10th ANNUAL RESEARCH SESSION

SABARAGAMUWA UNIVERSITY OF SRI LANKA

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10th ANNUAL RESEARCH SESSION
SABARAGAMUWA UNIVERSITY OF SRI LANKA

Organized by

Centre for Research and Knowledge Dissemination
Sabaragamuwa University of Sri Lanka

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Message from the Vice-Chancellor

Sabaragamuwa University of Sri Lanka

On behalf of Sabaragamuwa University of Sri Lanka, I take great pride in welcoming all the attendees for the 10th Annual Research Session (ARS 2020) to be held on 16th December 2020 at Sabaragamuwa University of Sri Lanka (SUSL). The Annual Research Session of SUSL is a multi-disciplinary scholarly platform that allows sharing an insight into the recent researches conducted by the University academics, the postgraduate students, and the undergraduate students of SUSL. The Annual Research Session of this year covers major areas of academic disciplines that include Agricultural Sciences, Applied Sciences, Geomatics, Management, Medicine, and Social Sciences & Languages. Therefore, I strongly believe that the ARS 2020 will contribute to enhance the research culture of the University immensely.

The Annual Research Session of this year is of course exceptional, particularly in terms of the circumstances in which it is taking place. While I regret that the COVID pandemic prevented us from holding the ARS 2020 completely at the university premises, yet I am excited about the opportunities of holding an innovative virtual event.

Organizing and conducting this type of a multi-disciplinary scholarly event is indeed an immense challenge. Therefore, I take this opportunity to express my appreciation to the organizing committee for accepting this challenge to make the 10th Annual Research Session a reality.

Finally, I look forward to welcoming you all to this exciting ARS 2020 and to meet you all in December 2020. Moreover, I do hope that you would join us to make the ARS 2020, a fruitful and a memorable event.

Prof. R.M.U.S.K. Rathnayake
Vice-Chancellor
Sabaragamuwa University of Sri Lanka

Message from the Director

Centre for Research and Knowledge Dissemination
Sabaragamuwa University of Sri Lanka

It is with great pleasure that I convey this message to the 10th Annual Research Session of the Sabaragamuwa University of Sri Lanka. As an annual event, organized by the CRKD, ARS intends to give a platform to all academics, postgraduate and undergraduate students to share the latest research findings with the multi-disciplinary scientific community of the SUSL and pave a pathway for their innovations and creativity.

The symposium would indeed be a great success in terms of its quality and the quantity of the submitted research papers. Fifty-one papers submitted by academics and postgraduate students were accepted for the oral presentation. Further, seventeen papers from undergraduates were also accepted for the poster session. Each paper received rigorous and professional reviews. I appreciate all the reviewers and the editorial committee for their tireless work in reviewing the papers. This year, ARS is featuring a renowned keynote speaker, Prof. Rangika Halwatura, who is attached to the Department of Civil Engineering, University of Moratuwa widely known in his field for the impact and innovative nature of his research contributions to Civil Engineering Science.

I appreciate and acknowledge the leadership and guidance of the Vice-Chancellor Prof. R.M.S.U. Rathnayake and the support of the Registrar and the Actg. Bursar in making this 10th ARS a success. This year, due to the measures that were taken for COVID-19, organizers had to face a new challenge in organizing a virtual session. I would like to thank all the members of the organizing committee, Dr. P.G.R.N.I. Pussella (Chairmen - ARS), Dr. R.M.A.S. Bandara (Co-Chair - ARS) and Dr. P.K.C.M. Wijewickrema (Secretory - ARS), Faculty Coordinators and Ms. S.M.F. Shafnaz (Research Assistant - CRKD) for their tremendous efforts, to make this event a success. I would like to thank the Dean of the Faculty of Graduate Studies, Prof. H.M.S. Priyanath, who has made significant contributions, by bearing all the responsibilities to organize the postgraduate's colloquium.

More importantly, my sincere thanks extend to the authors of manuscripts, the keynote speaker, the technical program committee members, reviewers, technical session chairs, language editors, poster presenters and all other participants who assisted in this endeavor in numerous ways to make this event a reality.

Prof. Chandrika Dissanayake
Director/CRKD

Message from the Chairman of the 10th Annual Research Session 2020

Sabaragamuwa University of Sri Lanka

It is a great pleasure to put forward this message to the Tenth Annual Research Session (ARS) of Sabaragamuwa University of Sri Lanka. This event was initiated in 2014 and, this year we have the prime objective of providing a solid platform to disseminate innovative research findings achieved by the academics and postgraduate and undergraduate students attached to different faculties of the university during their research careers. In addition, this offers a very good opportunity to the participants to present their research works, to a wider community of academics and, at the same time, they have been given a very good platform to get comments and suggestions from senior academics of the university for making further improvements in their researches.

This year, the ARS is encompassed with presentations mainly under, three categories. Firstly, there are 21 presentations from the academic staff members of the university who have conducted and finalized post-graduate researches in local and international universities and research institutions all over the world. Furthermore, 30 postgraduate students attached to the Faculty of Graduate Studies of the university are presenting their research findings and proposals to this gathering. Also, a poster session has been arranged, specially, for the under-graduate students attached to SUSL to show their talents in the research field. Also, it is great to announce that the "Abstracts of the Annual Research Session, Sabaragamuwa University of Sri Lanka" is registered as an international standard publication under the ISBN.

We would like to take this as an opportunity, to express our sincere appreciation to our key note speaker Prof. Rangika Halwathura, Senior Lecturer, Department of Civil Engineering, Faculty of Engineering University of Moratuwa. Furthermore, we would like to express our positive reception to the Vice Chancellor of SUSL and Director of the Centre for Research and Knowledge Dissemination (CRKD) and the staff for their invaluable support extended to make this event a success. In addition, we would like to thank all those who worked hard and gave their fullest support to organize this event successfully. Finally, we wish all the presenters as well as non-presenting researchers of SUSL every success in their career paths.

Dr. PGRNI Pussella.
Chairman of the Organizing Committee
ARS 2020 – Tenth Annual Research Session.
Sabaragamuwa University of Sri Lanka

Message from the Dean

Faculty of Graduate Studies
Sabaragamuwa University of Sri Lanka

It is indeed with great pleasure that I issue this congratulatory message for the Annual Research Session (ARS) of Sabaragamuwa University of Sri Lanka as it is a very significant event organized annually to provide scholars, postgraduate and undergraduate students with a platform to disseminate their research findings. This Annual Research Session organized by the Center for Research and Knowledge Dissemination (CRKD) of Sabaragamuwa University of Sri Lanka is particularly significant for the Faculty of Graduate Studies (FGS) as FGS is fortunate enough to organize its Graduate Colloquium – 2020 in collaboration with the CRKD as one of the main events in the Annual Research Session. FGS annually organizes the Graduate Colloquium to encourage postgraduate students to share their research findings and progress, with a panel of experts who will help them improve their postgraduate studies. I am confident that the postgraduate students of the FGS will be immensely benefited by this event.

I take this opportunity to congratulate the organizing committee for taking the challenge of organizing the Annual Research Session in a very professional manner despite this tremendously tough situation in the wake of COVID-19 pandemic. I have no doubt that the Annual Research Session – 2020 will offer our university academia and postgraduate students to share their latest research findings and insights with their colleagues and experts in a multi-disciplinary forum.

On behalf of the FGS, I would like to extend my sincere thanks to the Director – CRKD and the organizing committee who shouldered the task of organizing the annual research session – 2020.

Finally, I wish all the participants to experience an interesting, a thought-provoking, and a productive event.

Professor H.M.S. Priyanath
Dean
Faculty of Graduate Studies

Summary of the Keynote Speech

Natural Science Vs Artificial Science

Prof. R. U. Halwatura

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Nature is a huge teaching space that offers many lessons for those who take the time to reflect and discover. In decades ago, scientists and inventors studied characteristics of things in nature and came up with amazing technologies and products invented as a result of studying nature. However, in the recent past we forgot this simple fact and started ruling nature. As a result, the human factor was deteriorating more than inventions/ innovation, Instead the disruptions have come into the picture. This was evident immensely in the recent past. Nature has started responding and that will hint us to recheck our actions. It was well known that any civilization can't exist without novelty. However, if that goes against nature and natural justice, a reversal of the whole process should be expected soon. That was again evident with COVID 19.

Sustainability has become the most important challenge not just for the present, but also for the decades to come. Scientifically-based solutions should drive technological innovations that enable compliance with the still-growing environmental constraints. Research in this particular field of interest is advanced from the physical, chemical, biological, lifecycle assessment, engineering, and materials science perspective, often leading to synergistic approaches. The success in a research will come in many ways. However, the whole story of the research process line will start with finding a moral question, which can lead to groundbreaking outcomes. At the same time, if a person can try to find a natural or near natural solution to a natural problem than an artificially created issue, that will surely pave the sustainable future ahead.

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Session 01
Professional Forum

Applied Sciences, Agricultural Sciences and Geomatics

A Microelectrode Study on the Interfacial Kinetics of Fuel Cell Reactions

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Alkaline anion membrane exchange (AAEM) fuel cell technology is a low-cost alternative to the depleting sources of fossil fuels. AAEM fuel cells operating at elevated pH values show improved electrode kinetics on non-precious metal catalysts, better water management and improved fuel crossover effects. However, the state of art AAEM fuel cells show low performance which is attributed to carbonate ion poisoning. In this study we have analyzed the effect of carbonate ions of the membrane, on the anode- membrane interfacial kinetics and on the transport of electroactive species through the membrane. A solid-state electrochemical cell employing a 100μm Pt microelectrode, Pt counter electrode and a dynamic hydrogen reference electrode was constructed in a controlled atmosphere to mimic the fuel cell anode-membrane interface. Two types of hydroxide-conducting membranes which mainly differed by the thickness, Tokuyama A201 and A901 were analyzed. The hydroxide ions in the membrane were exchanged with carbonate ions, and hydrogen oxidation reaction (HOR) and the methanol oxidation reaction (MOR) were carried out. Carbonate ions have a negative effect on the electrode reactions, lowering the pH of the anode reactions as well as by imposing blocking effect on molecule diffusion through the membrane. Both HOR and MOR reactions showed slow kinetics in the presence of carbonate ions. Carbonate ions strongly adsorb on to the electrode surface decreasing the hydroxide ions required for the reaction. Hydrogen diffusion through the membrane is not significantly affected by the presence of carbonate ions due the smaller size of the hydrogen molecule. However, hydrogen concentration in the membrane was drastically decreased. While methanol solubility in the membrane is minimally affected, the diffusion of bulky methanol molecules is greatly hindered by the carbonate ions.

Keywords: *Anion exchange membrane fuel cell, Hydrogen electro-oxidation, Methanol electro-oxidation, Methanol diffusion, Carbonate ion poisoning*

Conjugate Shear Fractures in Galgoda Charnockite, Balangoda

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Conjugate Shear fractures are pair of fractures which were developed during brittle failure of rocks. Presence of shear fractures signs faulting or relative movement of rocks in a particular area. This study aimed at investigating the shear fractures present in the Charnockite at Galgoda, Balangoda in order to understand the sense of slip and brittle deformation history in the area. Orientation data of fractures (n=136) and slickenside striations were collected using geological compass. Samples were collected from selected locations for laboratory studies. Fracture orientation data were plotted and analyzed using Rock Ware Stereo Stat software. Poles plot for shear fracture planes were contoured and best fit great circles were constructed. Principal compressive stresses (σ_1, σ_2, σ_3) were then calculated using the software. A thin film of fault gouge is present in the shear fractures. Slickenside striations are distinct in some planes while slickenside striations in some planes with moderate plunge seem to have overprinted. Steps are also visible in some planes. A vertical to near vertical shear fracture is present where slickenside striations are parallel to the strike of the shear plane. These, slickenside striations show moderate to horizontal plunge with NW, W-NNW and NNW-N trends. Orientation of shear fractures shows four directions showing presence of two generations of conjugate fault systems. The principal stress directions of one conjugate fault system are σ_1(089°/63°), σ_2 (282°/26°) and σ3 (189°/06°). The principal stress directions of the other conjugate fault system are σ_1(170°/74°) and σ_2 (329°/15°) and σ_3 (060°/06°). Because the σ_1 direction is nearly vertical, the sense of slip on both conjugate faults is dominantly vertical. The sense of shear in vertical to near vertical shear fractures could indicate strike-slip on tensile fracture. Thus, the Galgoda Charnockite shows at least two generations of normal faulting and a subsequent strike-slip suggesting change of the stress regime acting on these rocks.

Keywords: *Charnockite, Conjugate shear fractures, Fault gouge, Slickenside, Tensile fracture*

Efficacy of Mechanical *versus* Manual Cervical Dislocation for On-Farm Euthanasia of Layer Chicks

R.M.A.S. Bandara[1*], S. Torrey[2], P.V. Turner[3], A. Zur Linden[4], A. Bolinder[5], K. Schwean-Lardner[6], and T. M. Widowski[2]

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According to animal welfare concern, the aim of any killing technique is to achieve rapid loss of sensibility to cause minimal pain in animals. This study assessed the efficacy of novel Koechner Euthanasia Device Model-S (KED) in comparison to manual cervical dislocation in anesthetized layer chicks (2-3 day old). Due to ethical concern, novel killing devices are tested in anesthetized animals. Thus,16 chicks (Avg BW ± SD; 44 ± 3 g, Shaver White, ISA Brown and Lohman Select Leghorn-lite) were randomly assigned to the two experimental groups: manual cervical dislocation in anesthetized chicks or mechanical cervical dislocation by KED in anesthetized chicks(n=8). Generalized linear mixed model (GLMM) by using SAS 9.4 version was used to analyze the antemortem measurements. Longer time to lose the pupillary light reflex (94.4 ± 7s, P=0.09) and cessation of heartbeat (196.4±15s, P=0.03) was observed in the chicks killed by KED in comparison to the other group (66.6 ± 9s and 138.5 ± 18s respectively). Radiographs assessment reported that manual cervical dislocation resulted in cervical dislocations below the C4 vertebra. The ideal dislocation of skull to C1 was absent in both the killing method. Few chicks killed by manual cervical dislocation exhibited cervical fractures. Cervical dislocations and fractures were not observed in the chicks killed by KED. Higher scores for the subdural hemorrhage at the site of cervical dislocation was observed in the chicks killed by manual cervical dislocation whereas it was minimum for the chicks killed by KED. Brain trauma was absent in both the methods. Based on time to brain death and anatomical pathology, KED resulted in lower efficacy in comparison to manual cervical dislocation as on-fam euthanasia method for 2-3-day old layer chicks.

