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7th ANNUAL RESEARCH SESSION
SABARAGAMUWA UNIVERSITY OF SRI LANKA

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Message from the Vice-Chancellor

Sabaragamuwa University of Sri Lanka

It is a great pleasure and a privilege to welcome you to the 7th Annual Research Session 2017 of the Sabaragamuwa University of Sri Lanka. The annual research session is a major event of the University Calendar. Annual Research Session has been providing an ideal platform for university academics, postgraduate and undergraduate students to share their research findings and I am confident that the young academia of Sabaragamuwa University of Sri Lanka will immensely be benefited from the ARS – 2017.

I take this opportunity to congratulate the organizing committee for taking the challenge and organizing the 7th Annual Research Session in a very professional manner. I have no doubt that ARS – 2017 will offer our university academia to share their national and international experiences, latest research findings and insights with their colleagues in the different fields of interest.

Finally I hope that all of you would enjoy with the ARS 2017 and would experience a very stimulating and interesting session.

Prof. M. Sunil Shantha
Vice-Chancellor
Sabaragamuwa University of Sri Lanka

Message from the Director

Centre for Research and Knowledge Dissemination

Sabaragamuwa University of Sri Lanka

In marking the significance of the Annual Research Session (ARS), as the Director of Centre for Research and Knowledge Dissemination (CRKD) it is a great pleasure for me to forward this message on the 7th ARS of Sabaragamuwa University of Sri Lanka (SUSL). Universities are committed to encourage research and knowledge dissemination to determine the sustainability. ARS provides a platform annually for academic and students to disseminate their new research findings on predominantly specializing areas of interest. Here, the university shows consistent encouragement and leadership through the ARS towards its vision. Since the CRKD is the body purposefully established for the research and knowledge dissemination of SUSL holding the 7th ARS marks the milestones in the successful journey. Besides, the ARS is becoming a well-recognized institutional stimuli to build the confidence and research culture. Hence a number of enthusiastic and energetic young researchers from diverse disciplines in the university proliferate the magnitude of the 7th ARS remarkably. Enabling the intra and interdisciplinary networking and dialogue among the growing researchers to widen the knowledge on research and sharpen critical thinking of research. Eventually this enables the university to expand the horizon research and publication reaching national and global standards. This also will be an opportunity for the CRKD to expand its resource base to serve for the stakeholders and wider community. The presence and keynote speech of the well-known scientist and eminent scholar in Sri Lanka help the upcoming scholars and researchers to mold them to suite the future world. As the Director of the CRKD I really appreciate and acknowledge the leadership and guidance of the Vice-Chancellor, Prof. M. Sunil Shantha, and the support of Registrar and Bursar in holding the 7th ARS. I am also obliged to acknowledge the 7th ARS organizing committee specially the Chairman, Dr. R. M. K. T. Rathnayaka and Secretary, Dr. G. R. S. R. C. Samaraweera, for their untiring efforts to hold it through many challenges.

I extend my best wishes for the success of the 7th ARS while extending my gratitude for contributors and presenters.

Dr. M. S. M. Aslam
Director
Centre for Research and Knowledge Dissemination
Sabaragamuwa University of Sri Lanka

Message from the Chairman of the 7th Annual Research Session 2017

Sabaragamuwa University of Sri Lanka

It is with immense pleasure that I write this message as the chairman, on behalf of the ARS 2017 Organizing Committee to welcome you all to the 7th Annual Research Session of the Sabaragamuwa University of Sri Lanka. I have no doubt that ARS-2017 will offer our university academia to share their international and national experiences, latest research findings and insights with their colleagues in the different fields of interest. Our main aim of organizing this event is to inculcate a productive research culture and promote scholarly discussion among the academics of our university, emphasizing on the applied research that can contribute to the nations' development and sustainability. ARS 2017 is apart from this, a platform given to the undergraduates who identified by respective departments well in their undergraduate studies can be seen as right motivation for them to step further into their academic carrier and become accredited among the scientific community.

On behalf of the ARS organizing committee, we are much delighted to organize ARS 2017 and obliged to convey our sincere thanks to the Vice Chancellor of Sabaragamuwa University of Sri Lanka, Professor M. Sunil Shantha, for providing us with right guidance throughout this event and encouragements.

Furthermore, we are indebted to our Chief Guest, Senior Professor Hemanthi Ranasinghe, Dean, Faculty of Graduate Studies, University of Sri Jayewardenpura and the Technical Speaker, Mr. Pubudu Liyanage, Director / Human Resources and Process Development at IFS R&D Ltd., for gracing this occasion with their intellectual speeches. We would also like to make this an opportunity to express our gratitude to the Director, Centre for Research and Knowledge Dissemination Center, Dr. M. S. M. Aslam for the invaluable support that he extended to make this event a success.

There were over 60 abstracts submissions for the 7th ARS and it was a real challenge for the editorial board to select abstracts for the presentations because almost all the abstracts submitted were in high quality. I sincerely thank the members of the editorial board and the reviewers for their diligent work.

Finally, we wish all the researchers who had submitted abstracts for ARS 2017 as well as non-presenting researchers of SUSL all the success in your research endeavors, making 2018 a promising year to our research portfolio as a whole.

Dr. R. M. Kapila Tharanga Rathnayaka

Chairman - 7th Annual Research Session 2017

Sabaragamuwa University of Sri Lanka

ABSTRACTS

OF THE

7th ANNUAL RESEARCH SESSION,

SABARAGAMUWA UNIVERSITY OF SRI LANKA

Abstracts of technical sessions of the 7th ARS 2017 are organized as follows;

- Summary of the **Keynote Speech** by Prof. Hemanthi Ranasinghe, Senior Professor in Forestry and Environment Science and Dean, Faculty of Graduate Studies, University of Sri Jayewardenepura– (pp.01–03)

- Summary of the **Technical Speech** by Mr. Pubudu Liyanage, Director Human Resources and Process Development at IFS R & D Limited– (pp.04–05)

- Abstracts of the **Oral Presentation Sessions**
  - **Session 1: Agricultural Sciences** – (pp.06–08)

    Chairman – Prof. A. A. Y. Amarasinghe

    Rapporteur – Dr. P. K. Dissanayake

  - **Session 2: Management Studies**– (pp.09–13)

    Chairman – Prof. D. A. I. Dayaratne

    Rapporteur – Dr. R. S. S. W. Arachchi

  - **Session 3: Applied Sciences (Food Science and Chemistry)** – (pp.14–17)

    Chairman – Prof. R. M. U. S. K. Rathnayake

    Rapporteur – Dr. E. P. N. Udayakumara

  - **Session 4: Applied Sciences (Computer Sciences & Information Technology)** – (pp.18–22)

    Chairman – Dr. E. M. U. W. J. B. Ekanayake

    Rapporteur – Mr. R. K. A. R. Kariapper

- **Session 5: Applied Sciences (Physics & Geomatics**)– (pp.23–26)
  Chairman – Dr. Thilantha Dammalage
  Rapporteur – Dr. Duminda R. Welikanna

- **Session 6: Social Sciences and Languages** – (pp.27–30)
  Chairman – Dr. W. Manoj Ariyaratne
  Rapporteur – Dr. A. Aruna Shantha

- Abstracts of the Students' **Poster Presentation Session** – (pp.32–57)

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	Faculty of Social Sciences and Languages	**Prof. H. M. S. Priyanath**
		Dr. W. M. J. Welgama

Summary of the Keynote Speech

Research, Technology Transfer and Innovation: the Role of Universities

Hemanthi Ranasinghe

Senior Professor in Forestry and Environment Science and Dean, Faculty of Graduate Studies, University of Sri Jayewardenepura

Research is a systematic inquiry that investigates hypotheses, suggests new interpretations of data or texts, and poses new questions for future research to explore. It consists of asking a question that nobody has asked before, doing the necessary work to find the answer and communicating the knowledge thus acquired to a larger audience. There are fundamentally two kinds of research; a pure pursuit of knowledge for its own sake and research linked to problem solving. The former is usually more appropriate for countries and situations which are able to allocate large amount of funds for research while the developing countries who are struggling with finances especially towards research and development needs to focus more on the latter in which research leads to problem solving. The research thus needs to be more focused taking on board the global and local issues and priorities. In 2015, the United Nations announced the Sustainable Development Goals (SDG) which are a collection of 17 interrelated global goals. They cover a broad range of social development issues such as poverty, hunger, health, education, climate change, gender equality, water, sanitation, energy, environment and social justice. The SDGs are also known as "Transforming our World: the 2030 Agenda for Sustainable Development" or Agenda 2030 in short. The goals were developed to replace the Millennium Development Goals (MDGs) which ended in 2015. Unlike the MDGs, the SDG framework does not distinguish between "developed" and "developing" nations. Instead, the goals apply to all countries. More locally, the Ministry of Science, Technology and Research in our country, having identified the focus areas that need immediate research and development interventions came up with a comprehensive National Research and Development Framework (NRDF) having ten focus areas and ten interventions to direct research with the objectives of enhancing the quality of life of the people of the country, enhancing the economic development and laying the foundation for the country to become scientifically and technologically advanced nation while preserving its environment. The ten focus areas identified were water; food, agriculture and nutrition; health, shelter, environment, energy, mineral resources, apparel industry, ICT and knowledge services and basic sciences, emerging technologies and indigenous knowledge. This further endorses the Sustainable Vision for 2030 for Sri Lanka which is to become a sustainable, upper middle income Indian Ocean hub that is economically prosperous, competitive and advanced, environmentally green and flourishing and socially inclusive, harmonious, peaceful and just based on balanced inclusive growth. However, in order achieve these targets we need to use research, technology and innovation and positive mindsets.

Innovation is considered as an essential component or the engine of modern economies to survive within the global competition through introduction of new products, services and processes. In this approach, the importance of the interrelationship among the major actors to create and diffuse new knowledge and technology for the commercial benefits is stressed. Among the major actors, the universities are now moving to play an essential role that contrasting from traditional teaching roles to more complex and active engagements with industry and other S&T institutions (public and private), in terms of research works, sharing infrastructure, technology transfer through skilled technical personnel etcetera. The attention on the role of universities in the national innovation system of a country has been continuously increased. This is a result popularization of findings of university research activities in the processes of development of new products, services and technologies introduced by the industry. This has led to increase the importance of multi- and inter-disciplinary research and development. Further, it has strengthened interrelations for the purpose of industrial applications of basic research activities. In the university system, the traditional role in teaching and research is considered as first priority. Transferring the knowledge to industries and society began to be considered as the next priority. The third priority was the stream combination of first and second priorities. These three modes of streams require specific policies and resources to ensure the effective functioning for a strong innovation climate. As a part university role, it needs to develop models, marketable ideas and also transfer those effectively to the industry for commercialization. This Triple – Helix concept emphasized the necessity of university-industry-government interactions for these fruitful modes of streams. This can be effected in the engagement in joint research activities together with industry firms, transferring new products to industry, sharing infrastructure, mobility of high trained research and development personnel and visiting lecturing for industry etc. Universities distribute knowledge via teaching and improve the stock of human capital. Apart from that university broaden the knowledge via researching. Without satisfying from above, they need to transfer the generated knowledge to society by collaborating with industry. This category of activities is the results of the first two functions that are education and research. Third stream has not yet been a core function in the same way as the first two streams but it seems increasing attention on this. Today, universities have to play an active role in transferring knowledge, science and technology development to useful innovations all the time. In the global context, all national, regional and local levels are motivating the “third stream” which is describing the collaborative role of universities industries. Currently, university involvement for the innovation based development is greatly appreciated than earlier. Eminent universities in the world have shown three missions to be accomplished. They are trying to excel as well as to exploit and create strong connection among those missions that are teaching, conducting research and technology transfers. Role of modern universities have been recognized as create and introduce potential innovations for the requests of the societies. In contrast, industrial innovation in many developing countries is highly informal and unsystematic. Innovations in those countries are not the results of formally articulated through conscious

engagements in research and development activities. The studies in innovation should be interconnected with the country's economic and institutional development and growth. Newly industrialized countries such as South Korea, Taiwan have paid attention on strengthening their national innovation systems and were able to acquire a great economic growth. The developing countries need to pay considerable attention on enhancing their strategic capacity for innovation in the government level, institutional level, educational level etc. Comparing major inputs of the innovations in developing countries with those of developed countries, it is noted that capital accumulation which facilitates knowledge creation and learning is significantly higher in developed context resulting strong innovations. It can be concluded that innovation is the results of the collaboration between societal activities and findings of the science and technology initiatives. However, innovation does not count only as a result of technology creativeness. Most of the specific regional, social, economic factors affect to the effective innovations to be developed within countries. The developing countries need to learn from developed and newly industrialized countries and thereby try to grasp the benefits of increased economic performances.

Summary of the Technical Speech

The importance of close collaboration between academia and industry

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Industry-Academic relationship and partnerships are becoming more and more collaborative as a result of economic volatility, competition, resource scarcity, high industry demands and rapidly changing technology. Industry interests to fund academic research have increased over last years as government funding is somewhat limited. Collaborations are not limited to academic research, but are expanding to different activities like industry funded laboratories, hybrid degree programs jointly carried out by industry and academia, student centric learning and development activities, student internships etc.

