medals as the measure of success particularly considering the size of the likely medal haul in a very successful Olympic Games for a country like Sri Lanka. A Sri Lankan version of the Long Term Athlete Development Model of Canada which is designed and developed combining the best research findings of latest sports science and best practices from around the world, is recommended for all schools and universities in Sri Lanka, in order to produce athletes who reach their full potential. One of the possible means to achieve short-term success is through 'cross sport' talent identification and development. In the face of remarkable human resources and infrastructure facilities, if Sri Lanka properly concentrate on all pillars of the SPLISS Model, the country could certainly count on winning medals at elite competitions in the most important sport of athletics.

Keywords: Athletics, Elite, SPLISS Model

A Customer Relationship Management System for the MICE industry in Sri Lanka – “MICESL”

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Sri Lankan Tourism is a rapidly growing industry that has stepped into sponsoring other prospects in the industry over the past year. A significant segment within the tourism industry is MICE Tourism, which refers to Meetings, Incentives, Conventions and Exhibitions. MICE Tourism is an industry that entices revenue to the host country. However, the Sri Lankan MICE industry is unable to accumulate the total revenue from MICE activities, resulting in a negative impact to the growth of the country. Therefore, the research focus was on the impact of Sri Lankan service industry and destination image on MICE Tourism.

The aim of this research was to build a web based framework, in order to effectively support, Sri Lankan MICE industry. Therefore, a detailed literature survey was conducted to analyze the problem domain in the industrial expert's viewpoint. In addition, web based questionnaires, semi structured interviews and observations were used to gather data from other stakeholders of the system. A sample of 50 employees of the service industry, 36 employees of business organizations and 14 MICE tourists was used to conduct this survey.

Based on the industrial survey the key findings of this research was that Sri Lanka has established plans to improve the infrastructure of the country to attract and accommodate more MICE tourists. However, the image of Sri Lanka is not well developed and the service quality of the hospitality and transport industry plays a major role in a MICE tourist perception of the country.

Therefore, based on the findings of the research it was considered to develop functional online collaboration platform as a website linking organizations, hospitality and transport industry of Sri Lanka for attraction of MICE tourists. The web based prototype was developed using a Content Management System: Word Press, PHP integrated with MySQL. In order to conduct this research, object oriented methodology was used as a general approach and rational unified process as the system development approach.

Keywords— MICE industry, Service Quality, Destination Image, Customer Satisfaction, Customer Relationship Management

Employee Motivation and Productivity Improvement in Sri Lankan Apparel Manufacturing Sector

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Employee motivation is highly significant for the organizational productivity. Improved productivity in apparel manufacturing sector is considered as one of the key input for the development of Sri Lankan economy. Lower productivity targets achievement, having higher labour turnover rates and higher employee absenteeism rates more than the standard set levels and these are critical situations in Sri Lankan apparel manufacturing industry. Employees are regretting highly on their financial benefits and non financial benefits, which are provided by their organizations. This empirical study was carried out on employee motivation and productivity improvement. Main question of this research was that, what the effort made by authority to improve productivity through a sound motivational mechanism in Sri Lankan apparel manufacturing industry? The aim was surveying the relationship between motivation and productivity, and on the other hand personal factors, organizational factors and interaction factors affecting on employee motivation. There were four objectives and research was based on four hypotheses. Research approach was deductive approach. Statistical population was entire apparel manufacturing organizations in Sri Lanka and the methodology has been questionnaire based survey, observational methods and interviewing techniques. Sample size was 500 and subjects selected were the apparel employees; top, middle and lower levels from ten large scale apparel manufacturing organizations located within Western province in Sri Lanka. Non random stratified convenient judgement sampling technique was applied. Reliability of data was checked by Chronbach's alpha. The data were analysed using statistical methods of simple linear regression, correlation and multiple regressions with the SPSS.

There is a strong positive relationship between employee motivation and productivity, and also different personal factors; such as perception of behaviour, interest, needs as well as, different organizational factors; feedback, co-workers, task design, supervision and rewards significantly affect employee motivation, while attitudes and communication do not significantly affect on employee motivation in Sri Lankan apparel manufacturing sector. Further, there is an interaction between two key employment hierarchical levels; top level and middle, lower level for different personal factors and organizational factors. Ultimately, well planned rewarding strategy, positive feedback with praising for accomplishments, employee mentoring, training and development and concerning the psychological aspects are highly recommended to improve productivity through a sound motivational mechanism for Sri Lankan apparel manufacturing industry.

Keywords: Motivation, Sri Lankan apparel manufacturing industry, productivity

Implementation of the 360 Degree Performance Appraisal Feedback System in Private Sector Organizations in Sri Lanka

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Performance appraisal is very essential for effective management which helps to develop the employees and leads to improve the performance of organizations. The job performance of employees in an organisation is measured and evaluated through a performance appraisal system over a period of time with set standards. Different types of organizations are using different methods of performance evaluation and 360 degrees performance appraisal is one of them. Though, this system is not popular in Sri Lanka, many multinational organizations are using this method for measuring employees' performance. This technique receives feedback of employees' performance not only from their supervisor/s but also from co-workers, subordinates, self, customer etc. as a multiple source feedback.

Many organizations in Sri Lanka are managed as per the hierarchy and the decisions are made by the top level of the hierarchy. Most of the time, subordinates are dissatisfied about their performance rating which were given by their supervisor/s due to the usage of a performance feedback system that does not absorb the real image of their performances. Therefore, the research problem was whether the 360 degree performance feedback system can be implemented in Sri Lankan private sector organizations or not. This paper attempts to discuss possible ways of implementing this system in the Sri Lankan private organizations.

Quantitative as well as qualitative data were utilized to achieve the objectives. The sample includes 200 employees from selected 10 medium and large scale organizations in Colombo area. A random number table was used to select 20 employees from each organisation. Cronbach's Alpha value was calculated based on the feedback of 11 variables that directly affect to the satisfaction levels of employees. The Cronbach's Alpha value of 0.826 suggests that the questionnaire used for collecting the data on satisfaction levels is highly reliable. Data presentation and analysis were based on selected statistical measures (central tendency, dispersion and skewness), diagrams and tables. The SPSS was utilized to analyze the collected data.

The results depict that the 360 degree performance feedback system is not utilised by the private organizations in Colombo area mainly due to hierarchy of the organizational culture as well as time consuming and unawareness. However, the findings show that there are some avenues to implement the 360 degree performance feedback system as an addition to the existing conventional appraisal system. Implementation of the 360 degree performance appraisal feedback system in Sri Lankan private organizations will help in the development of the organizations as well as employees.

Keywords: Performance appraisal, 360 degree feedback system, Employee development

Is Stress a Bad Factor in Employee Work Performance (EWP) in Sri Lankan Public Sector?

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Stress experienced by employees has been identified by plenty of scholars as a horrible phenomenon that should be eliminated so that the employee work performance (EWP) could be enhanced. In other word, stress has mostly been noted as a negative phenomenon as far as the EWP is concerned. This notion of idea was tested in the present enquiry by analysing data obtained in Sri Lankan public sector organizations. The study was conducted in the months between July to December 2013 in association with Sri Lankan public sector organizations covering three provinces (Western, Southern, and North Central). The sample studied was composed of 661 employees belonged to three employee categories (managerial, clerical, and below clerical) working in three organizational categories (national, provincial, and district). The methodology of the study was the survey method in which a questionnaire was used as the key data gathering tool. Data analysis process was occurred by the use of computer based SPSS package (version 20), and one-way ANOVA system was used to investigate co-relations among variables. The study clearly identified those who had experienced some level of stress reported over 30% work performance as compared to those who experienced no stress. According to the result of the hypothesis test, it was found that there is no significant difference in mean impact level due to stress among employees belonged to diverse employee or organizational categories. These findings are a clear indication to suggest that stress caused by employees (irrespective of their employee and organizational categories) is no longer a horrible factor in taking EWP into account, and what is the truth is the opposite. Last but not the least, the findings of the study makes a counter argument against the dominant ideology, to state that some level of stress experienced by employees is a positive factor that enhances EWP.

Keywords: Stress, Employee Work Performance, Findings of the Study

Analysis of the Household Demand for Dairy Products in Sri Lanka: an Almost Ideal Estimation with a Censored Regression

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Dairy sector has been identified as the leading sector amid other livestock sub sectors in Sri Lanka. However, only around 20% of the domestic requirement has been realized by the current status of the dairy industry. Conversely, out of milk and milk products available for the consumption, 71.2% have been imported into the country, mostly in the form of powdered milk, which has become controversial due to the toxic chemical dicyandiamide (DCD). Besides, the annual per capita consumption of milk has been recorded as much lower than the recommended level for an average Sri Lankan. Hence, consumption of milk and/or milk products should be promoted in order to meet the nutrient requirement. Thus, this study intends to present price and expenditure elasticities, in order to discover the consumption behaviour of several types of dairy products, by households in Sri Lanka. Moreover, this aims to determine the impact of demographic factors which influence the dietary choices of those dairy produce.

With the assistance of the Household Income and Expenditure Survey, 2006/07, Linear Approximation of the Almost Ideal Demand System (LA/AIDS) was employed to estimate elasticities, by considering 18,544 households. The infrequency of purchases, a typical problem encountered in LA/AIDS estimation is circumvented by using a probit regression in the first stage, to capture the effect of demographic factors, in consumption choice.

Results reveal that the buying decision of almost all dairy products is having non-significant impact from most of the demographic factors. Hence, it can be said that Sri Lankans consume these milk produce regardless of the area they live, size of the household, gender of the household head, education level of the head and spouse, prevalence of heart diseases and diabetes. Conversely, estimates highlight that pasteurized milk is highly demanded by urban households, while estate community is more likely to go for fresh milk. Moreover, it is quite clear that households where children are present reflect a significant positive relationship with the consumption of infant milk powder. Since blood pressure patients are encouraged to consume low-fat milk in order to obtain the nutrients which lower the blood pressure, results report that households where blood pressure patients are present tend to purchase more milk powder than other products. All dairy products except milk powder are highly responsive to their own prices. Cross price elasticities suggest that there is a strong substitutable relationship between infant milk powder and fresh milk, while both of them can be substituted with milk powder. With respect to the expenditure elasticities, fresh milk, milk powder and infant milk powder are identified as necessities and the rest is identified as luxuries.

Because milk powder holds the most prominent choice among all other alternatives, any action imposed on powdered milk will have a significant impact on Sri Lankans' dietary choices with respect to the dairy products. Moreover, demand for rest of the milk products will be more influenced by price related policies than income oriented policies.

Keywords: AIDS model, censoring, dairy products

Poverty and Perception: Driving Sri Lankan Children's Homes at Multiple Levels

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In Sri Lanka, many children are housed in institutions for economic, social and cultural reasons, as well as the impacts of the civil war and global climatic change. Children's homes house almost 20,000 children, a huge population who have been denied basic human rights by being deprived of parental care and labelled orphaned, abandoned or destitute. These figures are disturbing in a multi-religious and diversely cultured state where moral rhetoric abounds, but concerns need to be translated into practice.

My participatory action research was carried out across all nine provinces in Sri Lanka, involving policy makers and service providers responsible for children without parental care. All commissioners of the Provincial Departments of Probation and Child Care Services were interviewed to ascertain their role in the policy making process. Thirty managers from different children's homes were interviewed concerning their service provision. All 298 probation officers, 287 child rights promotion officers, and matrons and wardens of all 416 children's homes were included in a questionnaire census approach. Of these, approximately half responded. The recruitment of these groups as participants for the study was based on the aim of using their feedback to produce a set of guidelines for the process of policy making and governance of children's homes.

This participatory action research has identified many issues of policy implication and service provision across agencies charged with care of children. This paper investigates the impacts of socio-economic and cultural environments on children both before and during their institutionalization.

Keywords: Participatory Action Research, children without parental care, agencies.

A study on Economic Liberalization and its Impact on Foreign Trade in Sri Lanka

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This is a study of the Economic Liberalization and its impact on Foreign Trade in Sri Lanka. At independence, Sri Lanka consists of a dualistic export economy. The economic performance of post independent, Sri Lanka has improved after the introduction of liberalization policies in 1977. General objective is to investigate the effects of liberalization on the foreign trade in Sri Lanka. Specific objectives were to find out the relationship between liberalization and its impact on exports and imports. In order to accomplish the objectives secondary data over 35 years (from 1977-2012) and descriptive analysis and SPSS are used. The data series used were obtained from annual statistics of Central Bank of Sri Lanka and the Internet. However, after the liberalization, exports sector started to play an important role in the economy in various streams. Also import sector faced dramatic changes in performance. Agricultural exports which were 80% in the total exports of the country in 1977 declined dramatically to 19% in 2007. In contrast industrial exports increased from 14% in 1977 to 76% in 2007. In 2007 the value of total Export is US\$ 7640 and it has gone up to US\$ 9773.5 in 2012. In 1990 the total value of imports has taken the value of US\$ 2,686 and it has increased up to 13,512 in 2010.

Keywords: Economic Liberalization, Foreign Trade, Industrial Exports.

The Role of Education as a Source of Human Capital on Rural Poverty: A Review of Literature

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Rural area is a geographic area located outside cities and towns. In order to have long term sustainability in rural sector, education as a source of human capital formation plays a major role by empowering the rural people to a right direction in a productive manner for right decision making ability. Hence the education would be a sustainable strategy to uplift the rural sector with agricultural development. Although for last few decades, many subsidiary programs were introduced in order to alleviate rural poverty, still rural sector has poverty. However, there is a structural change in the rural sector due to either subsidies or free education system. Hence, the objective of this review is to explore how educations as a source of human capital would impact on to expand the living standards of the rural sector as identified by literature. For over past two-three decades, large number of studies has been documented in relation to this theme. In the present study substantial amount of published articles were referred in order to grasp the real gravity of the agricultural development in the light of education as a desk research.

The objectives guiding the analysis of literature are to; understand the relationship between education and human capital development; human capital and human development; human capital and rural agricultural productivity; and human capital as a source of human capital to alleviate rural poverty. This review is instigated by searching key academic databases using relevant search questions. The literature suggests that there is an inverse relationship between human capital and rural poverty

Keywords: human capital, rural poverty, education

Indo-Sri Lanka Bilateral Relations: Analytical review on Political & Cultural relations since 2005

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In ancient history, India and Sri Lanka maintained close relationship with each other's due to closed geographical proximity. Meanwhile religious and political ideology brought important factors to determine bilateral relations between both countries. During the western colonization in Asian content, both countries were under British Raj nearly hundred and thirty years and got independence during same time. During the colonial period both countries faced political & cultural threat to their own regimes due to British administrative framework & missionary in Asia. During the post-colonial era both countries maintained close relationship within the international system due to their bond to commonwealth organization and ethnic sensitivity towards each other's.

Indo-Sri Lanka Political and Cultural relations mark critical point since the beginning of ethnic conflict in Sri Lanka. Sinhala Tamil ethnic conflict which is protracted internal war made more Indian involvement to Sri Lanka in past three decades. Under His Excellency the President Mahanda Rajapaksa, Indo-Sri Lanka Bilateral Relations begin in new face to develop interdependency with each other's. Moreover India becomes more influence party to determine Northern and Eastern development over Sri Lankan Tamil community during Eleam War IV and post war era.

The main objective of this paper is to evaluate Indo-Sri Lanka bilateral relations focusing on Political and Cultural arena. Through that understanding the Indian supremacy over Sri Lankan and regional territory and Indian involvement to post war development is also gained. Moreover, this paper will highlight contemporary issues between India and Sri Lanka. Through that finding, solutions for those challenges could also be expected.

More confidential primary sources such as Government Press Release, the speeches, made by authorities are highly useful to examine this context. Secondary sources such as newspaper & Journal articles will be referred to understand the context and address the research issues properly. Both primary and secondary sources will be referred to address Indo-Sri Lanka Political & Cultural Relations since 2005 and changes of patterns in recent decade.

Keywords: Development, Political Relations, Ethnic Sensitivity

Impact of Drug Addiction & Its Dangerous Outcomes & the Future of Sri Lanka (A Buddhist Perspective)

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Drug addiction has been considered as one of the world's largest enemies. As Buddhists, we must be aware of this terrible situation with the open-mind. True Buddhist never violates the Five Precepts (*pañcasīla*). The last of the Five Precepts in Buddhism advocates complete refraining from taking intoxicating drinks and the other alcoholic drugs. Total abstinence from taking intoxicants is extremely significant for the mental and physical health of society. *Drug addiction like alcoholic drinking, tobacco smoking like cigarettes, cigars and pipe smoking, smoking cannabis (ganja), heroin ...Etc* has become one of the most troubling social problems in the modern Sri Lankan society. Objectives of this article are to suggest the Buddhist solutions to wipe out drug abuse. One of the main factors that is retarding sustainable development economic growth and the increase in poverty at the grass roots level continues to be the use of drugs mainly alcohol and cigarettes. Trend in Liquor challenges the entire moral order of society if we are planning for a prosperous country. The cost burden to a country because of the consumption of alcohol due to ill health, violence, accidents, loss of productivity has made alcohol the number one factor in the burden of disease of middle income countries such as Sri Lanka. The data for study has been collected from the primarily Buddhists teachings and the relevant books and articles written related the field and social experiences. Buddhism is fully aware of the nature of social problems, their causes, and the methods for resolving them. Its social impact is tremendously great. The Four Noble Truth can be applied as a resolution for this dangerous issue. The *Singālovāda*, *Vanijjā*, *Parābhava Suttas* talk about how it causes for moral and cultural decline.

Keywords: Drug Addiction, Buddhism, Five Precepts, Development, Sri Lanka

Determinants of Child Labour in Sri Lanka

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Children are the key of future human resources of any region. However some children have to work entire day to satisfy the basic needs and wants and their family as a labourer, called child labour. The child employment is hard, cruel and violates their rights of education, health protection from work that is hazardous or exploitative. In Sri Lanka one of out of every eight children is economically active. A large number of children in Sri Lanka work in unregistered sector.

The prime objective of the study is to identify the determinants of child labour in Sri Lanka. 120 questionnaires were used from both child labors and non child labors from the Pettah, Colombo district using Convenience sampling method. Binary logistic regression was used for analysis.