Keywords: *Anesthesia, Brain death, Brain-stem reflexes, Cervical dislocation, Poultry welfare*

Simulation Modeling to Predict the Response of Selected Upland Field Crops to Present and Future Climate

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Process-based crop simulation models can predict the climate change impacts on crop production. In Sri Lanka, crop simulation models have been used predominantly for rice. These are tailor-made cropping system models with limited applicability to the agro-environment and crop varieties. Hence, there is a need to develop locally-applicable crop simulation models to predict the growth of important 'Upland Field Crops' grown in Sri Lanka. Accordingly, this work was aimed at developing three crop simulation models to estimate growth and yield of maize, mung bean and tomato and to predict the impacts of long-term climate change on their phenology and productivity. Data required for the model development were obtained from multi-locational field experiments conducted at Rahangala, Kundasale, Maha-illuppallama and Killinochchi representing a range of temperature and rainfall conditions in Sri Lanka. These models were validated using independent data gathered from multi-location field experiments conducted in the present study, and secondary data were obtained from the Department of Agriculture. Accordingly, model predictions on crop phenology (i.e., time required for 50 % flowering), leaf area index and yield showed satisfactory agreement with observed data. Model predictions revealed that the potential shifts in maize and tomato cultivation from warmer lower-elevations to cooler higher-elevations in the future, unless new heat tolerant varieties are introduced. Moreover, increasing future temperatures would increase crop productivity in cooler environments while decreasing productivity in warmer areas. Furthermore, parameters estimated in the present study fill the existing knowledge gaps for modeling phenology, growth and yield of maize, mung bean and tomato. Predictions of this study would be used in policy formulation to increase climate resilience and protect farmers' livelihoods in vulnerable areas.

Keywords: *Maize, Mungbean, Tomato, Phenology, Climate change*

Modelling of Multivariate Binary Responses

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In different fields of study, multivariate binary data are often encountered especially when several different characteristics or attributes are measured on the same unit or from the same person. However, bivariate or multivariate responses observed from the same individual or a unit is possibly expected to be correlated. This study aimed to assess the influence on the estimates of marginal parameters of the joint binary response model when the data is non-clustered and random effect is assumed bridge and normal distributions. Additionally, evaluating the performance of the joint response model compared to the marginal models. Generalized linear mixed models (GLMMs) are used to model correlated binary responses jointly by adding the random effect to the linear predictor. The GLMMs typically adopt a logit or probit link functions embedded with random effects into the linear predictor for correlated binary data. Therefore, the random intercept logistic regression model is used to estimate the model parameters since its ease of interpretation. The 2011 Bangladesh Demographic and Health Survey data were used to study the practical application of the proposed method. A simulation study was employed to illustrate the impact on the joint response model when the use of the bridge and normal distributions for the random effect and to examine the performance of the joint response model compared to the marginal models. R software version 4.0.2 as well as the SAS University Edition®, and 'NLMIXED" procedure were utilized to simulate and to estimate the parameters of the joint response model and marginal models. The simulation study implied that joint modeling of the correlated binary responses provide a better gain in efficiency in the parameter estimates compared to separate models. It is more noticeable for smaller sample sizes. Moreover, this study results revealed that, even after the random effects follow the normal distribution, assuming bridge distribution for the random effect in the joint response model leads to slightly more accurate results. Assuming a bridge or normal distribution for the random effect to accommodate the correlation between two binary responses provided somewhat closer parameter estimates although the standard errors are slightly different.

Keywords: *GLMMs, Joint modeling, Bridge distribution, Correlated binary responses, Random intercept logistic regression*

Future Direction of the Geomatics Profession in Sri Lanka

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Customarily, the role of the land surveyor was to collect spatial information pertaining to a land parcel including its boundaries, extents, nature and its ownership. However, in recent times, it has developed to a status of a managerial role. It also encompasses various other professions including; valuation, disaster management, agriculture, transportation, environmental monitoring, crime scene investigation to plastic surgeries. Therefore, the profession of land surveying has been rebooted through the recent decades by the rising demands for construction and the changes in the industry requirements, which have created new challenges and opened new opportunities. Various trends in the surveying profession have emerged globally during the last two decades. In today's world, the profession remains in existence by addressing the future needs of the community. Most of the international professional associations have redefined their professional competencies from time to time in accordance with the development and demand of the industry. However, the adaptation and response to those changes by most local associations and communities in developing countries are minimal. Therefore, it is beneficial to examine these career trajectories within the surveying profession in relation to Sri Lanka to provide directions for its positive impact on the industry. This study is mainly based on the in-depth interviews and questionnaire survey with selected surveyors, educators, business professionals and government authorities. Over 140 responses were collected. Here, four career paths were identified including Geomatics, Geoinfomatics, Hydrography, and Construction as future trajectories in the profession. However, to become a professional surveyor, one should have a general understanding of all of the above paths. In future, more and more automated measurement techniques such as laser scanners, drone surveys, and advanced GNSS will gradually overtake the conventional survey techniques. But, the opportunities for continuing professional development (CPD) courses on those aspects are limited. Finally it is strongly stressed that the professional institution, practitioners and academia must work collaboratively to uplift the profession in Sri Lanka.

Keywords: *Geomatics profession, Strategic planning, Surveying*

Availability of Green Spaces in Colombo Municipal Council (CMC) Area

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With unmanaged and unplanned process of urban sprawl and its inherent consequences, land cover and land use have being changed dramatically all over the world to cater the basic needs of urban dwellers. In order to measure the urban sustainability, different approaches have been introduced by various governmental and private institutes. One such approach is identification of green space extent for one person which is generally known as the per capita green space. Current study was planned with the objective of identifying the availability of green spaces in CMC. Further, it was compared with the available urban green space standards introduced by UN, WHO and EU to check present situation of the city and compared with main cities in the South Asian region. Landsat images which were taken in different years from 1980 to 2015 were used as data sources. Integrated approach of GIS and Remote Sensing was used to analyze the problem. NDVI differencing technique was applied to detect the changes of green spaces and prepared green space maps. The final results of this approach identified that there is a remarkable decrease of green space. It has been recorded as 31.0 km^2 in 1980, but it has been dropped to 5.02 km^2 in 2015. Further, the per capita green space recorded in 2015 is 7.16 m^2 which is below than WHO standard of 8 m^2. However, it can be noted that Colombo city is in a better situation compared to other main cities in the region (Dhaka - 0.49 in 2014, Bangalore – 2.17 in 2011, Mumbai - 0.635 in 2011). Finally, it is recommended to policy makers and urban planners to take immediate actions on this issue immediately to make a comprehensive city plan.

Keywords G*reen space, Urban, Land use*

Session 02
Professional Forum

Applied Sciences and Medicine

Neuromuscular and Strength Adaptations to 'Concurrent' Training in the Young Recreationally Trained Men

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The amount of neuromuscular adaptation depends on the characteristics and effectiveness of the exercise prescriptions used in the training program. Thus, each person responds differently to each training program. Therefore, this study aimed to compare the effects of 8 weeks of three distinct "concurrent" training: Traditional Concurrent Training (TCT), Sprint Interval Training (SIT), and High Intensity Resistance Circuit-Based Training (HRC) protocols on neuromuscular and strength performance. Thirty-four young males were recruited (24±5.8 years, 174.9±5.9 cm height, and 73.4±7.9 kg) and randomly assigned to three groups (HRC: 13, SIT: 10, and TCT: 11). All subjects exercised twice a week for 8 weeks. Maximal Voluntary Contraction (MVC), Rate of Force Development (RFD) and H-Reflex, M wave, and 6RM were assessed. Standard descriptive statistics were used to characterize the study population. A mixed analysis of variance with repeated measures and Bonferroni post hoc tests were used to investigate the interaction effect and significant differences. The main results show that significant increment ($P<0.05$) in MVC and 6RM following HRC and TCT, while both induced increases in RFD but only HRC was significant ($P<0.05$). However, SIT showed decrement in RFD and H max, whereas leg extension and deadlift only attained significant increment ($P<0.05$). After comparison of protocols, significant between-group statistical differences were shown in H max, M max and muscle strength in bicep curl following HRC and TCT. HRC induced a small effect size of maximal H-Reflex (ES=0.32), H:M ratio (ES =0.44) with significant increases in MVC and 6RM, it suggests that possible adaptations occurred in efferent motoneuronal output. Probably, slow twitch and fast twitch fatigue-resistant motor units' activation decreased H reflex, H:M ratio, and RFD after SIT, indicating possible adaptations in neuromuscular function. Remarkably, TCT based training led to an enhanced response at the spinal cord level and muscle contraction velocity. Overall, these observations suggest each training protocol induced more or less strength adaptation associated with spinal reflex specifically to the training demands.

Keywords: *Hmax, Mmax and EMG, HRC and SIT*

Relationship of Neck Pain Intensity with Anthropometric Measurements: A Cross Sectional Study Carried out in Patients with Chronic Neck Pain

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Neck pain is a very common public health problem worldwide and is allied with both work absenteeism and disability in daily life. Chronic neck pain is common in the adult population. The aim of this study was to investigate the relationship between neck pain intensity and the anthropometric measurements of patients' and chronic neck pain. A cross sectional study was conducted on 285chronic neck pain patients aged between 20 and 69 years attending the rheumatology clinic at the Colombo South Teaching Hospital. Data were collected by using an interviewer administered questionnaire. Pain Intensity (PI) was measured by a visual analog scale 0mm (no pain) to 100mm (worst possible pain).It was categorized as mild (1-25), moderate (26-50), severe (51-75) and worst possible pain (76-100).Standing height (StHt), weight (Wt), sitting height (SiHt), neck length (NL), neck circumference (NC) were measured. Body mass index (BMI) and relative neck length (RNL) was calculated. The mean age of the patients was 52.79 ± 12.15 and 224 (78.5%) were females. Mean PI was 75.03±11.991. The mean PI in male and female were74.69±11.246 and 73.55±11.977 respectively and not significantly different (P = 0.497). The mean BMI ± SD was 24.38 ± 4.0404 and 181 (63.5%) were overweight or obese from which 169 (93.4%) had severe or worst possible pain. The mean BMI of patients with 'moderate pain' (22.75±4.2958) was not significantly different from mean BMI of 'severe and worst possible pain' (24.525±3.9979). However, there was a significant (P = 0.031), low positive (r =.146) correlation between PI and BMI.The mean SHt of male and female were 83.87±4.670 cm and 79.13±4.621 cm respectively. A statistically significant (P = 0.034), low positive correlation (r = 0.161) was found, between PI and SiHt in female and there was no statistically significant, correlation between PI and SiHt in male (P = 0.789, r = 0.041). Male and female together, StHt was not associated with PI. RNL was associated with PI in both male and female. The mean NC of male and female were 159.79±15.858mm and female 142.81±16.88mm. The mean NL were 363.15±37.064mm in male and 339.14±29.708mm in female. NC and NL were not associated with PI in both sexes. This study concludes PI is associated with being overweight and obese. Sitting height of the women are significantly associated with PI but no association in male with chronic neck pain.

Keywords: *Neck pain, Neck length, Neck circumference, Sitting height, BMI*

Levels of Physical Activity and Its Relation to Academic Performance of the First Batch (2017/18) of Students of the Faculty of Medicine, Sabaragamuwa University of Sri Lanka

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Physical inactivity is the fourth leading risk factor for deaths in the world, killing more than 5 million people every year. Many researchers have found that the physical activity level is correlated with academic performance of students studying at the Universities. During the recent years, this concept has gained a high importance, especially in the professional educational system. Hence the objective of the research was to find out the levels of physical activity and its relation to academic performance of the first batch of medical students who are studying at the Sabaragamuwa University. This study was conducted as a cross sectional study and 59 medical undergraduate students were recruited as subjects of it. The long form of the self-administrated International Physical Activity Questionnaire (IPAQ) was used to evaluate the levels of the physical activity. The academic performance was measured by using the preclinical subjects' marks of the two consecutive end semester examinations. Simple descriptive analysis and Chi-square test were performed to determine the strength of the relationships. Analysis of the IPAQ showed that the majority of the students reported as being moderately physically active (high = 13.6%, moderate = 57.6% and low = 28.8%). The results indicated that the percentage of students who passed the Biochemistry subject were similar in terms of the male (73.1%) and the female students (72.7%). But the percentage of students who passed the Anatomy (male=76.9%, female=72.7%) and Physiology (male = 80.8%, female = 63.6%) subjects were higher in terms of males when compared with their female counterparts. The result showed that, there was a higher prevalence of having a moderate level of physical activity among the students who passed the preclinical subjects (Biochemistry = 58.1%, Anatomy = 54.5%, Physiology = 61.9%). The prevalence of having a low level of physical activity among the students who passed the preclinical subjects (Biochemistry = 27.9%, Anatomy = 29.5%, Physiology = 21.4%) were higher than the prevalence of having a high level of physical activity (Biochemistry = 14%, Anatomy = 15.9%, Physiology = 16.7%). Using the Chi-square test, the study showed that there was no significant correlation between the levels of physical activity and the performance of preclinical subjects (Biochemistry P = 0.965, Anatomy P = 0.60 and Physiology P = 0.119). The study emphasized that, more than half of the students who passed the preclinical subjects were moderately physically active. Furthermore, it was revealed that the levels of physical activity had no influence on their academic performance.

Keywords: *International physical activity questionnaire, Anthropometric measurements, Body mass index, Self-administrated*

Presence of Residual Antibiotics in Urine and its Effect on Urine Culture

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The presence of antimicrobial agents in body fluids may potentially interfere with microbiological cultures. Urine is commonly tested for antibiotic activity since most chemical compounds achieve high concentrations in urine. Therefore, it is important to understand the use of antibiotic at the time of investigation and prior to the investigation requesting for a urine specimens' culture. If any antibiotic treatment was commenced prior to specimen collection, the sensitivity of bacterial cultures is reduced leading to false-negative results. The study was carried out to detect the presence of antibiotic residues in urine specimens received for culture and to identify the number of false negatives among these. A total of 265 urine specimens received at the hospital laboratory and which were reported as culture negative were tested over 6 months for residual antibiotic activity using the disk diffusion bioassays for the detection of antibiotic activity in urine. Suspensions of *Escherichia coli* (Gram - ve) ATCC 25922 and *Staphylococcus aureus* (Gram + ve) ATCC 25923 similar to 0.5 McFarland was seeded on two Mueller-Hinton agar plates and 6 sterile filter paper disks were placed on each plate. A volume of 20 µ L of uncentrifuged urine sample was added onto the disks and plates were incubated overnight. Specimen with a sufficient concentration of an antibiotic creating a zone of inhibition was interpreted as a positive result given below. Of the samples collected 60% (159/265) were of females and 40% (106/265) were of males. A 19.2% (51/265) of the specimens exhibited inhibition zones indicating the presence of antibiotics active against *Escherichia coli* ATCC 25922 and *Staphylococcus aureus* ATCC 25923. Of the positive samples a (51), 25.5% (13/51) showed a zone of inhibition for Gram-positive bacteria and 13.7% (7/51) were positive against Gram negatives. And Therefore, a total of 60.8% (31/51) of the samples were either Gram positives or Gram negatives. Therefore, we can assume a 19.2% of specimens had residual antibiotics to produce false negative culture results. This study has shown that about 1/5 of specimens contain antibiotics that interfere with culture results. Since when urine culture requested most often a detailed history of the use of antibiotics by the patient is not recorded during the history taking. Therefore, obtaining such information is important before requesting urine for culture thereby would prevent a missed diagnosis of urinary tract infections.