Research interests of universities and industry are traditionally at different ends – universities focusing on more knowledge driven academic research and industry focusing on profit driven applied research. But in the current setup universities have become more entrepreneurial and industry has realized the potential of academic expertise to foster their corporate objective.

Industry are having different challenges in terms acquiring the right talent with an industry ready skill set from academic institutes. This has become a fierce competition during last few years. Innovation and Creativity have become key terms in the IT industry. Technological improvements sustain short term product cycles and the need of technological advancement and readiness to go ahead with changing technologies has become essential.

If we are to look at opportunities we have there are many models in terms of collaboration:

1. Hybrid Degree Programs jointly carried out by Industry and Academia
2. Industry funded academic and student research (short term to long term partnerships) to strengthen Research and Development activities
3. Academic Institute facilitating Industry Professionals to embed with research with both academics and students
4. Industry funded incubators to promote Innovation and Entrepreneurship mindset in universities
5. Create a collaborative knowledge network of Academics, Students and Industry Professionals that will be beneficial for all the parties
6. Industry funded and maintained research laboratories inside universities

7. Industry funded programs (both mid-term and long-term programs to support universities to develop and deliver sustainable industry oriented degree programs)
8. Learning and Development activities for students – sharing industry knowledge, best practices etc. with students to make them industry ready
9. Help students to develop both interpersonal and intrapersonal skills – which has a high industry focus (this need to include both student mentoring and coaching)
10. Student Internships that gives the right level of exposure to students
11. Staff exchange programs (transfer staff from Industry to University and also from University to Industry)
12. Curriculum development activities

Key goals or outcomes of an industry academic collaboration are People (transfer graduates with right skill set to the industry), Resources and Ideas (ideas with actionable outcomes, new research directions, IP).

A right strategy is needed to have a prosperous Industry Academia collaboration that will be beneficial to both parties and also the government from an economical perspective.

Impact of Soil Fertility Improvement Strategies on Annual Crop Cultivation in Mid Country Homegarden Systems in Aluthgama Village, Nawalapitiya, Sri Lanka

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The homegarden systems developed and nurtured by farmers through generations of innovation and experiment are often cited as the epitome of sustainability. The main objective of this study was to assess the impact of some different kinds of inputs on soil fertility and productivity improvement of homegardens. The study was further elaborated by addressing how to maintain crop diversity and cultivation of cash crops which affected the management of homegardens and vice versa in the Aluthgama village, Nawalapitiya, Sri Lanka, during 2014-2016. Eight homegardens, four each from the 'improved' and 'non-improved' categories were selected. Annual crops (i.e. Phaseolus vulgaris L. and Capsicum annuum L.) were cultivated with treatments: No fertilizer, chemical fertilizers as recommended, only compost (4 MTha-1), only green manure (4 MYha-1), ½ the recommended amount of chemical fertilizer with (2 MTha-1) compost and (2 MTha-1) green manure. Crop growth and yield, and soil chemical and physical parameters were analyzed before and after each crop. In addition, crop species diversity was evaluated in 53 homegardens belonging to the two categories, and prospects and issues of homegardening and associated tea cultivation were recorded taking 100 homegardens into consideration. Data were analyzed using SAS and SPSS statistical software.

The results of the total leaf area, dry weights and yield of both crops indicated that the treatments containing the artificial fertilizer and compost or green manure were giving comparable values as the artificial fertilizer alone, which were superior than other treatments. Based on the agro biodiversity, the homegardens in the area could be separated in to two clusters (Shannon Weiner Index 2.43 and 2.32, Simpson's index 0.92 and 0.88 in cluster 1 and 2 respectively) and cluster 1 superior in more species diversity. Most homegarden owners in the studied area cultivated tea in a mixed cropping system. More attention was given by the farmers to the tea lands compared to the homegardens, which had negative impacts on management of the homegardens. The study emphasizes proper management of soil fertility, biodiversity and appropriate crop cultivation as the key components of the development of homegardens. Promotion and development of tea associated homegardens can be a strong foundation and conspicuous method to secure food and income amongst smallholder farmers in the mid country.

Keywords: Agro-Biodiversity, Homegarden, Soil fertility, Tea

Dose Regime Effect on Porcine Primordial Follicle Survival *In Vitro*; Perspectives of Vascular Endothelial Growth Factor 165a in Culture Medium

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Mammalian folliculogenesis is a complex process which determines the availability of viable oocyte for successful fertilization. Initiation of mammalian primordial follicle development also known as primordial follicle activation is poorly understood. Vascular endothelial growth factor 165a (VEGFA165a) is a well-known angiogenic factor which stimulate the vascular bed formation in cows with cystic ovarian lesions. Therefore, studies on VEGFA role on ovarian follicle activation are indispensable. The objective of the current study was to determine the different dose regime effect of VEGF165a on porcine primordial follicle development *in vitro*. This preliminary data was obtained from short-term (72 hours) *in vitro* culture of porcine ovarian cortical stripes under 5% CO_2 and 95% O_2 with the humidified atmospheric conditions. Out of three different dose regimes, 0.1ng/ml (10-6M) has shown highest viable follicles numbers (22.40±0.16) compared to 1ng/ml (10-5 M) (22.36±0.15) and 10ng/ml (10-4M) (7.0±0.0). Dose regime 10ng/ml VEGFA165a treatment has shown the accelerated follicle degeneration (20.11±0.11). For the first time, here we reported that lower concentration of VEGFA165a provide more follicle viability in porcine tissues under short term culture conditions. All the data were analyzed using SAS 9.0 and the treatment effect was not significant among any treatment nor with the control ($p>0.05$). In conclusion, it was evident in this study that the lowest concentrations of VEGFA165a has increased the follicle viability while higher concentrations implicit increased follicle degeneration. Acknowledgements: This study was supported by National Science Foundation of Sri Lanka grant NSF/SCH/2015/07 and Sabaragamuwa University Research Grant, SUSL/RG/2015/06.

Keywords: Follicle activation, *In vitro*, Porcine primordial follicle, $VEGFA_{165a}$

Superoxide Dismutase Gene Might Play a Major Role in Tapping Panel Dryness of Rubber (*Hevea brasiliensis Muell. Arg.*).

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Among the rubber producing plant species, *Hevea brasiliensis Muell. Arg*., commonly known as rubber tree, is almost the sole source of natural rubber. Currently, the rubber industry of Sri Lanka contributes about 1.0 % of the GDP being one of the major income sources of the agriculture sector. Over the past decades, the rubber yield has been significantly increased due to the introduction of high yielding clones. However, the latex production is seriously affected by tapping panel dryness (TPD), a physiological disorder, which ultimately results in decline or complete cessation of latex production and causes 15 % to 20 % yield loss worldwide annually. In Sri Lanka, yield loss due to TPD is increasing at an alarming rate. It is hypothesized that TPD is caused by tapping induced oxidative stress resulted from over exploitation. Under oxidative stress, plants generally increase the production of free radical scavenging or antioxidant enzymes such as, superoxide dismutase (SOD), catalase (CAT) and peroxidase (APX). At present, the cause of TPD is not clear. Therefore, this study was started with the objectives of studying the role of antioxidant genes on TPD. The expression differences of antioxidant genes in both TPD affected and healthy trees of RRISL 2001 rubber clone were analyzed using semi quantitative RT-PCR. Gene specific primers designed to span exon junctions were used for PCR amplifications and the amplified products were visualized on ethidium bromide stained agarose gels. The band intensities were determined by visually. The results showed that the expression of the rubber SOD gene is highly down-regulated in TPD affected trees compared to that of healthy trees. Whereas, the CAT gene is slightly up-regulated in TPD affected tress leading to conclude that rubber SOD gene might play an important role in TPD. Moreover, our results support to the hypothesis that TPD is caused by inefficient scavenging of reactive oxygen species due to defects in antioxidant system of some rubber trees.

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Keywords: Catalase*, Hevea brasiliensis*, Semi quantitative RT-PCR, Superoxide dismutase, Tapping panel dryness.

Determinants of Stock Returns: A Comparative Analysis of Stock Markets in Sri Lanka and in the United Kingdom

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This study examines the determinants of stock returns of Colombo Stock Exchange (CSE) and London Stock Exchange (LSE) for the period spanning from 2000-2012. The study applies a panel data approach in a multifactor assets pricing framework using seven firm specific variables and nine macroeconomic indicators. The fitted one-way fixed effects firm factor regression indicates that Return on Assets (ROA) and sales growth rate play a significant role in explaining variation in stock returns in Sri Lankan companies while one-way random effect firm factor model in UK shows that E/P ratio, B/M ratio, fixed assets growth rate, size and ROA are the most dominants priced factors in London listed companies. The explanatory power of regressions increases considerably when we incorporate macroeconomic indicators controlling for firm effects and results show that inflation, GDP and exchange rate remain leading predictors of stock returns variation in both CSE and LSE whereas unemployment and Foreign Portfolio Investments (FPI) become statistically significant only in CSE. Thus, the results do not reveal big differences between the systematic and unsystematic risk factors which are priced in both the LSE and the CSE stocks. It can be concluded that the stock markets of the UK and Sri Lanka are more sensitive to macroeconomic changes and the findings of this study disagree with the predictions of Fama's (1970) semi-strong form of the market efficiency. Hence, it seems that, based on the publicly available information, the investors can make abnormal profits through stock trading strategies and the multifactor assets pricing models work effectively in both the CSE and the LSE.

Keywords: Colombo Stock Exchange, Determinants, London Stock Exchange, Panel Data Regression, Stock Returns

Impact of the Macroeconomic Variables on All Share Price Index in Colombo Stock Exchange, Sri Lanka: GARCH-X Approach

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This study examined the dynamic impact of macroeconomic variables on All Share Price Index (ASPI) volatility. Data were collected for the period spanning from January 2006 to December 2015 using annual reports of the Central Bank of Sri Lanka and publications of Colombo Stock Exchange. Money supply, interest rate, consumer price index, exchange rate, and industrial production index were used as macroeconomic variables of the study. The AR (1) - GARCH (1, 1) - X model was identified as the significant model to model volatility of all share price index. It was found that the previous all share price index (lag 1) positively and significantly affects the current ASPI implying that the volatility of stock market prices is affected by related news from the previous period more than by past volatility. Negative values of two parameters of the GARCH indicate that shocks to the conditional variance take a short time to die out, so volatility is not persistent. The result further implies that the volatility in interest rate and industrial production index have significant impact for the volatility of all share price index. The Johansen-Juselius cointegration test suggested that macroeconomic variables in the system share a long run relationship. Results imply that, ASPI has significant positive long run relationships with money supply, interest rate and exchange rate while significant negative long run relationships with industrial production index and consumer price index. Investors in the stock market should look at the systematic risks revealed by the macroeconomic variables when structuring portfolios and diversification strategies.

Keywords: All share price index, Dynamic relationship, Macroeconomic variables

Factors Influence Sewing Efficiency of Machine Operators: An Interpretive Structural Modeling (ISM) Approach

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Apparel industry occupies an important place in the Sri Lankan economy. It has become the largest export industry in Sri Lanka since 1986 and represents 39.7% of the total exports and 52% of industrial products exports, becoming the largest foreign exchange earner of the country today. In the apparel manufacturing process sewing is the most critical function, because it assembles what customer asks. Moreover, it is the area the efficiency problem is frequent since it is wholly labor oriented. In the sewing operation, the sewing machine operator plays the central role, because even where there is whatever sophisticated machinery only their hands can create what customers ask. Through the preliminary study the researcher was able to find that the majority of the garment factories in Sri Lanka operate below the targeted sewing efficiency level. Hence the research problem of the current study was "what are the factors that influence the poor sewing efficiency of the machine operators in the Sri Lankan garment industry"?

The main objective of the study was to develop a structural model of the factors that influence the poor sewing efficiency of the machine operators in Sri Lankan garment industry. Here the researcher identified sixteen key factors that influence the sewing efficiency. Then structured interviews were conducted with 20 experts from academia and industry to identify the relationships among these sixteen variables. Then classification of factors was carried out based upon dependence and driving power with the help of MICMAC analysis. Out of sixteen factors five factors were identified as dependent variables; seven factors were identified as the driver variables and three factors were identified as the linkage variables and one factor was identified as autonomous variable. Here, the driving variables were: experience of the machine operator, garment construction variations, quality of supervision, line balancing, training and development process of the organization, corporate culture, quality of sewing materials, machines, tools and equipment. The dependent variables were: skill of the machine operators, sewing machine breakdowns, reworks in sewing lines, absenteeism of the machine operator, turnover of the machine operator and the linkage variables were: work in process inventories, physical working environment, satisfaction of machine operators. The autonomous variable was input delays. Finally, a hypothetical model of these factors was developed based upon experts' opinions.

The study will contribute to identify the factors that influence the poor sewing efficiency of the machine operators in Sri Lankan garment industry and to prioritize them. Then, the structured model developed will help to understand the interdependence of these factors. But this model has not been statistically validated.