The study found that child labor is primarily caused by low income level of household . Parents of child labors are received lower level of income compared with the parents of non-child labors. The income is not enough to maintain family needs and wants. It leads to exploitation of children's time for employment instead of schooling or education. Education level of household heads also has negative relationship on child labor. Lower levels of education of parents have higher possibility to make their children with employment. The education will be the key of making skills and capacity of persons and it is linked with income level of persons or family. Lower level of education of the family will make the worst form of attitudes on education. The lacks of supports of household on education are resulted to make low motivation of children's study. Thus the time of schooling will convert to employment activities. Further magnitude of the household is one of affected factor to engage children in employment. Child labour rate is high when the members of family more than considerable amount compared with families that have fewer members. Employment status of head of the family makes negative impact on children's employment. Many of child labour can be seen where the heads are self-employed workers or small business holders. Many of temporary employment opportunities are available in business or self-employment sector. Thus children have opportunity to engage with such kind of employment under the permission of parents or not. The family with child labour has lack of infrastructure compared with non labour families. Thus the lower facilities availability in household are affected to child employment.

Keywords: Child labour, Non child labour

Factors Affecting the Patients' Decision in Selecting a Hospital in Medical Emergency

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Selecting a hospital in a medical emergency is a critical decision for any patient or patient's guardian. Though there were many researches done on this subject area in the developed countries, there were no studies done in Sri Lanka. As Sri Lanka did not have a structured emergency medical care setup covering the entire island, it was a quite interesting exercise to establish the factors which influenced a patient or patient's guardian in selecting a hospital in medical emergency. On the other hand, private hospitals in Colombo have better facilities for medical emergency patients than the state sector hospitals. But many patients sought the services of state sector hospitals in medical emergencies.

This study was done to establish the reasons for above mentioned situations. The patients admitted with medical emergencies to National Hospital of Sri Lanka (NHSL) and Lanka Hospitals (LH) were considered for this study. 15% of the medical emergency patients of NHSL and LH in the first week of April 2014 were randomly selected for this study. Based on that, we had collected the data pertaining to 166 patients out of 1,036 emergency patients of NHSL and 40 patients out of 266 emergency patients of LH. The collected data was analysed using SPSS version 16. Nominal and ordinal scale data were reported as absolute and relative frequency.

The study revealed that a patient or patient's guardian considered a number of factors in selecting a hospital in medical emergencies. The study explained that the reputation of the hospital in handling the medical emergencies was considered as the most important factor in choosing a hospital for medical emergencies. Further non-availability of health insurance cover and unaffordability were the other major reasons for selecting NHSL in medical emergencies.

The study revealed that the patients preferred NHSL than private hospitals in Colombo when there was a medical emergency. Further the medical emergency patients of NHSL satisfied with their treatment than the patients of LH.

If a private hospital in Colombo expects attracting more medical emergency patients it will have to concentrate on the factors which improve the reputation of its Emergency Department. This can be achieved through a research based interventions on the areas of patients' concerns in relation to Emergency Department of the hospital.

Keywords: medical emergency, emergency department, reputation

Sociological study on the Female Stereotypes in Sri Lankan TV Commercials

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Common female stereotypes found in the media have a powerful influence over how society views women and how women view themselves as a whole. A Stereotype is a rigid and inflexible image of the characteristics a group. It attributes these characteristics to all individuals belonging to that group with positive and negative impacts. Thus, the main objective of the present study is to examine the impact of Sri Lankan TV commercials on generating and reflecting the female stereotypes in the society. This content analysis is conducted by employing 100 advertisements selected under purposive sampling method, which has telecasted in the ITN channel from 01st September - 30th September 2012. The study is limited to ITN, as commercials telecast in TV channels generally similar in nature. Furthermore, ITN has undergone some notable changes to compete with other TV channels and gained much attraction from the audiences and came top of the rank in the television awarding ceremonies within the recent years.

According to the research findings, 69% of women in the advertisements were attached to household activities by impounded them in conservative portrayals of the private sphere, while presenting men as an incompetent for those. Female images in the advertisements tend to undervalue women as whole, and diminish them to sexual objects and passive human beings by adding desirable physical characteristics include being thin, long-legged, slim-hipped in 71% of commercials. Furthermore, purpose of commoditisation of the female body, it has used 35% of Indian and 10% of European advertisements. Traditional village beauty is highlighted in the most local commercials. In 52% of advertisements women were represented as helpless beings depending on male power and knowledge. This creates very low expectations, especially for adolescents and their role models. Accordingly, most of the advertisements clearly reflecting the existing gender inequalities and maintain the status quo. These negative stereotypes inevitably affect our cultural values and norms through the socialization process. Thus, it is needed some unbiased practice and policy framework in creating TV commercials in Sri Lanka.

Keywords: Stereotype, Commoditification, Socialization

Disciplinary Enculturation in Critical Thinking: Do we adopt a Strategic Approach?

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As critical thinking is a key of higher education, academics in various disciplines in Western universities strive to cultivate disciplinary based critical thinking by introducing subject specific knowledge and allowing students to apply these skills in a broader physical and social context. Such a task is equally challenging in postgraduate and undergraduate courses. Numerous studies show that students from Asian contexts demonstrate poor critical thinking skills and therefore, Asian universities must consult this debate to examine the validity of these dichotomous views. This study investigated macro and micro strategies that academics adopt in their teaching and assessment procedures to enhance students' critical thinking skills at an Australian university in the schools of Physical Sciences, Engineering, Humanities and Business. The study included 20 in-depth interviews with academics and the qualitative analysis of 20 summative and formative assessment tasks. The study shows that critical thinking is an essential component in transforming students to be workplace ready in their fields. Thus academics adopt various pedagogical strategies to cultivate critical thinking in their majors. The study indicates several challenges in developing disciplinary focused but holistic thinking with a subtle shift between scaffolded activities and independent learning. The study provides implications for pedagogy and curriculum measures. These findings offer a helpful platform for other higher education contexts devise their curriculum and pedagogical strategies.

Keywords: Critical thinking, pedagogy, enculturation

Tertiary English Education: Are we Producing Lifelong Learners?

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Given the importance of English language as a pre-eminent international language today, the competency in English language, maintaining continuous passion to learn English, and acquiring the skills associated with lifelong learning of English have now become essential. Thus, most Sri Lankan universities have also acknowledged the need to offer an English course for all the undergraduates and it is vital that the undergraduates should develop into lifelong learners of English who retain a passion for learning English even after the completion of formal examinations. Thus, this paper attempts to explore whether the undergraduates in Faculty of Social Sciences and Languages (FSSL) of Sabaragamuwa University of Sri Lanka (SUSL) have the inclination to become lifelong learners (LLL) of English after completing their Core English Language (CEL) course and whether there is any association between their gender and their tendency to become lifelong learners of English.

Using the simple random sampling 130 students of SUSL were selected for this study. In addition to semi structured interviews and class room observations, data were collected mainly by questionnaires designed on a five-point Likert-scale adopting items from Macaskill & Taylor's questionnaires (2010). Mean Comparison, Crosstabs and Pearson Chi-square were computed for the purposes of analysis.

The study revealed that over 80% second-year undergraduates of FSSL in SUSL had the propensity for lifelong learning of English whereas 19% undergraduates were not lifelong learners. Moreover, no significant association could be seen between their gender and the tendency to become lifelong learners. Hence, as they have the most required propensity to become lifelong learners of English irrespective of their gender, the lecturers, and the administrators should take every possible step to make them enjoy learning English, get the maximum benefit out of the CEL course, and help them to sustain and develop the skills associated with lifelong learning.

Keywords: Lifelong learners, Gender, Tertiary English Education

The Effectiveness in Implementation of the National Plan for a Trilingual Sri Lanka: in Relation to the Role of English in School Level

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The 10 Year National Plan for a Trilingual Sri Lanka could be identified as a major step in the Sri Lankan history which upon being successfully implemented and executed could result in many benefits to the country as well as the society.

The Plan was first executed only in the fairly recent history of 2012. Thus, the expected outcome and the overall effect of the plan remain completely hypothetical. Therefore, given the lack of analysis or rather any detailed account on the Effectiveness of the National Plan, it is the aim of this Paper to account for the effectiveness of the National Plan in relation to the Role of English.

The Paper will especially revolve around the Role of English (in relation to schools) in the National Plan while dealing with the many strategies adopted by the Plan to promote English Language Island wide. The strategies that are now used to promote English language in schools, promise of a better catering to the need of promoting English language nationwide in an equal and a more benefitting manner. Through this Paper the strategies are discussed analytically as to how it is implemented in a practical scenario. And in addressing these issues the paper tries to look into the challenges and drawbacks faced during the implementation of the mentioned strategies. The Paper tries to seek the methods which can be incorporated in order to increase the effectiveness of the National Plan in relation to the role of English language in schools.

Thus the objectives of this research would be as follows,

1. To collect information about the effectiveness of the National Plan at its current phase, in relation to English in schools.
2. To Form an analysis on the effectiveness of the Plan in its expected outcome.
3. To construct an insight into the 10 Year National Plan.

The Paper will follow different methods of data analysis and will be largely quantitative in nature for the reason that the research aims to achieve a practical approach in determining the research problem. Therefore, the research will be based on a field setting of various government institutions, departments, schools etc which deal with the execution of the 10 Year National Plan. (E.g. - Ministry of National Languages and Social Integration, Ministry of Education)

The primary sources of data collection would be interviews and questionnaires gathered mainly through the above mentioned institutions. The secondary sources of data collection would mainly be the various reports, articles, books on the 10 Year National Plan for a Trilingual Sri Lanka.

Keywords- The Ten Year National Plan for a Trilingual Sri Lanka, English as a 'life skill'

Stakeholder Needs in English for Legal Purposes (ELP) for Sri Lankan Undergraduates

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Studies on need analysis in English for Specific Purposes (ESP) have focused their attention on identifying contradictory stakeholder needs. This study is aimed at identifying needs of stakeholders with regard to the preferred content of an English for Legal Purposes Course (ELP) for Sri Lankan law undergraduates. Needs of 104 stakeholders in two university English courses (i.e. law undergraduates, law lecturers, English lecturers, Heads of Departments of Law and a Course Coordinator and lawyers) were collected using questionnaires and semi-structured interviews. Stakeholder needs were identified in terms of necessary language skills, learner lacks, stakeholder rights and collaboration. The mean values of the law undergraduates' responses, collected from questionnaires, were calculated, and in order to measure whether there is a significant difference in the mean values of the undergraduates of each academic year One Way ANOVA tests were carried out. Further, data collected from open-ended items of the questionnaires and semi-structured interviews were analysed qualitatively by grouping related responses and identifying patterns of stakeholders' responses. The results of this stakeholder needs analysis include necessary language skills, preferred activities and non-linguistic needs such as teaching methodology, materials and assessment. This study would provide an empirical basis for curriculum planning for an ELP course and a foundation for tailor-made language course for Sri Lankan law undergraduates.

Keywords: stakeholders, needs analysis, linguistic need

A Comparative Study on the Analysis on "Verb" by Kumaratunga Munidasa and J. B. Disanayaka

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Both Kumaratunga Munidasa and J. B. Disanayaka are two eminent scholars who have compiled novel grammar books by analyzing the structure of Sinhala verb in terms of fulfilling the contemporary language needs of the society. This research comparatively studies the definition, categorization and analysis on "verb" described in *Kriya Vivaranaya* (1932) written by Kumaratunga Munidasa and *Basaka Mahima: II - Kriya Padaya* (2001) written by J. B. Disanayaka. The methodologies of Corpus Planning such as standardization, reformation, and purification are used in the process of analysis. Kumaratunga has analyzed the verb based on "**dhatvarthaya**" (meaning of a stem) and on the other hand Disanayaka analyses the verb based on "verb suffix", "morpheme". Both "**Kriya Prakurthiya**" (*Dhathu*) and "**Kriya Prathya**" are significant in the same capacity when formulating a verb, because a verb is a synthesis of both the items. Kumaratunga categorizes the verb into three main categories namely "**Shuddha Kriya**", "**Nama Kriya**" and "**Nipatha Kriya**" and he uses five basic factors in categorizing "**Shuddha Kriya**" or "**Aakyathaya**" (predicate), they are "**Sankya Bhedhaya**" (Number), "**Kaala Bhedhaya**" (Time), "**Pada Bhedhaya**" (Gender) and "**Karaka Bhedhaya**" (voice). Disanayaka's categorization illustrates six types of verbs namely "**Avasana kiyapada**", "**Anawasana Kriya Pada**", "**Vakya Anubaddha**", "**Kriya Pada**", "**Prayojjyak Kriya**" and "**Other Verbs**" and the other verbs are further analyzed under several sub categories. There is a clear diversity in the nomenclature, categorization and the analyses of the verb by the two authors. Though, both of them were analyzing the verb, the analyses were different. Actually, what Disanayaka has done is not a standardization the theories of Kumaratunga, but rather a modernization and a reformation of them. The research also scrutinizes the variations of their analyses while bringing to light the fact that the theories of Kumaratunga and Disanayaka have got non-standardized among the novel language standardizations of contemporary society.

Keywords: Verb, *Kriya Vivaranaya* (1932), *Basaka Mahima: II - Kriya Padaya* (2001)

The Contribution of Caregivers in Christian and Buddhist Preschools in Respect of Early Childhood Care in Sri Lanka

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Early childhood is considered as the most important and decisive period in forming the foundation of the holistic development of one's personal life. The type of one's future personality depends on how he or she brought up during this period. According to the national early childhood care and development in Sri Lanka this period is defined as the period from conception to the age of five years. The views of teachers in four Christian preschools and four Buddhist preschools are examined in this qualitative study of early childhood education in Sri Lanka. In Christian preschools, the guiding principle was that each child was a precious gift of God. This belief resulted in a play-oriented curriculum that maximized the choices available to children. Teachers also attempted to encourage children's creativity and their ability to formulate thoughts and express them to others. The data are drawn from interviews and observations of 32 early childhoods in Colombo and Negaombo area. The visit to each setting included an observation of approximately 1 hour in a classroom serving 4-year-olds and an interview with the one or more teachers. The open-ended interview, which lasted from 1 to 3 hours, was designed to probe cultural models regarding goals of the preschool experience, theories about the role of the teacher in facilitating learning, views about discipline and control, details of the curriculum and activities, and perceptions about the family and its relationship with early childhood education. The observations were used as a source of examples to deepen these extended conversations. All interviews were tape recorded; in addition, detailed notes were kept during the interview. Notation on the brochure for Negombo preschool sums up the connection between nutrition, group orientation, and spiritual awareness.

The Buddhist schools were among the many schools, some had over 600 pupils. If the present economic uncertainties continue, these schools will likely continue to be a very appealing method for parents interested in giving their children a head start in school. Yet, in spite of factors that work to blur the distinct philosophical contribution of the various religions, researchers have seen concrete ways in which the ideologies of Christianity and Buddhism continue to influence Sri Lankan preschools. In the past decade, researchers and policy experts have been grappling with the feasibility of a global definition of child care quality that could be applied across all institutions in any community across the country. The elements of "appropriate practice" have been articulated by the Policy of western province Pre School.

Keywords: curriculum, Activities, preschool, creativity

Factors Affecting to Distract the University Students Education in Sri Lanka

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Government Universities in Sri Lanka are institutions which offer free university education in all disciplines to local students who attain higher grades and Z score in the General Certificate of Education Advance Level. Approximately 250,000 students sit for University entrance examination annually and approximately 20,000 qualify to be admitted to the universities in different disciplines.

The qualified students are admitted to 15 universities, 03 compasses and various other higher education institutes. These students are suppressed by internal factors which are inheriting to students such as Language barriers, inferior Personality, Lack of Vision, Depression, Home Sickness, Poor Time Management and Lower Social Status, and External Factors such as Shortage of Food, Unavailability of reasonable clothing and Poor Accommodation. Though the authorities have taken measures to cushion these factors by way of granting scholarships and allowances, a third dimension emerges as Influential factor which the authorities have not well identified. New Society, Sub Groups, Politics, Uncertainty of future, Influences by Senior Students, fear and obligations are included in this third dimension. These factors alter the students' attitude and behaviour resulting an unhygienic environment to their university education. To counter this issue, Universities along with certain ministries have launched many programs inclusive of Leadership Training but to date there have been no concrete solution found to mitigate the students' unrest.

Aim of this paper is to examine the actual facts which change the behaviour of the University Students, how this change affect their education and to give possible solutions to the problem. It was hypothesised that Internal, External and Influential factors affect the behaviour of University Students.

The Study was focused on the Art Stream University Students of UGC approved State Universities. Interviews were conducted and a Questionnaire was disseminated among students to gather data.

University is supposed to be a knowledge development agency which enhance the intellectual abilities of its students but at present it is not so as the study is not futuristic and job oriented. Further Government University education does not give a job guarantee to its students. These factors along with internal and external factors act negatively creating a National issue.

To minimize the above possible affects, the following are recommended to practice.

- a. Quality of education to be improved with latest technological aids and facilities.
- b. University education shall be Job oriented.
- c. Students shall be given an exposure to industries.
- d. Students bank loans by state banks to be provided with less interest.
- e. Reasonable and adequate accommodations facilities must be provided.
- f. Effective student counselling system shall be introduced.
- g. Create a friendly atmosphere improving student / lecturer relationship.
- h. Student and Lecturers union to be introduced.
- i. The leadership training shall focus on developing soft skills and a Vision to students.
- j. The Mahapola Scholarships and bursary must planned before enrolling the students.

Impact of Music on Education of Primary Students in Colombo District

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Education is the process of transferring skills, knowledge and habits of people from one generation to the next. Education is obtained through the methods of learning and teaching, and by life experiences. As Oxford University defines, music is “Vocal or instrumental sounds combined in such a way as to produce beauty of form, harmony, and expression of emotion”. One’s learning which is done in order to obtain education is affected by his or her learning diversity. So, it is hypothesized that music can be used as a tool of learning diversity which will be reliable to make the education of a primary student, more effective and meaningful.

Researches have been conducted about the application of ‘music for education’. But they have not researched its effect on primary students using the concentration power of music for the achievements of education. The research was conducted as a quantitative research. Two sets of samples in which each consists of 50 students of grade five were taken from Piliyandala Central College. All of them were given an IQ paper, which matches the IQ level of their age, of half an hour while one set is provided with a piece of pleasurable music throughout the paper while the other is not. Other than that, all the other factors which will affect their concentration and performance were kept equally to all the sets. The same experiment was conducted using the same samples twice a month for three months providing them different IQ papers.

According to school CENSUS 2008, Colombo is the district in which many studies have been carried out having the largest student population of the country. The selected sample for the study is also located in Colombo district, representing both male and female students. Convenience sampling is occupied as the sampling method.