Keywords: *Residual antibiotics, Bacterial cultures*

Chitosan-Alginate Nanoparticles as a Novel Delivery System for Linamarin

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Nanoparticulate delivery of naturally occurring therapeutic agents provide a new insight towards prevention and therapy for diseases like cancer. Linamarin, found in cassava has been proven as a drug candidate for cancer due to its cyanogenic property. This study dealt with developing a nanoparticulate system using chitosan and alginate to deliver linamarin. Chitosan-alginate nanoparticles were prepared by a two-step method composed of ionotropic pre-gelation of an alginate core followed by chitosan polyelectrolyte complexation. They were characterized using Fourier transform infrared spectroscopy (FT-IR), Transmission electron microscopy (TEM), Scanning electron microscopy (SEM), particle size analyzer, and thermogravimetric analysis (TGA). Then the *in-vitro* release profiles were studied at pH 7.4 and pH 2 and kinetically modeled. Cytotoxicity was assayed against MCF-7 breast cancer cell line. After the incorporation of linamarin, the particle size was 70.64 ± 5.54 nm and zeta potential was -30.10 ± 2.21 mV. The encapsulation efficiency was 57.67 ± 5.32%. The SEM and TEM images demonstrated that the linamarin loaded chitosan-alginate nanoparticles had spherical and homogeneous shapes. Successful loading was evidenced by FT-IR and TGA data. *In-vitro* release studies and kinetic analysis data demonstrated the controlled release behavior at pH 7.4 and pH 2. The overall cumulative percentage release after 120 h was about 72% at pH 7.4 and 88% at pH 2 and it became significantly higher (91%) in the presence of linamarase enzyme. All three experimental conditions exhibited anomalous transport mechanism. Dose dependent cytotoxicity was observed where 50% cell viability was exhibited after 48 h at lower drug concentrations (100 µg mL^{-1}≥) while 48 % cell viability was observed after 24 h at higher drug concentrations (200 µg mL^{-1}). The IC_{50} value of linamarin loaded chitosan-alginate nanoparticles at 48 h was 80 µg mL^{-1}. *In vitro* cytotoxicity results revealed that when linamarin was loaded into chitosan-alginate nanoparticles, it was delivered and internalized more effectively than free linamarin. The formulated linamarin loaded chitosan-alginate nanoparticles have the potential to be developed into a nutraceutical as a novel candidate for cancer prevention and therapy.

Keywords: *Chitosan- alginate, Linamarin, Nanoparticles, MCF-7 cells*

Session 03

Professional Forum

Social Sciences and Languages, Management Studies

Postcolonial Man within the Paradox of Tradition and Modernity: Traversing through Naipaul

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This study examines the failure of decolonization and its political outcome of returning to historical nostalgia that is manifested in the selected works by V. S. Naipaul. It also contextualizes that postcolonial totalitarianism is a by-product of that returning. Post-colonial nations, once abandoned by their former colonial 'masters' and then taken over by unsuccessful indigenous rulers, have encountered a symptomatic political development of returning to the past. Thereby, the glory of the past is often used to escape from the humiliations, dislocation, anxiety, jealousies and alienation generated by modern secularist developments, which are often transmitted through colonialism. Such postcolonial nations exhibit a form of "retrogressive nostalgia" in their returning to the historical and traditional essence to address present problems, and this move ultimately results in producing violent totalitarian regimes. Such societies still struggle to come to terms with modernity, although the material conditions of their daily life improve. The mental transformation of subjects in such societies, from the old to the new, remains stagnant and unprepared. This destructive energy used against the new is examined in light of Habermas' idea of 'compensation for the pain suffered through the disintegration of traditional forms of life'. This study uses literary interpretation and textual analysis to examine how such symptomatic developments are explored in Naipaul's work. To strengthen the argument further, it articulates textual evidence with modern psychoanalysis, Frankfurt School Thoughts and a critique of ideology based on the views of critics such as Slavoj Zizek. The study reveals that historical nostalgia rises from the confused and paradoxical transposition of tradition and modernity, which triggers symptoms of totalitarianism to actualize the lost past.

Keywords: *Naipaul, Decolonization, Totalitarianism, Historical nostalgia*

A Study on Klingon Language: An Exploration of Language Change and Development

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Language is generally understood as a system of communication that uses arbitrary signals, such as voice sounds, gestures, and/or written symbols. Constructed languages or Artificial languages are different from natural languages, specifically due to their origin. A constructed language is defined as a complete language system written by one person, who wants his/her language to be used by others for specific purposes. The Klingon language is the constructed language that was developed for the movie Star Trek, spoken by the fictional Klingons in the Star Trek universe. Upon request of the director of Star Trek, the linguist Mark Okrand deliberately designed Klingon language for the warrior clan in the said movie. The main aim of this research is to analyze how the Klingon language changed throughout the years of its existence. This study investigates the lexical and grammatical changes of the Klingon language. It questions whether the Klingon language, being an artificial or a constructed language, goes through the same process of change as a natural language. It is the contention that even so-called 'natural' languages are a product of humans throughout human civilization. Thus, it argues that constructed languages also function, evolve, and change similar to natural languages. Content analysis and desk review were used as the primary data analyzing methods of this research. Multiple theories were used for this purpose, including theoretical information on language change, types of language change; specifically, lexical and grammatical changes, and Michael Halliday's Systemic Functional Linguistic Model. Through this study, it was identified that the Klingon language has gone through alterations over time. The gathered data proved that the Klingon language has changed both in the forms of lexical and grammatical aspects. However, the researcher discovered that the pace and manner in which these changes occur in constructed languages are different from natural languages. For instance, one of the main constraints towards the development of this language is the hegemony of the language maker and conservative perception of neologism.

Keywords: *Klingon, Constructed languages, Star trek, Michael Halliday, Mark Okrand*

A Critical Study of the Thematic Complexities of Post Realistic Modern Sinhala Novels

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The objective of this research is to conduct an analytical study of the thematic complexities of the post realistic modern Sinhala novels. In many countries in the world, before the introduction of "Novels", the tradition of "fiction" prevailed. This holds true with Sinhala literature as well. The salient feature of a novel which distinguishes it from a fiction is 'the reality'. Reality means the sum or aggregate of all that is real or in existence, as opposed to that which is merely imaginary. Beginning with the first Sinhala fiction "Meena" published in 1905, the year 1944 with the publication of the novel "Gamperaliya*"* by Martin Wickramasingha is considered the year of the introduction of realistic Sinhala novels which distinguished those from the Sinhala fiction. The year 1956, that Wickramasingha contributed his novel "Virāgaya" in a new style is also considered a milestone in the history of Sinhala novels. Subsequently, with its influence, many novels on the theme of individual characters were predominant and this trend was changed to certain extent with the creation of "Goluhadawata" by Karunasena Jayalath in 1962. This was centered around the love of youngsters in their school life. In the 70th and 80th decades, many novels based on the analysis of human society were published and at the end of 80th decade, the emergence of "Surrealistic writing style" was established with the publication of *"*sansārāranyayēdadayakkārayaā" by Saimon Nawagateegama in 1981, which is also is evident in Sinhala novels. Successively, Sri Lankan writers like Tenyson Perera, K.K. Saman Kumara and Mohan Raj Madawala in the 90th decade deployed the same writing style in their novels. Ajith Thilakasena, being a Sinhala short story writer, Kapila Kumara Kalinga, Manjula Wediwardana, Liyanage Amarakeerthi, and Mahinda Prasad Masimbula also followed the same style of writing claiming that the realistic writing style is not capable enough to portray the current complex society. Their writing could be considered as "post -realistic" writings. The content analysis was deployed as the research methods to interpret the selected texts and to identify the thematic complexities of Post Realistic Modern Sinhala Novels. This study is dedicated to communicate the thematic complexities of modern Sinhala novels with special reference to six themes in the area in detail. Of them according to the findings, it is evident that the themes like cast, nationality and the human problems are depicted in a very powerful manner with the very productive usage of the new style of writing. This development could be considered a blessing for modern Sinhala novels in its path. It is also clear that though the new writing styles have emerged, the potentiality of realistic writing style is still in existence in modern Sinhala literature and particularly in modern Sinhala novels.

Keywords: *Fiction, Reality, Realistic writing style, Surrealistic writing style, Post realistic modern Sinhala novels*

Perceptions, Engagement and Productivity of Teacher Professional Development (PD)

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PD initiatives have a broader implication for English as Second Language (ESL) teachers at the Sri Lanka university sector for enhancing their professional growth and students' performance. A qualitative case study was undertaken with ten ESL teachers of a government university of Sri Lanka at identifying their perceptions of engagement during PD sessions and how their perceptions impact on their engagement in PD activities. The study used semi-structured interviews as the research instrument, and Thematic Analysis for recognizing, analyzing and interpreting of data. Participants' reactions and engagement in PD activities during sessions were mostly regulated by contextual factors - relevance to ESL of the content of the session, interest in the session, practitioner-centeredness of the activities, and other contextual aspects - rather than their by perceptions or type of PD. Therefore, participants' level of engagement in PD was heavily dependent on the managerialist and democratic regulations that decide the aims, the content, and the format of PD activities. Findings and recommendations offer a valuable contribution to PD facilitators and policy-makers that would be of help for introducing productive changes to the existing PD activities at all universities in Sri Lanka. Moreover, the recommendations informed by the study would be useful in designing and implementing new PD activities for university ESL teachers. As such, ESL practitioners in the university sector in Sri Lanka would have opportunities to engage in focused and meaningful PD activities that may enrich their knowledge, skills and professionalism.

Keywords: *Contextual factors, Engagement, Perceptions, Productivity, Professional development*

Mainstreaming Academic Literacy in English Medium Degree Programmes: Locating the Pedagogical Practices in Sri Lankan Universities

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Academic Literacy (AL) is not only the subject matter knowledge and the fluency of four English language skills in the context, but also the ways of behaving in particular disciplinary contexts that are acceptable within specific groups of people. Currently, AL is gaining wide attention in the global higher education context. The two main theoretical understandings of AL - autonomous and ideological - influence the AL practices in English Medium Degree Programmes (EMDPs). Mainstreaming AL which is ideological in its philosophy is well-known as the most advanced and influential practice in current global higher education. The main objective of this study is to find out the existing AL practices of nine faculties - science, management and social sciences/ humanities - of three state universities in Sri Lanka. A qualitative study design has been employed to achieve the objective and data collection has been done through lecturer interviews and official documentation in the form of curricula and pedagogical practices. The data have been analyzed through Qualitative Content Analysis (QCA) and three major themes have been identified: teaching English as a discrete course in EMDPs, subject lecturers' pedagogy in EMDPs and signs of mainstreaming academic literacy. The first theme discusses the strong call for teaching English as a discrete course in EMDPs. The second theme converses the subject lecturers' pedagogy in English Medium Instruction (EMI) in the nine faculties. The third theme - mainstreaming academic literacy discusses the signs of mainstreaming academic literacy practices in EMDPs. This study concludes that the commonest practice of English language courses is the stand-alone English courses in EMDPs but this practice does not allow students to transfer their acquired English language proficiency into the particular disciplinary context as expected and serves little to develop academic literacy in EMDPs. Further, subject lecturers do not gain EMI-specific pedagogical trainings as part of their professional development and there are no prominent signs of mainstreaming academic literacy practices found in EMDPs in the nine faculties. Hence, this study calls for attention on academic literacy development in EMDPs through staff, student, curriculum and institutional development.

Keywords: *Academic literacy, Autonomous, English medium degree programmes, English medium instruction, Ideological influence*

Developing a Hybrid Journal Recommender System Comparing Different Disciplines

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With the exponentially increasing journals being published every year, researchers need support in choosing the most fitting journal in submitting articles. To address this problem, this study developed a recommender system for journals with a content-based component to compare the text-based similarities between an input article and an already published journal articles in a database. The recommender system also includes a knowledge-based component, to assess the publication requirements of the researcher. This recommender system assists researchers of social sciences and medicine, to find appropriate publication venues from the open access journals. This research evaluated 16 factors that could influence the selection of journals. A survey was conducted to find out the importance of the 16 journal selection factors from the researcher's point of view. Subsequently, suitability of five algorithms was studied to find the most appropriate algorithm to implement the content-based component. According to the results, BM25 similarity surpassed the other algorithms that were studied. A knowledge-based component was developed to combine with the content-based component. Knowledge-based component organizes the order of journals recommended by the content-based component which is based on researcher's requirements of journal selection factors. A second survey was conducted to find whether and to what extent researchers considered these journal factors when choosing a suitable journal for in publishing their recent articles. A third survey requested the participants of the second survey to rank the suitability of journals recommended by the combined recommender system. The results revealed that about 58.8% of researchers from Social Sciences and 66.2% of researchers from Medicine, agree with the suggestions made by the combined recommender system. Furthermore, 40.4% of Social Sciences and 35.5% of Medicine researchers have recommended more suitable journal(s) than the one they have already published in. Average performance of the recommender indicated that about 18% and 15% of the researchers in Social Sciences and Medicine respectively have lost the similar recommendations, according to the most suitable order. Percentages were indicated as 28.4% and 22.4% of loss in Social Sciences and Medicine respectively when the average performance was scrutinized with a system that recommends suitable suggestion for all 10 topmost retrievals according to the most suitable order. The end result of this study is applicable to publishers of journals, editors, policy developers of academic organizations, librarians, and system developers, in addition to researchers.

Keywords: *Publishing, Journal selection, Manuscript submission, Recommender systems*

Transaction Cost of the Self-Employment Credit Process of *Samurdhi* Bank in the Perspective of *Samurdhi* Beneficiaries

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Sri Lanka has propelled the *Samurdhi* program as a national strategy with the primary objective of alleviating poverty by guaranteeing to support the poor in the income generation process. The foremost component of S*amurdhi* is *Samurdhi* Bank, which primarily extends loans for beneficiaries. Compared to the other banks, *Samurdhi* Bank has a considerably more complex loan borrowing process. The absence of a systematic academic work which evaluates the loan borrowing process of *Samurdhi* Bank from the transaction cost perspective creates a gap in the literature. This study attempted to bridge this gap by assessing the transaction cost of the loan borrowing process of self-employment credit issued by *Samurdhi* Banks. This study used convergent parallel mixed method employing both qualitative and quantitative data. Qualitative data was collected from eight *Samurdhi* beneficiaries, while quantitative data was collected from 86 beneficiaries selected from Imbulpe DS Division in Ratnapura District. Data was analyzed using descriptive statistics and narrative analysis. The results revealed that *Samurdhi* beneficiaries have spent a significantly higher amount of time and money to search for information about loans and trustworthy members to create a cluster, thus generating a higher searching cost. Further, higher cost is spent on conducting group meetings to negotiate with *Samurdhi* members and other officers. Time and money are spent to monitor the activities relating to credit and to resolve transaction disputes. Thus, the transaction cost of the loan borrowing process which is fairly high, adversely impacts the motivation of *Samurdhi* beneficiaries to demand credits. The *Samurdhi* self-employment loan scheme has several inefficiencies concerning the transaction cost perspective. Therefore, policymakers must take proper actions to minimize the transaction cost of the loan borrowing process by formulating a relaxed framework which can easily be accessed by any beneficiary.