Keywords: Interpretive Structural Modeling, Machine Operators, Sewing Efficiency

Modeling Ageing Population (60+ Years) in Sri Lanka

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Population ageing is an universal phenomenon and it is expected to be among the most prominent global demographic trends of the 21st century. In Sri Lanka there was a rising trend of ageing population throughout the past years and has recorded the highest number of agers within South Asia. However, no sound statistical or mathematical models were developed to project ageing population in Sri Lanka. Using the population aged 60 years and above in Sri Lanka during 1950-2016, three types of statistical models: (i) ARIMA (0, 2, 1), (ii) exponential trend model, and (iii) double exponential smoothing model were developed. The models were compared using various statistical indicators and some statistical diagnostics tests. The comparison was done for both training set as well as validation set. Among these models the double exponential smoothing model was found as the best fitted model. According to the forecast derived from the best fitted model, it was found that the increasing trend of ageing population in the country will continue in the future and there will be approximately 2,936,000 ageing population in Sri Lanka in 2020. The information obtained from this study is beneficial for planners and decision makers in the government sector and other relevant organizations to cater the needs of the increasing agers in the future of Sri Lanka.

Keywords: Ageing Population, ARIMA, Demographic, Exponential Smoothing

Textbook Analysis of Wir and the Preparation for the New Textbook Implementation for G.C.E. Advanced Level German Curriculum in Sri Lanka

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Since the 1980s the increasing demand for the acquisition of the German language has grown in the Sri Lankan educational system with the growth of Tourism sector in Sri Lanka. The National Institute of Education (NIE) in cooperation with the Ministry of Education has implemented a new curriculum for all subjects of the G.C.E. Advanced Level in Sri Lanka to be implemented within seven years. For this reason, since 2010 the curriculum was implemented with the course book `Wir I-III` for the G.C.E. A/L German subject.

This study inquires the question how the present curriculum for A/L German is didactically related to media concept of the textbook. Two questionnaires, one for the German A/L students and another one for the German A/L teachers are focused to gather primary data and the three government schools such as Royal College Colombo, Maliyadeva Balika Vidyalaya Kurunegala, and Karunarathna Buddhist College, Ragama are selected to collect the required data. In order to more objectively assess the subjective appraisal of teaching materials and the selection of a criterion is to be submitted for the textbook analysis. Therefore, in this study, the prescribed textbook ``Wir`` is analyzed using the criteria of Funk 2004, which contains 12 quality areas, since this compact assessment catalog is very relevant to the problem presentation of this study. The question "Is it necessary to implement a new teaching program and new textbook for Advanced Level German in Sri Lanka?" is answered in the conclusion. The proposals and criticisms of the study will be especially adjuvant for the preparation of new curriculum implementation and also for the German teachers and learners in Sri Lanka.

Keywords: Textbook analysis, Wir, Funk 12 textbook quality areas

Occurrence of Heavy Metal Contamination and *In Vitro* Bioaccessibilitiy of Heavy Metals in Widely Consumed Green Leafy Vegetables Obtained from Colombo Area, Sri Lanka.

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This research was aimed to investigate the occurrence of heavy metal contaminations (Ni, Cd, Cr, Pb and Cu) in five key Sri Lankan green leafy vegetables (GLV) ["Kankun" (*Ipomoea aquatica*), "Mukunuwenna (*Alternanthera sessilis*), "Thampala" (*Amaranthus viridis*), "Nivithi" (*Basella alba*) and "Kohila leaves" (*Lasia spinosa*)] grown and marketed in and around Colombo District, Sri Lanka. The study was focused on the heavy metal contents in soils, fertilizer and irrigated water, distribution patterns, bio-accumulation between different GLV species and an *in vitro* gastrointestinal extraction to find the fractions of heavy metals available for absorption after dietary ingestion of raw and cooked forms of GLV.

According to results, the average concentrations of Cd, Cu, Ni, Cr and Pb in the tested soils were 1.45±1.15, 66.5±59.52, 51.5±45.51, 48.4±42.9 and 39.7±32.26 mg kg^{-1}, respectively in the tested areas. Pb, Cd, Cu and Cr levels in the irrigated water samples collected from the cultivation areas were complied with the recommended guidelines, except for Ni. The mean concentrations of heavy metals tested in all GLV exceeded the WHO/FAO safe limits, except for Cu. Among the GLV analyzed, Kohila leaves showed the highest tendency to accumulate metals from the environment. Irrespective of the species and the location, all the collected GLV showed the distribution pattern for the heavy metals as: roots>stems>leaves. Despite the higher total heavy metal concentrations found in GLV, the bioaccessible fractions of heavy metals were significantly low (at $P<0.05$) in raw, cooked and stir-fried GLV samples.

Keywords: Green leafy vegetables, Heavy metals, *In vitro* bioaccessibility

Nutritional, Antioxidant and Antimicrobial Properties of Underutilized Yam Species Grown in Sri Lanka

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Underutilized food crops, with good nutritional potential and easily cultivable characteristics, have been recognized as one of the promising solutions for the world food crisis. Substantial number of underutilized yams that are grown under natural climatic condition with little or no-input are available in Sri Lanka. But little is known about their nutritional and functional values. This research attempted to investigate those properties of widely grown eight yams available in Sri Lanka. It includes six yam cultivars of Dioscorea including Rajala, Kahata Angala, Dandina, Higurala and Seeni Ala and two aroid cultivars Kidarang (*Amorphophallus campanulatus*) and Kiri Ala (*Xanthosoma sagittifoliu*). Selected varieties were tested for proximate composition (moisture, crude protein, crude fat, crude fiber, ash and carbohydrate), mineral composition (Fe, Cu, K, Zn, Na, Mg and Ca), antioxidant capacity, antimicrobial activity by using AOAC officially approved methods, Atomic absorption spectrometer, total phenolic content assay, DPPH radical scavenging assay and agar well diffusion method respectively. The data obtained were analyzed by performing ANOVA using Minitab 17 statistical software. Highest values for the proximate and mineral composition were observed in Kidarang. Highest antioxidant capacity was observed in Dandina. Rajala was effective against pathogenic microorganisms. Generally, all studied varieties were found to be rich in nutritional and functional characteristics. Therefore, it is recommended to promote the consumption of those varieties among Sri Lankan consumers as healthy foods.

Keywords: Antioxidants, Dioscorea, Healthy foods and yams.

Diffusion of Chitin Oligosaccharides Across the OccD-like Chitoporin in *Escherichia coli*

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Chitin, a biopolymer of β-1,4-glycosidic linked GlcNAc residues, is an abundant source of carbon and nitrogen for microorganisms. Chitin degradation by microorganism is achieved using a complex pathway including various enzymes and transporters. Diffusion of chitin oligosaccharides across the outer membrane of Gram-negative bacteria usually occurs through chitoporin channels. In this study we described the characterization of a novel chitoporin (so-called EcChiP) which helps to uptake chitin oligosaccharides in non-chitinolytic *E. coli*. Single channel recoding in Black Lipid Membrane (BLM) reconstitution technique demonstrated that EcChiP form monomeric channel with specificity towards chitooligosaccharides. The molecular mass obtained by size exclusion chromatography for the purified EcChiP was 60,000 Da, which is in good agreement with theoretical molecular weight for monomeric channel. Together with bulk permeation study by liposome swelling assays, we demonstrate that EcChiP is a sugar-specific transporter, with pronounced specificity towards long-chain chitooligosaccharides such as chitohexaose, chitopentaose and chitotetraose. Thermodynamic assessment by isothermal titration microcalorimetry (ITC) suggested that chitohexaose-EcChiP channel interactions are driven by an endothermic process, yielding a binding constant (K) value of 2.5 x105 M-1. Analysis of protein fluorescence enhancement suggested that the binding process was hydrophobic. Non-linear curve fitting of the chitohexaose titration curve from protein fluorescence enhancement yielded the binding constant (K) of 2.9x105 M-1, a value that agreed well with the values obtained from ITC experiments and from single channel recordings. For the first time, these data provide insights into chitooligosaccharide uptake by OccD-like chitoporin in non-chitinolytic bacteria.

Keywords: Chitoporin, Electrophysiology, Calorimetry, Membrane transport

Preparation of TiO_2 and Fe_2O_3 Pigments from Sri Lankan Natural Ilmenite

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Mineral sands deposits represent the most promising and profitable future resources for the country. The crude heavy minerals at Pulmudai-Sri Lanka contain about 60% to 70% of heavy minerals having composition of 70% to 75% ilmenite (about 52% of titanium dioxide and 48 % iron oxide), 10% rutile (about 95% titanium dioxide) and 8 to 10% zircon (65% zirconium dioxide and 35% silica). Titanium dioxide is an important inorganic chemical material, especially the best-quality white pigment.

The objective of this project was to apply a simple and very effective method to produce nano particles of titanium dioxide and iron oxide powders from beach mineral sands. Low cost environmental friendly hydrothermal technique was used to breakdown well structured mineral of Ilmenite, with a composition of $FeTiO_3$. Breaking down of ilmenite structure into TiO_2 is normally done at 850 °C using 70% H_2SO_4. It is assumed that this can be done at a relatively low temperature with saturated vapor pressure or high pressure under hydrothermal conditions since near critical state condition of water which facilitate to fabricate most of inorganic compounds.

In the acidic media, ilmenite could was mixed with a strong acid such as HCl or H_2SO_4 in different ratios of ilmenite to water then the mixture was reacted under hydrothermal conditions at different temperatures and pressures. Ilmenite was decomposed completely after several hours. Nano-particles of TiO_2 could be obtained by hydrolysis and low temperature calcinations of the hydrothermally derived product. The effect of pH on the size and morphology of particles in nano-powders were also investigated.

Our results showed after the hydrothermal treatment of ilmenite, black-colored granules changed into swelled yellowish-white product. The HCl solution was also colored yellowish, indicating the Fe-ion leaching from the natural source. This phenomenon implies the hydrothermal treatment for natural rutile can be used not only as a reaction step but also as a semi-purification step. The further research on evaluation and optimization should be conducted in detail; this preliminary results are encouraging toward the present cost-effective process. The results demonstrated that the process is inexpensive, environment friendly and promising in preparing high-purity TiO_2 from ilmenite with a high content of gangues.

The Research Grant SUSL/RG/2016/05 is acknowledged for the financial assistance

Keywords: Ilmenite, Titanium dioxide, Hydrothermal conditions

An Ontology-based Knowledge Management System for Software Testing

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Software development is conceptually a complex, knowledge intensive and a collaborative activity, which mainly depends on knowledge and experience of the software developers. Effective software development relies on the knowledge collaboration where each and every software engineer shares his or her knowledge or acquires knowledge from others. Software testing which is a sub area of software engineering is related to various activities such as test planning, test case design, test implementation, test execution and test result analysis and they are all essential. Given great importance to knowledge for software testing, and the potential benefits of managing software testing knowledge, an ontological approach to represent the necessary software testing knowledge within the software testers' context was developed. Using this approach, software testing ontology to include information needs identified for the software testing activities was designed. Competency questions (contextualized information) were used to determine the scope of the ontology and to used to identify the contents of the ontology because contextualized information fulfills the expressiveness and reasoning requirements of the software testing ontology. SPARQL query was used to query the competency questions. A web based KM Portal was developed using semantic web technologies for knowledge representation. Software testers can annotate their testing knowledge with the support of ISTQB and IEEE 829-2008 terms. Both ontology experts and non-experts evaluated the developed ontology. We believe our software testing ontology can support other software organizations to improve the sharing of knowledge and learning practices.

Keywords: Software testing ontology, Software testing knowledge, Ontology-based knowledge sharing, Knowledge management system

Human Bio-kinematic Parameter Estimation using Inertial Sensors

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This is an attempt to accurately capture human bio-kinematic parameters for physical tele-rehabilitation using measurements from inertial sensors. The contributions can be classified into three categories: accurately capturing human kinematics despite intrinsic uncertainties omnipresent with human movements, improving the tracking accuracy by correcting the sensor misalignment error and assessing rehabilitation exercises quantitatively or qualitatively in a systematic way for evaluating the progress of people with disabilities.

Firstly, a dynamic model for human kinematics is proposed and different data fusion algorithms are applied to fuse inertial sensor measurements for obtaining accurate movement angles. Specially, a novel robust extended Kalman filter with linear measurements (REKFLM) is proposed to improve accuracy in estimated angles.

Secondly, a sensor misalignment calibration method is proposed. In addition, a method for estimating the limb's length for assessing a common musculoskeletal disorder called Limb Length Discrepancy is proposed. Importantly, these two methods are proposed considering the curvature in limb trajectories which has not previously used in similar problems. The qualitative and statistical analyses for trunk movements are conducted to distinguish Parkinson's patients from healthy subjects.

Finally, these advancements led to a prototype of a mobile cloud-based physical tele-rehabilitation system for motion capturing and evaluation of patients. This prototype is developed in the web cloud to facilitate convenient access to patients using mobile devices. A multi-level encoding scheme is proposed to avoid limitations of mobile and sensor devices to ensure reliable and efficient rehabilitation services.