After three months, the controlled groups were changed. Those who were kept as the controlled group were given those pieces of music while they face tests during the period of next three months of the research. The other sets were then considered as the controlled sample and they were not given the music. The tests will be conducted in the same manner, for the following three months and then the test papers will be collected and marked.

Through the research, it is expected a considerable difference in overall performance of the students of controlled group and the other. It is hypothesized that due to the concentration gained through music, students must have obtain better marks in the tests. The marks of each group for all the tests can be graphed versus the fifty students. The difference of distribution curves between controlled and non-controlled groups were analysed using SPSS.

Keywords: Music, Education, primary level students.

Animal Figures Found from Mosaic Designs at *Karagampitiya Subodharamaya*

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The main objective of this research paper is to explicate about animal figures found from mosaic designs in Sri Lanka with special reference to mosaics at Karagampitiya Subodharamaya. The methodology of this research paper consist with field research and library survey methods; field research method was highly emphasized to collect data. This temple has great significance from archaeological, anthropological, historical and art historical aspects. Karagampitiya Subodharamaya located at Karagampitiya village in Dehiwala divisional secretariat which belongs to Colombo district in Western province. It has extended history from the king Parakramabahu VI (1412 - 1467 AD) and it was faced to several changes within the colonial period of Sri Lanka. A piece of art work created by placing coloured segments of tiles, porcelain, glass, stones and coins in a pattern to create a picture is called as Mosaic art. This art tradition has ranged history from BC and in the world Mosaic art, developed in various periods according to the subject and features. At the Image house and at the *Sathsathige* can be seen floral figures, animal figures, geometric shapes and some other objects which were created with mosaic art tradition. Among these mosaic designs at the image house; animal figures can be considered as a limited art historical source due to the used features, structures, colours and shapes. According to the collected data could identify both real and mythical animal figures; such as Tusker, Horse, Lion, Bull, Rabbit, Goat, Unicorn, Fish, Peacock, Parrot, Hen and Snake were designed by mosaic designs. These animal figures can be categorized as birds, quadruped, reptiles and fish. According to the main objective of this research paper will be discussed about foreign influences and special features of created animal figures, reasons for designed animal figures, present situation and reasons for weathering of mosaic designs.

Keywords: Mosaic, Karagampitiya Subodharamaya, Art History

Fashion Syntax: Concept of Contextual Perspective

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Fashion is a mode of language where man's ability to transcend his expression. Like language in this sense, dress functions as a kind of syntax, according to a set of more or less constant rules depending on whether it dealing with traditional costume fashion. Furthermore article of clothing (item) and new dress forms have many possible meanings there is likely to be a certain degree of ambiguity. Moreover the articles of clothing that are worn together many have numerous possible meanings and they also interact with one another to produce additional ambiguities. Contextual perspective means the study of how people manage and perceive appearances in everyday life, considering the actual social situations and larger cultural or historical contexts in which people find them. The contextual approach enhances the people's understanding not only of appearance from people's viewpoints, but also how common such viewpoints are within a culture. This process of contextualizing allows people to see changes in the meanings of dresses as contexts dissolve into one another.

The Kotte period of Sri Lanka (from 15th - 17th Century) marked the culmination of emerging novel dress features. The existing fashions of dresses were mixed and matched with South Indian and traditional Sri Lankan items of clothing. By the time of the Portuguese invasion introduced novel dress fashions with new articles (items) of clothing such as attached collar known as the tippet, buttons, cuffs, hats, and new dress forms like pantaloons or trousers, coat or cabaya, and jacket (hettaya). The royals adopted new dress features into their original so called Sri Lankan native dress. It is possible to reading the earlier fashion language of Sri Lanka during a period that intensified Sri Lankan Indo Portuguese exchanges depends on a lot on uncovering some of the various impulses that energized fashion syntax.

The objective of the research is to explore how the articles of clothing and new dress forms mediated through fashion language and created different new meanings in different contexts. Qualitative research method was adopted for the research. Sequence of observational studies carried out with temple paintings, wood carvings, sculptures, cloth paintings and ivory carvings. The literary data were gathered from documented manuscripts, historical records (chronicles), poetry, published research and inscriptions. Validations of data were confirmed with cross checking with literary sources, pictorial evidences. Furthermore concept of contextual perspective theory applied for synthesis of data.

The research reveals that a fresh or new style may appear inappropriate when it is first introduced, but its novelty is essential to the arousal of interest in perceivers. In conclusion the concept of contextual perspective prompted that the articles of clothing and new dress forms become dress signs and create messages in one context and made it possible to move across contextual boundaries (Sri Lankan, Portuguese) because they were borrowed some appearance cues from (signs) different contextual boundaries.

Keywords: Social situation, contextual perspective, fashion language

Selecting the Best Logistics Path in Times of a Natural Disaster: A Game Theoretic Perspective in Relation to Sri Lankan Context

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The purpose of this paper is to design a model to determine an evaluation method to find a best logistic service provider (LSP) within the local players at a response stage of a disaster to effectively and efficiently distribute humanitarian aid (HA) to the affected people. In this paper, a game theory based application model has been designed to select the best player among many. Variables which have an effect to the performance were considered when developing the initial utility values for each player. Thereafter a game theoretic application was developed to find the best player who has the most significant contribution with highest utility and the lowest cost. The evaluation criteria were designed considering the Sri Lankan context. The paper highlights the variables associated with performance of the logistic service providers. A key finding of this paper is the application of game theoretic model to evaluate the logistics service providers (LSP s). Utility calculation matrix presented in the paper can be further applied to evaluate the performance at individual level as a strategic management measure. This model will help various donors by providing a pre-entry evaluation system to effectively manage and distribute their aid to the recipients. However it is recommended to test the model at a major disaster to further study and to refine the same.

Keywords: Humanitarian Aid, Humanitarian Logistics, Performance Measures, Game Theory, Sri Lanka

Trucking Industry Perceptions of Congestion Problems and Potential Solutions to Container Transportation in Sri Lanka

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Inland Container transportation is coordinated and interacted between port terminals, Container Freight Stations, exporters, consignees, clearing agents, freight forwarders and primarily container transport companies. This paper has identified important issues and challenges in designing, planning, and operating inland transportation with respect to containers, from the transport companies' perspectives. The infrastructure plays a vital role in efficient cargo handling operations thus adequate infrastructure is needed to avoid congestion especially when a country has increasing cargo flows. Sri Lanka has a vision of developing the country as a commercial and naval hub in which efficient and effective container transportation would be the key.

The key objectives of the study were to reveal the perception of container transportation industrialists with respect to road Congestion problems in Sri Lanka; and propose recommendations to improve the intermodal freight transportation. Therefore the factors that make an impact on road congestion namely, Road; Timing; Human; Vehicle; and Weather were examined.

There are 102 major trucking companies registered in Sri Lanka. The survey was conducted as a series of interviews and questionnaire survey. The questionnaires were sent to all trucking companies concerned. It also suggested nine potential solutions to mitigate the road congestion. There were 61 responses thus overall response rate of 59.80% was obtained. The study also considered the Past data and future projections of Ports in Sri Lanka as truck transportation have a direct relationship with container movements in the country.

Congestion experienced by trucking companies is considerable as 79 percent of respondents view that traffic congestion as a critically serious problem in intermodal transportation. The continued growth of traffic and the rapid improvements owing to implementation of the commercial hub concept may create serious road congestion in future particularly in urban areas. As a consequence the maritime intermodal carriers are more likely to miss schedules because of traffic congestion. Therefore, congestion mitigation measures should be adopted especially in the urban areas at this time to face future challenges successfully.

The study had considered five key variables that may cause congestion. This includes road, time, and weather related issues as external factors while HR and vehicle issues represent internal factors of trucking companies. The trucking industry perceives that the congestion occurs often or very often during 6am-12 midnight. No congestion was experienced during 12 midnight- 6 am. It was revealed that traffic congestion often experienced in Colombo-Negombo road; Colombo-Kandy road; passage Between Colombo-Kandana; and Area within Colombo city limits.

The possibility of adding more expressways wherever possible should be looked into. It would be necessary to have a more visibility in the system with respect to customs and other border management agencies in order to install electronic clearance stations at international border crossings. Further improvements in maritime intermodal operations may require creative public/private sector collaboration and would help for "sustainable" growth of country's logistics performance. Increased use and reliability of container status inquiry systems that supply carriers

with information about movement of trucks would be essential. It would also be necessary to implement a system for better coordinating of traffic Signals and an effective system to attend emergency crews in clearing accidents should be done.

Further research should be carried out prior to taking any policy decisions with regard to certain sensitive proposals. This includes, 1) dedicating a single lane to truck traffic; 2) designating truck-only lanes on some surface streets; 3) truck-only streets for access to ports, rail terminals, and airports; 4) Eliminating some on-street parking during certain periods.

Keywords: Congestion, Containers, Transport, Trucking, Intermodal, Freight

Determinants of Air Passenger Demand in Sri Lanka: A Case Study based on Bandaranayake International Airport

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Air transportation plays a significant role in nations' economy providing expeditious links to the international markets. Globalization and advanced technological applications have squeezed the entire world, where by aviation industry further diminishes the existing gap by physically linking two locations. It is an all time true that aviation provides the speediest, most convenient and efficient travel, with comparatively highest cost of all five modes. But it is evidenced by the transport statistics that, the demand for air transport is been increasing yearly, even though the cost is a problematic component. Since it is observed that, examining the determinants of air transport demand would be prudent and an effective effort in policy implementations as well as in forecasting which would be an essential requirement in corporate planning process.

The objective of this research is to determine the factors affecting air passenger travel demand in Sri Lanka and was conducted based on Bandaranaike International Air Port (BIA). The focus of the research was on Air Passenger demand at BIA and not the Air Freight. Macroeconomic factors have been considered as explanatory variables. Three dependent variables as Air Passenger Arrivals, Departures and Total Movement of air passengers has been taken into consideration.

In analyzing the data set, uni-variate descriptive analysis has been carried out and hypothesis testing has been done using Pearson correlation coefficient. In doing advanced statistical modelling, three models have been fitted for total air passenger volume, arrivals and departures separately. In the process of constructing multiple linear regression model Forward Selection Method has been used.

According to the empirical findings it is proved that only five out of fourteen specified independent variables, namely Tax Revenue, Average Exchange Rate, Tourists Arrivals, Interest Rate and FDI have a significant relationship with Total Air Passenger Movements, Air Passenger Arrivals and Air Passenger Departures and for only Air Passenger Arrivals, Government debt has become a significant factor.

Keywords: Air Transportation, Regression Analysis, Bandaranaike International Air Port

The Study on Factors Affecting the Decline of Freight Movement: The Case of Sri Lanka Railways

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The freight movement by the Sri Lanka Railways has had a dramatic decline over the last three decades. The freight market share of the Sri Lanka Railways(SLR) has come down to 0.7% in the recent past, which was 32% in 1979 showing a drastic decline in the efficiency and competitiveness of SLR in handling freight.

This study focuses on the identification of factors affecting the decline of freight movement by SLR. Primary data was collected through visits to SLR and meetings with Deputy General Manager, Operations Manager for cargo division. A visit to Pettah vegetable market also yielded some primary data. Secondary data was collected from annual reports of Central Bank, and the documents that were collected from SLR. The collected data were analyzed quantitatively and qualitatively. Software like E-views and SPSS were used for quantitative data analysis. Case studies were used for the analysis of quantitative data.

This study highlights the following factors to be reasons for decline of freight movement by SLR. Monopolistic characteristic of SLR and its poor customer oriented services lead to decline of freight business compared to fast moving freight forwarding firms who increase in numbers and in their provision of customer oriented service. Inefficient price mechanism for road transport is also a main reason for the above even though the freight rates of SLR is cheaper. Substantial development of motorized road transport is also a dominant factor that has also resulted the decline where as the SLR does not have well developed network all over the island. Lack of intermodal infrastructure facilities that connect SLR is also a factor why customers have less interest on the SLR to transport their goods by SLR. Not having an active regulator has resulted in failure of freight business where this could be further developed to an international standard if a proper regulator is in place because SLR has been the backbone for the economic development of the country three decades ago.

Keywords: Decline, Freight movement, Sri Lanka Railways

Importance of Ethical Leadership in Public and Private Enterprises of Sri Lanka in Developing and Global Contexts

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A truth that's told with bad intent beats all the lies you can invent.

William Blake (1757–1827)

This conference paper will attempt to address key aspects of a resurgent and a contemporary business issue – importance of ethical leadership in private and public enterprises of Sri Lanka in developing and global contexts. It drew primary survey data as empirical evidence from a developing economy (Sri Lanka), where 17 leaders and managers of Sri Lankan organisations consisting of private and public enterprises were interviewed face-to-face and researched recently, as well as survey data drawn from secondary research contrasted to compare with those of a developed economy (Australia) carried out in a recent doctoral research (2011/12) in order to compound the importance when compared with a developed economy. Organisations and their leaders often underestimate how closely they are being watched by not only by their employees, but by the general public at large – both within the country and globally. The gap must close in between what leaders *actually* do versus what they *ought* to do (Brown, 2007). The importance of this research is the impact of ethical leadership on organisations and their outcomes. It affects on management in economic development from a micro (organizational) perspective to a more macro economical perspective posing the central question how important leading and/or managing ethically is. The paper argues, significantly how both economies (Sri Lanka and Australia) behave similarly in leading ethically, but mechanisms that are in place to make organizations accountable for ethical violations which result in acts of misconduct and mismanagement in Sri Lanka are either absent, lacking or ineffective or all of the three; providing motivation and scope for greater mobilization of ethics in Sri Lanka. Ethical leadership is bound to escalate stakeholders and the public to place the country's image with an improved and positive perception globally and reap benefits of development, according to a conceptual model developed by the author.

Keywords: Ethical leadership, developing, global

Impact of Granting Micro Finance Facilities on the Living Standards of the Rural Poor in Sri Lanka

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This paper establishes facts to evaluate the impact of the micro finance credit schemes in operation, on the actual living standards of the beneficiaries of such schemes. In Sri Lanka, micro finance credit facilities are being granted to the rural poor and needy in the society as a step towards alleviation of poverty. This intends to help them overcome the financial constraints in life in order to achieve a better living standard. To accomplish the said objective, the government has got together with many other financial institutions as well as non-governmental organizations through which a substantial amount of capital has been granted to the poor despite the high levels of risk associated with same. Nevertheless, there is no proper paper mechanism in place within the country in order to carry out a post – credit evaluation to assess whether there is an actual impact through such loan facilities for the borrowers and whether it has created a positive impact on their living standards. The main objective of the study is to fill this gap.

The paper is structured into five sections with an extensive introduction on micro financing. Section two examines a wide array of available and existing literature on the subject area with a special emphasis on Sri Lanka. Section three gives the conceptual framework inclusive of the methodology and the experimental design. Section four covers the data collection and analysis while section five concludes the paper.

The study has been carried out in the purposively selected geographical area of Monaragala and Kegalle, where more than one third of the total population lives under or at par with the poverty lines. The population is selected as individuals who have obtained loans under various micro finance credit schemes. For the clarity of the population, this has been confined to beneficiaries of micro finance facilities granted through licensed commercial banks of the area. Stratified random sampling method is adopted in selecting the sample. Pre and post study design has been used, which avoids the drawbacks of one time cross sectional studies. Three independent variables have been established; namely the timely utilization of micro finance funds, utilization of micro finance funds for the intended purpose and the risk management ability of the borrower. The dependent variables in assessing the living standards have been identified as the household assets, household savings and the household expenditure.

Primary and secondary data has been used in the study, and the primary data was gathered through a structured questionnaire. The questionnaire has been designed to reveal the general demographic details of the respondents, enabling more clarified analysis of same. Scientific analysis of the collected data has been utilized to identify the relationship between identified variables in order to achieve the main objective of the study.

It is concluded, as evidenced in data, all factors identified relating to the micro finance schemes indicates a positive impact of varying degrees on the living standards of the beneficiaries cum borrowers, with the management of the risk showing the weakest impact.

Keywords: Micro Finance, Standard of living, Rural Poor

A Review on Geometric Brownian motion for forecasting the Daily Share Prices in CSE

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Capital Investments in stock market is the easiest and fastest way for building healthy financial foundation for our future life. As a result, stock markets have become more institutionalized in the past few decades and have advanced as the main forms of investments for numerous organizations as well as individuals for arranging large investment funds to the general public.

The global growths of the market prices and trade volume rates have changed with highly volatile fluctuations. Present study mainly focuses an attempt to develop a suitable model based on Geometric Brownian Motion (GBM) to estimate the short-term share price behaviours in the Colombo Stock Exchange (CSE), Sri Lanka based on daily price indices data from January to December, 2013. Furthermore, a time series technique such as ARIMA was used to compare the results.

The minimum values of Akaike information criterion and Schwarz criterion suggested that, ARIMA (3, 2, 1) and ARIMA (1, 1, 1) models were most suitable for predicting short term patterns of ASPI and SAP price indices respectively. Furthermore, the mean absolute percentage error (MAPE) results reveals that, this new proposed model is more significant and gives best solution to predict short term predictions in high volatility fluctuations for short time predictions in CSE.

Keywords: CSE, Geometric Brownian Motion (GBM), ARIMA and MAPE

Environmental Disclosure Practices of Manufacturing Industry – Evidence from Listed Companies in Colombo Stock Exchange (CSE) in Sri Lanka

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This study examines the level of Environmental Disclosures by the companies listed in Colombo Stock Exchange (CSE) in Sri Lanka and their association with some specific attributes of the companies. For this purposes, a sample of 36 companies listed in Colombo Stock Exchange under Manufacturing Sector were selected. The level of Environmental Disclosure by each company is measured using Environmental Disclosure Index (EDI). EDI consists of 19 items of disclosure under four categories. Further, content analysis is used to analyze the level of Environmental Disclosure. The greatest score of 3 is awarded if the item related to Environmental Disclosure Index is disclosed quantitatively and specifically. A score of 2 is assigned to non-quantitative but specific information and score of 1 is given to general qualitative information. The association between companies-specific attributes and level of Environmental Disclosure is examined using Ordinary Least Square Regression Model. The calculated EDI reveals that the level of Environmental Disclosure by Sri Lankan manufacturing companies is at a very low level. Further, the regression results show that the level of Environmental Disclosure is significantly associated with Environment Concern (EC) and ISO14001 certification (ISO). It is also found that the Shareholder Power (SP), Government Power (GP), Return on Assets (ROA), Size and age are not significantly associated with the level of Environmental Disclosure.