Keywords: *Samurdhi banks, Samurdhi beneficiaries, Self-employment credit, Transaction cost*

Assessing Systematic Risk through an Accounting Model: Evidence from Colombo Stock Exchange

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The focus of this study is to assess the systematic risk through an accounting model based on the objectives; to test whether the accounting model significantly influences the systematic risk and to identify the explanatory power of the accounting based risk factor model with single index model and capital asset pricing model. To achieve this aim, the researcher selected 154 companies from 16 economic sectors in the Colombo Stock Exchange (CSE). Then six portfolios were constructed which doubled on firm beta values. In order to carry out operationalisation of the relationship with regard to the accounting variables such as Return on Equity, Free cash flow to Equity, Total accruals, Leverage, Share turnover, Market value per share, Change in gross margin, Sales growth, Change in earrings and the Working capital turnover with systematic risk, a panel data analysis was conducted in stock analysis ranging from portfolio of higher beta stocks, portfolio of moderate beta stocks and portfolio of lower beta stocks as well as overall stocks. Then time series analysis was used to assess systematic risk with beta sorted portfolio small, portfolio medium and portfolio big. Within this application, the present study seeks to present empirical evidence on the relationship between accounting information and systematic risk in Colombo Stock Market. The study found that the accounting variables significantly influence the systematic risk. While accruals found to be not significant on influencing systematic risk. Also the accounting based risk factor model well explains the beta than the other popular market models in Sri Lanka. As per the results on portfolio of higher beta, moderate beta and lower beta stocks presented in between the range of 94% - 99% of adjusted R square as well as more than 95% significant F statistics while the single index model and CAPM resulted less than 5% of adjusted R square and F stat is only significant for CAPM. This study suggest more importantly the accounting variables are well explain systematic risk and recommend to use accounting based risk factor model other than market based risk factor models on Sri Lankan context as the study confirms the accounting model is effective on investment decisions.

Keywords: *Accounting information, Accounting model, Beta, CAPM, Colombo stock exchange (CSE), Systematic risk*

The Impact of Technology Readiness on Customer Adoption Intention in Mobile Banking Applications

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Technology has enabled the banking sector to create continuous, more flexible transaction methods. According to theories, customers are also more towards new technologies. However, the actual behavior of customers in developing countries is particularly questionable. Even though it is important to understand the technological readiness of the customers towards banking technologies, there are no studies that investigated the impact of technology readiness on mobile banking adoption intention. Therefore, this study has taken an interest to investigate the impact of technological readiness on customer adoption intention towards mobile banking applications in Sri Lanka. This is a quantitative research study where a structured online questionnaire was distributed and collected data from 390 generation Y (1980-1994) and above aged banking customers who are not using mobile banking applications using a convenience sampling method. Regression analysis was employed to analyze the hypotheses with the support of Amos 23 and SPSS 21 statistical tools. The results of this study discovered that technology readiness has a positive impact on customer adoption intention towards mobile banking applications in Sri Lanka. Further, this study has provided an opportunity for bankers, to improve their knowledge regarding the customers' readiness to accept new technologies in the banking context and further to get an insight into the customers' adoption intention.

Keywords: *Customer adoption intention, Mobile banking, Technology readiness*

Session 04
Graduate Colloquium

An Analysis on the Relevance of Capital Structure Theories in Relation to Firm Specific Variables

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The decision on capital structure relates to the combination of the company's debt and equity, which may have significant implications for the value of a firm and the cost of capital. This is a crucial decision because the wrong choice of capital structure can lead to financial distress and even to bankruptcy. Based on the theorems of Modigliani and Miller (1958) and empirical evidence of financing decisions, two competing capital structure theories have been developed and these two theories are Trade-Off Theory and Pecking Order Theory, which seek to explain the shift in leverage ratio by focusing on cost-benefit function and position of transaction costs of borrowing, mostly dependent on observable firm attributes. As a consequence, differences in capital structure theories emerge in their definitions of tax significance and changes in information, transaction and agency costs. The predictions of traditional capital structure models have been well established primarily in the context of developed economies. However, the applicability of theoretical principles to capital structure decisions by companies in emerging and developing countries persist minimal. Many of the research conducted on the analysis of Capital Structure Theories do not concentrate on the applicability of Capital Structure Theories considering firm unique variables. The purpose of this study is to theoretically assess the relevance of Trade-Off Theory and Pecking Order Theory in relation to firm-specific variables. The analysis included firm-specific elements such as profitability, size, liquidity, tangibility and growth in order to review the relationship with the above two theories and to validate the objective of the study. The study concludes that there is an interaction with capital structure, firm-specific variables, and relevance of Trade-Off Theory and Pecking Order Theory.

Keywords: *Capital structure, Firm-specific variables, Pecking order theory, Trade-off theory*

Impact of Green Supply Chain Management Practices on Financial Performance Related to Plastic Goods Manufacturing Sector in Sri Lanka

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Managing the supply chain with greening is progressively a concern for many manufacturing companies and a challenge for logistic management in the 21st century. The concept of greening the supply chain is considered worldwide by academics, researchers, and business entrepreneurs. Further, many stakeholders encourage business enterprises to adopt green or environmental activities, especially on manufacturing processes. The purpose of this research was to investigate the impact of green supply chain management practices (GSCMP) on the financial performance of the plastic goods manufacturing industry in Sri Lanka. The research study analyzed three main elements of green supply chain management practices, i.e., external green supply chain management practices, eco-design, and investment recovery. This qualitative research study was carried out as a case study with special reference to a major plastic goods manufacturing company in Sri Lanka. Data was collected through interviews and documents (annual reports). Empirical findings disclosed a strong impact of green supply chain practices: external green supply chain management practices, eco-design, and investment recovery on the financial performance of the plastic goods manufacturing sector in the country. The findings of this study will be a novel contribution to the body of knowledge in the field of green supply chain management.

Keywords: *Green supply chain management, Eco-design, Investment recovery, Financial performance*

Contribution of Lean Manufacturing System to the Green Productivity towards the Sustainable Manufacturing

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Lean manufacturing is one of the well-known philosophies which focuses on the reduction of waste. Green productivity focuses on the greener application on the organisation which leads to the Sustainability. This study is to identify the significance of the lean Manufacturing approach towards the Green productivity improvement to practice as a simultaneous approach to develop the organizational productivity and less environmental impact which marches towards sustainability. This study is a mixed method, both qualitative and quantitative, Applied and Conceptual research in nature. The main objective of the proposed study is to identify the significant contribution of lean manufacturing practices towards the green productivity in apparel Industry in Sri Lanka. Sub Research objectives are, (1) to identify the Green waste related to "*MUDA*" types under Lean Manufacturing which has an impact towards green productivity, (2) to quantify the impact of lean manufacturing '*MUDA*' waste towards green productivity, (3) to calculate the quantify values of lean Manufacturing waste types towards green productivity quantification values, (4) to develop a lean waste and environmental friendly Metrix to control the environmental impact by the apparel industry in Sri Lanka, (5) to identify the financial improvement of the effect by the application of Greener Lean concept. Both primary and secondary data will be used for the study. Population Unit is considered as Brandix Pvt Ltd–Kuliyapitiya Ltd and Hela Pvt Ltd Uhumeya in SL (Lean and Non-Lean industries). Population is considered as Annual process data related to eight *MUDA t*ypes in production system. Sample is Six months *MUDA* data (expected nearly more than 1000 processes for six month) from each plant. We will interview responsible authorities- nearly 30 executive levels from each plant. Sample selection method is Simple Random sampling method under Statistical sampling methods. Reliability study, Multiple Regression Analysis, and correlation coefficients, Chi test for sample mean, lean manufacturing tools and Green Productivity tools will be used to analyse the data.

Keywords: *Green productivity, Lean manufacturing, Sustainability*

Impact of Macroeconomic Factors on Going Public Decision in Sri Lanka

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The decision on going public of private companies has taken more attention among researchers during the last thirty years. Studies reveal that the number of going public decision varied along with changes in nation's economic conditions. Theoretical and empirical literature revealed diverse views on the relationship between Initial Public Offering (IPO) activity and macroeconomic determinant. However, the empirical study on co-movement between IPO activity and macroeconomic condition is rare in literature. Therefore, this study intended to investigate the selected macroeconomic factors on going public decisions in the Sri Lankan context. This study collected firm-specific IPO activity data from the Data Library of Colombo Stock Exchange (CSE) and macroeconomics data from annual reports of the Central Bank of Sri Lanka during the period from 1990 to 2018 to examine the long and short-run dynamic impact of macroeconomic conditions on IPO using time-series econometric techniques. The unit-root tests for each of the variables were done to make sure their stationery, which revealed that most of the variables are stationary at level and few become stationary at 1st difference. This study used the Auto-Regressive Distributed Lag (ARDL) and Bounds testing procedure and ARDL Error Correction Regression since time series here integrated mix of both order zero and one. The lag selection of the variables was automatically selected using the Akaike information criterion (AIC). Analysis of the time series variable revealed that there are long-term equilibrium relationships that exist between IPO activity and selected macroeconomic variables such as Economic growth, interest rate, foreign direct investment, trade openness, and money supply. The more robust result can be obtained by engaging a large number of observations for long period and/or employing monthly / quarterly data rather than annual data.

Keywords: *ADRL, CSE, IPO, Going public Decision, Macroeconomic factors*

ICT Usage, Bounded Rationality and Business Performance: An Empirical Investigation of SMEs in Sri Lanka

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In the present knowledge economy, SMEs have the possibility to access sufficient information through Information and Communication Technology (ICT). Consequently, ICT leads to increase the rationality and safeguard their transaction from opportunism and thereby improve their Business Performance (BP). Nevertheless, empirical evidence on how the use of ICT makes effects on bounded rationality and thereby BP of SMEs do not appear in the past literature. Therefore, this study intended to explore the effect of ICT usage on BR and BP of SMEs in Sri Lanka. The deductive approach has been utilized to establish the conceptual research model based on ICT, BR, and BP which generates working hypotheses and tested those applying the quantitative method. Survey method employed to collect data from the selected sample of 400 manufacturing SMEs from 81,531 SMEs in Sri Lanka by applying the Inverse Square Root Method. Pre tested structural questions used for data collection having face to face interviews. Partial Least Square - Structural Equation Modelling (PLS-SEM) utilized to analyse the data by using Smart PLS V3. The results discovered ICT usage has a negative impact on BR and a positive effect on the BP of SMEs in Sri Lanka. Consequently, BR has a mediating effect on the relationship between ICT usage and the BP of SMEs. Thus, the study recognizes that ICT usage makes an avenue to eliminate the information asymmetry and reduce the BR thereby increases the BP of SMEs in Sri Lanka. The study strongly recommends SMEs to reinforce the usage of ICT especially, mobile technology with applications that plays a dominant role to enhance performance. Finally, the study provides useful insight into the role of ICT on the BP of SMEs by minimizing BR as a novel perspective.

Keywords: *Bounded rationality, Business performance, ICT usage, SMEs*

The Strength of Relational Aspect of Social Capital on Livelihood Success of *Samurdhi* Beneficiaries: With Special Reference to Imbulpe DS Division

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Samurdhi Organization is one of the prominent Community Based Organizations (CBOs) in Sri Lanka. It was established with the objective of improving the quality of life of its beneficiaries and one of the ways it is achieved is by ensuring their Livelihood Success (LS). According to scholars, one way that CBOs achieve LSof its members is by strengthening their social capital (SC). However, In Sri Lanka, even though CBOs have been functioning for a considerable period of time, the existing poverty makes it evident that the members have not achieved LS as expected. One significant reason for this could be that all the aspects of SC: networkings, relational and cultural, have not been addressed. Hence, this study mainly focused on how relational aspect of SC impacts the LS of *Samurdhi* Beneficiaries. This study used convergent parallel mixed method and data were collected from eighty-six beneficiaries selected from Imbulpe DS division in Ratnapura District, Sri Lanka. Quantitative data was collected through structured questionnaires while qualitative data were gathered through in-depth interviews. Partial Least Square Structural Equation Modeling were used to analyze quantitative data and qualitative data was analyzed through qualitative content analysis. The results revealed that relational norms among *Samurdhi* beneficiaries have a positive significant impact on LS while interpersonal trust also has positive correlations with LS of *Samurdhi* beneficiaries. Thus, relational aspect of social capital positively contributes to the livelihood success of *Samurdhi* beneficiaries. The reason for relational norms to have more influence over trust is that trust develop with factors such as time and frequency of interaction, while relational norms are socially enforced and morally bound and depends on their personal value system. Focusing on these facts, policy makers can yield a productive outcome by taking the maximum advantage of SC that exists in the community when designing and implementing initiatives targeting *Samurdhi* Beneficiaries.

Keywords: *Livelihood success, Relational social capital, Samurdi beneficiaries*

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A Study on How the Lack of Understanding of Collocational Phrases Affect the Communication Skill of the Foreign Language Learners

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For the past few decades, the number of Japanese language learners in Sri Lanka and the number of Sinhala language learners in Japan have been increased. In that context, researches on developing teaching methodologies for Japanese and Sinhala as foreign languages have become more prominent. It is now universally acknowledged that the foreign language teaching requires much attention over the students' communication skills other than the grammatical knowledge. Therefore, this research mainly focuses on the usage of collocational phrases and its cultural background in both Japanese and Sinhala. It is observed that the current Japanese language teachers do not have the slightest understanding of the collocations in Japanese language and they are not included even in the text books. Vice-versa, the Japanese people learning Sinhala as a foreign language do not have the understanding of the Sinhala collocations. Moreover, they face difficulties occurred by the diaglossia in Sinhala, as diaglossia cannot be found in Japanese. This research aims to prove how the lack of understanding on collocational phrases and their cultural contexts, can negatively influence over the communication skill of the language learners. In order to prove these hypotheses, questionnaires from 50 students and 40 students from University of Kelaniya and the University of Sabaragamuwa respectively, 40 Japanese Language teachers from national schools, interviews with 15 Japanese nationals working as JICA volunteers in Sri Lanka, 03 Sinhala Language teachers who teach Sinhala to Japanese people, 05 Japanese translators and one dubbing director and some translated scripts of Japanese films done by the researcher were used as case study. It was proved that the current teaching methods have not allowed the students to understand the usage of collocations in different cultural contexts so far. There is a dearth of dictionaries which explains the collocations of Japanese and Sinhala Verbs. Sri Lankan JFL Students and Sinhala-learning Japanese people face difficulties in expressing themselves because they are always influenced by the sentence patterns of their mother language, as they lack the understanding of the collocational phrases of the target language. Thus, this impacts on the learners' career prospects too.