Keywords: Human bio-kinematics, Tele-rehabilitation, Inertial Sensors, Sensor Fusion

Psychophysiological Effects of Orange Aroma Inhalation during a Short-term Cognitive Stressor

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The effects of two different concentrations of orange aroma on peripheral and cardiac autonomic nervous system activity were investigated under a short-term cognitive stressor in a highly reproducible manner using an olfactometer. In a within-subjects experiment, 19 male university students performed a 30-min calculation task under three aroma conditions: 1% orange, 20% orange, and scentless air (control). Each aroma was intermittently delivered using a proprietary olfactometer in a counter-balanced order. Along with a visual analogue scale (VAS) comprising seven items (nervousness, effort, concentration, tiredness, irritation, boredom, and fed up), the nose tip temperature and the cardiac activity on electrocardiograms were recorded throughout each experiment. Regardless of the aroma condition, significant decreases in nose tip temperature ($p < 0.001$) and the high-frequency (HF) component of heart rate variability ($p < 0.01$), and a significant increase in heart rate (HR) ($p < 0.001$) were observed during the task. These results indicated a typical acute stress response. However, the increase/decrease in HR and HF were significantly lower with 1% orange compared to 20% orange and the control condition ($p < 0.01$), indicating an inhibition of sympathetic nervous system elevation and parasympathetic nervous system suppression by 1% orange. However, none of the VAS scores showed a significant difference between the two doses ($p > 0.05$). There were also no significant differences between the two doses either in terms of preference or perceived strength ($p > 0.05$). The findings suggest that mild orange essential oil inhalation inhibits the cardiac stress response, but with no significant effect on the subjective stress.

Keywords: Heart rate, Heart rate variability, Nose temperature, Olfactometer, Orange aroma, Stress

Geometric Brownian Motion Based New Hybrid Statistical Approach for Forecasting Time series Data under the Volatility

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The high volatile fluctuations with instability patterns are common phenomenon in the Colombo Stock Exchange (CSE), Sri Lanka. In the CSE context, very few studies have been focused and attempted to find out the new methodologies for forecasting stock price indices under the high volatility. The purpose of this study is to propose a new hybrid forecasting approach based on Geometric Brownian Motion to forecast stock market data under the unstable volatility.

The model selection criterion results of Akaike information criterion and Schwarz criterion suggested that, ARIMA (4, 1, 3) and ARIMA (1, 1, 1) approaches are suitable for predicting ASPI and SL20 price indices during the time period between 2010 January to 2016 December. Furthermore, the model accuracy testing results of mean absolute percentage error (MAPE) (GBM-ANN(0.024)<ARIMA (4,1,3)(0.124)) and Mean absolute deviation (MAD) (GBM-ANN(0.324)<ARIMA (4,1,3)(1.251)), suggested that new proposed GBM-ANN hybrid approach is the most suitable for forecasting price indices under the high volatility than traditional forecasting mechanisms.

This study was supported by Sabaragamuwa University Research Grant, SUSL/RG/2017/04.

Keywords: Colombo Stock Exchange, Mean absolute deviation and Geometric Brownian Motion

An Online Platform for Predicting Crops Based on Environmental Variables

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There is an emerging consensus that sustainable and more productive agriculture is needed to encounter the local, regional and global food security challenges. As the environmental factors are changing rapidly and questions regarding the selection of the crop is very important. This consensus implies significant emergence in new and improved tools that can be used to ensure the sustainability. Therefore, this project proposes to provide real-time information to support farmers to make decision on the crop selection and also to identify the hidden relationships among the environmental variables and the crop, hence improving the science behind predictive tools.

Agricultural technology is dependent on the prediction about weather, diagnosis of fertilizers in soil, type of crop and environmental issues. Precisely suitable soil types are selected for a particular crop types. Weather may be classified on the basis of temperature, rain and humidity. Producer prices are considered as other attributes related to environment.

As the first level Monaragala and Badulla districts are the areas taken into consideration. Maize, Potato, Tomato, Green gram and Red onion are selected as crop types. Rainfall, humidity, temperature, soil pH, soil types and producer price are some of the inputs for this prediction model. The most appropriate crop set for the relevant land output is the predicted output.

The purpose of this project is to address the literature by exhibiting an efficient model that stores agricultural data in proper and efficient manner to response ad-hoc queries of the farmers while providing a user interface which would provide most appropriated crop list for the relevant land.

Keywords: Crop, Soil types, Weather, Agriculture technology

Atomic Hydrogen Adsorption Behavior of Boron Nitride Thin Film

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Carbon nanotubes (CNTs) are the most extensively investigated carbonaceous material for hydrogen storage. Chemisorption of atomic hydrogen has already been reported for graphite as a planer model system of CNTs with regard to the degree of hydrogenation and the preferable adsorption structure. Boron nitride (BN) has attracted much research attention as a promising candidate for hydrogen storage and it has been reported that BN nanotubes are more superior compared to CNTs for storing hydrogen. But, it is not clear yet how the adsorption mechanism works on BN materials. One of the most basic arguments is the site dependence of atomic hydrogen adsorption. However, there are a number of theoretical reports that contradict with each other. In this study, we have investigated the site dependence of atomic deuterium adsorption on a thin film of BN, using near-edge X-ray absorption fine structure (NEXAFS), X-ray photoelectron spectroscopy (XPS), and photo stimulated ion desorption (PSID) in order to verify the appropriate theoretical models.

All experiments were performed with linearly-polarized synchrotron radiation at the BL-11A beam line of the Photon Factory in the High Energy Accelerator Research Organization, Japan. A BN thin film was formed on Ni (111) by chemical vapor deposition with borazine gas. Then the film was exposed to an atomic deuterium beam produced by a tungsten hot filament in an ultra-high vacuum chamber. NEXAFS and XPS spectra were measured before and after the exposure to atomic deuterium. A clear spectral change was observed in the B K-edge region after deuteration and only slight change was observed in the N K-edge region. The XPS spectrum of B 1s showed a prominent shoulder on the low binding energy side of the main peak after deuteration, while the N 1s spectrum showed only peak broadening at the high binding energy side. After deuteration, D+ ion yield was measured as a function of the incident photon energy at the B and N K-edges in the PSID measurements. It was observed that there was a clear enhancement of D+ signal at the B K-edge but no such enhancement at the N K-edge. The experimental results of NEXAFS and XPS were analyzed by the DV-Xα molecular orbital calculation method with core-hole effect. Finally, it was concluded that hydrogen atoms are preferentially adsorbed on the B sites of BN materials, via a single hydrogen adsorption model.

Keywords: Boron nitride, Hydrogen, NEXAFS, PSID, XPS, DV-Xα

Spatial Distribution of Earthquake-Induced Landslides in the 2004 Mid-Niigata Prefecture Earthquake

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Japan is a seismically active island nation and which has long been at risk of earthquakes and related disasters due to its geological location. At the Japanese Standard Time (JST) 17:56 on October 23, 2004 an earthquake with a moment magnitude of 6.8 struck Mid-Niigata prefecture in Japan and caused many landslides and slope failures in the Chuetsu region of Niigata prefecture. This catastrophic earthquake was followed by severe aftershocks and caused many types of landslides such as surficial slides, shallow slides, and deep slides. This study analyzed the correlations between landslide occurrence and the slope angle, slope aspect, rock type, bedding plane orientation and dip, and distance from the epicentre fault line by using landslide occurrence ratio (LOR), based on geographic information system (GIS) technology. The LOR is defined as percentage of area affected by seismic landslides. Surficial slides are correlated well with slope angle and distance from the epicenter fault line. Shallow slopes that face parallel to the fault direction are more prone to failure. In addition to that shallow slides occurrence ratio decrease with distance from epicenter fault line. Deep slides are strongly affected by the geological structure.

In addition, to examine the spatial distribution of earthquake-induced landslide, it is essential to consider the seismic effects for designing slope stability, retaining walls, bridges, and other engineering structures. It is important to determine the shear strength parameters on a failure surface for stability evaluation and engineering analysis of a landslide, as these parameters are mainly determined by the test, back analysis method and engineering experience analogy method is used. Among these methods, the back calculation is a procedure, which offers the opportunity to estimate the shear strength properties along the failure surface by the mathematical method. Soil strength calculation by back analysis avoids many of the problems related to laboratory testing and is widely used, especially in association with landslide repair studies. This study presents the rational procedure to calculate the horizontal seismic coefficient according to the distance from the epicenter fault line and shear strength of the weathered soil. The seismic coefficient is found similar with past research works.

Keywords: Landslide occurrence ratio (LOR), Geographic information system (GIS) and Seismic coefficient

Effect of Temperature on the Photovoltaic Characteristics of Polycrystalline Silicon Solar Cells at Hambantota Solar Power Plant

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As a renewable energy source, solar power is becoming one of the most important promising energy sources in the modern era. In past two decades, many researches on operational principle of photovoltaic (PV) devices and their power generation efficiencies have greatly increased over the world. And also, there is an enormous trend towards the field of solar energies in Sri Lanka as well. Manufactures in this particular field under standard test condition predict the temperature coefficient of power generation efficiency designated by γ is approximately $-$ 0.41% per Celsius. But as usual, it changes under realistic environmental conditions. Quantitatively finding the influence of temperature on the power generation efficiency of polycrystalline silicon solar cells by the sensor monitoring system under realistic environment conditions is the main aim of this research study. Accordingly, the temperature and the total output power of the polycrystalline silicon solar cells were simultaneously measured to analyse the effect of temperature on the photovoltaic characteristics of solar cells under these circumstances. The temperature coefficient of power generation efficiency γ with +0.0004% per Celsius has been observed for these solar devices at Hambantota Solar Power Plant.

Keywords: Silicon solar cell; PV module; Temperature coefficient

Single Spin Asymmetry of W Production in Longitudinally Polarized $p + p$ Collisions at $\sqrt{s} = 500$ GeV

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The "proton spin crisis", emerged from an experiment carried out by the European Muon Collaboration, remains one of the major unsolved problems in nuclear physics. In solving this mystery, determining the polarized anti-quark parton distribution functions (PDFs) may hold key. So far the sea anti-quark polarizations have been measured in the polarized Semi Inclusive Deep Inelastic (SIDIS) experiments and are poorly constrained compared to the valence quark polarizations due to large uncertainties from fragmentation functions.

Measurement of parity violating longitudinal single spin asymmetries of W production is a complementary approach, free from fragmentation uncertainties compared to Semi-inclusive Deep Inelastic Scattering measurements, probing the flavor-separated polarized sea quark distributions in the proton. At mid-rapidity range of $|\eta|<0.35$, candidate $W^{\pm}/Z$ events are identified through their $e^{\pm}$ decay channels. In 2013, PHENIX at the Relativistic Heavy Ion Collider recorded data with an integrated luminosity of $\sim 146\ pb^{-1}$ in longitudinally polarized p+p collisions at $\sqrt{s}$=510 GeV. The single spin asymmetry results of the run 2013 will be presented.

https://journals.aps.org/prd/abstract/10.1103/PhysRevD.93.051103

Keywords: Proton spin, Nuclear, Particle physics, PHENIX

Effect of Social Capital on Transaction Costs of Small Enterprises in Sri Lanka

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Small Enterprises (SEs) have a higher failure rate due to various limitations mostly reflected in Transaction Costs (TCs). They fail to govern TCs in an economizing manner by using either 'Market' or 'Hierarchy' as suggested by the Transaction Costs Economics (TCE) due to the information and resource limitation. Instead, SEs develop informal and personal relationships with different members of the network expecting supports in order to overcome their resources and information limitations. The network relationships lead to build Social Capital (SC) (values of social relationships; i.e. Inter-personal trusts, relational norms, flexibility, integrity, common understand etc.) and thereby facilitate access to information and resources which have an influence on mitigating TC. However, the dearth of academic work studying how SC affects the TC, represents a significant gap in literature. Therefore, the study attempted to explore the effect of SC on TC particularly SEs in Sri Lanka. The study mainly employed the survey method and the data were collected from 373 SEs, selected using multi-stage sampling method to represent all Provinces in Sri Lanka, conducting face-to-face personal interviews with the respondents. The data were analyzed using Partial Least Squares-Structural Equation Modelling.

Results revealed that structural, relational and cognitive SC have a significant negative effect on TC of SEs. All the dimensions of SC have a negative significant impact on opportunism of exchange partners, positive significant effect on rational ability of the Owners of Small Enterprises (OSEs), significant negative influence on transaction uncertainty, positive significant impact on transaction specific assets and transaction frequency. The results further explained that the reasons for the TC and the determinants of TC have a significant mediate effect on the relationship between SC and TC of SEs. Thus, the study has provided sufficient evidences to conclude that SC has a significant impact on mitigating TC of SEs in Sri Lanka. The study contributes to theoretical knowledge by synthesizing all the dimensions of SC and all the variables of TC into a new framework and testing it empirically. This empirical contribution extends the TCE in the context of SEs in a LDC. The study contributes to the methodology quantifying SC of SEs using a multi-dimensional conceptual model. The study provides important insights for policy makers to focus their strategies to new direction rather than conventional supporting approaches to develop SEs.