Keywords—Environmental Disclosure, Manufacturing Sector, Disclosure Index

Box-Jenkins Approach for Out-of-Sample Forecasting of Stock Price Index: Evidence from Colombo Stock Exchange

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Univariate time series analysis under the time domain has become a widely used data analysis technique from the past. The methods belong to time series could be used to identify the temporal structure of the data and their forecasting. Among them Box and Jenkins approach has been used in the research studies and could be rendered as the commonly utilized method. Accordingly, they introduced a model to predict the future behaviour through an auto-projective method which uses the past behaviour of the series.

The purpose of this study is to investigate the appropriateness of ARIMA model in out-of-sample forecasting for stock price index. The daily All Share Price indices (ASPI) over the period from 2nd January 2012 to 31st December 2013 in Colombo Stock Exchange (CSE), Sri Lanka are used. The study uses Box-Jenkins method with four main concepts of model identification, estimation, diagnostic checking and forecasting. Basically, the concept of information criteria is used for the model identification process and the corresponding model parameters is estimated from the training data sample using the least square method. The residual plots and residual tests are used to check the model diagnosis. The forecasting performance of the selected models is measured using different type of error approaches such as mean absolute error (MAE), root mean square error (RMSE), and mean absolute percent error (MAPE).

The results of Akaike's information criterion (AIC), Schwarz's Bayesian information criterion (SBIC), and Hannan-Quinn criterion (HQIC) show that ARIMA (4,1,3) model is the most suitable in out-of-sample forecasting and it outperforms the others.

Keywords: Box-Jenkins method, ARIMA, Forecasting.

Risk Analysis of Governance in Community Development Projects

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Community development and livelihood improvement projects play a dominant role in the economy as they do focus on community development and livelihood improvement in order to enhance incomes and the quality of the life of the poor. Governance in a community development project could be referred as a process of decision making in order to achieve expectations, and management goals. The good governance ensures transparency in decision making and accountability. Governance in community development projects must achieve their set objectives which focus on the government is national development policy agenda. Number of empirical work done on the subject of Governance in community development projects in Sri Lanka is small. Even though it had been identified five risk areas: financial, institutional, procurement, grievance and communication, there was no specific evaluation process adopted to find the validity of these projects. This study analyzed the risk areas of the Second Community Development and Livelihood Improvement project in order to bridge the prevailing gap in empirical information. The study aims at administrative risk areas of community development projects, determining the success level of governance while identifying the relationship between risk areas assigning values to qualitative features to give a quantitative facet. Primary data were collected from a sample of 150 employees of the community development and livelihood improvement project through a field survey by the researcher playing the role of participant as observer. The study used the stratified random sampling method as the population of 500 employees had been divided into more relevant and significant strata based on their position. Reliability of the questions was listed and that was high (0.87). The structured interviewed type of questionnaire were administered for nearly three months to collect data. The correlation analysis showed that there was a strong positive relationship between financial risks and procurement risks and they were not significant at 5% level as they were achieved targets. Overall, finance risks and procurement risks were above the expected level but communication, grievance and institutional risks were below the expected level due to weakness in disclosure policies, poor communication progress and absence of proper grievance handling mechanism. The governance system was able to alleviate the risks. Employees handled finance and procurement functions according to the community operation manuals and under the close supervisions and guidance of the professionals. It is recommended that the necessity of trained staff whom should also have a sound working environment free from political intervention. The appraisals and compliance handling should be done by an independent team. The complains and grievance handling should be very fair and transparent as well as strong enough to challenge the individuals who are misusing their authority and neglect their duties.

Keywords: Governness, Risk Analysis, Community development

Perception on Credit Cards for E-Payment in E-Government Services in Sri Lanka

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The technological advancements in the field of ICT have changed the way people's behaviour and all. In competitive and complicated context, people look for quick, short and quality services. Government as well needs to provide competitive services by integrating new technologies. In an e-government, a solid and trusted environment is a pre-requisite to ensure the trustworthiness of the payee for the paying bills especially utilities, in foster payment especially through electronic media. The expansion of the Internet has facilitated the attractiveness of this payment instrument. e-commerce and e-government has created new financial needs that in many cases cannot be effectively fulfilled by traditional payment systems. There are plenty of electronic payment systems. Among them, credit card has popularized for paying bills in Sri Lanka. Author's question is: are there any potential to use these trends as an imperative means for e-payments in an e-government services in Sri Lanka? Hence, the paper aims to examine perception of credit cardholders on using credit cards for e-payment in e-government services through an exploratory inquiry. The literature related to the present investigation is used to develop a framework for the study. Result reveals that behavioural elements of credit card holder's perception on credit card for e-payment have significant influence on their perception about e-payment through credit cards. Sri Lanka is moving toward greater e-government adoption interestingly. Accordingly e-payment means also should be taken into consideration, majority of online population in Sri Lanka is yet considered "infants" with a shallow level of Internet knowledge, and this builds up fears of using e-payment. Results of the present study evident that there is a positive trend towards the perception of using credit cards as a mean for e-payment in e-government services. There are substantial potentials to encourage and further improvements of e-government concept in Sri Lanka.

Keywords: Credit card, e-government, e-payment, perception

Determinants of the Factors Affecting the Customer Satisfaction in Super Market Industry of Sri Lanka

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Customer satisfaction and service quality are crucial factors when defining organizational success. The winning approach in brining success is to serve the best quality to the customers. The current situation requires improvements of customer satisfaction of the supermarket industry of Sri Lanka have come under limelight due to the competition where super markets are trying to gain competitive advantage through the human factor.

Excellent customer satisfaction does not only mean higher profits but also acts as a challenge for the employees to perform to their maximum abilities to meet the competition. By serving customers with the best quality products, organizations can maintain and expand their customer base and this will cause an increase in customers' confidence and competitive advantages among the market leaders. This study examines the effects of various factors of the supermarket industry which affects customer satisfaction.

The purpose of the study is to determine the factors affecting customer satisfaction in the super market Industry of Sri Lanka. Learning of this study would help to identify the areas which are need to be improved in order to improve overall customer satisfaction and service quality in order to gain customer satisfaction.

In this research paper, the relevant data were gathered through a self-administered questionnaire from 300 respondents. Univariate descriptive analysis has been carried out. Chi-square test and Fisher's Exact test has been carried out in doing hypothesis testing. Multinomial logistics regression approach has been used in fitting an advanced statistical model for customer satisfaction.

It of great importance to understand how to satisfy customers as it seems to be the key success factor in modern organizations. Service quality, knowledge of the staff, support given by the staff, recommendations and the attire of the staff variables were significant in the model. The recommendations are given to improve the service quality in order to increase the customer satisfaction which helps the super markets to attract more customers in future.

Keywords: Customer satisfaction, Multinomial logistics regression approach, univariate analysis.

Online Shopping Behaviour of Young Adults in Higher Education Sector: How Brand Matters

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The purpose of this study is to find out the online shopping behaviour of Sri Lankan young adults with special emphasis to brand loyalty. With the rapid growth of E-Commerce and online consumer shopping trends, the importance of building and maintaining customer loyalty in electronic marketplaces has come into sharper focus in marketing theory and practice (Gommans et al., 2001). Building and maintaining brand loyalty is a vital part in establishing sustainable competitive advantage. Consumers become committed to a particular brand and make repeat purchases overtime if they are loyal to that brand. In online shopping environment, consumers have no physical touch to the products and services and also prices among different brands can be easily compared with each other. Therefore, it is worth studying the role played by the brand loyalty when young adults shop online.

In this study the researcher addresses the following basic problem statement. Internet has widely spreaded among the Sri Lanka specially among young adults with relaxed financial policies and high quality delivery services. E-enabled young adults shop online increasingly. The target age group of this study was 23-26 studying or just passed out from the university with having a limited budget. It is interesting to know how young adults behave in the online shopping environment with limited budget with the “brands” that they are fond of.

The sample consisted of 100 final year undergraduates and graduates of the University of Moratuwa. Final questionnaire was developed based on the responses received from a pilot study. Collected data were analyzed using SPSS. Among the 100 participants majority have shopped for at least once in their life time. However, only a few have purchased goods online. Majority of them that is 88% have internet access to their homes whilst 64% access the internet through their mobile phones. Majority use internet to search information. Online shopping is the fourth preference.

Quite interestingly the majority search the internet when they want to buy goods. But they are buying goods physically at the shop instead of online purchasing. Ebay is the most sought purchasing site among the respondents. When purchasing online, most of the respondents concern price than the reviewers’ comments before making a final decision.

The findings of this study provide interesting insights for marketing managers who are interested in online shopping. As the Internet usage grows worldwide, managers need to understand their consumers and the distinguishing characteristics between Internet shoppers and non-shoppers globally. This distinction will enable managers to tailor the online experience in ways that will actually make Internet shoppers purchase and repurchase from their websites while enabling these websites to appeal to non-shoppers as well. An additional goal of such an understanding should be to encourage non-shoppers to shop online.

Keywords: online shopping, brand loyalty, young adults

Investigation on Functions and Product Structure of Islamic Banking vs Conventional Banking in Sri Lanka: A Case Study

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Islamic banks (IBs) were originated to satisfy the financial needs of Muslim community by rejecting interest and following Profit-Loss sharing paradigm while conforming to Shariah principles. IB is increasingly gaining attention across the global financial environment due to its unique framework relative to Conventional banks (CBs). But the public still lack the comprehensive knowledge about how actually IBs differ from CBs. Hence, there is a lack of participation of the public with the IBs for banking transactions. The objective of the study is to explore 'how' and 'why' IBs differ from CBs with giving special reference to the functions and products. Hence, this research would fill the knowledge and empirical gap in the Sri Lankan context.

The study adopts interpretative methodology and multiple case study strategy. Primary and secondary data were collected through interviews, observations, reports and websites.

Major findings of the study concluded that IBs and CBs enclose differences as well as similarities in their framework. The major differences were identified connecting to the framework of IBs as they need to follow interest free paradigm, Profit and Loss Sharing (PLS) paradigm and Shariah principles in performing the banking functions comparing to interest based CBs. However, still both IBs and CBs function as financial intermediary carrying out similar functions. Similarly in terms of product and services, IBs offer similar saving and financing solutions to banking customers as of CBs, but still their products tend to be unique as they adhere to above principles and variety of Shariah product concepts such as Mudharaba in forming savings accounts and Mudarabah, Musyarakah, etc in offering financing products. Likewise similarities and differences can be observed in investments and financing structure between two systems.

Thus it is evident that IBs and CBs enclose differences as well as similarities in their product and working structure. Accordingly the major principles of interest free paradigm, Profit and Loss Sharing paradigm and Shariah principles have influenced for the emergence of unique structure that differentiate an IB from general CBs though few similarities can be observed between two systems. Thus these results are consistent with the findings of other researchers in the similar areas.

Keywords: Islamic bank, Conventional bank, Functions, product structure

IB Adoption in Sri Lanka: Analysis of Demographic Variables of Banking Customers

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Contemporary concepts of information and communication technology and implementation strategies to banking services have become a significant matter to all banks in Sri Lanka. The advancement in technology has played an important role in improving service delivery standards in the banking industry. At present, Sri Lanka has a liberalized telecommunications market that has huge impacts on the economic and social development of the country. The Sri Lankan government has initiated several projects, emphasizing the need in rural areas and to provide unrestricted sources of information to all its citizens. When compared with the development of information and communication technology in the country, the demand for Internet Banking facilities is not at a significant level. Therefore, the main objective of this research study was to analyse the demographic factors of IB users and IB non-users in Sri Lanka. This study incorporates both primary and secondary data. Primary data were collected by utilizing semi-structured interviews and a customer survey of selected banks in Sri Lanka: private bank (Sampath Bank), government bank (Bank of Ceylon) and a foreign bank in Sri Lanka (HSBC). The questionnaire was mailed and handed over to the customers of each bank along with a postage-paid return envelope and a cover letter explaining the purpose of the study. A total of 253 questionnaires were received resulting in a response rate of about forty two percent. However, only 240 questionnaires were useable as the remaining questionnaires had substantial portions not filled in. Therefore, the samples included 120 IB users and 120 IB non-users. The convenience sampling method was employed to select the sample of IB and IB non-customers for this study. Analyses of the ungrouped binary data were based on the Logit Model and Statistical Measurements: Central Tendency, Dispersion and Skewness. Data were analyzed using Eviews version 5 application to strengthen the accuracy of results. McFadden R^2 (R^2 McF), P, and Likelihood Ratio (LR) Statistic tests were utilized for testing the goodness of fit, statistical significance of the parameters and for testing the overall significance of the model. In addition, the Jarque-Bera (JB) test was used for testing Normality. The findings of this study have important implications for researchers in the field of IB, banks that are currently offering IB services as well as banks that are planning to offer such services. The outcomes of this research can be applied to developing countries in the region in general.

Keywords— Internet Banking, Demographic Analysis, Banking in Sri Lanka

POSTER PRESENTATIONS
MANAGEMENT
SOCIAL SCIENCES &
HUMANITIES

Social Consequences of Involuntary Resettlement; Impact of Development Projects

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In developing countries, development related population displacement has grown rapidly over the past few decades due to the compelling need for infrastructure as a result of fast growing population densities. Those displaced due to development projects are resettled by project planners, but have to face specific socio economic issues in their newly relocated areas.

This study focuses on identifying social, cultural, and economic issues of involuntarily resettled persons. The Southern Highway, the main development project was selected to examine this problem. Structured and semi structured interviews were used to collect primary data.

Study samples have identified eight risks; Homelessness, Landlessness, Unemployment, Marginalization, Food insecurity, Increased Morbidity and Mortality, Loss of common property and Services and Social disarticulation. In relation to that, the issues faced by resettled community can be divided three categories.

Most effected problems were landlessness, Joblessness, and Social disarticulation. Homelessness, Marginalization and Loss of access to common property were the marginally effected problems and less effected problems were food insecurity and morbidity.

The broad ranges of problems are not only the economic risks, but also the social and cultural problems also contribute. Those are inter-related problems and doesn't affect to the community equally therefore the dimensions of issues are differentiating from one another. One might think that the severances are high with the economic risks, but on the contrary social risks are severe than the economic ones. Due to the development projects, the environment in which the people lived in was subjected to harsh changes, the people lost their familiar environment, and this can't be evaluated through the scales of economy.

Keywords: Involuntary resettlement, involuntary displacement,

A Study on J.B Disanayaka's analysis on "verb" given in his book titled "Basaka Mahima: II - Kriya Padaya"

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Prof. J.B. Disanayaka is a grammarian and a linguist who has been studying and scrutinizing the internal and external features (sociolinguistic features) of the contemporary Sinhala language for a long time. This research solely examines Disanayaka's analysis on "verb" - "**kriya padaya**" which is a basic component of the internal structure of language. Disanayaka is one of the eminent grammarians of 21st Century who has been researching and analyzing Sinhala grammar after the past grammarians like Pathiraja Piruvanpathi Thero, Abraham Mendis Gunasekara, W.F. Gunawardhana and Kumaratunga Munidasa who concerned upon the written variety of language. Therefore, this study comparatively analyses the traditional or conventional grammar analysis on "verb" referred by the names of "**kiriya**", "**kriyava**", "**kriya padaya**" in **Sidath Sangarawa** with the contemporary analysis given by Disanayaka in his book **Basaka Mahima: II - Kriya Padaya**. The nomenclature, categorization and the analysis on verb in **Sidath Sangarawa**; or rather the conventional analysis on verb has been standardized by the contemporary analysis of Disanayaka. This particular feature is brought to light in this research through a comparative study. "**Sidath Sangarawa**" was used to bring to light the features and nature of the conventional analysis and the features of the contemporary analysis was brought out through "**Basaka Mahima - Kriya Padaya**" written by Disanayaka. **Sidath Sangarawa** provides an introduction to "verb" - (**kiriya**) in its first chapter and allocates the chapter number seven to descriptively analyse verb while considering the factors of person (**Purshathraya**), time (**Kala Bhedaya**), number (**Wachana Bhedaya**), and gender (**Linga Bhedaya**). Also, causal verb (**Piyadu - Prayojjyak Kriya**), imperative mood (**Vidi - Vidhi Kriya**), optative mood (**Aasi - Aashirvaadaathmaka Kriya**), conditional mood (**Asabahaw - Asambhavyak Kriya**), present participle verb (**Musu - Mishra Kriya**), past participle verb (**Purva Kriya**), **Aruth Kriya**, **Bhawa Kriya** were separately analyzed and described in the book. The special feature of the conventional analysis is, describing and illustrating verb and its categorization along with examples. On the other hand Disanayaka categorizes the words (**pada**) in Sinhala grammar into several categories and mentions that the "verb" too is a one category of words / parts of speech (**pada**). At the same time he brings out the difference between the other categories of words and the category called "verb" as well. Disanayaka defines the "verb" and breaks it into various parts in his analysis. He breaks it into major categories such as **Kriya Pada Prabheda**, **Awasana Kriya Pada**, **Anawasana Kriya Pada**, **Vakya Anubaddha** and **Prayojjyak Kriya** and analyses it. When dealing with the process of comparing both conventional analysis and the contemporary analysis given in both the books on "verb", it is understood that Disanayaka has modified the conventional analysis rather than standardizing and reforming it. Also Disanayaka adheres to the method of "analyzing" the factors and data whereas the conventional analysis is based on "explaining". Accordingly the research analyses and brings to light such differences as well as the similarities of both conventional analysis and contemporary analysis given on Sinhala "verb".

Keywords: Standardization, Modernization, Reformation

Empowering People through Education from the Perspective of Millennium Development Goals

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Education plays a significant role in people's empowerment which ultimately leads to sustainable development in any country. Therefore, this crucial position held by the education has become a universal acceptance. Further, as revealed by the South Asian Development Report, if the men and women are not empowered by the education and the health, the sustainability won't be a reality (2004). Moreover, it has emphasized the education as one of essential components of growth process.

Generally, the term empowerment refers to a multi-dimensional social process that enhance diverse of human capabilities. Further it is relevant to all the aspects that boost competences of human beings which are crucial for the development. Empowering people can be varied from the individual level to the community level. Even more it can go beyond the community level reaching up to the international level. Therefore, it is imperative to study how people can be empowered through the education since education is recognized as a key player of the human empowerment.

Millennium Development Goals were set by the United Nations in the year 2000 with the aim of achieving eight major development goals by 2015. Achieving universal primary education is one of key Goals in Millennium Development Goals. Therefore, it is obvious that, education is widely accepted as a tool for empowering people in the world.