Keywords: *Collocations, Culture, Japanese, Sinhala, Translations*

Searching for The Tradition or Creating it Newly: A Comparative Study of The Creative Contribution of Two Cultural Agents

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Post-colonial *indigenization* movement of Ceylon seems to be more interested in finding ethnic identities than producing a *National Culture*. Despite the great *logocentric* construction of the rights of the Sinhala community, Sri Lanka is a multicultural, multi-ethnic state. On the other hand, in creating a new cultural tradition, attention must also be paid to all social classes. There is very little support from the ancient traditions in creating a cultural tradition that focuses on ethnic and class differences in the present society. Then it would be more practical to create new traditions instead of exploring the ancient heritage. It could be observed that cultural agents in the post-colonial indigenization movement in Ceylon were afraid to create new traditions. Some of these cultural agents have made a special effort to show that they are discovering and re-establishing the tradition of the past. This study compares the cultural contributions of Ediriweera Sarachchandra, who said he was exploring the tradition of the past, and Sunil Santha, who said he was creating a new tradition. The first part of this research was to find out through field research what kind of connection Sarachchandra's local drama tradition has with Sri Lanka's ethnic and class divisions. He is trying to create a Sinhala Buddhist classical play. The second task of the research is to explore the relationship of Sunil Santha's musical tradition with ethnic and class differences of the present society. He wanted to create a music that could be enjoyed by all the people in society and therefore, he did not try to stick to one tradition. The analysis identified which of these two creators was most likely to overcome racial and class differences in society. This research proved that the most successful indigenization model in a society with multiple identities is the invention of traditions than in search of the ancient tradition.

Keywords: *Indigenization, Invention of traditions, National culture, Sarachchandra, Sunil Santha*

A Socio-Anthropological Study on the Relationship between the Lifestyle and the Modern Communication Equipment of the Sri Lankan Coastal *Veddas* in the Eastern Region

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The *Veddas* are the most medieval community group in Sri Lanka and also they are one of the oldest folk groups among the world aborigines. Many scholars have pointed out that whatever their ethnicities these groups have a historical lifestyle. The trappers/*Veddas* are basically categorized into three groups namely Trappers, Coastal Trappers, and Village Trappers. C.G Seligman the researcher who made the first significant analytical research related to *Veddas* of Sri Lanka reveals that the Costal *Veddas* mostly reported in the northern and eastern areas of Sri Lanka. The literature survey related to the study is enriched with the extensive contributions provided by scholars like PB Meegaskumbura, EM Rathnapala, Nandadeva Wijesekara and R.L. Spittle. Presently focused ethnic group appears in the areas of Pellanchenai, Panichchankerni, Kudaladi, Parchenai, Nargantonai, Echalanputta Ihalatottam and Thopoor. This study mainly focuses particularly on the *Vaddas* who live in the eastern region. Accordingly, the study has drawn special attention to identify and study the differences between the Coastal Trappers and Village Trappers. The research is aimed to find the socio-cultural and eco-political patterns and the new behavioral trends of the said community. Five villages belonging to the Batticaloa district were taken as the focus area of study. The participatory observations, case studies and key informants are used to collect primitive data and the help of some literature used to fine-tune the argument. In the past, the livelihood of Coastal Trappers was based on industrial fisheries. However, at present, they have been transformed to an agrarian culture, just like the general society. The reasons for this adaptation are lack of land, destruction of the jungle, repercussions of the past ethnic crisis and mainly owing to communication technology. In the early days, Coastal *Vaddas* used much uncomplicated methods of communication and now they have completely shifted to modern communication equipment which has made a considerable change in their lifestyle. This key emphasis of the study attempts to reveal the relationship between the absolute changed lifestyle and the communication tool, that they have been widely influenced over this transformation.

Keywords: *Aborigines, Costal vaddas, Village vaddas, Modern communication equipment, Transformed lifestyle*

Session 05
Graduate Colloquium

Impact of Energy Balance on Body Composition of Sport Sciences Undergraduates in Sri Lanka

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Energy Balance is where energy intake (EI) equals the energy expenditure (EE). When EI > EE, it is known as energy surplus (+EB) and, when the EE > EI, it is known as energy deficit (-EB). This study examines the impact of energy balance on the body composition of Sport Sciences undergraduates. Sport sciences undergraduates (n = 101) voluntarily participated and completed the assessments at the beginning and the end of the study year (42 weeks). The body composition and basal metabolic rate (BMR) were measured using the bioelectrical impedance analyzer. EI was measured by the three-day food diary. The EE was calculated by adding the thermic effect of food expenditure and physical activity energy expenditure (International Physical Activity Questionnaire), and BMR. A total of 35 female (55%) and 11 (30%) male undergraduates reported an average of +EB of 319±248 kcal, 189±177 kcal respectively while 29 females (45%) and 26 male (70%) undergraduates reported an average -EB of -244±163 kcal and -421 ± 262 kcal respectively. Undergraduates with +EB displayed an increase in their Bodyweight (Bw), Fat Mass (FatM), and Fat Free Mass (FFM), while -EB undergraduates displayed a decrease in their Bw, FatM, and FFM. Only female undergraduates with -EB significantly reduced their Bw from 54.74 ± 10.88 kg to 52.55 ± 10.81 kg ($t = -4.63$, $P = 0.000$), FatM from 16.66 ± 7.35 kg to 15.75 ± 7.48 kg ($t = -3.05$, $P = 0.005$) and FFM from 38.08 ± 4.05 kg to 37.17 ± 3.99 kg ($t = -3.91$, $P = 0.001$).Positive and -EB exhibited a significant impact only on the female Bw (0.57±2.09 kg, -2.19±2.55 kg, $t_{(54)} = 4.68$, $P = 0.000$), FatM (0.21±1.85 kg, -0.91±1.61 kg, $t_{(61)} = 2.60$, $P = 0.012$) and FFM (0.21±1.01 kg, -0.91±1.26 kg, $t_{(53)} = 3.88$, $P = 0.000$). Therefore, our results have shown that the -EB has a significant negative impact on the female body composition which also reflects on their dietary pattern.

Keywords: *Energy balance, Fat mass, Fat free mass*

EEG-based Mental Rehabilitation for War-Affected Armed Forces

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The understanding of human emotions for developing applications is a new avenue in human computer interface. In the Sri Lankan context, military troops and other individuals involved in war are generally suffering from post-war negative mental conditions. Although different types of rehabilitation programs are being conducted currently, brain Computer Interface technology, which was at first used for disabled people, is used for entertainment, memory capacity improvement, brain activity development of healthy people. Gaming is one such application of this concept. Thus, Brain Computer Interface technology could be effectively utilized in the process of mental rehabilitation for war-affected armed forces and individuals with emotional control disabilities. In this research, we separate one emotion and use it as a parameter which was represented in the game. This separated parameter is not merely a parameter but that logically connect with the real-life characteristics which will assist to the subjects to control emotions in critical situations. By practicing this game, subjects will be trained to eliminate negative emotions. Detection of emotions during gaming is the basic concept behind the mechanism. Using emotions for therapeutic aspects by training elimination of negative emotions though BCI game has never been done before. Therefore, previous literature available is relatively less in this area. In this research we focus on identifying human emotion, anger as the negative emotion with wireless 16 biosensor EEG head set and use anger driven game for monitoring the ability to self-control the emotion. Furthermore, statistically compare efficiency of detecting anger with relatively low electrode number and a few features. In this paper it is discussed how anger can be separated from the other closely coupled emotions like frustration and sadness. The results will conclude the best feature excretion method for emotion separation and the best combination of electrodes for the emotion, anger. Finally, we statistically analysed the effectiveness of real time EEG based Game which will help people to identify negative emotions as quickly as possible when it occurs, and train them to eliminate such blocking emotions and possibility to use this as a tool to help patients effectively.

Keywords: *Anger detection, Brain computer interface, EEG, Emotion classification, Feature selection.*

A Comparative Analysis of Data Mining Techniques in Social Media Networks

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Social networks have gained exceptional attention within the last decade. Social network sites like Twitter, Facebook, YouTube, and LinkedIn are evolving in a speckled fashion. Users rely on social networks for both information and entertainment needs. Social media analytics with data mining technology could be an analysis axis cantered on extracting trends, patterns, and rules from the social media pool, to serve the people and organizations to have optimum choices concerning many disciplines. The traditional media analytical techniques appear obsolete and inadequate to gratify this immense array of unstructured social media knowledge characterized by three key problems namely; size, noise, and dynamism, predominantly shifting from the batch scale to the streaming one. The objective of this study is to investigate the data mining techniques that were used by social media networks between 2010 and 2018. The study demonstrates a systematic review of analysing trends and content analysis of studies within the field of social media analytics that were published in databases principally IEEE, Elsevier, ScienceDirect, and ResearchGate. Hundred articles were reviewed in this paper. Content analysis was implemented based on their approach, tools utilized, language, the dataset used, country, year, and nature of the experiment. Data mining techniques were utilized for retrieval of information, statistical modelling, and machine learning that engage data pre-processing, data analysis, and data interpretation. The review discovered that fifteen data mining techniques were employed in social media data while frequently used in Support Vector Machine, Bayesian networks, and Decision Tree. The study focused on assisting the involved analysers and educators to capture the research trends and problems associated with the Social media analytics process with future research initiatives.

Keywords: *Data mining, Data mining techniques, Social media, Social media analysis*

Application of Data Mining Technologies for Crop Selection Based on Environmental Variables

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Sustainable agriculture is a necessity to overcome global and local food security challenges. At the same time, productive agriculture is also important to enhance the socio-economic status of farmers. Integrating modern technologies with the agricultural sector was identified as one of the most important solutions to overcome many issues. Therefore, we aimed to apply machine learning technologies to identify the most suitable crop types for productive farming. Badulla district was the focused area for these studies. Potato, tomato, green gram and red onion were the selected crop types. Rainfall, minimum and maximum temperature, minimum and maximum relative humidity were the selected weather conditions. Wholesale price and retail price of each of the above crop type were considered crop prices. Locations were specified as *gramasewa* divisions and their soil types were considered. CRISP-DM methodology was followed throughout the research. Weka libraries were integrated with Java programming language for the implementation and MYSQL database was used with JDBC database connector to maintain the data. Data mining classification technologies were trained and tested in different conditions while performances were evaluated using mean absolute error values and root mean squared error values. M5P model tree and Random forest tree performed comparatively better performances in weather forecasting and crop prices forecasting. In the system, farmers have to select the relevant *gramasewa* division for their farming location. The system will identify specific soil types in the relevant land and identify suitable crop types. Then, predicted weather conditions are compared with required weather conditions for each crop. Finally, the crop prices were evaluated. According to the results, the higher-ranking crop list was provided to farmers as the output. These results may help in decision making in the crop selection process while contributing to change the field of agriculture as a profitable industry.

Keywords: *Agriculture, Classification, Crop selection, Data mining, M5P model tree, Random forest tree*

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Session 06
Graduate Colloquium

Cd Immobilization in Horton Plains Using Natural Bio Char Generated from the Same Eco-System

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Horton Plains is one of the most important natural resources in Sri Lanka which has been threatened by a large-scale forest dieback. A previous study revealed that isolated soil Cd as one of the key causes behind forest dieback in Horton Plains. The extraordinary capabilities of biochar in detoxifying both organic and inorganic contaminants have been well recognized and it is vital to develop an effectual and cost effective method using biochar would be an applicable remedial measure. Biochar has the ability to immobilize heavy metals from contaminated soil due to its' chemical composition. The pH and the CEC of the forest soil used for the study were 5.4 and 210 c mols kg $^{-1}$ respectively. The soil was rich with organic matter and the content of soil organic matter (SOM) has reached up to 13.4%. Bio char which was prepared under controlled conditions using the wood collected from Horton Plains was used as the soil treatment and along with the control the study consisted of two treatments of five replicates. Ten soil samples which contained 25 g were acquired from bulked soil and five of them were treated from 5 g of biochar available in Horton plains and every single soil sample was spiked with 20 ml of 500 ppm Cd solution. Treatments were added to the soil samples and the available Cd was extracted using standard methods in literature, and the Cd concentrations were analyzed using the Atomic Absorption Spectrophotometer (AAS). Immobilization of Cd in the soil samples treated with biochar naturally available in Horton plains was significant ($P < 0.03$) and the rate of the reduction of the available Cd in the soil was drastic. However, the control has also shown its capacity to immobilize soil Cd because of the existence of extraordinary level of SOM and active natural sorbents presence in SOM such as humic and fulvic acids.

Keywords: *Horton Plains, Forest dieback, Soil remediation, Cadmium immobilization, Bio char*

Tourists' Perceptions on Spice Markets: A Guideline to Introduce Spice Market Concept into Sri Lankan Context

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Spice tourism has evolved as a culture rooted and a customer-centric segment of global tourism. Our approach mainly focused to investigate the use of marketing mix elements of the Cochin, Turkey, and Dubai spice markets, to select suited location/s to establish spice market/s in the Sri Lankan context, and to develop guidelines and strategies to thrive the spice market concept within the country's economic, social and environmental framework. Traveller experiences field observations, focus group discussion with local experts were principal data sources. Locations of main tourist attractions within the spice growing areas were considered for spice market positioning. Both qualitative and quantitative techniques were instrumental in data analysis. Traveller review typology identified 85%, 76%, and 75% pro-level reviews respectively for the Turkey, Dubai, and Cochin spice markets. Product strategy varied from raw spices, organic spices, fair trade spices to high end value additions like nutraceuticals. Cochin and Turkey spice markets recognized as reliable sources of high-quality spices with the consensus of 80% and 66.7% of the reviewers. Women cooperatives, Arabian, Egyptian, Indian, Iranian, and Syrian marketing channels were the focal sources of spices. Price skimming, premium pricing to cost plus pricing were common to all market places considered for the study. Pricing strategies of Dubai (94%) and Turkey (74%) markets were less attractive to many travellers. Spice markets were established within the central location of the main tourist hub open up doors for many visitors and considered as a key attraction of the site. Promotional strategies varied from onsite special promotions, public relations, online tools, advertising to branding. Visitor experiences on services offerings were negative. Ethical, customer friendly, caring and trustworthy services were main customer demands. Bentota, Hikkaduwa and Kandy, famous tourist destinations of the country would be promising locations to establish spice markets considering the fact that availability of raw material, centres of spice growing areas that are surrounded by other attractions to make perfect visitor experience.