Keywords: Small Enterprises, Social Capital, Transaction Costs

A Contrastive Analysis of Hindi and Sinhala Compound Verbs

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This Research analyses the contrast between Hindi and Sinhala Compound Verb. When there are two verbs in the sentence, the main verb has a basic meaning, and the original meaning of the second verb is lost. Then these kinds of verbs are called Compound Verbs in Hindi.

The Compound Verb is formed by connecting a main Verb and a supportive Verb. It has its own independent meaning elsewhere, but when used in the form as a joint verb, it disappears from its original fundamental meaning.

The Compound verbs in Hindi and their corresponding Compounds in Sinhala have been used in the study. There are many meanings in the same word in Sinhala and Hindi; but here the same main meaning used in Hindi and similarly in Sinhala, has been taken for the analysis.

The International Phonetic Alphabet (IPA) has been used as an example of Hindi verbs, enabling non Hindi speakers to pronounce Hindi perfectly. In review of literature I have found that there was no research done on the verb phrase in Sinhala and Hindi, this is the first effort.

1459 Verbs have been selected in Hindi based on the Dictionary of Hindi Verbs written by Helmut Nespital, for the data collection. Compound Verbs in Hindi and similarly Sinhala were analyzed. Sinhala verbs which are identical in meaning to those Hindi Verbs have been analyzed in the discussion.

In this research, 1459 verbs were selected for analysis. 486 compound verbs have been found in Hindi, out of 1459 verbs. 330 verbs are similarly used as compound verbs in Sinhala. The contrast has been found on 156 verbs in Sinhala in meaning out of 486 compound verbs in Hindi.

Keywords: Compound Verb, Contrastive Analysis, Hindi Verbs, Sinhala Verbs.

Questioning Friedrich Engels's Theory on the Origin of the Family, Private Property and the State in the Context of Globalization

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Friedrich Engels and other classical Marxists believe that women's subjection is the result of private property ownership. According to them, class divergence was emerged due to the private property ownership. Therefore, every class society has private property ownership, except socialist society or proletariat dictatorship which will be created after the proletarian revolution, economic resources and private property ownership possesses to the male who represents the ruling class. According to them, that is why every class society consists of male supremacy and female suppression. This context can be conceptualized as structural oppression. According to classic Marxism, it is compulsory to fight with male dominancy and class divergences to emancipate from female suppression. Then, it leads to create class conflicts in society as well as interpersonal conflicts within the family. On the other hand, globalization expands new opportunities such as international labour migration and job opportunities for skilled and unskilled women labour. Therefore, women were able to access economic resources and have private property ownership. In this theoretical and empirical milieu, this study primarily concerns to question Friedrich Engels's Theory on the Origin of the Family, Private Property and the State with emphasizing political empowerment of migrant women of Sri Lanka in the context of Globalization. Do women have political empowerment in private and public domain after achieving sole breadwinner position of the family by migration in the context of globalization? This is a qualitative study which is based on post-positivist research methodology and ethnography as a research method. The sample of the study is consisted of 60 households of women migrant workers. They were selected by applying purposive sampling method. Further, with the aim of maintaining gender mainstreaming phenomena in the data collection process, the sample of households is equally divided into two categories such as female headed households and the male headed households. Then, there were thirty (30) female headed households and thirty (30) male headed households. Findings of the study have proven that the economic factor does not acquire timeless universal value. It depends on the factors of time and space. Though the economy is the supreme factor in the time of industrial revolution and capitalist accumulation, it does not acquire same value in every society in the world, especially Asian counties like Sri Lanka. The number of other factors such as patriarchal form of governance, cultural hegemony, institutionalized sexual violence within the sphere of family, domestic violence, elderliness vs. youngest syndrome or the concept of being a ''balaya'' can be seen as the crucial factors behind the women economic and political empowerment or disempowerment in the context of globalization, except economic factors.

Keywords: Friedrich Engels's Theory, Globalization, Institutionalized Sexual Violence, Political Empowerment, Private Property, Women Migration

The Role of Statistics in DNA Evidence Interpretation

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Forensic DNA analysis has received much public attention over the last thirty years because of its incredible usefulness in criminal investigations. It has also had considerable scientific scrutiny, mainly in response to changes in science and legal challenges. The field of statistics is paramount in DNA evidence interpretation because of the intrinsic probabilistic nature of the problem. Statistical DNA interpretation uses knowledge from the fields of: statistics, population genetics, and molecular biology. This has been in existence for longer than any of the current technologies used for typing the evidence, because the same basic ideas generally apply, regardless of how the evidence is typed.

In a typical criminal case, biological materials such as blood, semen, saliva, or other body tissues, may be recovered and between 50 to 100 picograms (10^{-12}g) of DNA is extracted from these materials for polymerase chain reaction (PCR) amplification. PCR amplification allows length variants in the DNA, called short tandem repeats (STRs), to be detected by measuring relative fluorescence when the sample is exposed to laser light. The resulting signal is collected by a photomultiplier and displayed graphically as an electropherogram (epg). The epg consists of a trace signal displayed on a molecular weight axis, which is mostly flat with peaks in various locations. The presence of a peak corresponds to the alleles present in the DNA sample. Crudely, alleles are variants or polymorphisms of a gene, which can be used to describe differences between individuals. The heights of the peaks are approximately proportional to the amount of template DNA present. This quantitative information (as opposed to the discrete allele information) can greatly enhance the interpretation process.

The likelihood ratio (*LR*) approach is (now) the favoured method for presenting forensic evidence in the court in many jurisdictions. It links the evidence related to two hypotheses: prosecution and defence. The prosecution hypothesis claims that the accused is the donor of recovered DNA from the crime scene while the defence claims that an unknown person who is not blood-related to the accused is the donor. Then the ratio between the probabilities of the two hypotheses is defined as *LR*. There are four competing models: classical, binary, semi-continuous, and continuous for the interpretation of DNA evidence, which essentially differ in the definitions of the weights assigned to sets of possible genotypes. Implementing continuous probabilistic models which ensure relatively greater objectivity and consistency between analysts requires statistical models for PCR phenomena such as stutter. This research reviews the existing models and develops new, advanced, Bayesian models for predicting stutter with increased accuracy. The models include nonhierarchical, hierarchical, and infinite mixture models.

Keywords: DNA, Electropherogram, Forensic, Likelihood ratio (LR), PCR, Stutter

Poster Presentation Session

7th Annual Research Session

Sabaragamuwa University of Sri Lanka

Polymerase Chain Reaction (PCR) Optimization of Sex Chromosome Linked CHD Gene for Genetic Sexing of Domestic Chickens (*Gallus domesticus*)

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Chromodomain Helicase DNA (CHD) binding protein loci is one of the sex chromosome linked gene found in most avian species including domestic chickens. CHD genes are preserved within avian Z and W sex chromosomes. The size of the gene is slightly different in Z and W chromosomes due to the variance in the intron regions, thus, making female (ZW) to have two different sized CHD genes and male (ZZ) to have only one sized CHD gene in their genome. Primers were designed to co-amplify these regions therefore give two bands are given for female and one band is given for male in gel electrophoresis enabling them to be used as gender identification molecular markers. Although different primer sets have been designed and published in previous studies, most of them have failed to present the optimum conditions for the precise amplification of CHD loci. Therefore this investigation was aimed to optimize the amplification of the genes CHD1Z and CHD1W. Genomic DNA extraction from whole blood of mature male and female animals was performed by a commercial DNA purification kit. The primer set used for the study was selected from previous studies on domestic chickens. PCR conditions; concentration of genomic DNA, annealing temperature, annealing time, extension time, and PCR cycle number were optimized. Gel electrophoresis conditions; concentration of the gel, concentration of buffer, running time, and electrophoretic voltage were optimized. Staining procedure was optimized by using different staining techniques such as pre staining, in-gel staining, and post staining to obtain a clear resolution in the electro-gram. A DNA concentration of 10ng/ul in the final reaction volume of 20ul, and PCR conditions of an initial denaturation of 94°C for 3 min, a denaturation of 94°C for 20 sec, an annealing of 55°C for 30 sec, extension of 72°C for 1 min, cycle number of 40, and a final extension of 72°C for 7 min gave the best amplification for the primer set. Modifying the standard protocol for annealing temperatures, annealing time and extension time increase the success of co-amplification. A loading volume of 20ul DNA at a concentration of 10ng/ul, 1.5% agarose, 1X Tris base, boric acid and EDTA (TBE) buffer, 60 Voltage for 2.5 hours of running for gel electrophoresis, and post staining of the gel with 1:10000 mixture of Diamond dye and 1X TBE buffer for 30 min were observed to be the best for co-amplification of selected CHD1Z and CHD1W primer set on domestic chicken.

Keywords: CHD loci, *Gallus domesticus*, Genetic sexing, PCR optimization

Optimization for Hematoxylin and Eosin Staining for Cultured Ovarian Cortical Stripes of *Sus scrofa domesticus*

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Staining is an integral part of modern histopathology and without proper staining histology would be a mere concept. Haemotoxylin and Eosin (H&E) stain have been evolved during last several decades and considered as the golden standard for histological examinations for paraffin or resin embedded animal tissues which have been fixed, processed, embedded and sectioned. It has been widely used and has recognized as the best method to highlight the fine structure of cells without compromising the morphology of the cell. Among many synthetic aniline dyes Haemotoxylin is the only natural dye which is an extract of the Logwood (*Haematoxylum campechianum*). After many attempts of using dyes to stain animal tissues such as ovary from *Sus scorfa domesticus* which is inevitably rich with large fat globules, it has been discovered that traditional methods were not very effective. The objective of current study was to optimize existing H&E staining to achieve better results in high fat cultured tissues than low fat fresh tissues. Briefly, following procedures were adapted with strict time control methods. Deparaffinization of the sections on glass slides was performed. Two dips in xylene for 4 min each and followed by rehydration of the sections with a series of submerge in Ethanol (ETOH). Starting from 100% ETOH two dips followed by 90%, 70%, 50% alcohol and rehydration was completed with a final two dip of distilled water. All these steps were done for 2 min each. Subsequently sections were submerged in Haemotoxylin for 15 min followed by gentle washes with running tap water for another 10 min. Then all slides were subjected to another dip in Eosin for 30 sec. Slides were washed gently again for further 2 min with running tap water. Finally all the slides were dipped at 1-2 sec in 70%, 90%, 100% alcohol serial and xylene respectively. As soon as completion of the last xylene step, cover slips were placed on top of the permount mounting medium which are already placed on the tissue section and allowed the slides to dried-up for 24-36hrs before microscopic observation. In conclusion, it has been discovered double staining of high fat cultured tissue with Haemotoxylin and Eosin with this modified technique has evident best microscopic observations, provided example images showing results produced using modified protocol, as well as commentary on the strengths and limitations of the approach. This study was supported by Sabaragamuwa University Research Grant, SUSL/RG/2015/06.

Keywords: Eosin, Haemotoxylin, Histology, H & E staining

Effect of Pulp Water Temperature & Maltodextrin Percentage on Final Weight & Properties of Spray Dried Durian (*Durio zibethinus*) Powder

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Durian (*Durio zibethinus murray)* is commonly known as "king of fruit" in fruit world which is growing South East Asian tropical region. It is highly seasonal, expensive, highly perishable, nutrient rich and alternative bearing thorny fruit with specific odor. Usually the durian is a restricted fruit even in the luggage area of flights, some restaurants, public places, taxies, public transport and hotels. Generally durian consumes as a fresh fruit without any preservation and value addition in the growing countries except Thailand and Malaysia. Durian has great export potential but has practical limitations due to its odor and bulky thorny husk. Therefore it needs some new preservation methods and value added products as a solution for early mentioned difficulties. Hence spray drying is a one of the best method which is produces wide ranges of light weight dry powders and agglomerates by flesh dehydration. This study for explains the method and the finds some optimum parameters to dry durian pulp using commercial scale spray dryer. The raw durian flesh was blended with different water temperature treatments and filtered before the spray dying. Maltodextrn was used as the microencapsulating agent. In this process three pulp making water temperature (0 ^{0}C, 27 ^{0}C and 40 ^{0}C) of durian and three levels of maltodextrin (10%, 20 % and 30 %) were used to identify the best treatment combination which was resulted highest final powder yield. After Durian powder produced, the ten physicochemical properties such as Total Soluble solids , P^H , Moisture percentage, Acidity percentage, Ascorbic acid level, Solubility , Rehydration time, Hygroscopcity, Organic matter percentage and Ash percentage were evaluated to find the effect of treatment combination. Six value added products such as Yoghurt, Yoghurt drink, Cake, Ice cream, hot drink with tea and Cool drink with milk were produced by using spray dried Durian powder. The final analysis was the sensory evaluation of the value added products for check the marketability and acceptability. In this evaluation, 15 members were randomly selected and given the value added products for evaluate flavour, colour, texture, smell and overall acceptability. It was found that durian pulp can be transformed to powder using the spray dryer. The suitable pulp extracting water temperature and maltodextrin level were 0 ^{0}C and 20% respectively to obtain higher powder yield, higher ascorbic acid preservation and low moisture level of the powder. The all six value added products got more than 73% overall acceptability ranks and which is important in commercialization of the product.