Main objective of this study is to explore the potential of education to empower people as human development is considered as one of central pillars of development. Concurrently, this study aims to examine the applicability of the Millennium Development Goals to such scenario focusing on its most apposite segments. Mainly this research would be an archival research which would base on secondary sources. Additionally, the study would focus on the United Nations reports and statistics.

This research finds that education is an indispensable factor regarding empowering people. Further; this research reveals that human empowerment is a multi-commitment task which is directly applicable to development process. Concurrent to that, this research has highlighted the relevance of the Millennium Development Goals to the implementation of empowering people through education. Moreover, this study finds that empowering people through education can generate apparatus required for the development process leading to profound social changes at both personal and societal level.

Keywords: Development, Empowerment, Education

Minimizing Environmental, Social and Economic Conflict between the Peripheral Community and Reforestation Projects in Sri Lanka: A Study on the Pinus Plantation in the Northwest (NW) Slope of Sinharaja Forest Reserve

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Reforestation projects were introduced in 1970 Sri Lanka as a forest conservation method. The forest cover in Sri Lanka have been reduced due to population increase and deforestation. Reforestation projects are very important to increase the forest cover in Sri Lanka especially in the low land wet zone up country forest areas. In the beginning of twentieth century exotic species such as *Tectona grandis*, *Swietenia macrophylla*, *Eucaliptus species*, *Pinus caribaea* and *Pinus patula* were introduced for reforestation. These species were found not suitable for the local eco system . As a result many environmental and socio economic conflict cropped up in the forest peripheral areas between forest peripheral communities and the reforestation projects. This study focuses on the methods to minimize these conflict in Sri Lanka. The main objective of the study was to identify suitable methods to minimize the environmental, social and economic conflicts among the community and reforestation projects in the affected villages of the NW slope in the Sinharaja primary forest periphery. Other objectives were to study the effect on water resources, traditional lives styles, economic activities, climatic patterns and soil in the study area. Six villages namely Pitakele, Pethiyakanda, Kudawa, Ketalapaththala, Kosgulana and Kongahakanda were selected on a parallel linear orientation to the forest as the study area. Fifty nine (59) families were selected randomly for collection of primary data. A house to house questionnaire survey on the selected families, using questionnaire was the primary investigation method adopted. Interviews, case studies and field observations were also used. Results were analyzed using simple statistical method such as percentage. According to the study 94.91% families have not utilized the pinus plantation areas for their needs and it has affected their traditional life styles. 81.35% indicated that reforestation had reduced the quantity of water available. 76.77% said it affected their economic activities and 33.90% indicated that soil quality in the pinus plantation was poor. 66.1% indicated that rainfall has been reduced in the study area after reforestation. It is suggested that measures may be taken to remove pinus trees and grow endemic flora and tree species in the pinus plantation and introduce other tree varieties such as Jack, Hal, Mango and Rambutan in these areas.

Keywords: Reforestation, Pinus plantation, Enviromental Social Economic Conflict

The Role of Education on Agricultural Productivity in Sri Lanka

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Rural area is a geographic area located outside cities and towns. In order to have a long term sustainability in rural sector, education plays a major role by empowering farmers with right direction, right thinking pattern, right decision making ability and right choices. Hence education would be a sustainable strategy to uplift the rural sector with agricultural development through agricultural productivity. However in order to enhance the productivity of the rural sector, the role of education is crucial. The pecuniary and non-pecuniary benefits of the education have impacts on farmers for their shorter and long-term pricing efficiency, scale efficiency, allocative efficiency and technical efficiency to increase the agricultural productivity. The objective of the study is to examine the relationship of education with the productivity. And a sample of 409 families were taken and semi structured questionnaire was used to collect the data. As a data analytical tool, Structural equation method was used with the support of SPSS AMOS (Version 21).

However study concludes that the household with no schooling has an inverse relationship with the productivity while the educational level of primary level and secondary level have a positive influence on the Total Factor Productivity of farming and Total Factor Productivity of non-farming. In addition to that the study indicates that the extension services, social capital and other informal and non-formal education streams also influence on agricultural productivity positively.

Keywords: human development, agricultural productivity, education

TECHNICAL SESSIONS

ENGINEERING &

TECHNICAL SCIENCES

Optimizing Energy Output at Canyon Hydro Power Station: A Case Study

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Due to the rain fed central hills in Sri Lanka, the country enjoyed low cost, renewable hydro electricity generation since 1950's. With the completion of nearly all major hydro site developments and the growth in electricity demand hydro generation currently contributes only 44.5% (average over the four year period 2010 – 2013) to the gross electricity generation in the country. In view of increasing dependence on carbon polluting fuels for electricity generation, development and utilization of hydro power potential to the maximum level and in an optimum manner would bring multiple benefits.

This paper presents a case study to achieve optimum generation at the Canyon power plant and the new Laxapana power plant. Current practice of loading cascaded Laxapana complex plants is mainly based on meeting pond balancing constraints and the spinning reserve requirements. Efficient performance of the plants are not given due consideration in the dispatch process. However, such considerations would lead to loading patterns which generate same amount of electricity using less water due to the fact that especially in case of Francis turbine plants the efficiency significantly varies with the load. As an example a single Canyon unit delivering 14.56 MW at full reservoir level uses 0.578 m³ of water per second per MW whereas the same unit delivering 25.57 MW needs only 0.553 m³/s per MW. Further, when both machines are running in parallel the resulting head loss is higher than that when a single machine operates to give the same unit output. An algorithm is developed to obtain all the requested energy output within a specific period using minimum of water. Rescheduling the dispatch of plants on a selected day by the new algorithm saved 61271.6 m³ of water while generating 722 MWh of energy. The water saved could generate 29.5 MWh on a later date and this amounts to a saving of 4% in energy terms. However, some load shifting outside the critical peak period was necessary to achieve this saving. As similar savings can be achieved almost every day implementation of this algorithm would lead to avoidance of cost through reductions in thermal generation and associated GHG gas emissions.

Keywords: cascaded hydro power plants, efficient operation

Analysis of Power Quality Issues due to the Proposed Solar Power Plants in Hambantota

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The world is facing an energy crisis due to the fast depletion of conventional energy sources such as petroleum, coal and natural gas and many countries are shifting their emphasis towards the use of non-conventional renewable energy sources for the generation of electricity. Sri Lanka has built several power plants using wind, solar, biomass and mini-hydro sources and they are now in operation.

Solar power plants, despite their high initial investment are fast spreading in Asian countries owing to the availability of higher solar radiation throughout the day time. In Sri Lanka, two grid connected small scale solar power plants of 737 kW, 500 kW are already in operation located in Baruthankanda, Hambantota. Three private developers have made proposals for another 30 MW solar plants, (each 10 MW) near the existing plants which would be directly connected to 33kV Bus at Hambantota GSS (Grid Substation). However, unpredictable variations in the source of energy and power electronic converters of such a large solar power plant can create a significant impact on the power quality of the existing power system.

This paper describes a study carried out on the probable impacts on power quality at the Hambantota GSS due to random fluctuation of solar radiation level of the proposed 30 MW plant. Standards IEEE 519-1992 and IEEE 1547-2003 are used in the power quality assessment. The system with proposed plants is modeled and simulated with PSCAD™ software. The model is validated by simulating the system with existing solar plants and actual field measurements with data loggers. The results of the study and recommendations are presented in the paper.

Keywords: Power Quality, Solar irradiance, harmonics, photovoltaic systems, PSCAD™

Analysis of Thermal Effectiveness in Sri Lankan Context: A Research based on Vertical Greeneries of Multi-storied Buildings

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Thermal energy, which comes from the heat, makes the great influence state-of-the-art of global climate simulations. This effect feels especially for multi stored buildings and concept of greenery has been introduced as a tool for mitigating the thermal effect directly by shading heat-absorbing surfaces and indirectly through evapotranspiration cooling. These greeneries can be placed either horizontal or vertical or both surfaces, which are having the direct exposure to the heating sources. Vertical greens, the key concern of this research, especially gives more benefits by make use of natural processes such as lighting and temperature control. It has been observed that vertical greenery reduces thermal effect up to some extent and reduce energy consumption of the building for air conditioning. Studies have shown that vertical greenery systems are able to reduce thermal heat transfer into the building which in turn reduces energy consumption for air conditioning.

This research is carried out as a case study based work. Three case study areas are selected, which are having the great exposure to the sun light. Two main categories of vertical greens layers can be observed basically in Sri Lanka and the selected sites as case study areas covers both categories of vertical green layers. First category is wall vegetation that is the green layer on the wall and the rest is the green facades, which is the green layer not having any contact with the wall and vegetated by using a separate support. The spot temperatures on both sides of different walls with and without green layer by using Infrared thermometer is observed, compared and analysed.

A significant temperature reduction is observed between inside and outside of a room of a building is able to obtain the effect of vertical green vegetated wall when compared to the bare wall. This reduction tends to decrement the cost of energy for air conditioning of a building. Literature expresses, to reduce the room temperature from a single degree of Celsius using a split air conditioner requires the almost 5% of its total energy consumption per day. Thus it has been observed the significant amount of energy can be saved due to the vertical greenery, when validating the above criteria for the research findings. Concluding the research, the choice of design parameters for vertical greenery is an essential to make sure its contribution for energy saving, since the direct relationship exist the energy reduction and vertical greenery.

Keywords: Vertical green vegetated wall; green façades; thermal comfort

Effect of Degree of Chlorination on Chlorophenols Dechlorination Water Treatment with Zero Valent Iron

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Chlorophenols (CPs) are manufactured organic compounds. Most of the CPs are listed as priority toxic pollutants by USEPA and causing water pollution. Removal of Pentachlorophenol (PCP) has gained awareness in groundwater treatment but degradation of Tetrachlorophenol (TeCP), Trichlorophenol (TCP) and Dichlorophenol (DCP) have received little attention. Zero Valent Iron (ZVI) is a cost effective and readily available material, which can be used to treat water via CP dechlorination. However, incorporation (sorption, co-precipitation and/or physical entrapment) of CPs with the iron oxides is identified as another process occurring concurrently with dechlorination. Incorporation could be influenced by the physical-chemical properties of CPs, which leads to concerns with efficiency of ZVI for CPs dechlorination. This study aimed at investigating ZVI efficiency for CP dechlorination and the effect of degree of chlorination on CPs incorporation and dechlorination.

PCP, 2,3,4,6-TeCP, 2,4,6-TCP and 2,4-DCP were chosen to study dechlorination and incorporation of CPs using ZVI. All experiments were carried out under identical experimental settings in batch reactors under anoxic conditions. Each CP was added to the solution and tested as a single compound in each vial. CP dechlorination was assessed using Gas chromatography-Mass spectrometry to quantify the respective CPs as well as all dechlorination products formed. Raman spectroscopy was used to identify the specific iron oxides formed on the ZVI surfaces.

Removal of CPs with ZVI occurred due to concurrent dechlorination and incorporation. CPs dechlorination increased with increasing degree of chlorination except for with 2,4-DCP. The sequence of CPs dechlorination was PCP > 2,3,4,6-TeCP > 2,4-DCP > 2,4,6-TCP with accumulation of lower CPs over 25 days reaction. The highest mass balance was achieved with PCP [≈92% of the PCP initially added]. CPs with lower degree of chlorination showed greater incorporation with the oxides. The 2,4,6-TCP and 2,4-DCP concentrations in the solutions decreased over time but there was no increase in dechlorination products resulting in poor mass balance. The higher pKa values of 2,4,6-TCP (5.97-7.42) and 2,4-DCP (7.68) could lead to greater affinity of these two CPs and/or their degradation products for incorporation with the oxides. Although incorporation was a significant removal process of 2,4,6-TCP and 2,4-DCP, minute levels of lower CPs detected provide evidence of dechlorination in these two systems. However, the majority of the end products may have also been incorporated with the oxides during the reaction. During the PCP/ZVI reaction, predominant build-up of magnetite on the ZVI was consistent with enhanced PCP dechlorination observed. Reaction of remaining CPs with ZVI resulted in formation of a mixture of passive iron oxides (akaganeite, hematite, lepidocrocite, goethite and wustite) and relatively low amount of magnetite compared to that formed with PCP. These passive oxides could also limit the dechlorination but lead to incorporation of higher amount of 2,4,6-TCP and 2,4-DCP with the oxides. In conclusion, CP dechlorination using ZVI increased with the increase in degree of chlorination. CPs showed increasing affinity for incorporation with the iron oxides and decreased dechlorination as the degree of chlorination decreases.

Keywords: Chlorophenol, Dechlorination, Sorption

Monitoring of Air Pollution due to Vehicles at Ratmalana, Sri Lanka

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Urbanization and industrialization are the main causes of air pollution in most of the areas in Sri Lanka. Air pollution is occurred due to natural and manmade activities. Monitoring of air quality especially in urban areas in Sri Lanka is significant because the quality of air is degraded day by day due to various activities. In Sri Lanka, most activities on air quality monitoring and management are concentrated in Colombo, which is the commercial capital of Sri Lanka. However, few attempts were taken to study air pollution in other industrial areas as well. Transportation sector is responsible for majority share of the most of the gaseous emissions to the environment with compared to any other sector. Therefore, this attempt has been made to discuss the air pollution due transportation sector at Ratmalana area in Sri Lanka. Sri Lanka has adopted emission standards for all vehicles, but those standards are yet to be effectively enforced. Further, there is no mechanism to evaluate the benefits due to emission control strategies as no reliable emission inventory is available, specially to estimate local concentration levels. Therefore, the main objectives of this paper are to discuss the level of air quality in this particular area and to develop a vehicle emission inventory that could be used for estimating vehicle emission with respect to special distribution. A traffic survey was conducted near Galle road at Ratmalana for about two weeks. The emission standards were collected from Automated Air Quality Monitoring station which is operated by the Central Environmental Authority of Sri Lanka. The level of emission and values of emission of each pollutant were estimated for each vehicle. It was found that the major sources of Carbon Dioxide, Nitrogen Dioxide, Sulfur Dioxide and Particulate Matter are Light Trucks and Heavy Duty Vehicles however; the major sources of Carbon Monoxide are Cars and Vans. In addition, it was estimated the paths of air pollution and percentages of each vehicle of each pollutant per hour. Finally, it was recommended to use the Carpooling system and public vehicles to mitigate the air pollution due to vehicles at Ratmalana, Sri Lanka.

Keywords: Air Quality, Vehicular Emissions, Air Pollutants, Urban Areas

Building Section for Passive Climatic Modifications in Sri Lankan Non-Domestic Architecture

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Air-conditioning is commonly used to achieve thermal comfort for commercial buildings in the hot and humid climates. Typically air-conditioning accounts for nearly 60% of electricity consumption in such situation. Passive system is a way of introducing systems that has the capability to be operated by itself with minimum interference of manmade fossil based energy such as electricity.

Sectional characteristics of a building design can be effective in modifying external unfavourable climates into favourable indoor climates. Therefore by narrowing down to the building section it is expected to make a clear identification on how the passive climatic systems should work and what are the explicabilities for warm humid climate like Sri Lanka. And also with the study of building section it is expected to achieve a defined knowledge on how the materials and openings help to improve the thermal comfort of the building in respect to passive climatic modifications.

Measuring the thermal degrees can help to understand the applicability of each and every passive climatic modification for building section. Advancing a comparison analysis in-between the outdoor climate and indoor climate examine design strategies into the climatic data can make a better impact for comparing passive climatic strategies in respect to building section.

Two case studies with similar functions, similar context were selected to understand the sectional adaptations. Case one is a modern and two story building with different building section modulations. The case two is single story building with traditional building materials and simple sectional planning. However the case one has shown the effective usage of advanced passive climatic modifications when the outdoor reaching 37.2°C the indoor temperature was modulated by the building section to 32°C. But it wasn't effective throughout the day. Thus the building functional time (from afternoon to evening) shows very effective usage of passive system within the building. The case two has very simple section form which was designed with understanding of solar radiation factor. The use of materials such as thermal mass and other techniques were very effective for sectional form. The building indoor was almost in a constant temperature of 29°C to 34°C when the outdoor almost above 30°C. Cross ventilation was introduced as passive cooling system to the building as a cooling system. The building does work as yet with high population and with high heat generating activities such as dancing while continuing the indoor temperature of 32.7°C while outdoor temperature is 34.1°C.

Nonetheless the use of passive cooling can be used to intensify indoor climate into favourable condition of contemporary modern buildings in Hot Humid Sri Lanka. By enhancing the indoor climate can help to minimize the energy consumption of the building such as day time air conditioning etc. And which will help to reduce the day to day energy consumption as well.

Keywords: Building section, Passive Climatic Modifications, Thermal mass

Development of an Integrated Urban Drainage Cycle Management Model for City of Colombo

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Floods are the most frequently occurring hazard event among all natural disasters. Poorly prepared compact cities have become prone to flash floods even in a small storm event. Present urbanization happening in these cities creates an imbalance between urban runoff volume and effective drainage capacity. For the survival of these cities it is vital to establish proper urban drainage systems resistant to flash floods. However, this is a complicated task for many Asian cities due to solid waste blocking drainages. Thus, Asia urge for a more comprehensive drainage design which considers present and future forms of the cities, solid waste disposing patterns, floating population and imminent prone areas of urban sprawl. This research project introduces a novel approach in urban drainage management through the concept of “Urban Drainage Cycle”. Geographical Information System based computational techniques are being used to define spatial units within the urban drainage cycle to develop an “Integrated Urban Drainage Cycle Management Model” using the city of Colombo as the case study area. Developed model will be implemented and tested in a selected part of the city of Colombo to evaluate the effectiveness of the resulting “Solid Waste Resist Urban Drainage Design”.

Keywords: Flash Floods, Solid Waste, Urban Drainage System, Asian Cities

Introduction to Skeleton Bridge Abutment

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Abutment in a bridge structure is a vital component, defined as the first and the last support to the bridge deck. Most commonly used bridge abutment type is the wall type abutment. Bridge abutment is subjected to horizontal and vertical forces. Horizontal forces are due to braking of vehicles on the bridge deck and the force due to soil fill behind the abutment. Vertically transferred force on to the abutment from bridge deck is constant for a particular live load combination, but the horizontal force varies with the height of the abutment. Tall abutments are subjected to massive earth pressure force. For shorter height of the abutment, the dominating force would be the vertical force and when the abutment height increases the dominating force changes from vertical to horizontal. In order to avoid the massive earth pressure of the embankment, the skeleton bridge abutment could be used effectively. Skeleton abutment supports the bridge superstructure and it does not effectively support the horizontal force due to earth pressure. This paper describes the basic concept of skeleton bridge abutment, its behaviour, advantages and disadvantages, limitations in practice and its practical application in 'Mahaweli Raja Mawatha' from Adikarigama to Mapakada in Sri Lanka.