Keywords: *Marketing mix, Strategies, Spice market*

Prevalence of Infectious Hypodermal and Hematopoietic Necrosis Virus Disease in *Penaeus monodon* Shrimp Industry in Sri Lanka

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Growth of shrimp industry in Sri Lanka has been severely affected, time after time, by three reported viral diseases-White spot disease, Monodon Bacculoviral disease and Yellowhead disease. However, incompatible disease symptoms to those, that were found in shrimps during the recent past, led to discover another shrimp viral disease in Sri Lanka - Infectious Hypodermal and Hematopoietic Necrosis Virus (IHHNV). It has been listed by World Animal Health Organization (OIE) as a disease causing severe economic losses, but with low mortality in *Penaeus monodon*. Despite the economical significance, however, prevalence of IHHNV in Sri Lanka has not properly been studied. Therefore, the aim of this study was to investigate the prevalence of IHHNV in wild caught broodstock (BS), hatchery reared post larvae (PL) and farmed *Penaeus monodon*. Samples were collected representing broodstock collecting regions of the country. PCR was done using IQ 2000TM test kit for the samples collected during the years of 2017 and 2019. In 2017, 131 samples of BS collected from two BS collecting areas, 54 samples of PL represnting03 BS collecting areas and 66 pond samples representing 02 shrimp farming provinces were tested. Results revealed that 31.3% BS, 24.07% PL and 18.03% of farmed shrimp samples were positive for the IHHNV and the severity of most of the infection was recorded as very light. From the samples collected in 2019, 44 BS samples representing 05 BS collecting areas, 30 PL samples from02 BS collecting areas and 18 pond samples from 01 shrimp farming province (North Western Province) were tested and the results indicated that 27.27% BS, 16.67% PL and 5.56% of farmed samples were slightly positive for IHHNV. Therefore, this study provides the evidence to show the prevalence of IHHNV in *Penaeus monodon* in Sri Lanka, in all three life stages that is important for farming. As IHHNV is more severe in *P. vannamei* than that of *P. monodon*, emphasis should be made in strengthening Good Management Practices for the success of both *P. monodon* & *P. vannamei* industries.

Keywords: *Prevalence of IHHNV, P. monodon, P. vannamei, Shrimp viral diseases*

Taxonomic Complexity and Biogeography of Endemic Channids in Sri Lanka

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Taxonomic status of endemic members of the Sri Lankan snakeheads from family Channidae i.e. *Channa orientalis* complex and *Channa ara/marulius* complex are still plagued with taxonomical ambiguities and complexities. The objectives of this study were to understand and resolve such issues of these two groups of species based on molecular genetics, morphological characters and biogeographical modelling. A field survey was carried out to record their distribution pattern while fin clip samples were collected for molecular genetic study. *C. orientalis* complex has been recorded from Mahawali and southwest icthiological zones while *C. ara/marulius* complex was recorded from southwest, Mahaweli and dry ichthyological zones of Sri Lanka. Genetic diversity of these two groups were assessed using the mitochondrial COX1 gene. Our findings confirmed the existence of two cryptic lineages within *C. orientalis* complex (with >8% genetic divergence), while these two populations could not be distinguished based on the currently known morphological characters. Further, the study revealed taxonomical and molecular genetics ambiguity within the *C. ara/marulius* complex suggesting the need for further studies. Among the studied linages of *C. orientalis*, one population is restricted to Mahawali and Kelani basins including coastal flood plain penetration to lower reaches of Kalu and Benthara catchments. The other lineage is distributed in Nilwala, Gin and upper reaches of the Kalu river catchment, without overlapping the previous population. Current taxonomy on *C. ara/marulius* complex has elsewhere suggested to be consisting of three distinct, but puzzling lineages based only on a few morphological characters and COX1 barcoding gene region. However, our findings revealed that morphologically intermediate characters specially in the contact zone of *C. marulius* and *C. cfara*, proposing a genetically and morphologically highly diverse single species than two or three separate species. To resolve the taxonomic puzzles related to these two groups ,we proposed to assess the molecular genetics of species by using additional genetic markers such as NT2 and 16s rRNA and also to examine extended morphometric characters.

Keywords: *Biogeography, Channa, cox1, Icthiological zone, Molecular genetics*

Quantification of Biofilms by S*almonella, E. coli* and *Proteus Spp*

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A biofilm is a microbial community attached to a surface which embedded in a self-producing complex extra polymeric matrix of polysaccharide, protein and DNA. Biofilms gain special attention as it causes chronic infection, chronic source of contaminations due to its role in development of resistance to antibiotics, disinfectants and resisting phagocytises. This study focused on isolating *Salmonella*, *E.coli* and *Proteus* spp from broiler chicken meat and investigating their ability of forming biofilm. Organisms were isolated from 50 samples of broiler chicken meat collected from retailer shops. Subsequently, the isolates (10*Salmonella*isolates, 3*E Coli* isolates and1 isolate of *Proteus*) were checked for their ability to form biofilms with two different nutritional conditions (Undiluted Luria-Bertainy (LB) broth and 1:100 diluted LB broths) at 37^0 C for 24 hours by micro titre plate assay. The study revealed that there are four strong, five moderate and five week biofilm formers in nutritionally rich undiluted medium where as one strong, nine moderate, two week and two no biofilm formers in nutritionally diluted medium. Among the 10 *Salmonella* isolates, there were three strong, five moderate and two weak biofilm producers in undiluted condition whereas one strong, seven moderate and two weak *Salmonella* biofilm producers in diluted LB medium. All the three *E. Coli* isolates tested were weak biofilm formers in nutritionally rich medium. Two out of three *Coli* isolates did not produce any biofilm in the diluted medium but the other isolate showed moderate biofilm formation. The *Proteus* isolate showed its ability to form strong biofilm in nutritionally rich condition and moderate biofilm formation in diluted medium. Some isolates formed strong biofilms at nutritionally rich medium whereas some were strong at nutritionally diluted medium. Moreover, the different isolates at similar nutritional environment exhibited variations in biofilm formation. This study concluded that there is a species variation in biofilm forming ability and nutritional conditions of the medium also has different impact on biofilm formation by different bacterial isolates.

Keywords: *Biofilms, E. coli, Proteus, Quantification, Salmonella.*

Changes of Temperature and Precipitation Extremes in Anuradhapura District, Sri Lanka during 1981–2019

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Anuradhapura is one of the major agriculturally important districts located in the low country dry zone of Sri Lanka and recently frequent crop failures were reported owing to extreme climatic events such as droughts and floods. Although, many researchers have investigated the climatic changes of the area during the past several years, very few attempts can be seen on studying the extreme climatic events. Therefore, the objective of this study was to analyze the occurrence of extreme climate events in Anuradhapura district in Sri Lanka. Using daily minimum and maximum temperature and precipitation data from 1981 to 2019, four extreme temperature and six extreme precipitation indices which were defined by Expert Team on Climate Change Detection and Indices (ETCCDI), were analyzed by RClimeDex software package (Version 4.0.2). Simple linear regression was performed to detect the significance of trends of extreme events. The number of very heavy precipitation days (R20),number of days above 25mm (R25), very wet days (R95p), extremely wet days (R99p), annual total wet days precipitation (PRCPTOT) and simple daily intensity index (SDII) have increased during the study period, but did not show a significant ($P>0.05$) trend. A significant ($P<0.05$) positive trend was observed for warm nights (TN90p) and negative trends were observed for cool nights (TN10p) and diurnal temperature range (DTR). Non-significant negative trend was observed for warm days (TX90p) during 1981-2019 period. It can be concluded that there is an increasing trend in the occurrence of extreme precipitation indices and conspicuous changes in temperature indices during 1981-2019 period in Anuradhapura district.

Keywords: *Climate indices, Drought, Flood, Simple linear regression*

Black Solider Fly Larvae (*Hermetia illucens*) as a Substitute for Fish Meal for Commercial Broilers: A Conceptual Research Design

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In Sri Lanka, meat industry plays a key role in livestock sector where chicken meat contributes about 70%. However, economically, meat production would allocate nearly 80% of total cost of production especially in terms of crude protein for the animal feed causing profit chains to be in pressure. In this context, Black Soldier Fly (*Hermetia illucens*) Larval (Larval (BSFL) meal has been identified as one of the exceptional protein sources to substitute for some key protein ingredients in animal feed. Black soldier fly larval meal comprises around 42% crude protein and 29% crude fat with an excellent amino acid profile. No studies have been conducted locally so far, to assess the potential of substituting BSFL for one of the major imported protein sources, fish meal. Basically, the objectives of the proposed study are to assess the nutritional composition and the Apparent Metabolizable Energy (AME) of BSFL reared on kitchen waste and to assess the maximum inclusion levels of BSFL in broiler diets. The BSFL will be reared on kitchen waste in a BSFL based compost bin. Substrate and the pre-pupae samples will be subjected to analyze for the nutritional composition in duplicates. AME of BSFL meal will be estimated by using acid insoluble ash (AIA) as aninertan inert marker, with 80, 21-day old commercial broilers using a pre-formulated reference diet, 5%, 10% and 15% BSFL substitutions of reference diet. Feed samples and excreta samples will be analysed for gross energy and AIA. To assess the maximum inclusion level of BSFL in broiler grower and finisher diets, nine isoenergeticis energetic and isoproteic diets containing full-fat and defatted BSFL at 0%, 2.5%, 5%, 7.5% and 10% will be used to feed 324 birds. The nutritional composition of each diet, weekly feed intake, body weight gain, feed conversion ratio and mortality will be determined. Forty-two days old broilers will be subjected to analyze the meat characteristics for number of sensory properties by 30 untrained panelists using a predesigned questionnaire. A cost benefit analysis will be carried out in terms of feed cost per kg live weight gain to find out the most economical inclusion level.

Keywords: *Broiler, Black solider fly larvae, Crude protein, Fishmeal*

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Black Soldier Fly (*Hermetia illucens*) Larvae as a Feed Ingredient for Commercial Fish Culture

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Use of insect-based protein sources in feed industry have come of age as an alternative to the highly expensive fishmeal. Black soldier fly (BSF) *Hermetia illucens* larvae is a dipteran with promising results as a fishmeal replacer in livestock industry, the potential of BSF in Sri Lankan commercial aquaculture is yet to be evaluated. It is also not clear as to how a crude protein (CP) and crude fat (CF) rich larvae (29-32% and 35-39% respectively) should be processed to a meal rich enough to provide high protein and low fat levels as a meal. Present study is therefore aimed at developing a BSF larval meal to be used in aquaculture. BSF larvae grown on domestic waste was harvested at 5th in star stage before reaching prepupae-a stage with high chitin content. Harvested larvae was then purified and steamed at 105^{0}C for 05 minutes, gut content was removed and defatted using a mechanical oil extraction machine. After oven-drying at 50 ^{0}C larvae was grounded and sieved to a fine powder with 0.01 mm particle size. Prepared BSF larvae meal had low CP level (34%) and high CF level (39%) where rendering the meal useless as a protein source. Therefore, an additional grinding step was performed followed by steaming step to make the structural lipids available for extraction. As a result, CP levels rose up to 41.29% while crude fat, gross energy, crude ash and dry matter were at 33.09%, 4668 kcal kg^{-1}, 5.93% and 94.97%. Hence, proximate composition of the meal prepared using additional grinding was therefore suited as a fishmeal replacer. Four dietary treatments were prepared by replacing different levels i.e. 0%, 25%, 50% and 75% of fish meal with a developed BSF larvae meal. Feed formulation was done to match the requirement of Rohu (*Labeo rohita*). Diet was prepared to be isonitrogenous, isolipid and isocaloric at 35%, 11% and 3149 kcal kg^{-1} respectively. In conclusion, the protocol used here is effective in developing a BSF larval meal to be used in feeding fish for aquaculture.

Keywords: *Black soldier fly, Chitin, Defatted, Dipteran, Fish meal*

Acknowledgement: *This research was funded by AHEAD/RIC grant*

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Session 07
Graduate Colloquium

Enhancement of the Molecular Orientation of TPBi in Co-evaporated Films of UGH-2 Host Molecules

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In this study, we investigated the formation of spontaneous orientation polarization (SOP) on co-evaporated mixed films of polar and non-polar molecules. The SOP is generally observed in evaporated films of organic light-emitting diode devices and, performance of the devices has changed effect on the SOP. However, the formation mechanism for the SOP remains to be clarified. Here, we describe characteristics of the surface potential and the enhancement factor as a function molecular composition ratio of polar (1,3,5-Benzinetriyl)-tris(1-phenyl-1-H-benzimidazole) (TPBi) with nonpolar molecule of 1,4-Bis(triphenylsilyl) (UGH-2) and 4,4′-Bis(9-carbazolyl)-1,1′-biphenyl (CBP) under the ultra-high vacuum (UHV) conditions. The evaporated films were characterized via Kelvin probe (KP) measurement technique in order to measure the surface potential. Further, the surface morphology of the films was observed via atomic force microscopy. We have found that the degree of molecular orientation of TPBi increased on UGH-2 and CBP hosts, although it was small directional, scores are considered in UGH-2 hosts due to van der Waals's interaction. The strong anisotropic trend of TPBi can be attributed to the disk- like molecular shape.

Keywords: *Permanent dipole moment, Surface potential, Orientation polarization, Organic light-emitting diodes*

Statistical Correlation between Soil Erosion and the Prevalence of Chronic Kidney Disease of Uncertain Etiology (CKDu) in Uva Province, Sri Lanka

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Uva Province is one of the most prominent provinces where a number of CKDu patients have progressively increased recently. Since the water and the soil quality are hypothesized as causative factors for CKDu in Sri Lanka, assessing the soil erosion and possible sediment deposited areas in the study area is crucial for understanding the relationship between soil quality and the prevalence of CKDu. Thus, the prime objective of this study is to investigate any statistically significant correlation between soil erosion and the prevalence of (CKDu) in the study area. Integrated Valuation of Ecosystem Services and Tradeoffs (InVEST) Sediment Delivery Ratio (SDR) model was applied to estimate and map the mean annual soil loss rates of each of the 26 Divisional Secretariats Divisions (DSDs) in the study area using digital elevation model (DEM), rainfall erosivity (R) map, soil erodibility (K) map, land use land cover (LULC) map, crop management factor (C) data and support practice factor (P) data. Furthermore, the frequency of CKDu patients in each of the DSDs was recorded to compute the correlation. The results revealed that ~39% of DSDs fall into extremely high erosion category (> 60 t ha−1 year−1) where the lowest numbers of CKDu patients were recorded while ~19% of DSDs fall into the low erosion category (≤ 5 t ha−1 year−1) where the highest numbers of CKDu patients were recorded. Furthermore, ~15%, ~12%, and ~15% of DSDs fall into moderate (5 to 12 t ha−1 year−1), high (12 to 25 t ha−1 year−1), and very high (25 to 60 t ha−1 year−1) erosion categories respectively. Moreover, soil erosion was skewed (skewness = 0.39), which violated the assumption of normality. Thus, the Spearman rho statistic was calculated, $r(24) = -0.83$, $P \leq 0.01$. The direction of the correlation was strongly negative, which means that the areas with low soil erosion rates in the study area tend to have a higher number of CKDu patients.