Keywords: Alternative bearing, Hygroscopcity, Microencapsulating, Maltodextrin , Spray Drying

Fabrication of Dye Sensitized Solar Cell Using Semiconductor Nano Composites Made of Sio_2 Extracted From Rice Husk.

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The dye sensitized solar cells are fabricated using low cost materials and inexpensive techniques. As such, they are cheaper electric power devices for domestic usage. But their efficiencies have comparatively got low values. Therefore, increasing of efficiency of these types of solar cells becomes a major task in this research study. Dye sensitized solar cell provides an efficient and easily implemented technology for future energy supply. Comparing to congenital solar cells, it accomplishes comparable power conversion efficiency at low material and manufacturing cost which are inexpensive, abundant and innocuous to the environment.

Rice husk is a wasteful colluvium in day to day life and these waste rice husks can be used to extract silica. Dye sensitized solar cells which are manufactured using extracted silica composite semiconductor materials has a low cost value compare with other semiconductor solar cells. As such, it is intended to observe the performance of dye sensitized solar cell by making composites of silicon dioxide (SiO_2) treatment with titanium dioxide (TiO_2) on thin film. The enhancement of cell efficiency at its optimum composition is the major objective of this study. After electrical and electronic analysis, it was observed that the optimum composition ratio between SiO_2 and TiO_2 is 1:9, and it consists current-voltage curves obtained with solar cells employing the photo anode with TiO_2 & SiO_2 sensitized by the ruthenium dye. The characteristic parameters, namely; short circuit current (I_{sc}), open circuit voltage (V_{oc}), fill factor (ff), and efficiency (η) obtained for the above device were noted and observed by I_{sc} = 0.856 mA, V_{oc} = 657 mV, ff = 0.408 and η = 0.2295 % respectively.

Keywords: Dye-sensitized solar cells, Photo anode.

Determination of A Better Place for a Solar Park Using Remote Sensing Data

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Energy is strongly related with the modern life of the community and acts an essential part of human life as well as national security in the country. The necessity of energy has increased due to the evolution and usage of modern technology. Among different types of natural energy sources, solar energy is a broad, pure and renewable source of energy and it is available all over the earth. Knowledge of incident solar radiation spread over the earth surface and other factors that affect to solar radiation is very important in planning an efficient solar power plant. But realistically, prior determination of suitable location using such type of method is quite rare. This investigation has been done to make a model for finding a better place for a solar park using environmental parameters such as the cloud density, shadow density and solar radiation energy. Satellite data were obtained from Moderate resolution imaging spectroradiometry (MODIS) web site for cloud mapping and cloud shadow mapping. Ground base solar energy meter was used to measure incident solar energy on the earth surface. Using the relevant data of cloud density, cloud shadow density and solar radiation energy obtained throughout two years from 2014 to 2015, a relationship was formed considering one pixel. The model was built to show the variation of incident solar radiation energy on the earth surface with the cloud density and cloud shadow density in the atmosphere. This model was built for one pixel in Hambanthota area in Sri Lanka. Finally, considering all the pixels in Sri Lanka and substituting each cloud and cloud shadow density for the above model, the solar radiation energy values was taken as an array using computational MATLAB programming. Then, it is possible to find the maximum retrieved solar radiation energy predicting the better place for a solar park.

Keywords: Solar energy, cloud, shadow, remote sensing

Preparation of PLA/HAP composite microspheres for 3-Dimentional Printing

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Calcium phosphate nanoparticles are important for the nano medicine in biomedical. It is main inorganic component in the human bone and teeth. It has good biodegradability, biocompatibility and bioactivity. Mainly calcium phosphate nanoparticles (nCaP) are nontoxic. Therefore it can be used as a drug carrier. Because in different pH areas it can be controlled the drug release and mainly able to release drug in proper area. Especially this nanoparticle calcium phosphate used to treat bone cancers. Bone cancer is malignant tumor. There are different types of bone cancers such as osteosarcoma, Chordoma, fibrosarcoma, chondrosarcoma….etc. This research was found poly lactic acid (PLA) and poly lactic-co- glycolic acid (PLGA) microspheres for 3 dimensional (3D) printing and as a drug carrier respectively. PLA has high molecular mass. Therefore it is difficult to prepare nanometer scale microsphere from PLA. 3D printing microsphere should be in micrometer scale and drug loading microsphere should be in nanometer range. Inside this microsphere have nCaP particles. These nCaP particles in nanometer range and it is the special material for treatment. This microsphere preparation was checked with nCaP which prepared in different temperature. The nCaP particles were prepared during one hour and microsphere samples were prepared during three hours. Micrometer scale microspheres and nanometer scale microspheres were prepared with magnetic stirring method and ultrasonic method respectively. There are different methods to prepare nCaP particles. In here, precipitation method was used to prepare nCaP particles.

Crystalinity of the nCaP particles vary with temperature. Prepared 3D printing microspheres were in 50μm to 80μm range and nanospheres were in 90nm to 100nm range. These all nCaP particles and microspheres were characterized by using different methods and instruments. All characterization methods were given best results about microspheres and able to use as 3D printing and as drug carrier.

Keywords: Bone cancer, Drug carrier, Microsphere, Nanoparticle

Multisite Shipment Business Solution

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Multisite shipment is a business solution that is developed to handle import charges process separately when there are multiple purchase orders which may arrive partially or fully in a single shipment. The company has more than one branches located in Sri Lanka and all of them release purchase orders. So the purpose of this multisite shipment business solution is to make functionality to contain multiple purchase orders from multiple sites in a single shipment and giving capability to customer to handle purchase order shipment and related chargers from a single window. Through this solution all the charges which are involved with the shipment and the parts which are purchasing are calculated per units (may be per line/per amount/per weight or volume) and finally calculates the overall charge which needs to release the stock. The charges which can be connected to a Multisite shipment have to be separately defined. This is implemented in the supply chain module in the IFS Enterprise Resource Planning (ERP) system. The user interface is IFS Enterprise Explorer. It appears like a web browser and displays the forms in pages. There are several navigation options which can be used to find the pages and functions which are linked with each other. To develop this solution layered application architecture was used and developed through agile development methodology. Harvest Workbench was used for version controlling. The languages which were used are PL/SQL for Backend Development and Business Logic, and C#/.net for Windows Client development (IFS Foundation1 framework). The tools which were used to develop this solution are Visual Studio 2013 (with IFS Developer Tools) and IFS Developer Studio. IFS Life Cycle Support (LCS) and IFS Solution Developer were used to manage the project. Although this business solution was developed to fulfill the requirement of Stafford Motors Company this was developed with a capability of reuse for any other customer who needs this functionality.

Keywords: Multisite, ERP, Enterprise Explorer, PL/SQL

A Preliminary Study on the Effect of Industrial Effluent on Groundwater Quality in Selected Locations in Gampaha District

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Groundwater represents 97% of global freshwater and is an important source of water for agriculture and industrial activities worldwide. This valuable resource is increasingly being threatened due to increase in human population and anthropogenic influences. Industrialization has also become a major threat to groundwater quality worldwide due to contamination of water with industrial effluents. This study was conducted with the objective of evaluating the effect of industries on the groundwater quality in selected locations in Gampaha district.

Water from 40 shallow wells located in close proximity to industries and 20 shallow wells located in non-industrial areas in Katana, Mahara, Biyagama, Wattala and Ja-Ela were collected from November, 2016 to December, 2016. Industrial effluents discharged from 10 industries located in the industrial area were also collected separately for the analysis. The collected industrial wastewater and well water samples were analyzed for pH, Temperature, Turbidity, Electrical Conductivity (EC), Total Suspended Solids (TSS), Chemical Oxygen Demand (COD), Biological Oxygen Demand (BOD5) and Oil & grease. The water quality data of well water collected in industrialized areas and non-industrialized areas were compared using the student t test.

Turbidity and EC values of wastewater samples collected from Wattala area exceeded the permissible limits of effluent discharge standards for inland waters of Sri Lanka. COD and BOD5 levels recorded in wastewater collected from Ja-Ela area also exceeded the permissible limits of wastewater discharge standards. EC, COD and turbidity values recorded in almost all the shallow wells located near industrial areas exceeded the permissible limit of SLS drinking water quality standards. The results of the present study suggested that EC and turbidity values in shallow well water in industrialized areas are having a close association with the industrial activities. Findings of the present study suggest the need of proper industrial waste water discharge mechanisms in order to improve groundwater quality of the area. Further studies are also required to evaluate the effects of the seasonal variations on groundwater quality.

Keywords: Temperature, Turbidity, Electrical Conductivity and Total Suspended Solids

Use of Passive Air Sampling Technique to Monitor Air Quality Levels in Protected Areas: A Case Study in Horton Plains National Park

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Horton Plains National Park (HPNP) is an ecologically sensitive area; therefore, utilization of such an area should involve a high consideration on environmental safeguarding. Visitor statistics of HPNP clearly indicate that the number of visitors is in increasing trend and parallel increment of vehicles entering the park each year. But, the park does not have any regular air quality management system in place yet and the past measurements of air pollution have been done on an ad hoc basis. In this context, the necessity to carry out a study to determine current levels of Nitrogen Dioxide (NO_2) and Sulfur Dioxide (SO_2) concentrations in ambient air in the National Park and initiation of an ambient air quality database was identified. This research work describes the determination of levels of NO_2 and SO_2 at HPNP using of passive sampling technique. Ambient levels of these pollutants were monitored in twelve sites including two background sites from 9th November 2016 to 31st January 2017 at two weeks' intervals.

There was a significant strong positive relationship between the results obtained by duplicate sampling of passive sampling device. Highest variation of both NO_2 and SO_2 was observed in the Ohiya road ranging from 1.02 µg/m^3 to 6.41 µg/m^3 and 4.75 µg/m^3 to 21.14 µg/m^3 respectively. The highest two weeks mean concentrations of NO_2 and SO_2 were recorded at the Car park and Pattipola road with values of 3.67 ± 1.92 µg/m^3 and 17.68 ± 4.58 µg/m^3 respectively. The lowest two weeks mean concentrations of NO_2 and SO_2 were recorded in undisturbed forest site (background site) and forest die back site with values of 0.95 µg/m^3 ± 0.38 and 2.91 ± 1.56 µg/m^3 respectively. Ambient NO_2 concentrations of 6.41 µg/m^3 and 0.32 µg/m^3 were recorded as Highest and lowest levels for the entire data collection period respectively for Ohiya road and background site. Highest and lowest SO_2 levels of 25 µg/m^3 and 1.32 µg/m^3 were obtained for the Pattipola road site and the background site. Results indicate that the measured air pollutant levels in HPNP currently are very low and do not exceeded the Sri Lankan ambient air quality standards. Furthermore, correlations of ambient pollutant levels (NO_2, SO_2) with visitor presence, rainfall, temperature and relative humidity were also investigated in this study.

Keywords: Air Pollution, Horton Plains National Park, Nitrogen Dioxide, Passive Sampling, Sulphur Dioxide

Variation of Plankton Composition in Ballast Water of Ships Visiting Colombo Harbour and Western Coastal Area of Sri Lanka

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Accidental introduction of alien invasive species through ballast water discharges from ships has raised global attention as a major cause of marine invasions. Colombo harbour facilitates a large number of ships annually and a great amount of ballast water is discharged into the harbour during deballasting operations. The present study was carried out to identify variation of plankton assemblages in ballast water of ships arrived at Colombo harbor, and Western coastal area of Sri Lanka in order to identify possible introductions of marine planktons through ballast water. Plankton samples were collected from five ships arrived at Colombo harbour and three local sites including Colombo harbour, Panadura and Pamunugama. Physical and chemical parameters including water temperature, pH, turbidity, salinity, Electrical conductivity, total dissolved solids, nitrate and orthophosphate were also recorded at sampling locations. Plankton assemblages of local sites and ballast water were evaluated using univariate and multivariate statistical tests.

A total of 126 plankton taxa were recorded in the samples. Twenty six out of 70 taxa recorded in ballast water were totally alien to Western coastal area of Sri Lanka. A significant ($p<0.05$) difference was observed in physical and chemical parameters excluding conductivity and nitrate among four sampling sites. Zooplankton communities were dominated by Copepod nauplii in all four sites. Alien plankton species observed in ballast water samples included Peridinium spp., Ceratium declinatum, Ceratium dens, Rhizosolenia setigera and Prorocentrum spp which are known to be toxic and some of them are well known for bloom forming.

Findings of this research revealed a greater potential of accidental introduction of alien planktons to Sri Lankan coastal waters via ballast water. Therefore adoption of ballast water discharge related regulations and implementation of effective management measures are important. This study also suggests that the continuous monitoring programmes in harbours and neighboring coastal area are important in early detection of new threats arising from plankton introductions.