Keywords: Bridge, Earth Pressure, Skeleton Abutment

Enhancement of Hardness of Aluminum 6063-T6 Alloy by Applying Two Step Age Hardening Process

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Aluminum 6063 T6 is an alloy that is mainly used for structural applications such as window and door frames, partitioning, L bars, U bars, and ladders. It contains magnesium (0.45-0.9%) and silicon (0.2-0.6%) as the main alloying elements. T6 denotes the heat treatment process of solution treatment is followed by artificially age hardening. Age hardening process is used to improve the hardness and strength of this alloy by forming second phase particles of Mg_2Si which act as a barrier for dislocation movement.

This work is mainly focused on the enhancement of hardness of Aluminum 6063 T6 extrudates, and increasing the production rate while keeping the cost effectiveness. Two step age hardening treatment is developed as a substitution for the existing single step age hardening treatment applied in local industry, to reduce the total time period and temperatures while improving the hardness. In this work, average hardness value of Aluminum 6063 T6 extrudates produced in local industries is taken as the reference and that is improved up to the required level by varying the time periods and temperatures of two step age hardening process.

The developed two step age hardening process is effective in terms of achieving hardness of 68.4 HV that is a significant improvement relative to the reference hardness value of 63.5 HV. The reduced total time period of 210 min and reduced second step aging temperature of 175°C in developed two step age hardening process lead to decrease the energy consumption by 30.72% and time period by 28.57% relative to the age hardening process used in local industry.

Keywords: Al 6063 T6, Age Hardening, Hardness

Purification and Characterization of Clay Minerals from Giant Tank, Murunkan

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Structural modified clay minerals are developed with aim to obtain new materials with predefined and required properties to a broad range of applications both in industry and in science. Montmorillonite (MMT) is very important clay among the other types of clay. In Giant's Tank, Murunkan has high content of MMT clay.

Naturally occurring clay mineral sample was collected from a place where the clay was taken for cement industries 30 years ago and were purified physically by magnetic stirring followed by centrifugation. In chemical purification, carbonates were first removed by incremental additions of a 0.5M Sodium acetate buffer (pH 5) until the clay suspension reached pH 6.8. Organic matters were oxidized using hydrogen peroxide H₂O₂.

Purified samples were then subjected to X-Ray Diffraction (XRD). The XRD data showed that the sample contains significant amount to Kaolinite (3.62 °A, 7.08 °A) and Quarts (4.98 °A, 5.67 °A, 6.04 °A) and 26.68 °A spacing relevant to the MMT clay. Much higher d-spacing of MMT is probably due to the presence of water after washing the sample several times with water. The clay sample may contain four or five water layers, sometimes with some exchangeable cations or else this can be regularly interstratified chlorite-MMT.

Chemically purified sample showed decrease in intensities and d-spacing in the XRD spectrum similar to MMT itself increased from 26.68 °A to 26.78 °A probably would have been due to original exchangeable cations were replaced by Na⁺ when treating with acetate buffer.

Keywords: Murunkan, Montmorillonite, Purification

Analysis of Thermal Shock Resistance of Ceramic Article

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The thermal shock resistance (TSR) is one of the most important parameters for many ceramic article, since it determines their performances in many applications. Due to their inherent brittleness and poor TSR performance, catastrophic failure may occur under severe thermal shock, which is one of the most important reasons for ceramic fracture. Therefore, improving the TSR of ceramics has been one of the most important focal points in the manufacturing of ceramic article.

The study is focused on the thermal shock resistance of ceramic article; it is important for the applications such as ceramic cookware and dinnerware, cutting tools as they undergo sudden changes in temperature. The common measure of thermal shock resistance (TSR) is the maximum jump in surface temperature which a brittle material can sustain without damaged or cracking. TSR depends on materials properties such as thermal expansion coefficient, thermal conductivity, thermal diffusivity, elastic modulus, fracture toughness and tensile strength of the article. The geometrical shape and volume are also important role than the physical and mechanical properties.

Nine types of ceramic articles were selected with different geometrical shapes of thin plate, thick plate and thin disc and analysed with the theoretical and simulation results show the same trend in different thermal shock conditions. The mathematical models were validated with Finite Element methods. The result shows necessity of adjusting the thickness variation during heating and cooling of the ceramic article. The results lead to optimization of parameters for necessity of the adjustment thickness variation compared with the unmodified ones.

Keywords: thermal shock, ceramic article

Extraction of Montmorillonite Nano Particles from Clay Deposits in Nachchaduwa Area

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Clay deposits in Nachchaduwa, located in the Anuradhapura district, have been mined for generations for the rich clay content that can be used in variety of applications. The typical usages of the clay mined from this region was mainly restricted to brick, tile, and traditional cookware manufacturing. Previous research done on these deposits have yielded that these deposits mainly consist of Kaolinite and Montmorillonite clay mixed with different impurities. For the time being these clay are being used as it is without any separation being involved. However if Montmorillonite can be extracted from these deposits as nano particles they can be used in the manufacturing industry.

Montmorillonite which belongs to the smectite clay group has applications mainly in the field of polymer-clay nano composite fabrication. Composites synthesised by infusing Montmorillonite nano particles in the polymer are known to show superior mechanical properties otherwise not possible to achieve. Therefore Montmorillonite nano particles have a huge demand in the manufacturing industry. For the time being the Montmorillonite needed for the local industries are being imported. If this type of clay can be extracted locally it will add a huge value to these deposits and will also contribute positively to the growth of the country's economy.

This research was mainly focused on the extraction of these Montmorillonite nano particles from the clay deposits located in the Nachchaduwa area, which can be used in the fabrication of polymer-clay nano composite. The extraction technique was based on sedimentation and centrifuging techniques, which was possible because of the difference in specific gravity of Montmorillonite. The initial stage of the extraction process consisted of removing impurities, which mainly consisted of quartz. After this purification the clay fraction of the samples were isolated and were subjected to several centrifuging steps to isolate the Montmorillonite. Characterization of the resultants after major steps in the process were carried using X-Ray diffraction and laser particle size analysis.

The results of these analysis revealed that these clay specimens in this region was mainly consisting of Kaolinite and Montmorillonite, which concurs with previous research findings, and the main impurity being quartz. The impurities were removed to a great deal by initial sieving and then the clay fraction was isolated by the initial sedimentation. The final resultants were analysed for the presence of Montmorillonite, and it was found that it contained Montmorillonite and no considerable amounts of Kaolinite which shows that the two minerals have been separated.

Keywords: Montmorillonite, extraction, Nachchaduwa

Feasibility Studies on Sustainable Fisheries Infrastructure Development

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Sri Lanka, being an island, fisheries activities are carried out along its entire coastline extending over 1600 km. A large coastal population is engaged in fisheries activities and the fisheries sector forms an important part of the national economy. Marine fishing contributes to more than 85 % of total fish production and is carried out by a variety of crafts ranging from smaller non-motorized Traditional Craft to larger Multi Day Boats with inboard engines. The smaller crafts are based in a large number of Landing Sites scattered along the coastline while the larger craft are usually based at various Anchorages and Fishery Harbours.

Plans have been formulated by the government to increase the fish production and the national targets indicate significant increases in marine fisheries production. The expansion of the marine fishing fleet and the development of appropriate fisheries infrastructure for the operation of such craft would play a vital role in achieving the future targets for fish production. Also, fisheries activities have resumed/expanded in the northern and eastern regions of the country since the end of the conflict that prevailed in the region for nearly three decades. With many of the facilities in a dilapidated state due to damages suffered during the conflict and years of neglect, a strong need exists for the rehabilitation and development of fisheries infrastructure facilities in these regions.

The fisheries infrastructure facilities provide essential shelter for mooring and/or beach landing and loading/unloading activities of fishing crafts and shore facilities for related support activities. The level of coastal infrastructure requirement to provide the necessary protection is closely related to the nearshore wave climate of the area, and depending on the severity of the resulting coastal processes, the requirement may vary from enhancement of the natural shelter provided by features such as headlands and reefs to full breakwater protection. The coastal areas of the country are predominantly sandy beaches and the construction of fisheries infrastructure in the form of breakwaters and/or jetties could cause alterations in sediment transport patterns in the area. Such alterations could lead to adverse impacts in the form of coastal erosion and/or accretion in the area as well as siltation in the sheltered area, raising concerns related to the sustainability and the effectiveness of the development.

In view of these circumstances, a number of studies were conducted recently to assess the feasibility of developing sustainable fisheries infrastructure in various parts of the country. In the absence of recorded nearshore data at many of the locations considered, the investigations were mainly based on field studies, analysis of available data and local knowledge gathered through community consultations. Although socio-economic aspects, availability of land for shore facilities and other related aspects were also considered in assessing the feasibility, attention was mainly focussed on related coastal engineering aspects to minimise the adverse impacts on the coastline in order to ensure the sustainability of the proposed development. The details of selected investigations are presented and the recommendations are elaborated.

Keywords: Fisheries Infrastructure, Nearshore Wave Climate, Sediment Transport

A Paths Solution Algorithm for Evacuating from Multiple Regions to Safer Regions Using Graph Theory and Dynamic Programming

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During disasters such as natural disasters, fires, wars, industrial accidents or viral outbreaks, it is important to guide the people to safer zones from hazardous zones. Usually the trapped people are guided through safer routes towards safer zones via evacuation paths planned maps. An evacuation paths planned map is represented by nodes and links(Graph). The roads are represented by the links and the hazardous zones, junctions and the safer zones are represented by nodes. The evacuation paths solutions are obtained by usually using stochastic simulation(SS) methods, taken into account the perception impedance, available paths, mobilizing speeds and traffic flow volumes. The paths solutions are dynamically changed considering the traffic of the paths, speeds and trapped populations. However if the traffic flows of the paths are not significant to force a perception impedance change of the movement of the crowd, use of stochastic algorithms may not be the optimum approach and in case of short distance paths requirements the solution may not be reached on time. Moreover to simulate the optimum paths from multiple zones to safer zone by using SS methods would take longer time and therefore may not be the best approach for time critical evacuations. This paper discusses an algorithm based on graph theory and dynamic programming capable of selecting optimum paths(groups of links) solution from multiple zones to safer zones during a disaster for unconstrained traffic flows.

Hazardous zones and junctions are taken as multiple start nodes(SN) and safer zones are taken as the destination nodes(DN) of the graph. Traffic based route planning algorithms estimates the path based on link weight functions. For unconstrained traffic flows the evacuation paths selection depends on the availability or non availability of paths between SN and DN. Each link is assumed to have a direction indicator capable of indicating avoid, and two directions (forward and backward). The tri states are assigned to values as follows, "0" for avoid, "1" for forward direction and "-1" for backward direction. Thus the solution is an output vector of tri state elements, having dimension equals to the number of links of the graph. Depending on the disaster situation some links of the junctions may be not available. The non available links are assigned with "0" state value. The directions for the rest of the links are selected by using the Dijkstra's optimum path estimation algorithm and dynamic programming. The Dijkstra's algorithm is used to estimate the optimum path between a pair of (SN, DN). If there is no path between a pair of (SN, DN) trapped zone/node (TN) is introduced. Then the most optimum solution defining the directions of the links are estimated by using dynamic programming while minimizing number of TNs. Depending on the field data the graph is updated and a new optimum path is estimated. The MatLab^(TM) simulation of this algorithm is carried out for graphs with 10,50,100 SNs, and 2,3,4 links per node, and 2,5,10 DN.

Keywords: Dynamic Programming, Dijkstra's Algorithm and Evacuation

Accidents Involving Guilty Car Drivers in Sri Lanka

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The government of Sri Lanka in line with many other countries named the first decade of Action for Road Safety 2011-2020 according to the official proclaim declared at the United Nations General Assembly in March 2010. This demonstrates the high impact of traffic accidents on the society in the recent past all over the world. There have been many researches done on factors influencing the severity of traffic collisions and sometimes to predict the accident frequencies. In this study the associations between variables on traffic collision of cars are analyzed. Car drivers are only second to motorcycle riders in getting involved in traffic accidents in Sri Lanka. Furthermore, car drivers are the most among all drivers who have been guilty for the traffic accidents in the country in recent years. The data collected by the Traffic Police, Sri Lanka on age of vehicle, age and gender of driver, ownership of the vehicle, validity and maturity of the driving license, and driver's pre-crash factor on the accidents involving car drivers at fault (as decided by the police) in 2010 and 2011 are used for this study.

Objective is finding the statistical associations between age of driver, age of vehicle, maturity of driving license and driver's pre-crash factor on car accidents.

Cleaning and processing of raw data is done prior to the statistical analysis. The preliminary analysis is performed by examining the frequency distributions of individual variables and chi-square testing for two-way associations of factors. Application of log linear model for four response variables is of choice in this analysis.

More than 90% of car drivers who found to be liable for the accidents within this period are male, private owners of cars and holding valid driving licenses. Thus data modeling is focused on finding the associations between age of driver, age of vehicle, maturity of driving license and driver's crash factor. The log linear model is fitted and is concluded by the statistical evidence provided by the likelihood ratio test (G^2) that the model fits the data well with a p-value of 0.0488 and the dissimilarity index 0.0377. The model revealed the interaction of driver's pre-crash factor with maturity of license and age of vehicle and age of driver with age of vehicle, maturity of license are highly significant whereas, the interaction of driver's pre-crash factor with age of driver and the interaction between age of vehicle and maturity of license are found only marginally insignificant.

Keywords : Traffic Data, Car Drivers, Log-Linear Model

A Comparison of Factors Associated with Run-Off-Road and Non Run-Off-Road Crashes

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Run-off-road (ROR) crashes have become a major cause of serious injuries and fatalities. Crash data from Kansas, United States of America (U.S.A.) is used in this study to examine the crash risk in ROR crashes related to non-ROR crashes. Various factors such as environment, roadway, driver, vehicle and factors contributing to ROR and non-ROR crashes were analysed developing crash severity models so that potential countermeasures can be developed to improve roadside safety. Different factors that affected on ROR crashes and non-ROR crashes were identified using the models. Results indicated that some variables are significantly related to ROR crash severity but not non-ROR crash severity and vice versa.

Keywords: Run-Off-Road Crashes, Roadside Safety, Crash Data Analysis.

Congestion Monitoring in Nottingham Using Permanent Count Sites

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Permanent count sites are widely used for congestion monitoring in Nottingham. This project is aimed at urban congestion monitoring using permanent count sites during evening peak hours. "Congestion" does not have a fixed definition due to its subjectivity; therefore a definition for congestion is presented. Accuracy of loop detectors was analysed. Methodology was formed to estimate space mean speeds. Then relationships between parameters and fundamental parameters suggested that space mean speeds could be used as a congestion monitoring parameter.

Keywords: Space Mean Speed, Time Mean Speed, Occupancy, Flow, Free Flow Speed, Concentration, Jam Concentration

Implementing Outcome Based Education through Problem Based Learning: A Case Study of Kotelawala Defence University

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Outcome Based Education (OBE) is a worldwide trend in university education which has been introduced recently by the Institute of Engineers Sri Lanka (IESL) to the universities that offer engineering degree programmes. Outcome Based Education is an innovative approach which helps in expanding development horizons of education. At module or curriculum level, the OBE process comprises: (1) identifying the intended learning outcomes for students; (2) the design of curriculum, teaching, learning and assessment to enable students to achieve the intended learning outcomes; (3) the criterion referenced outcome assessment; (4) the continual improvement to both modules and programme. OBE attempts to incorporate outcomes with the knowledge, skills, attitudes and values that match the immediate social, economic and cultural environment of society. Problem Based Learning (PBL), which is a strategy where the student acquires new knowledge during the process of resolving problems, is an approach in implementing OBE.

The main objectives of this research are to evaluate the role of PBL in implementing OBE in BSc Engineering Degree in Civil Engineering at the General Sir John Kotelawala Defence University, Sri Lanka and identify potential improvements. A major curriculum revision of the Civil Engineering degree was carried out in 2011 and as a result, the programme duration which had been three years was extended by one year from the Intake 28. The extension of the programme duration enabled students to gain more exposure to the contemporary engineering practice by introducing the modules Industrial Training and Industrial Visits.

This paper discusses how PBL activities have been introduced through these modules to facilitate achieving the programme outcomes. Under the Industrial Training module, the undergraduates are assigned to engineering organizations to gain practical experience at the construction industry. They observe and report how the theory and principles that they have learned in the classroom is being applied in the real world of construction under the module Industrial Visits. Both of these modules offer opportunities for problem based learning at industrial setting and are aimed at enhancing the technical and professional competencies and soft skills of students, hence developing the attributes desirable in the engineering undergraduates. Civil Engineering students of KDU are given the unique opportunity to visit and work regularly at the construction sites of KDU, which offers them the chance to identify more PBL activities. For the two modules, both group and individual assessment are conducted in the forms of oral presentations, quizzes, reports and portfolios. The case study approach was used in the research and the role of PBL was critically analyzed and assessed using a questionnaire rated by the students of Intakes 28 and 29. It was found that PBL is highly effective in achieving the objectives of OBE, especially for modules such as Industrial Training and Industrial Visits and helps in enhancing the students' ability in critical thinking, analysis and problem solving in a practical scenario. It was observed that the students will be more benefited if the number of industrial visits could be increased in future.

Keywords: Outcome Based Education, Problem Based Learning, Industrial Training

RFID Localization Estimation Techniques for Indoor Environment

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The purpose of wireless sensor network (WSN) has made real time tracking of objects through the use of a radio frequency identification (RFID) system possible. Localization techniques in an RFID system affect on accurate estimation of the reading range between the sensor node and the tags. The tags consist of a chip and an antenna which receives from and transmits information to the sensor node. This paper aims to get the more accurate object location estimator within a complicated noisy propagation environment using RFID technology based on real time locating system (RTLS). The location estimate is based on the reading range using a time difference of arrival (TDOA) approach. In order to obtain the location information, a multilateration technique is employed. The TDOA value is investigated in order to get the estimated tag position. Different numbers of readers are simulated to compare the mean error and the standard deviation in multilateration techniques. As the simulation results, we get the high performance when the number of readers in the network is increased.