Keywords: *CKDu, Correlation, InVEST SDR, Soil erosion, Uva province*

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Effective Utilization of Eppawala Rock Phosphate using Natural Microbe Cultures (*Jeevamrutham)*

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Phosphorus, is one of the most demanding essential nutrients for crops that is usually supplied through fertilizers. Sri Lanka has a rock phosphate deposit at Eppawala, which can be utilized as a source of phosphorus fertilizer after increasing its water-soluble phosphate. Biological processes such as microbial activities are economically and environmentally more suitable than the chemical processes in increasing the water-soluble phosphate of Rock Phosphate. *Jeevamrutham* is a mixture of microorganisms which contains high microbial activities. This study investigates the suitability of *Jeevamrutham* to increase the phosphate solubility of High-Grade Eppawala Rock Phosphate (HERP) both at laboratory and field levels. Five different microbial inoculums (Jeevamrutham) were prepared using soils taken from undisturbed Eco systems (Sinharajaand Badagamuwa forests, Nonperial Pine, Girandurukotte Teak, and Diyathalawa Turpentine plantations), Cow dung, Sugar, Gliricidia and Natural water. In a laboratory experiment, HERP was treated within columns. Available Phosphorus content of each sample was determined within 2 months in 7 days intervals. In a field experiment *Zeamays* was planted in treated plots with three different ways such as five different *Jeevamrutham* + HERP, Five different *Jeevamrutham,* and HERP. The plants which were grown in untreated soil were considered as the controlled. Available P_2O_5%, pH, and Organic matter content of soil were determined within 3 months in 14 days intervals. The average biomass of each plot was determined after 3 months. The laboratory experiment revealed that the available P_2O_5% of all treated samples were significantly higher ($P<0.05$) than the controlled samples in every week. It was evident from the field experiment that the available P_2O_5% of soil and average biomass of crops were significantly higher ($P<0.05$) in *Jeevamrutham* + HERP treated plots than that of the other treatments. The highest biomass was resulted in the Nonperial pine forest's soil based *Jeevamrutham* + HERP treated Crops. The organic matter content of all treatments was significantly lesser ($P<0.05$) than the controlled while pH was retained at 5.1-7.2 range. *Jeevamrutham* has increased the water- soluble phosphate in HERP and *Jeevamrutham* treated HERP can be used as a phosphorus fertilizer for short term perennial crops in Sri Lanka.

Keywords: *Jeevamrutham, HERP, Water soluble phosphate*

A Survey on Pesticide use and Safety Practices among Farmers in Uva Province of Sri Lanka

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Majority of the rural population in Sri Lanka are engaged in agriculture and make a significant contribution to the national economy. Use of pesticides has become important in gaining maximum agricultural yield ensuring the plant protection. But the indiscriminate usage and improper handling of pesticides have caused various health risks among farming communities. Since the Uva province of Sri Lanka has been recognized as one of the provinces with a heavy usage of pesticides, a survey-based study was carried out to enquire the knowledge and habit of pesticide usage of the farmers in the area. The questionnaire survey was conducted using stratified random sampling technique with 227 respondents in total. Results indicated that 92.07% of interviewed farmers are using pesticides in their agricultural practices whilst 65.55% of them are handling more than one pesticide on a working day. Out of the farmers who use pesticides, 27.27% were identified to exceed the recommended dose. Only 32.54% are using head covers, 55.02% are using gloves, 53.11% are using masks, 56.94% are wearing long-sleeved shirts, 3.83% are using safety boots, 32.54% are practicing the proper way of applying pesticides by walking perpendicular to the wind direction during pesticide application. 52.15% of them store mixed pesticides in their houses. According to above findings, most of the farmers in Uva province do not adhere to the recommended safety practices during pesticide handling and application. Hence, they are prone to have potential health risks posed by pesticides due to the lack of knowledge on proper use, handling and safety application of pesticides. This study revealed the importance of having proper awareness programmes among farmers to reduce the potential hazards involved in the usage of pesticides.

Keywords: *Uva province, Pesticides, Pesticide usage habit, Safety practices*

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Inter-Relationships Between Canopy Openness and Vegetation Diversity in Tropical Rainforests of Sri Lanka Across a Wide Altitudinal Gradient

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As light transmission is essential for plants in the forest under story, canopy openness (CO) could be closely related to vegetation diversity in tropical rainforests. This study investigated the variation of CO of wet zone rainforests in Sri Lanka along an altitudinal gradient and its relationship to the Shannon-Wiener vegetation diversity index (H') and species richness (R). CO was quantified as the fraction of visible sky (V_{sky}) in canopy hemispherical photographs (HCPs). Ten Permanent sampling plots (PSPs) of one hectare was established along an altitudinal gradient from 117 m to 2132 m above mean sea level. Nine HCPs were obtained covering the entire 1 ha plot and canopy properties were calculated by Hemiview image analysis software. Plot-level means of V_{sky} and leaf area index (LAI) showed highly-significant ($P<0.0001$) variation among PSPs. Sinharaja-Pitadenitya at 618 m had the lowest V_{sky} and the highest LAI whereas Pidurutalagala at 2080 m had the highest V_{sky} and the lowest LAI, with a highly-significant negative correlation ($P<0.0001$; r=-0.784) between V_{sky} and LAI. V_{sky} and LAI showed respectively negative and positive second-order polynomial trends with altitude across its whole range. Vegetation diversity (H' and R) showed highly-significant ($P<0.0005$) linear decreasement with increasing altitude. V_{sky} showed negative second-order polynomial relationships with H' and R. Increasing H' and R decreased V_{sky} from 2132 to 509 m as increasing vegetation diversity increased LAI and reduced CO. However, this trend was reversed from mid- (*ca.* 500 m) to low (*ca.* 100 m) altitude where both CO and diversity increased. Vegetation diversity has probably increased at the lowest altitude (Kanneliya) because of greater CO and the resulting transmission of light to the ground level. Based on these results, it is concluded that whereas CO acts as a determinant of vegetation diversity at lower (<500 m) altitudes, at higher altitudes (>500 m), vegetation diversity determines CO.

Keywords: *Canopy openness, Shannon-wiener diversity index, Species richness, Tropical rainforests, Visible sky fraction*

Assessment of Groundwater Quality and Associated Geochemical Processes in a Tropical Watershed –Walawe River Basin, Sri Lanka

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The Walawe River basin is the fourth largest river basin in Sri Lanka which is undergoing rapid industrial and agricultural development. Hence groundwater has become an important freshwater source for consumption and become vulnerable due to over-exploitation and predicted climate change scenarios. A detailed hydrogeochemical study was carried out in the Walawe river basin to investigate the groundwater suitability for drinking and irrigation purposes. A total of sixty-four groundwater samples were collected from thirty-two locations of the study area during the pre- (May - June) and post-monsoon (February –March) periods and analyzed for their major and trace elements, and also for water isotopes ($\delta^{18}O_{H2O}$ and $\delta^{2}H_{H2O}$). The solute compositions in groundwater in the region were dominated by HCO_3^-, Cl^-, and SO_4^{2-}, which were mostly balanced by Na^+, Ca^{2+}, and Mg^{2+}. The Piper classification indicated that the groundwater in the region was dominated by Ca^{2+}-HCO_3^- type of water with subordinate contributions of Ca^{2+}-Na^+-HCO_3^-, Ca^{2+}-Mg^{2+}-Cl^-, Na^+-Cl^-, and Ca^{2+}-SO_4^{2-} rich waters. Groundwater in the region exceeded the levels in terms of EC, hardness, and fluoride. A greater percentage (82%) of post-monsoon samples was poor in quality for drinking purposes when compared to pre-monsoon (47%) samples. According to the US salinity laboratory and Wilcox's classification, two-thirds of investigated groundwater samples were suitable for irrigation purposes. The isotope data suggested that the groundwater in the region is recharged from the first inter-monsoon and north-east monsoon events and intensively affected by evaporation events. The findings of this study suggest that water quality management in the Walawe River basin is essential and water resources should critically monitor to reduce the anthropogenic stress on groundwater resources.

Keywords: *Agricultural pollution, Environmental isotopes, Irrigation suitability, Water quality index*

Farmer Knowledge and Perception of Pesticide Exposures towards Health and Environmental Hazard in Selected Areas in Uva Province, Sri Lanka

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Monitoring the knowledge of small-scale farmers on pesticide usage would be useful to assess the appropriateness of the information for reducing the risks from pesticides in rural regions of Sri Lanka. The patterns of pesticide usage, perception and levels of knowledge of the risks posed by pesticide usage to the environment were investigated by means of a semi-structured questionnaire survey and key informant interviews. Welimada, Haputhale, Badulla, and Ella DS divisions were selected as major vegetable growing areas (S_1=119) while Moneragala, Badalkumbura, Bibile and Medagama DS divisions were selected as major field crop cultivated areas (S_2=127). Basic information *viz*. farmer household and farmlands, commonly used pesticides and farmers' knowledge on pesticide usage was ascertained as the primary data. All the interviewed vegetable grown farmers have used fungicides and insecticides. However, only 35.3% farmers have used herbicides while all interviewed field crop cultivated farmers have used herbicides but 70.1% and 99.2% used fungicide and insecticides respectively. Only 29.4% (S_1) and 13.4% (S_2) of respondents have undergone a proper training on the effective use of pesticides and such trainings were mainly conducted by organizations of the private sector who are already involved in pesticide marketing.60.5% (S_1) and 61.4% (S_2) of farmers have taken some precautionary measures and long pants and long sleeve shirts are the most common precautionary methods during pesticide spraying. The correlation analysis indicates that farmers' knowledge on the correct handling of pesticides, disposal of pesticide leftovers/containers and personal hygiene after pesticide application were significantly ($P<0.01$) influenced by the farmers' level of education and training on pesticide handling. The present study indicated that the application of pesticides in the study area posed a potential risk for the environment and the farmers.

Keywords: *Agricultural pollution, Correlation analysis, Pesticides risk, Perception, Survey*

Acknowledgement: *AHEAD/DOR/STEM Grant No. 33 is gratefully acknowledged for awarding research grant*

Value Addition of Low-Quality Gems in Sri Lanka: A Case Study from Marapana, Ratnapura

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Sri Lanka is known the world over for its wide variety of coloured gemstones. In addition to the good quality gemstones, low-quality gemstones (Geuda) are found in Sri Lanka. Heat treatment is a physicochemical method to improve the colour and clarity of these low-quality gemstones. This study aims to conduct investigations based on chemical and spectrophotometric analysis in order to develop well-defined procedures to enhance the quality (colour and clarity) of the low-quality gemstones, namely Geuda, Ottu, Kahata and dark tourmaline. Low-quality gem samples were collected from two gem pits in Marapana, Ratnapura. Based on the initial characterisation, the gem samples were grouped in to four categories: Geuda, Ottu, Rambaha and Spinel and their weight ranged from 0.3 to 7 carrots. The size of the collected gems was ranged 4 - 12 mm. Initial observations were derived by using magnifying lenses which suggested that the majority of the samples contained mineral inclusions, cracks and had a semi-transparent appearance, therefore they possessed a low commercial value in the market. Further, characterizations of the samples were subjected to determine the physical properties (refractive index and specific gravity) and chemical properties (inclusions). Spectrophotometric properties will also be determined using Raman spectrometer, X-ray fluorescence (XRF) spectrometer, X-ray diffraction (XRD) spectrometer, UV visible spectrophotometer, Fourier-transform infrared spectrophotometer (FTIR) and Laser ablation inductive couple plasma mass spectrometer (LA-ICPMS). Based on the physical, chemical and spectrophotometric properties along with the spatial data, the heat treatment will be conducted using Lakmini, tube and muffle furnaces. Heat treated sample will be further investigated to identify atomic rearrangement and also to identify optimum heat treatment conditions for low-quality gemstones.

Keywords: *Furnace, Heat treatment, Optimum, Properties, Spectrophotometric*

Acknowledgement: *This research was funded by AHEAD/R2/RIC/No.7*

Status of Human-Leopard Interactions in Nuwara Eliya District within the Central Highlands of Sri Lanka over the Past Twenty Years

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Leopard *(Panthera parduskotiya)* remains the top carnivore in central highlands of Sri Lanka. Human-leopard interactions amplified due to the increased sharing of leopard habitats by humans, especially in plantation landscapes in central highlands. Increased media reporting and community awareness may also be contributing to the knowledge and reporting the incidents. Incidents causing life loss or injuries to people, domesticated animals or leopards over the past 20 years were studied with the support of a questionnaire survey. The study was conducted in upper reaches of Kelani river basin within Nuwara Eliya District, with reference to 65 tea estates in Kehelgamuwa Oya and Maskeliya Oya sub-basins. Forty-five leopard deaths out of 64 human-leopard incidents have been recorded in the study area between 2001 and 2020, with an average of 3 (±1.18SE) incidents and an average of 2.25 (±0.35SE) deaths of leopards per year. A majority (90.6%) of incidents were reported in unprotected landscapes while 45.3% of leopard deaths occurred due to snaring. There were 11leopard attacks associated with domestic dogs, while leopards had attacked people in nine occasions in defensive acts, causing one human death within the study area. However, zero leopard attacks in the study area were reported on livestock, while such incidents have occurred elsewhere from unprotected estate lands in Nawalapitiya and Pussellawa. Human-leopard incidents in the study area have shown a four-fold escalation with a six-fold increase in leopard deaths over the past 20 years, indicating signs of the issue developing into a conflict unless effective management actions are implemented. A blend of actions including behavioural and safety precautions for human and domestic animals, inculcating positive perception on leopards and involving to reduce snaring can lead to a solution, mitigating negative interactions and supporting wider human-leopard coexistence in Study area.