Keywords: Alien species, Marine invasions, Toxic, Zooplankton

Anatomy of the Niyandigala Landslide, Belihuloya and Residents' Perception of Landslides

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Many landslide incidents in Sri Lanka have been reported during or subsequent to an intense rainfall. A landslide occurred in Niyandigala, Belihuloya on 3rd May 2016 after a consecutive rainfall of few days. The debris of the landslide transported along Panniloya which crosses Badulla-Colombo (A5) main road between 162-163 km posts. In the event, Niyandigala temple (Arannaya) was completely destroyed while one fatality was reported. Investigation of landslides in this part is essential as there are considerable human settlements around this area including the Sabaragamuwa University of Sri Lanka. In this study, the anatomy of the Niyandigala landslide and peoples' perception of landslides were investigated with the participation of nearby residents of the landslide. Field investigations were conducted to demarcate the spatial distribution of the landslide, collect physical data such as transported material and measure attitude of planer structures of the bedrock. Catchment boundary of the Panniloya was delineated using GIS software. A Fracture lineament map of the landslide and surrounding area was prepared based on field data and aerial photo interpretation. Fracture lineament distribution of the Panniloya catchment and landslide direction were analyzed using Geo rose software. Rainfall received in Belihuloya area during the year was plotted and analyzed. A feedback questionnaire survey was conducted among fifty nearby residents of the landslide. The landslide initiated at an upper reach of the Panniloya catchment at an elevation of nearly 1250m (MSL). The axis of the landslide extends to 1.9 km in length. The main scarp is about 40m in length, and consists of highly weathered bed rock. Its depth varies about 15m-20m. Crown cracks were visible above the crown region. The width of the upper part of the body is 10-15m in width, and has a deeper slip surface. Width of the middle region of the body is 20-30m. Large sizes of rock boulders (2m-7m in diameter) were dammed closed to the Arannaya. This area is the widest (40 m-50m) place of the landslide and represents the lower region of the body. Toe is 0.6 km in length and 10m-15m in width. Toe consists with fine particles of debris. Belihuloya received 63.3 mm precipitation in the event day over 24 hours starting from 8.30 am. Fracture lineaments are mainly located towards the N150 E to N 300 E. Nearby residents of the landslide area show no proper knowledge about landslides risk. The landslide axis closely followed the direction of the lineaments. Niyandigala landslide is a debris flow which is slim, elongated and fracture controlled. The body of the landslide can be divided into three distinct upper, middle and lower regions. The 63.3 mm rainfall cannot be considered as the level of landslide triggering rainfall as those rainfall data fall outside the Panniloya catchment. The bridge on the Badulla-Colombo main road which crosses the debris path could have been damaged if the early damming of boulders did not occur. People's awareness should be developed by introducing an applicable disaster management plan.

Keywords: Debris, Fracture, Landslide, Rainfall, Soil

Effect of Regular Menstrual Cycle on Muscular Strength of Women Volleyball players

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Women experience many physical changes in their bodies due to hormonal level changes during the menstrual cycle. With the variations in levels of estrogen and progesterone have an effect on sport performance like changes in energy sources, effects on various components of physical fitness, body temperature control and psychological changes. The aim of this study was to identify the effect of three phases of the menstrual cycle on muscular strength. Within twelve women Volleyball players in MAS Holdings Mawathagama, Volleyball team selected four players were selected from age twenty to twenty eight (20-28) through a screen test by using a questionnaire because for this study consider about the players with a regular menstrual cycle. They have not used any oral contraceptives for last two months. Subjects were studied through one complete cycle. Muscle strength was tested by push up test, sit up test, half squats test and bench press test. Measurements included a number of repetitions done by subjects for each test.

Testing dates were decided according to the participators' starting dates of the menstrual cycle. The tests were performed in middle day of the three phases of menstrual cycle: follicular, ovulatory and luteal phase. Used ANOVA for statistical analysis and data were analyzed in the Minitab 14. P values for push up test, sit up test, half squat test and bench press were in order 0.683, 0.227, 0.755 and 0.535. Those are more than 0.05. According to the data ANOVA failed to show any significant differences among the strength variables during the three phases of the menstrual cycle.

Only four subjects with regular menstrual cycle were studied for one cycle and using simple strength test were limited the result of the study. Though there are little changes in values and they are there are not statistically significant, regularly menstruating female athletes do not need to adjust their training to their menstrual cycle phase.

Keywords: Menstrual cycle, Muscular strength, Volleyball players

Suitability of AAHPER Fitness Test as a Tool to Measure Physical Fitness of Youth Aged 10 – 17 in Sri Lanka

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Physical fitness is a basic component of total fitness which includes efficiencies, mental and emotional stability and social adaptability. Physical fitness is a positive quality found in people's age. In a society different strata and groups of people such as young, old, rich and poor; the most important and significant proxy of a society is the youth generation. The AAHPER youth fitness test was devised by American alliance for health, education, and recreation in America. They always concerned with ways to improve the physical fitness. The purpose of this study was to identify suitability of AAHPER youth fitness test to measure fitness of youth aged 10-17 in Sri Lanka. The field based experimental research method was applied to conduct the research with the participation of 1000 girls and boys selected using random sampling method. The study area was throughout the Sri Lanka from various provinces. The data was collected using the AAHPER test batteries which consist with six test items 50 yard run to measure speed, standing broad jump to measure explosive power, shuttle run to measure agility, pull-up for boys and flex arm hang for girls to measure to arm strength, sit up to measure abdominal strength and 600 yard run to measure endurance respectively. Data was analyzed by using SPSS. According to data analysis, following percentile norms were created 5th 10th 15th 20th 25th 30th 35th 40th 45th 50th 55th 60th 65th 70th 75th 80th 85th 90th 95th 100th. When compared to AAHPER test norms, newly assessed norms' value are more and less. Then using this fitness test can identify the strengths and weaknesses of Sri Lankan youth aged 10-17. This test is suitable for Sri Lankan youth aged 10-17 as a tool to measure their fitness. Further studies are essential to enhance the reliability and validate of the test battery.

Keywords: AAHPER, Physical Fitness, Youth age

A Study on Morphological, Chemical and Physical Properties between Dark and Milk Chocolate as Influenced by Particle Size Distribution, Fat Content and Crystal Structure

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Cocoa butter is the main ingredient in chocolate manufacturing, which is responsible for the continuous flow, glossiness, texture and melting properties of the final product. Chemical properties of cocoa butter depend on the triglyceride composition and physical properties depend on the polymorphic form. The aim of the present study was to study the relationship between morphological (Scanning Electron Microscopy-SEM), chemical (Fourier Transform Infrared Spectroscopy-FTIR) and thermal properties (Differential Scanning Calorimetry-DSC) as influenced by particle size distribution (particle size analysis technique), total fat content (Soxhlet method) and crystal structure (powder X-ray Diffraction-XRD) of market samples (n=8) of dark and milk chocolate.

The results revealed that the crystallinity of dark chocolate was higher than that of milk chocolate. The chocolate samples contained stable cocoa butter polymorphic forms β (V) and β (VI). In all tested samples, the particles were not homogeneous as revealed by the respective test. The melting point of dark chocolate was positively correlated with the total fat content (r=0.75) and negatively (moderate) correlated with average particle size as revealed by SEM. The melting point of milk chocolate was negatively correlated with total fat content (r=-0.42), but it was negatively (moderate) correlated with SEM average particle size. In dark chocolate, the melting point was highly dependent on the cocoa butter content and polymorphic form of cocoa butter (r=-1.00).

The melting point of milk chocolate was found to be affected by the particle size and total fat content. Particle size distribution, crystal structure of cocoa butter and total fat content had a strong influence on the hardness of the chocolate samples. The hardness of dark chocolate was positively (weak) correlated with total fat content and negatively correlated (moderate) with SEM average particle size. Therefore, the cocoa butter fat content is an important criterion to produce harder dark chocolate. The hardness of milk chocolate was negatively (weak) correlated with the total fat content and the SEM average particle size. The milk fat content also had a positive effect on the hardness of the milk chocolate. Both dark and milk chocolates showed a positive relationship between crystal structure and hardness of the cocoa butter.

Keywords: Chocolate, Fat, Melting properties, Particle size distribution, Texture

Studying the Dynamics of Wilpattu National Park, Sri Lanka Using Satellite Remote Sensing

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Forest is gift from nature and we depend on it for survival. Deforestation is foremost issue in the world. Identifying and monitoring of deforestation and forest degradation is a global requirement. When in view of current situation of Sri Lanka the deforestation is a leading problem. This study focuses on the Wilpattu national parkand its changes during the time, which has grown into a level of a national crisis.

The rapid deployment of remote sensing satellites and techniques have provided a reliable, effective, and practical way to characterize terrestrial ecosystem properties. In this study a series of Landsat imagery (Landsat 2, 5 and 8) ranging from the year 1975 to 2015 have been used for the analysis. Initially, Support vector machine (SVM) based land cover classification was performed for all the images and the changes in the forest class was determined. Secondly Vegetation indices Normalize Difference Vegetation Index (NDVI), Normalize Difference Water Index (NDWI), Green Normalize Difference Vegetation Index (GNDVI) were used to separately extract the Vegetation, surface water and canopy conditions respectively. Also the social and natural components indication the other swaying factors for deforestation and once more impermeable the SVM result. Calculation of the deforestation and reforestation rate is based on predefined equations from FAO (Food and Agriculture Organization). Finally via Markov chain analysis for modeling future of forest. The projected land cover map demonstration the future of the forest in the year of 2050. The outcomes of this study reveal that there is a reforestation inside the national park (annual reforestation rate of 0.17%), while a deforestation outside close to the boundaries of it (annual deforestation rate of 0.29%).;

Keywords: FAO, GNDVI, NDVI, NDWI, SVM, Markov Chains

Monitoring Temporal Movement of Samanalawewa Dam Using GNSS Observations

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The results of monitoring temporal movements are related to safety of engineering structures and human and animal lives. All engineering structures are subject to deform and displace due to several factors such as environmental stress, structural overload, tectonic movements etc. Generally, temporal movements monitoring can be accomplished by geodetic and geotechnical methods. Geotechnical instrumentation can achieve very good one-dimensional or two-dimensional results but often limited to the area where the instruments installed. Conventional geodetic method using terrestrial instruments for example total stations, EDM etc. is comparatively a slow process to GNSS method. Besides, GNSS can offer three-dimensional results at a relatively lower budget.

The Samanalawewa Dam is a dam that is primarily used for hydroelectric power generation in Sri Lanka. With heavy land mass movements the area surrounded by Samanalawewa, in the form of rock falls, landslides it will be useful to conduct a monitoring on the Dam itself in order to see is current standing. This research will highlight the role of GNSS application in geodetic deformation monitoring of the Dam for its planimetric movements using GNSS control network established in the vicinity at stable ground platforms. Also the research expand with to see for the best control network establishment (Using GNSS) in the case of large structural movements such as Dams, Bridges, etc., to use Differential GNSS observations to measure the points on the Dam from first and second order control networks to see for movements and to See the stability (any persistent change in the position) of the Dam with the fluctuation of the water volume.

Keywords: GNSS, GPS, Temporal Movement, Monitoring

Flood Area Extraction Using Synthetic Aperture Radar in the Kelani River Basin

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Among all natural disasters, flood is identified as the most frequent natural hazard in Sri Lanka, proved by its history as well. The climate of Sri Lanka is known as tropical monsoon climate with mainly two monsoons periods: southwest and northwest. We have witnessed during the period of last July 17-22, 2016 a strengthening of the upward trend, with an average rate was increased in aspect of flood disasters, such as it had a tremendously high human impact and caused high economic damages. The rapid response mapping using satellite remote sensing technology is widely used where increasingly preferred alternative option for emergency assessment and operation flood disaster management efforts.

The research is to have an accurate and reliable flood area extraction for a large urban area and extract flood area in Colombo during May 2016, using sentinel-1 C band single polarization (VV) SAR data and to characterized the performance and the ability of the C band VV polarization on flood effects. Urban flooding results in serious damages and stay as a complex phenomenon to map due to the land use heterogeneity it associates. Here the flood water is considered to be only calm water. Many flood mapping SAR algorithms model open water as a perfect smooth surface which reflects most radiance away from side-looking SAR sensors. Especially in urban areas SAR inevitably requires an oblique scene illumination resulting in undesired occlusion and layover. The sentinel-1 mission is expected to deliver a wealth of data and imagery.

In the context of floods to understand the backscatter behavior of various semantic classes a series of histograms representing the class backscatter coefficients were generated. These histograms were used to determine the backscatter threshold values between water and the non-water regions. The change detection was performed between the two images by using a contextual Mean Ratio Detector considering second order pixel neighboring system. The results were compared with the reference map generated by using field data, and the correlation coefficients for the sample area were in the range of 0.7 to 0.8 with high agreement. Further the visual interpretation suggests the level of details using the C band SAR data is significantly higher than the ground based interpretation.