Keywords: Wireless Sensor Network (WSN), Radio Frequency Identification System (RFID), Reader, Time Difference Of Arrival (TDOA), Multilateration, Non Line-Of Sight (NLOS)

Solid State Photovoltaic Cell Made from Cu/n-Cu₂O/Rhodamine-C₁₈/p-CuI Thin Films and Carbon Nanotubes as Upper Electrode

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Solar cells have been at the heart of current low-carbon economy and have led to growing interest in the field of environmental and energy applications because of the depletion and pollution of fossil fuels. Among various solar cells, dye-sensitized solar cell (DSSC) is a promising solution to global energy and environmental problems because of its clean, low-cost, high efficiency, good durability and easy fabrication. However, enhancing the efficiency of the DSSC still is an important issue.

Various kinds of carbon, such as activated carbon, carbon nanotubes (CNT) and graphite are considered as excellent contactor between conductive glass plate and semiconductor electrode in metal-based DSSCs because of their high electrical conductivity, chemical stability, large surface area and transparency of mono layer.

Here, thin film solar cell was prepared by using Cu/n-Cu₂O/R-C₁₈/p-CuI layers and CNT as upper electrode. A simple method was used to prepare the Cu₂O layers by boiling the copper plates in a CuSO₄ (10⁻³M) Solution. The band gap of n-Cu₂O was ≈ 1.9 eV. Dye sensitized solid state photovoltaic cell (DSSC) with Cu/n-Cu₂O/R-C₁₈/p-CuI are studied by controlling the formation of dye aggregates of R-C₁₈ Langmuir-Blodgett (LB) films on the p-CuI layer. CNT layer is performed as upper electrode of the solar cell. In this paper the diffuse reflectance spectra, photocurrent action spectra, I-V characteristics and stability curves were used to discuss the characteristics of solid state thin film solar cell. The maximum power conversion efficiency is 2.5% for before include CNT as upper electrode and after it becomes 4%.

Keywords: n-Cu₂O, Carbon Nanotube (CNT), Thin Film Solar Cell.

Household Utility Robot

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Dozens of smart tools and devices have been produced to make ease of the tasks which cannot be done otherwise. The matter is more crucial when children, elderly persons or differently able persons are faced with such situations. Our hypothesis is that the above issue can be addressed to a great extent by developing a small scale robot with vertical and horizontal movements. We wish to point out that the third degree of freedom to rotate the robot can be manually achieved by a human being so that the design of the robot and its control can be made simple. The robot is essentially portable, about 8 inches, and can be connected to a rod to gain extended length up to desired limit. The robot head consists of an IR camera which undergoes two degrees of freedom, generally horizontal and vertical. The vertical and horizontal displacements of the head of the robot are measured by rotation of two stepper motors. The displacements of the robot head is confined to end points of the two sliding guides through the signals coming from four IR sensors in those ends. The robot is able to scan its proximity, locate any object in the region, and display the information on a portable device such as a laptop, a smart phone or a tablet. The robot has been implemented by 16F877A microcontroller and shown promising results in accurate vertical and horizontal movements. This robot can be introduced as a smart device for a household toolbox.

Keywords: Utility Robots, Horizontal Movement, Vertical Movement

On Modelling Robot Navigation to Assist Differently Abled Persons

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Attending requirements of differently abled persons have been a research challenge in the modern world. This matter is crucial in many situations such as waiting areas in receptions, lobbies, airports and hospitals. A research has been conducted to design a line-following robot for attending differently abled people by assisting in tasks such as collecting their documents and issuing the tokens in such situations. The line-following robot has been designed to identify the differently abled persons sitting in designated locations which are assigned with unique identification numbers. When a differently abled person takes a seat, a pressure sensor attached to the seat transmits the seat number to the robot. The robot maintains a database of seat numbers and corresponding paths from the robot original location to the relevant seat. The path description from the original location of the robot to the seat is a bit string denoting 0 for going forward and 1 for turning left or right as per the detected line. A panel of IR sensors has been fixed in 'V' shape to detect bends on the line. Another IR sensor has also been fixed in the front panel to detect obstacles on the straight-line segments. While on the move the robot receives information of new arrivals of persons. The robot operates on first-come first-served basis and attends to the persons on the return trip to the original location. This robotic system has been implemented by KST-TX01 technical transmitter and KST-RX806 super heterodyne receiver running on 16F877a pic microcontroller. This robot has been tested in real life for its accurate navigation capability.

Keywords: IR Sensor, Signal Transmitter, Line Follower

Overview of the Cloud Computing for Big Data

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In the last few years, there has been a growing interest in Big Data technologies with cloud Infrastructure. Hadoop software tool is an open source platform that allows for the distributed processing of huge data sets across different clusters, which handles high volumes of the structured data, semi-structured data and unstructured data from various sources. Hadoop environment is scalable, and Hadoop adds new nodes without changing data formats or the application. The main objective of this research lies in summarizing the cloud computing and big data technologies, providing details of the most common infrastructures that have been developed, discussing several big data processing technologies and the presenting key problems of big data processing and the cloud computing platform. Finally the open issues and challenges are introduced and research directions in the future on big data processing are explored in cloud computing environments. Therefore cloud computing can be considered as an attractive technology platform for developing and deploying big data, and it has a good future.

Keywords: Big Data, Cloud Computing, Hadoop, Mapreduce, Cloud Services

A Sinhala Ontology Generator for English to Sinhala Machine Translation

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Ontology represents knowledge as a hierarchy of concepts. These Ontologies can be used to describe grammatical, morphological, syntactic, semantic and other special features of a word. Hence, ontology of a word (word ontology) is a valuable and essential resource to develop Natural Language Processing (NLP) applications such as machine translation systems, natural language understanding systems, word segmentation systems, parsing systems etc. Nowadays many researches are researching to model ontologies for the languages to develop NLP applications. In the Indian region, Word-Hindi dictionary has been developed by the Center for Indian Language Technology (CFILT) IIT Bombay, for the purpose of machine translation. This word-Hindi dictionary consists of Noun, Verb, Adjective and Adverb Ontologies for the Hindi words. Further, number of knowledge-based machine translation systems including PAN-GLOSS are used this ontology concept to model its language knowledge. Numbers of Sinhala language resources are available to develop NLP applications including Sinhala corpus, few English/Sinhala dictionaries, lexicon, part of speech tagger and Sinhala WorldNet in Sri Lanka. However, ontology model of the Sinhala words for the purpose of machine translation is still not developed.

This paper presents a multi-agent system, named Sinhala ontology generator which is capable to generate ontology for a given Sinhala word. Ontology of the Sinhala word has been categorized by using Sinhala Noun, Verb, Adjective and Adverb. Morphological, Grammatical, Semantic and Special attributes have been considered for the Sinhala noun and verb. Morphological, Semantic and Special attributes have been considered for the adjective and adverb. The Ontology generator has been designed through the MaSMT framework. MaSMT is a java based multi-agent system development framework, especially designed to develop English to Sinhala machine translation system. MaSMT provides two types of agents, namely ordinary agents and manager agents. A manager agent consists of number of ordinary agents within its control. Further, manager agents can directly communicate with other manager agents and each and every ordinary agent in the swarm is assigned to a particular manager agent. An ordinary agent in a swarm can directly communicate only with the agents in its own swarm and its manager agent. This ontology generator has an ability to communicate with other MasMT systems such as Morphological analyser, Syntax analyser, Sinhala word reader and the Sinhala dictionary reader. The Morphological analyser provides morphological information for the given Sinhala word. Syntax analyser provides grammatical information for the given word. The Sinhala word reader uses to search the usage of the given Sinhala word through the web. The Sinhala dictionary reader search synonyms and antonyms word form online dictionaries. The Sinhala Ontology generator combines information given by the above 4 systems (Morphological analyser, Syntax analyser, Sinhala word reader and the Sinhala dictionary reader) and generates the ontology. Finally, the Sinhala ontology reader provides the result (word ontology) through the XML or Prolog data format. The system has been tested with 400 sample Sinhala words and successfully results were achieved.

Keywords: Sinhala, Ontology, Multi-Agent, Sinhala Language

A Meta Analysis on Public Sector E-Health Practices to Suggest Emerging Areas of E-Health Services within Sri Lanka

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E-Health is directly intertwined with Information Technology. It is a key e-Governance domain which has a high tendency of growing rapidly to serve the society's health needs. In general it is obvious that e-Health concept does not have a considerable sound within Sri Lanka. And also the numbers are less of having a sound knowledge or perfect awareness of e-Health facilities which are currently practicing within the country. So it is vital to find out what are the current practices of e-Health in Sri Lanka and to seek the involvement of the society with the available e-Health services.

This study intended to carry out a Meta analysis and find out the untouched areas of e-Health. Through that, there was an expectation to give a reflection on such areas to attract policy makers to enhance e-health services in Sri Lanka. This study has largely investigated the implementations done in e-Health within the country. Interviews were the main research tool used and previously done research results also were the main sources of this research to mitigate the analysis. There were highly supportable reports from ICTA Sri Lanka and same kind of organizations were consulted in the research preparation.

The investigation reflects that, even there are many e-Health exposures in Sri Lanka due to lack of intermediate coordination the processes has broken the flow of distribution. Research investigations sound that only 1% of the e-Health implementations are successful within the country. Through e-Governance, e-Health services are yet to reach the general public due to the gaps between the service chains. Along with a side to side coordination it is vital to look for more opportunities in m-Health and e-health awareness programs to promote the present e-health practices as well as the new trends of e-Health services in Sri Lanka.

Keywords: e-Health, e-Health Policy, m-Health, G-to-P Governance

Colored Petri-Net based Model for Hybrid Security Architecture based on Reputation for Secure Execution of Mobile Agents

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Mobile Agents (MA) are software programs that live in computer networks, performing their computations and moving from host to host as necessary to fulfil user goals. Security is an important issue for the widespread deployment of applications based on MA. The major security threats are either threats against the hosts, or threats against the MA. This paper briefly introduces the Hybrid Security Architecture (HSA) inspired by the various existing security techniques including digital signature, encryption, intrusion detections, signed agreement, trust and others. Proposed architecture is derived by the various existing security techniques including digital signature, encryption, intrusion detections, signed agreement, trust and others. Since all are well studied and experimented techniques, paper does not discuss all in details. This paper discusses the trust model based on reputation for the proposed architecture. For the secure execution of MA on a host, first Trust is established among the source or base hosts and the hosts to be visited by the MA. In order to establish the trust, host will use its previous experience with that host or will share experiences of other trusted and known hosts and third party.

Various components of the proposed architecture have been modelled by using Colored Petri Net (CPN) Tool. Once the model is constructed, various tools provided by CPN such as monitoring, state space and user controlled simulation have been used to check the correctness of the modelled system. Various data gathering and report generation tools have also been used to generate and collect the data required for analysis. Simulation results have been used to check the performance in terms of trip time and network overhead.

Keywords: Mobile Agent, Security, CPN

Cost Estimation of Accelerating a Project

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In implementing a project it may become necessary to crash or accelerate the process due to various demands. This may be due to delays in implementation. It also becomes necessary to accelerate the project as a requirement at the top executive level. Very often the need is to complete the remaining activities in a shorter time period.

For this purpose additional resources may be required of which the cost has to be estimated to be provided to the chief executives. This may be done arbitrarily thus creating more issues on the management of the project.

This paper proposes a novel way the above cost could be estimated based on heuristic principles of the Critical Path Analysis (C.P.A) and Project Evaluation Review Technique (P.E.R.T)

It is a common feature in PERT to estimate the duration (d) of an activity, to use the heuristic method of determining optimistic (a), moderate (b) and pessimistic (c) time durations and based on Simpson's rule take $d = (a + 4b + c)/6$.

In the present paper a modified PERT technique is proposed to estimate the cost that will be required to accelerate the remaining part of the project at some stage of implementation. To accelerate, for each critical activity of the remaining portion of a project, a quantity called cost slope

$$s = \frac{(\text{crash cost} - \text{normal cost})}{(\text{normal duration} - \text{crash duration})}$$

has to be calculated and accelerating is carried out starting with the activity having the minimum cost slope. At present there appears to be no method for evaluating the above two costs and the minimum crash duration of any activity, apart from the estimates made by planner based on his/her experience.

In this paper it is proposed to make use of the PERT technique in estimating cost values too, This method will also allow the managers to monitor the time and cost factors at stages of implementation of any project, a matter vital in project management.

Modification of ID3 Aalgorithm to Explore Student Performance with their Attributes

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Classification is one of the leading techniques in a data mining process which can apply accurately to predict the target class for each case in a data set. Particularly, in the field of education the task of classification is the categorization of data for its most effective and efficient utilization. The Decision tree is one of the important methods of classification in data mining for facilitating decision making, in sequential decision problems from historical data. Iterative Dichotomiser 3 or ID3, is the one of the popular decision tree algorithm invented by J. Ross Quinlan (1986).

When construct the ID3 top down decision tree, the central choice is selecting which attribute to test at each node in the tree. ID3 uses the statistical property called information gain measure to select the candidate attribute at each step while growing the tree. In order to define information gain precisely, it begins with a measure commonly used in information theory, called entropy (expected information) that characterizes the impurity of a dataset D is defined as:

$$Info(D) = - \sum_{i=1}^m \frac{|C_{i,D}|}{|D|} \log_2 \left(\frac{|C_{i,D}|}{|D|} \right), \text{ where } |C_{i,D}|/|D| \text{ is the probability that an arbitrary tuple}$$

in D belongs to class C_i .

In order to classify a tuple from D based on the partitioning by attribute A_i , having distinct values, $\{a_1, a_2, a_3, \dots, a_v\}$, as observed from the training dataset and attribute A_i will be used to divide the data set D into $|v|$ partition or subset, $\{D_1, D_2, D_3, \dots, D_v\}$, where D_i contains those tuples in D that have outcome a_j of A_i , need to find the conditional entropy defined as:

$$Info_{A_i}(D) = \sum_{j=1}^v \frac{|D_j|}{|D|} \times Info(D_j), \text{ where the term } |D_j|/|D| \text{ act as the weight of the } j^{\text{th}} \text{ partition.}$$

Then the information gain value of the attribute A_i is defined as the difference of above two values such as: $InfoGain(D, A_i) = Info(D) - Info_{A_i}(D)$.

This ID3 algorithm is often biased to select the attributes with more taken values in an attribute, but which is not of necessarily the best attributes for decision making. It is a shortcoming of ID3 algorithm and a new modified decision tree algorithm is proposed to overcome the problem.

Keywords: Data mining, Classification, Decision Tree Algorithm Accuracy

Investigation of Relationship between Variation of Colour Change of Fruits with their Shelf-Life and Other Physical Properties

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Quality, the degree of excellence or superiority, of fresh fruits and their products is a combination of attributes, properties, or characteristics that give each commodity value in terms of human food. Main fruit maturity parameters are surface colour, shape, size, skin colour, soluble solids content, ratio of the fruit density to the density of water, treatable acidity, and total solids content. The main objectives of this work are to investigate the variation of the surface colour and the soluble solid content of pineapple with the maturity. In addition the dependence of these parameters with shelf-life is also to be investigated. 10 Pineapples were selected from the market as the sample, and each measurement was taken daily in morning during 8.30 am to 10.30 am from the picked up date until the rotting begins to start. Preliminary measurements made using a destructive type firmness tester (WAGNER FT Fruit tester with a plunger of 8mm and FDK30 14 Kgf) revealed that pineapple firmness varied only slightly, and a thorough investigation was therefore not warranted. A multispectral imaging system consisting of CMOS camera (Model C120,V-U0012, Logitech, Japan) with a zoom lens, a highly focused LED light source and two film polarizers with 600 nm in diameter and 0.22 numerical apertures (Edmund Optics Inc., NJ, USA) was constructed for this research, and spectral polarization difference imaging technique (SPDI) was used to measure diffused reflectance of Pineapple images daily. Computer algorithms were developed to quantify the multispectral scattering images and relate them to the Soluble Solid Content (SSC) of the fruit. SSC of the fruits was measured using a non-destructive type ATAGO Refractometer. MATLAB 2010 version was used to analyse data measured for soluble solid content and for diffuse reflectance of surface colour.

Surface colour of pineapple was found to change from Green colour to Yellow/Orange colour with shelf-life, and diffuse reflectance was found to increase significantly from 0.1 and reached a saturation point of 0.5 after nearly 10 days. Results also revealed that the soluble solid content of pineapple increases approximately linearly with time with a correlation coefficient of 0.7816 and maximum value of the soluble solid content for pineapple was found to be 13 in Brix. Results also indicate that the rate of increase of soluble solid content of pineapple is a constant, which is independent of the size of the fruit. The resulted model in between surface colour and soluble solid content with its shelf-life is correlated in 0.2602 and RMSE is 0.3485. The colour analysis also revealed that the spectra contain Blue colour in addition to Green and Red which are normally expected from such a fruit. The blue colour seems to reduce with the maturity resulting a further enhancement of Yellow/Orange colour of the fruit. It has also been found that the Yellow/Orange isles and the white portions of the matured fruits both contribute to the Blue colour.

It was also observed that if there is no artificial chemical added, Pineapple minimum ripping age is about 7 days and within 12 days it gets rotten after the picked day from the farm, and Pineapples are qualified to be placed in the showcase of the market from 6th day onwards recommended to be removed around 11-12th day. From the Picked up day from the farm until 6th day is suitable for transporting the fruits in room temperature.

Keywords: Pineapples, Shelf-Life, Multispectral Imaging, Soluble Solid Content (SSC)

FODET: Forensic Tool for Determining Suspects or Objects in Crime Scene Investigation

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Crimes are committed in society all around the world, and some crimes also disturb the peace and order of society as well. It is important to identify the suspects quickly and catch the criminals, and then conduct trials to put them behind bars as a punishment when necessary, especially when the crime is severe. However, accurate and real-time person identification still remains to be a problematic issue, even if digital images of the crime scene are available. With the available information (CCTV images, stored images of suspect etc.) in this regard, we have learned that it is possible to make an accurate identification of a person if object recognition (tattoos, necklace etc.) is done along with face recognition. This holistic approach would be more reliable since multiple aspects of the same person or crime scene are verified. In our work, we have designed and developed a computer-based system, called FODET for determining person or objects involved in crime, with new ideas that make this tool very useful in practice. FODET is user-friendly tool and designed to meet above challenges, while helping in identifying suspects and objects involved in crime with high level of accuracy. In addition to face recognition, detailed object recognition along with image differentiation, boundary based recognition is proposed and implemented in our work. We have conducted tests to show that the results are accurate, and the system can also be configured to suit the needs of a crime investigation department. We believe that our work has a lot of practical application and it could be adopted in the future by state police or crime investigation departments.