Keywords: Single polarization, Flood mapping and Contextual Mean Ratio Detector

A Review to Improve the Efficiency of Survey Department's Involvement in the Process of Cadastral System Reform in Sri Lanka

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Deeds registration based cadastral system has long been established in Sri Lanka. This system was originally introduced by the British Ceylon (1796 - 1948). Both the major components of this cadastral system, deeds registration and cadastral surveying, have several drawbacks. The deeds registration suffers low efficiency and ineffectiveness related matters. On the other hand, the cadastral surveying system fails because of incomplete land ownership information. In 1998, the Sri Lankan government introduced a title registration based cadastral system in response to the problems faced by this old system. The Survey Department and Land Settlement Department play major roles in this reform program. However, little progress has been made since the program's inception. The program administrators are now re-evaluating and forming strategies to expedite the progress of cadastral system reform program. Identifying different avenues to strengthen individual organizational involvement in the program is a key factor to this strategy formulation exercise.

This study aims to investigate the Survey Department's internal process that comprises registration of land titles and identify improvement options. Filed data collection involves interviews, direct observations in the field and review archival records. Findings of this study indicate that any delay of cadastral maps has affected the whole program as subsequent steps of title registration depend on cadastral plans. Although the current work processes of the Survey Department are satisfactorily efficient enough, the existing survey department regulations have not streamlined with the objectives of the cadastral reform program. The existing regulations of the Survey Department have satisfied self-interested objectives in the department. This collaboration delay among major government departments involved in the program has negatively affected the efficiency of the cadastral reform program. Finally, it was found that with the existing system, time taken to complete a cadaster plan cannot be reduced significantly. The necessity of a new systematic methodology to prepare cadastral map in a collaborative manner with other involved departments is clearly visible.

Keywords: Cadastral System, Cadaster, Land Titling Program, Survey Department

Investigation of Orthometric Height Correction on Spirit-Levelling

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The geoid is the reference surface for Orthometric heights and its fluctuation reflects the variation of Earth's gravity field mainly due to the density variation of sub-surface masses. To determine orthometric heights, gravity must be observed at the particular location. However in many regions, orthometric heights are obtained without gravity data through spirit-levelling technique. The objective of this study is to investigate the effect of orthometric height correction on spirit-levelling. Numerical experiments were carried out through field tests based on computed gravity at each set-up of the staff along number of leveling routes in the study area.

The study area is Pambahinna located in the Ratnapura district, Sri Lanka. The area lies approximately between 6° 42' - 6°44' N latitudes and 80° 46' - 80°48' E longitudes. In this study, fly- back levelling method was adopted and level lines run approximately North-South and East-West directions. The Earth Gravitational Model 2008 (EGM2008) was used to obtain the gravity anomalies along spirit leveling routes and subsequently gravity values at same locations were computed. Numerical investigations were carried out to find correlations of the computed orthometric height correction with direction, gravity and Height. From the obtained results of this study, it can be concluded that, the orthometric height corrections should be taken into account when high level of accuracy is required.

Keywords: EGM2008, Geoid, Gravity, Height, Levelling

Determinants of Consumers' Attitudes towards Viral Marketing Practices: Empirical Evidence from Pioneer Institute of Business and Technology

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The rapid advancement of information technology has opened many cost effective avenues for marketers to communicate their messages to customers. One of the emerging techniques of marketing communications through the use of information technology is viral marketing, which is widely recognized as a prolific direct marketing tool for marketers across the world. Despite the extant literature postulates that individuals who pass along messages play a vital role in viral marketing practices, factors that result in increased acceptance of viral marketing practices by consumers remain largely unknown. This study addresses voids in extant literature by examining factors influencing consumers' attitudes towards viral marketing practices of Pioneer Institute of Business Technology (PIBT). A total of 236 sets of questionnaire were distributed to target respondents from Colombo district in database of PIBT. However, there are only 182 set of questionnaire is usable for analysis. Correlation and regression analysis were used as the major analytical techniques. The study findings indicate that Informativeness and source credibility have a positive, statistically significant impact on consumers' attitudes towards viral marketing practices of PIBT whereas irritation has a negative, statistically significant impact on consumers' attitudes towards viral marketing practices of PIBT. However entertainment did not emerge as a determinant of consumers' attitudes towards viral marketing practices of PIBT. Implications for the marketing managers are to create and deliver viral marketing messages through a credible source that provides informative, authentic and trustworthy messages to customers. Moreover, the adoption of these findings in viral marketing campaigns may lead to more positive consumers' attitudes towards viral marketing practices of PIBT.

Keywords: Viral marketing practices, PIBT, Consumers, Attitudes

Factors Affecting Work-to-family Conflict: An Empirical Evidence from Aitken Spence Corporate Finance (Pvt.) Limited

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Work-to-family conflict has emerged as a rising issue for many working adults all over the world. Literature shows that individuals, families, and organizations are increasingly experiencing negative effects of work-to-family conflict. Therefore, how to reduce work-to-family conflict has become a still unsolved issue in the field of research. Based on the directions in literature, this study aimed to find out whether job involvement, family supportive supervisor behaviors, and perceived organization support impact on work-to-family conflict among executive level employees at Aitken Spence Corporate Finance (Pvt.) Limited. This study was conducted based on quantitative research methodology. Deductive approach was used and three hypotheses were established in the light of the light of Identity, Scarcity, and Social Support Theories. Self-administered questionnaire was developed using validated and reliable scales. Survey data was collected from119 out of 172 executive level employees, using simple random sampling method. Data was initially analyzed using a multiple regression analysis with the support of SPSS and Minitab software packages. However, family supportive supervisor behaviors and perceived organization support were rejected from the initial model. Therefore, final fitted model was developed using a simple regression analysis. The study revealed that only the job involvement has a significant positive impact on work-to-family conflict among executive level employees at Aitken Spence Corporate Finance (Pvt.) Limited. It indicates that if a person is over involved in a job, there is a possibility to arise work-to-family conflict. Thus time has come for the employees themselves and decision makers of this organization to develop appropriate strategies to reduce the level of employees' over involvement in work by understanding the optimal capacity of each individual and giving the work that best fits them.

Keywords: Family supportive supervisor behaviors, Job involvement, Perceived organization support, Work-to-family conflict

Service Quality, Customer Satisfaction and Customer Loyalty of ABC Hotel Colombo

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This study examines the impact of service quality, customer satisfaction and customer loyalty as a case study in ABC Hotel Colombo. Based on the sample, quantitative approach was carried out. Questionnaires were distributed for the guests in ABC hotel Colombo to collect the data. Correlation and regression was adapted to get the outcomes. Based on the results hypothesis testing was carried out. Pearson correlation coefficient revealed the positive association between service quality, customer satisfaction and customer loyalty. Three models which were articulated according to conceptual framework depicted the goodness of fit and significant of each variables included in the model and finally all models and hypotheses were accepted and considered significant. In this study, since it was reconfirmed that service quality had a significant effect on customer satisfaction, it paves way for customers being loyal and being evangelists by spreading positive word of mouth. The higher the service quality the higher the customers are satisfied and loyal customer may retain with the hotel. To overcome the drawbacks of ABC hotel Colombo, it was recommended to increase the quality of service, empathies of staff and satisfy customers to retain them loyal. To conclude, the effect and relationship of service quality, customer satisfaction and customer loyalty has been exposed and established.

Keywords: ABC hotel Colombo, Customer Loyalty, Customer Satisfaction, Service Quality

Factors Affecting Consumers' Green Product Purchase Decisions: with Special Reference to Green Household Electronic Products in Western Province

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The green consumer decisions are recently being discussed in Asian context. The literature on green consumer decisions and purchase decisions recently focuses on the Asian market and as a result it is being spread in the Sri Lankan context. Though environmental consciousness in Sri Lankan consumers is observed in the literature, purchase decision towards green electronic products is not yet clearly understood in Western Province. Energy efficient electronic appliances or green electronic appliances are purchased by a wide variety of customers in today's context. As a trend people are more conscious about environmental threats and willingly take steps to contribute to the environmental protection. Present research measured the impact of factors, supporting environmental protection, drive for environmental responsibility, environmental friendliness of companies, social influence, perceived value, perceived quality identified from literature and their influence onto the green electronic products purchase decisions in Western Province. The research aimed to solve the issue of what are the factors affecting the purchase decisions of green household electronics products in Western Province? The research was carried out by using quantitative method and a questionnaire was distributed among consumers who have purchased green electronic appliances and who are willing to purchase green electronic appliances. 450 responses were taken as the sample for the study. Correlation analysis and regression was implemented to understand the impact between the independent factors and consumers' green electronic products purchase decisions. Researcher found that green product purchase decisions are dependent on supporting environmental protection, drive for environmental responsibility, environmental friendliness of companies, and perceived value. According to research findings, these factors significantly impact the green electronic product purchase decisions of consumers in Western Province.

Keywords: Green Consumer Decisions, Green Household Electronic Products

Sociologycal Study of Non-Communicable Diseases and the Sick Role of Senior Citizens

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Sri Lanka is the fastest aging nation in the South Asia. Aging in Sri Lanka has resulted in a series of socio- economic issues. Vulnerability for diseases increase with the age. A high elderly population would not be a problem if they are economically and physically independent. Rapid growth of non-communicable diseases is a current reality in Sri Lanka and elderly population remains the most affected. Sick role of elderly population in Sri Lanka is under researched. The main objective is to study the non-communicable diseases of senior citizens along with their sick role experience. Identifying the most and the least common non-communicable diseases in the field, problems encountered and coping mechanisms against illness, and understanding the patient's rationalization of sickness become the specific objectives of the study. Interviews, questionnaires and simple observation were the methods of primary data collection. Boraluketiya Grama Niladhari division of Balapitiya divisional secretariat division in Galle district of Sri Lanka was the research field. A random sample of 100 families included senior citizens above 60 years suffered from non-communicable diseases. About 78% of elders suffered from hypertension while 42% and 32% had Diabetes and heart diseases respectively. A higher percentage of female elders suffered non- communicable diseases. Majorly with deteriorated health are unemployed dependents and they experienced a significant emotional breakdown. Dependency on medications has become a habitual practice responding physical discomforts they suffer. All elderly patients believed medical pluralism with a predominant inclination towards western medicine. There are significant changes in their sick role behavior with the age although, they identify with the sick role relatively earlier.

Keywords: Elderly, Non- communicable diseases, Aging, Sick role, Sri Lanka

Study of Incentives to Use the Bilingual Features and the English Language on Name Boards: With Special Reference to Kandy Municipality

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The use of English as the first language (L1) and code-mixing between Sinhala and English are common linguistic behaviors in both formal and informal spoken and written discourses in Sri Lanka. The majority of modern name boards of Sri Lanka also provide a variety of instances in this respect. However, the language used on name boards has been rarely examined in the linguistic field. Thus the major objective of this study was to examine the reasons for using such language behaviour on name boards. It also examined the attitudes of society towards these language variations and the effects of such language behaviour on Sinhala/Tamil and English languages. The study was a combination of both quantitative and qualitative methods of data collection and analysis: a questionnaire, interviews and field observations. The sample of the questionnaire consisted of 100 participants, and 15 individuals were taken for the interview. The samples of photographs and images of name boards were indicated as evidence. The relevant findings of the questionnaire were indicated using charts and graphs. In conclusion, the results of the research depict the modern trend, to attract people, blind imitation, as a token of status, false attitude, globalization, multiracial identity of Sri Lanka, the development of tourism and the minimum quantity of Sinhala equivalents for several English lexical items as the reasons for the utilization of code-mixing on name boards. The study revealed that, there are various social and learning advantages in this language phenomenon and there are mixed responses from the community in this regard.

Keywords: Attitudes, Effects, Language usage, Reasons and Social impact

Business to Business (B2B) Software Solution for Online Hotel Reservation: Bonotel

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Hotel reservation is one of key tasks in tourism industry. This is not only engaged with guaranteeing a room for traveler to spend a night but also is closely linked with other businesses: Airlines, Tour Operators, Wholesalers, Travel Inventory Distributors, Receptors, Event Planners and Destination Management companies. Hence, there is a high impact on developing an efficient hotel reservation system for effective customer service to travelers. Rezgateway is the worldwide leader in software for the travel industry. By using Rezgateway's range of services, customers can easily create, manage, integrate and distribute travel inventory using Internet technologies.

This study is an attempt to develop an online hotel reservation system that promotes Business to Business (B2B) e-commerce model using Rezgateway. Under this study, four major development channels: Call Center, Shopping Cart, XML, Comma-Separated Values (CSV) files were identified as supportive components to create, manage, integrate and distribute multiple travel products: hotels, leisure activities and event planner, tickets management, transport, tour guides and itinerary management. The system was developed under agile environment. Major tasks under the system development are sprint item development, fixing live system issues, participate scrum planning and slicing sessions. The system basically divided into two categories: back office and web site, also, it subject to module [report/setup/contracts/search…] developments, module improvements based on client requirements and continuous system maintain in both web and back office in order to provide a good customer satisfaction. This study took Rezgateway and BONTEL portal as its case. It looked at creating an online hotel reservation system to enable customers choose the primary accommodations along with other services they wanted for better traveling experience. The system was successfully linked with several world's famous hotel chains such as MGM Resorts, Leows Hotels, Fairmont Hotels and Resorts etc., as well as with third party suppliers like HotelBeds, Derbysoft, RateTiger etc.

Keywords: Back Office System, BONOTEL, Software Development, Travel Industry

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