Keywords: Face Recognition, Crime Investigation, Image Analysis, Similarity Measure, Object Detection

Airplane Performance Analysis through CFD Results: Assessment of a NACA 64A212 Wing-body Combination

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A comprehensive understanding of fluid and flight dynamics of an aircraft cannot be understated from both an engineering and aircraft handling perspective. In this context, availability of such descriptive information, especially in the case of trainer aircraft, will deliver profitable results for both students and teachers. Detailed information regarding the aerodynamic behaviour of the wing is not disclosed by the aircraft manufacturer to relevant stakeholders. A research was conducted by the same researchers to examine the aerodynamic behaviour of an aircraft having a wing tip designed with the NACA 64A212 airfoil through Computational Fluid Dynamics approach (CFD) and a generic lift curve and drag polar was developed for flows of reasonable Reynolds number.

Present work is involved with the assessment of performance of the NACA 64A212 wing-body combination based on the results obtained for the 2-D airfoil. A solid modelling software is used to create the geometry and computational mesh of the wing-body combination. A CFD tool models the flow physics involved in flight, thus rendering performance parameters which are available only through trial and error in the present context. The results provide new insights into the behaviour of the wing-body combination, thus enabling means of enhancing performance and handling qualities of the aircraft for both designers and pilots.

Keywords: Aircraft performance, CFD, Handling qualities

Accuracy Improvement of a Fast Algorithm for Discrete Legendre Polynomial Transforms

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Let $L = \{L_0, L_1, \dots, L_{n-1}\}$ denote the collection of the first n Legendre polynomials, L_k , of degree k and let $X = \{x_0, x_1, \dots, x_{n-1}\} \subset \mathbb{R}$ be a set of n sample points. The n point discrete Legendre polynomial transform (DLT) of an input vector, $f = (f_0, f_1, \dots, f_{n-1}) \in \mathbb{R}^n$ is defined by the collection $\{\bar{L}_0, \bar{L}_1, \dots, \bar{L}_{n-1}\}$, where $\bar{L}_j = \sum_{k=0}^{n-1} f_k L_j(x_k)$ for each $j=0, 1, \dots, n-1$. The DLT is a widely used numerical tool in a range of scientific and technical applications, including spectral methods for solving partial differential equations in global weather forecasting, statistical data analysis, shape analysis of molecular surfaces.

The direct computation of the DLT (DDLT) holds a matrix-vector product of Pf^T , where $P = (L_i(x_j))_{i,j}$ for $i, j=0, 1, \dots, n-1$ and it requires a time complexity of $O(n^3)$. This cost gets prohibitively increased for large values of n and thus it is undesirable for practical purpose. In recent our work, a fast algorithm of time complexity $O(n \log_2^2 n)$ (FDLT) has been formulated to compute efficiently the DLT. Although this algorithm is exact in hand computation, its accuracy is contaminated by lots of numerical errors when it is implemented in computer arithmetic. The approach of this paper is to improve the accuracy of the FDLT algorithm.

In the initial phase of the FDLT, it is required to compute efficiently the Vandermonde matrix vector multiplication given by $Z_0 = Vf^T$, where $V = (x_j^i)_{i,j}$ for $i, j=0, 1, \dots, n-1$. The available algorithm which is used to compute efficiently Z_0 is unstable in computer arithmetic. In this paper, instead of Vf^T , we apply the non-uniform cosine transform, defined by Cf^T , where $C = (\cos(i\pi c_j/n))_{i,j}$ for $c_i \in [0, n]$ and $i, j=0, 1, \dots, n-1$, to compute Z_0 . This modification does not bring down the efficiency of the FDLT. MATLAB implementations of the modified FDLT (MFDLT), FDLT, and DDLT algorithms were written and these programs were applied to perform numerical experiments to test the superior performance of the MFDLT. The CPU times taken by each algorithm were used to test the efficiency of the MFDLT, while relative errors with respect to the maximum norm and the 2-norm were used to test the accuracy.

The numerical tests demonstrate that the MFDLT permits high accuracy to be attained and that it is faster than the DDLT when $n > 128$.

Keywords: Non-Uniform Cosine Transform (NUFCT), Discrete Legendre Polynomial Transform (DLT), Linear Three Term Recurrence Relation, Fast Fourier Transform

An Analysis on Effective Outdoor Mobile Phone Jamming Using Radio Frequency Channels

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This paper investigates the design and implementation of mobile phone jammers for GSM (900MHz AND 1800MHz) and 3G (2100MHz) for outdoor use in a high signal reception zone. A mobile phone jammer is a device that blocks reception of signals from a Base Transceiver Station (BTS) of a service provider to a Mobile Set (MS). Blocking is conventionally done by creating some form of interference at the same frequency ranges that MS use. As a result, a MS will either lose the signal, or indicate non availability of network coverage

The usual concept employed in conventional MS jammers is to emit the jamming signal covering the entire BTS to MS transmission band. As the bandwidth is high which results in a reduced power spectral density, this in turn dilutes

Multi-homing to Provide Reliable Connectivity

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There have been tremendous advances over the past decades when it comes to wireless access technologies. Nowadays, several wireless access technologies are available everywhere. Even mobile devices have evolved to support different access technologies in providing the best possible access to the internet. Smart phones and tablet PCs (e.g. Apple Ipad) for example have the capabilities to support different networks access technologies, like 3G, 4G or WiFi networks. Currently these mobile devices can communicate using one access technology at a time. However there is a big potential for improving network capacity and enhancing user Quality of Experience (QoE) if these access technologies are integrated together. Such integration would make access technologies to cooperate and work simultaneously in a heterogeneous environment from which both the end users, as well as, the mobile operators can benefit. With the help of these integrated networks, users can be provided with more reliable connectivity in disaster management scenarios. In this work, it is investigated how to tackle the simultaneous usage of wireless access technologies. For this purpose a practical example of 3GPP (3rd generation partnership project) LTE (Long Term Evolution) and non-3GPP WLAN integrated heterogeneous network is considered.

Keywords: LTE, WLAN and QoE

Interaction of EM Radiation Emitted from Mobile Phones with Human Brain Tissues

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In this paper, we describe the interaction of electromagnetic waves with human brain. In particular, power dissipation mainly in human brain parts such as white matter, Gray matter, Cerebellum, muzzles, Skin eyes and bones is studied. For this purpose, an FDTD code has been developed to calculate specific absorption rates in the human head.

To achieve this goal:

A 3D FDTD Visual Basic (VB)code has been designed including a PML mesh truncation and human head model.

The tissue distribution in a human head is extensively studied to model the object successfully.

Measure the radiation output of various mobile phones (When communicating via normal mobile communication, Wi-Fi communication and the Bluetooth communication)and calculate SAR value for those various phones.

Calculate the safety time period of a mobile phone can be used continuously.

Keywords: EM Radiation, SAR, FDTD

POSTER PRESENTATIONS
ENGINEERING &
TECHNICAL SCIENCES

Evaluation of Solar Thermal Drying Potential Related with Fish Drying Product in Sri Lanka

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Sri Lanka is situated close to the equator; therefore most of parts in country receive an abundant solar radiation throughout the year. As estimated in the solar resource map developed by the National Renewable Energy Laboratory (NREL) of the USA, it varies from 4.0 – 4.5 kWh/m²/day. But solar thermal energy related applications are limited in commercial forms. However, solar energy is the most popular form of energy in day to day life. The one of most common commercial application of solar energy in Sri Lanka is fish drying process such as product of Dry fish, and Maldivian fish. In general small scale fish drying process are used open sun drying techniques for their products. But this method has several drawbacks such as poor quality, high drying time, and contaminations. Solar dryer is providing effective solution for this kind of product drying purposes. Research methodology is comparison of two technologies with field data. This paper presents the overview of solar thermal drying potential with fish drying process in Sri Lanka.

Keywords: Open Sun Drying, Solar Dryer, Drying Potential

Review of Knowledge Based Engineering and its Applicability to Optimisation of Machining Processes

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The knowledge capturing methods have evolved from computer aided design (CAD) to Knowledge based engineering (KBE). The KBE systems have been successfully implemented in different fields. Most of the KBE systems were geometry focus. One of the features of the KBE approach is to automate repetitive, non-creative tasks. The optimization of machining process is a repetitive, trial and error and experience based process. A KBE system for optimizing machining process will help the designers and manufacturing planners to select an optimal set of cutting tools and cutting conditions for different material properties and to give users alternatives on how to reduce cost and time. This research consists of reviewing different KBE methodologies and developing KBE model for machining process. A suitable knowledge based system was proposed to generate optimum solutions for machining processes by integrating CAD, computer aided manufacturing (CAM), material selection, costing and empirical equations.

Keywords: Knowledge Based Engineering; Computer Aided Manufacturing; Optimization.

Statistical Analysis and Forecasting Model for Monthly Mean Temperature in Colombo

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Colombo is an industrial city in western province of Sri Lanka which has a high population density. Also, it is one of the cities which is warming faster due to industrial processes and lack of forestry. According to the Koppen climate classification, Colombo has a tropical rainforest climate and the city consists of a geography based on a mix of land and water. The climate of Colombo is fairly temperate all throughout the year and consists of intra-year seasonal and cyclic temperature patterns. The scope of this research is to develop a time based regression model to forecast monthly mean temperature in Colombo with respect to the most related weather component. In this study, monthly mean temperature anomalies (in Celsius) of Colombo city for the period of 1986 to 2008 were analyzed and furthermore monthly mean temperatures for the year 2009 were forecasted using the estimated model. Data were collected from the weather station in Colombo attached to department of meteorology. An intra-year (within year) seasonal pattern was observed in January, February, May-July, November and December. The weather components average wind (Km/h) and average humidity (%) indicated higher correlations to the monthly mean temperature than average rainfall (mm) and cloud (oktas). Stepwise regression was performed to find the most accurate model by using stationary set of series. The most accurate model consisted of average wind and 11 numbers of dummy variables generated due to the seasonality. The significance of each predictor and indicator for the final model were checked. The Gaussian correlated residuals were modeled using linear auto regressive model AR (2) derived from Box Jenkins methodology. The coefficients of AR(2) model 0.3596 and 0.1726, were significant for the model of the residuals. The constant and the coefficients of final estimated model for forecasting monthly mean temperature were 27.1, 0.0893, 0.388, 1.04, 1.33, 1.47, 1.08, 0.838, 0.874, 0.812, 0.374. Accordingly, the fitted regression model was accepted as the best model with R^2 of 58.5 %.

Keywords: Koppen Climate Classification, Multiple Regression, Linear Auto Regressive model

QR Code Based Signature Encoding System

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Signature on a paper is a most general authentication method used in the world. Even though the duplication of one's hand signature by another is difficult faking another's signature is very common security violation. Also it is sometimes very hard to identify real signature from fake signature using naked eye at a glance. Signature contains features that identical to individual hand writing and extraction of those features is difficult to do in few seconds by a human. Personal signature plays significant role in a place like Bank in money transactions. Especially in a high transaction volume environments in banks often lead to false signature verifications. Therefore a signature encoding system provides secure reliable and fast money transaction.

Banks have a huge amount of customer's signature databases and need to handle thousands of verifications in a second. Therefore signature should encode to very simple form that enable fast online processing. QR code would be one of feasible solution in that context. Quick response code (QR code) is a 2-dimensional barcode that encodes numeric and alphanumeric data in to a two dimensional barcode symbol. QR code is capable of encoding 7089 maximum numerical characters in to one symbol. QR code is very small in size. Therefore QR code could use as simple encoded symbol that represent signature. This paper discusses a QR code based signature encoding system implemented with an FPGA based hardware platform to increase the speed of verification.

The image of the signature that is taken from webcam is used to generate QR code. Since the image matrix is more than 7089 characters direct generation QR code from the webcam image is not possible. Therefore image is pre-processed or pre compressed before encoding. First the input image is normalized and its contrast is enhanced by using histogram equalization. Then it is converted into a binary image. Afterwards this Binary image matrix is compressed into a simple matrix using two-dimensional wavelet analysis and it is further compressed using sparse matrix techniques. Then this compressed matrix is converted to a QR code. The system is implemented in FPGA based embedded system with a webcam interface.

The system is tested with signatures of 50 persons to verify consistency of QR code for set of signatures of same person and differentiation between signatures of two persons. The QR code totally depends on final compressed matrix. Compressed matrices of same person are sometimes slightly different. Therefore a tolerance value is introduced by using distance calculation. Final compressed matrices of the same person are tested. By using this method the signatures are encoded with accuracy around 60% and about 65% differentiation accuracy of two different signatures was observed.

Keywords: QR code, Signature Verification, Wavelet Analysis and FPGAs.

Automatic Temperature Measurement System

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The temperature is the major component in the weather measurement and also a critical factor in bio-functional and day-to-day activities. In today's scenario, lots of instruments are used in all over the world to measure the temperature. Most of these instruments take some time to read the temperature and they need second party support.

In this project the total focus is given to atmospheric temperature measurement. This was done using an electronic transducer where the physical quantity is converted into the relevant electrical signal and then measure, analyse, store and display these data automatically, gradually, very quickly and attractively. This task was achieved by using different software, programming and hardware circuits. LM 35 temperature sensor is used as electronic transducer and LabVIEW software is used to analyse and display relevant temperature data. The temperature obtained every hour. It was analysed and displayed attractively using graphs and indicators in LabVIEW front panel. The analysed data showed temperature values within 0.5 °C difference with the temperature measurement from a normal thermometer. The whole system worked successfully with a significant control.

Keywords: Temperature, LM35 Temperature Sensor, Automatic, LabVIEW

The Significance of Importance of an Architectural Pattern for AJAX Based Rich Internet Applications

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Rich Internet Applications are web applications, which have rich User Interfaces with interactive and responsive features. AJAX is a powerful script-based approach and turned out to be a trend in Rich Internet Applications development. Downside of this approach is, that it is suffering from various complexities. If these complexities are identified and addressed, we can simplify the AJAX based Rich Internet Application engineering process, and expect a good support in Rapid Application Development methodologies too.

In our on-going research of finding solutions for the complexities in AJAX based Rich Internet Application, we conducted a literature survey followed by a cross-sectional survey, parallel to a series of experiments. The literature survey helped to gain the background knowledge and definitions about the problem. The data gathered in the cross-sectional survey, were analysed using statistical methods, to infer up to date knowledge about the AJAX based Rich Internet engineering, and to support the findings of the literature survey. A diverse set of techniques were tested in the series of experiments, to try out solutions for the difficulties, related to the complexities identified in the surveys. The knowledge and the experience gained from the results of these experiments were analysed to identify set of features and patterns, which can be utilized to increase the realization of Rich Internet Applications.

In the literature survey, we noted that the reason for the difficulties in the AJAX based Rich Internet Applications engineering is caused by the difficulties in realizing the Rich Internet Applications, which is affected by lack of architectural formalism in Rich Internet Applications. In the cross-sectional survey analysis, we identified facts to evident that, showing that the difficulty level of AJAX usage increases with the number of AJAX features implemented in the same page; and the high CASE tools usage does not assist in reducing the complexities, which can be interpreted as – the complexities are originated from the level of architecture. The acquaintance gained from the experiment results directed us to understand, that the features and the techniques identified from the experiment results can be used to formalize a general architectural pattern for Rich Internet Applications, and this pattern can increase the realization of the features in the Rich Internet Applications, including the AJAX adoption. And the architectural pattern can be utilized as a general architecture in Rapid Application Development of Rich Internet Applications too.

Based on the both literature and cross-sectional surveys analysis, we conclude that it is important to have a general architectural formalism for AJAX base Rich Internet Applications – rather than another set of CASE tools – which reduces the complexities by increasing the realization, and assists in the development difficulties. And based on the experiment results analysis, we conclude that the architectural formalism is likely to be an architectural pattern, and the importance of having a general architectural pattern is significant when it comes to Rapid Application Development.

Keywords: AJAX, Rich Internet Applications, Architecture.

Relationship between Feeding Pattern and Environmental Factors with Productivity of Biogas Unit

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Bio meth nation is proved scientific solution for reduce global warming, greenhouse effect and good source of renewable energy. Bio gas unit functioning at north western command HQ Mullikulam from May 2013 with assistance of pilisaru project. Study aim to identify relationship of bio gas production with external factors.

The method adopted was an Analysis on relationship with biogas production and, Composition of feeding materials, Enhance culture media, Environmental temperature and PH valve/salinity of water effect on bio gas production.

Reduction of LPG consumption assumed as an indicator of bio gas production. Optimal temperature Celsius 30-32 and high culture media (wt. of cow done 37.16%) has augmentation effect on bio meth nation increase food waste (Carbohydrate- CHO) may reduce metabolism of anaerobic bacteria and increase of nitrogen [protein] composition (Rotten fish) may effect on increase of bio gas production –reduction/change of source of water feeding may cause increase salinity and increase toxins materials in media and caused reduction bacteria density and of bio gas production

Conclusion reached are as follows; Optimal maintaining of sensitive external factors is very important for proper functioning of bio gas unit and Bio meth nation is good scientific method of organic solid waste management and production of renewable energy.

The Potential of Inter Operator Roaming for the Future of Mobile Communication Industry in Sri Lanka

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Sri Lankan mobile network operators have been facing new challenges to maintain revenue levels and profitability. With increasing energy consumption, health hazards, capital and operational expenditures of deploying third and second generation networks are causing both existing and new operators to look at more potential approaches to fulfil the demand of their expanding networks. The main purpose of this research is to analyse, design, and develop a framework for inter operator roaming in a way which Sri Lankan mobile network operators can become more environmental friendly and maintain their revenue levels and profitability by branding themselves as more sustainable. The research can be considered partially exploratory, as it seeks out new sight on green development in Sri Lankan mobile communication sector and the impact of Inter Operator Roaming on it from global point of view.

The research was carried out according to the deductive research method where the data analysis triangulated using quantitative and qualitative methods. Under that, predetermined instruments and objectives developed, prior to the research. Therefore author has selected six fundamental factors (Rival Market, Economies of scale, Capital and Operational Expenditures, R&D on eco-friendly mechanisms, Health Hazards due Electromagnetic Radiation and the Absence of agreed Procedures and Performance Indicators) to design the research.

Through statistical analysis it was confirmed that each factor had a positive impact towards the Inter Operator Roaming, which was also supported through deductive research assessment. The research concludes with Inter Operator Roaming as a green development concept and it will enable mobile network operators to improve the quality of service by better service coverage. Further, the research identified that Inter Operator Roaming reduces cost of new third and second generation network deployments and cost of energy consumption while preventing loss of market share, eliminating customer dis-satisfaction and lowering carbon footprint of mobile network operators.

Keywords: Inter Operator Roaming, Capital and Operational Expenditures, Green Development