Keywords: *Central highlands, Human-Leopard interactions, Panthera parduskotiya, Unprotected landscapes*

Session 08
Undergraduate Poster Presentations

Development of Microorganisms Mediated Bioremediation Technique for Used Lubricating Oil Contaminated Soil

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Contamination of soil with Used Lubricant oil (ULO) has become an emerging environmental threat due to possible negative impacts of ULO on different ecological receptors. Therefore, remediation of ULO contaminated soils using novel and economically feasible technique is an urgent requirement. However, drawbacks in the conventional soil remediation measures have led the development of bioremediation techniques using naturally found microorganisms isolated from ULO contaminated soil. Hence, the present study aimed to characterize the isolated fungal strain with ULO degrading potential. Further, a comparative analysis of the ULO biodegradation ability of the isolated strains, *Aspergillus fumigatus* RUH_8 and *Brachybacterium conglomeratum* RUH_1, total microbial activity (TMA), and *Allium cepa* toxicity assay was performed for bioremediated soil. The experiments were carried out under laboratory-scale microcosms with 1-5% w/w contamination levels of ULO. Results indicated that a time-dependent increase in the biodegradation percentages of *B. conglomeratum* and *A. fumigatus* inoculated treatments. Following 35 days, the highest biodegradation percentages of *B. conglomeratum* and *A. fumigatus* were 77.63% and 70% respectively at 1% contamination levels. A concentration-dependent reduction of TMA was observed in two individual strains, *A. fumigatus* and *B. conglomeratum.*. Compared to *A. fumigatus*, the lowest root growth inhibition (REI) and chromosomal inhibition (CA) was observed in *B. conglomeratum* mediated bioremediated soil. The calculated percentages of REI and percentages of CA in *B. conglomeratum* mediated bioremediated soil were, 18.27, 41.83, 43.27, 49.52, and 59.89 and 1.0, 1.5, 2.25, 3.0, and 3.5 respectively at 1-5% w/w contamination level. Therefore, the findings of the study concluded that *B. conglomeratum* has the potential to biodegrade and reduce the toxicity of ULO compared to *A. fumigatus* highlighting the species-specificity of the biodegradation efficiency.

Keywords: *Aspergillus fumigatus, Bioremediation, Brachybacterium conglomeratum, Toxicity, Used lubricating oil*

Characterization of Polymer Structure and Evaluation of Functional Properties of *Kappaphycus alvarezii* Seaweed-Based Bioplastic Films

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The global demand for eco-friendly food packaging solutions is on the rise. Bioplastics from natural resources have been explored widely as sustainable food packaging with an increasing focus towards seaweed-based bioplastics. Polymer characterization is an important aspect to enhance the performance of bioplastics. Therefore, the aims of the present study were, to characterize *Kappaphycus alvarezii* seaweed-based bioplastics plasticized with glycerol (three different concentrations), to determine the functional properties and to evaluate the applicability of the synthesized bioplastic for food packaging. Material characterizations were performed using FTIR-ATR spectroscopy, XRD, TGA, UV-Vis spectrophotometry, colorimetry and tensile testing. Water vapor permeability (WVP) was determined using the wet cup method at 33%, 75% and 84% relative humidity (RH) conditions. Water solubility was evaluated using the method described by Fakhoury et al. Applicability of the developed bioplastic films and the coating solution was investigated on selected fresh fruits. Fresh-cut watermelon pieces were wrapped with films and L*, a*, b* values, TSS and visual aspects at ambient conditions were monitored for three days. Bananas (variety: Cavendish) with a ripening index of 5 were coated with film forming solutions and weigh loss %, firmness, TSS and peel browning were monitored for six days. FTIR spectra revealed the presence of chlorophyll a, carotenoids, phaeophytin; C-C 3,6-anhydrogalactose, and D-galactose-4-sulfate; C-O 3,6-anhydrogalactose, and D-galactose-4-sulfate; C-O, C=O and C-C stretching of pyranose ring; S=O bond of the sulfate ester groups; -CH_3 stretching and -OH stretching vibration. X-ray diffractograms revealed the amorphous nature of the polymer matrix. All three types of bioplastics exhibited a type 04 TGA curve indicating the multiple stage decomposition of polymer. The bioplastic films showed acceptable transparency and whiteness index. WVP of the films was found to be affected by the glycerol content and the RH. Tensile stress showed a decreasing pattern with increasing glycerol content. Water solubility ranged from 50.23% to 66.78% when increasing glycerol concentration from 10% to 20%. The 10% glycerol added film was identified as the most effective film type except for the transparency. Case hardening was observed in unwrapped watermelon within one day of storage and there was a significant effect ($P<0.05$) on flesh color after wrapping by the film. 20% glycerol added coating solution was identified as the most effective in decreasing the surface moisture removal and reduction of peel browning of bananas.

Keywords: *Bioplastic, Biopolymer, Characterization, Coating, Glycerol, Seaweed*

Novel Data Mining Approach for Prognostication and Customer Identification at Small Medium Enterprises

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Almost every industry, organizations use Information Technology for their core business activities. Similarly, SMEs tend to use technologies for their businesses and the usage has increased data generation. Even though the amount of data generated low compared to the Large-Scale Enterprises, yet SMEs' data reserves can be converted into meaningful information with the aid of data mining and machine learning concepts. When using data mining and machine learning approaches for datasets generated at SMEs need special cautions, due to constraints such as limited computational capacity at SMEs and as well as comparatively less data capacity at data repository than convectional Big data. This study aims to formulate a data mining model for sales prediction and as well as focus on initial Customer Relationship Management stage, customer identification within the context of SMEs, which is effective and efficient under the constraints identified. The data sets comprise of demographic features; Gender, Age, Residency information, Marital Status and Occupation. Preprocessed repository data used to initiate descriptive statistical analysis, variable correlation analysis and feature engineering. The processed variables used within number of machine learning algorithms; Linear Regression (LR), Ridge Regression (RR), Decision Tree Regression (DTR), Random Forest Regression (RFR), Multiple Layer Perceptron Regression (MLPR) models to find most efficient algorithm for sales prognostication. Furthermore, the customer identification had initiated with Principle Component Analysis (PCA) along with classification techniques. The finalized model for predictive analytics at SMEs determined through the lowest Root Mean Square Error (RMSE) and then a validation process carried out to assess the performance. For the predictive analytics in sales, DTR was suitable due to lowest RMSE of 2689 and through PCA and classification 3 customer bases were identified.

Keywords: *SME, Prognostication, Customer identification, Regression analysis, Principle component analysis*

Biomass Based Electricity Generation

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At present, reusable resources such as wind, hydroelectric, solar, biomass are being used around the world to reduce environmental damages. Thus, man is becoming accustomed to the usage of biomass to generate electricity in the world. In the process of thermochemical biomass gasification, synthesis gas, a gas product, which is converted in to solid biomass by a gasifier is produced by means of partial oxidation with air, oxygen, and/or steam. This gas contains the desired components CO, H_2, CH_4, CO_2, N_2, water, tars and impurities. In order for this synthesis gas to be used effectively, it must be very clean and the tar and impurities in the synthesis gas must be separated. The gasification reaction takes place in four zones according to the conventional theory of synthesis gas which are oxidation, reduction, pyrolysis and distillation zones. In this project, downdraft gasifier was designed to run six cylinder, 4-stroke and air-cooled direct injection gas engine, developing a power of 200 kW, at a rated speed of 1500 rpm. Wood offcuts were used as a feed stock and were loaded into the gasifier from the top at every 10-15 minutes of the operation. The desired specification was for 750-1500 kWh/day electrical output, ideally from a system operating less than 15 hours per day, 6 days per week.

Keywords: *Gasification, Gasifier, Biomass, Gas engine*

Modified Curing System for Accelerated Sulfur Vulcanization of Rubber Article

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Sulphur vulcanization is the most widely used technique and it is an essential step in the manufacture of natural rubber-based products. Prolonged cure time of the rubber compounds wastes energy and affects the production rates. The effect is very significant in the manufacture of thick articles formed using different layers of rubber. A new vulcanizing procedure was tested in an attempt to shorten the optimum cure time of rubber compounds without affecting the performance of the product. In this new method, a latex master batch of curing ingredients except the curing agent (sulphur) was first prepared and was converted to the dry form by heating under controlled conditions. Calculated amounts of curing agents were incorporated into the dry master batch to form rubber compounds. Both the gum compound and the filled compound were prepared using the modified method as well as using the conventional compounding method for the purpose of comparison. Reduction in scorch time was observed for both the gum compound and the filled compound made by the modified method. The modified method reduced the optimum cure time by 33% and 19% for the gum compound and the filled compound respectively. It was found that the modified method could be used to cure rubber without significantly affecting the mechanical properties of the final product.

Keywords: *Vulcanization, Cure time, Scorch time, Thick rubber article, Mechanical properties*

A Novel Heuristic Based Scheduling Strategy for Resource Management in Cloud Computing

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Cloud computing is a new computing paradigm that let users to access services over the internet. Cloud provides scalable and on-demand resources to cloud consumers. They charge their customers only for the usage. Cloud platform offers huge computing capabilities with numerous configurable variations. Resource Management plays a major role in optimizing the underlying system of the cloud platform. There are many techniques for resource management in Cloud. Task scheduling and workflow scheduling are two major open problems considered under resource management in the Cloud. Scheduling a task to an appropriate resource cloud is an NP-complete problem. Hence heuristic techniques can be used to derive a better solution for scheduling tasks. Many heuristics were proposed for addressing the task scheduling and workflow scheduling problem in the cloud environment. These heuristics have considered different scheduling parameters in finding a better schedule. None of them has considered the total execution time of the virtual machine as a factor for finding a better schedule. In this research, we propose a novel heuristic, Total Resource Execution Time Aware Algorithm (TRETA), that considers the total execution time of the virtual machine in scheduling workloads for the computing resources in Cloud. The algorithm is compared with the existing state of the art heuristics Min-Min, Min-Max, FCFS, DHEFT and MCT heuristics for Makespan, Degree of Imbalance, and System Throughput using synthetic workload traces and real-world workload traces of Nasa Ames iPSC/860 and HPC2N for task scheduling and real-world traces of the CyberShake workflow for heterogeneous environments. The proposed algorithm was implemented using CloudSim and WorkflowSim simulators. The algorithm shows significant improvements in Makespan, Degree of Imbalance, and System throughput compared to other existing heuristics for task scheduling and better results for workflow scheduling.

Keywords: *Task scheduling, Workflow scheduling, Total resource execution Time aware algorithm, Heuristics, Makespan*

Impact of Smoke and Ethephon as Artificial Fruit Ripening Agents on Ripening Behaviour, Quality and Safety of Papaya

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Papaya is one of the best demanded fruits in Sri Lanka, which is ripened artificially after being transported. However, the improper use of ripening agents causes health risks. The study evaluates the safest method out of the most common ripening methods, smoke and ethephon for ripening of papaya in relation to safety and marketable quality. Six treatments were arranged with three replicates: (T1) control - untreated fruits in a closed cubicle, (T2) control out - untreated fruits at ambient condition (28 ˚C ± 2), (T3) Fruits exposed to ethylene gas liberated from ethephon for 24 hours (25 ml of 1 ml L^{-1} ethephon + 2.5 g NaOH), (T4) fruits dipped in 1 ml L^{-1} ethephon solution, (T5) ethephon spray (1 ml L^{-1} ethephon solution) and (T6) smoke treatment (using burnt banana leaves) for 3 minutes. Quality of fruits were assessed in terms of physico-chemical parameters (physiological weight loss %, firmness (kPa), pH, total soluble solids (°Brix), titratable acidity %, and peel color (L*a*b values). Safety for consumption was assessed in terms of ethephon residues in ethephon treated fruits (Liquid Chromatography Tandem Mass Spectrometry System- LC/MS/MS) and polycyclic aromatic hydrocarbons (PAHs) in smoke treated fruits by using the High-Performance Liquid Chromatography (HPLC) system. The results revealed PAH residues in smoke (on peel 121.55 µg kg^{-1}) and ethephon residues in ethephon dip (1.0 mg kg^{-1} on peel) and spray (2.0 mg kg^{-1} on the peel and 0.2 mg kg^{-1} in the flesh) treatments. Ethylene gas treatment liberated from ethephon can be recommended as a safe fruit ripening technique that ensures fruit quality and safety.

Keywords: *Artificial fruit ripening, Residual analysis, Ethephon residues*

Rainfall Trends and Landslide Vulnerability: A Case Study of Badulla District

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The climate in Sri Lanka is tropical, and consists of various characteristics during dry and wet seasons. Landslides have become a major natural disaster in the country especially in Badulla District. The purpose of this study was to identify the correlation between rainfall and vulnerability for landslides in Badulla District which is very vulnerable for landslides according to the past evidences. Geographic Information System (GIS) based Analytical Hierarchical Process (AHP) and Weighted Overlay techniques were used in this process. The AHP technique was used in determining the relative importance of the selected criteria i.e., rainfall, slope, aspect, land use, lithology, population density and the distances from drainage, roads and pre occurred landslide. All annual rainfall data were considered and averaged into the four seasons identified in the study. The relationship between annual rainfall distribution and annual landslide occurrences were studied. Moreover, the relationship between monthly rainfall distribution and monthly landslide occurrences were also studied. The correlation between landslide vulnerability and rainfall was statistically significant. This research predicted the rainfall for the years 2021 and 2022 along with the landslide vulnerability for the same duration. These findings may be very useful for general public as well as disaster management related authorities in their decision making and other activities.

Keywords: *Landslide vulnerability, Disaster management, GIS, AHP, Rainfall trends*

Assessment of Tidal Effect on Gravity Measurements at Coastal Areas

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Traditionally, gravity measurements were observed by using conventional methods such as pendulum. Later, it was developed to various instruments including remote sensing techniques. CG-6 Autograv Gravity meter is an automated gravity meter that has a worldwide measurement range of over 8,000 mGals and a reading resolution of 0.0001mGal. This enables the user to operate in both detailed micro-gravity surveys and large scale regional or geodetic surveyors. Rain, wind and other meteorological variations directly impact the gravity measurements. Further, these gravity measurements employed various correction models such as temperature, tilt, tide, drift for reduce other influences. Gravity measurements taken near the sea could be directly affected by daily tidal changes. The aim of this study was to determine the effect of tides on gravity measurements and to eliminate the tidal effect from the gravity measurements. Gravity data were obtained from the CG-6 auto gravity meter at Colombo Port and Sabaragamuwa University continuously for 25 hours. Tidal data at the Colombo port were also collected simultaneously with the gravity data. Since the university is situated at inland area, there was no effect due to the tide observed. This data were used to validate the tidal effect. Bougueranormaly correction was used for eliminate the tidal effect from the gravity measurements by computing the mass variation due to tide. Finally, after correcting for the drift correction, a good correlation between observed gravity measurements and mass variations due to tidal fluctuations was observed.

Keywords: *Gravity, Coastal areas, Tide, Bouguercorrection*

Bathymetry Mapping of Hikkaduwa Coral Reef Area using Multispectral Satellite Imagery

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Many years ago bathymetry was determined by using conventional methods that retrieved depth at a single point at one time. Later it was developed to many modern systems which can determine water depth more accurately that are high in cost. In recent years, with remote sensing data, shallow water areas up to 25m can be easily mapped. The idea behind this method is to use the reflection intensity of various wavelengths captured by satellite sensors. While coral reefs are found in Sri Lanka, reefs around Hikkaduwa are among the most diverse and accessible which have a typical fringing coral reef with a shallow crest. The study was to estimate degradation of the coral reef by bathymetry maps of the area created with Relative Water Depth Index (RWDI) model integrated in ENVI Suite Relative Water Depth Tool which is developed by Stumpf and Holderied (2003). As they do not appear actual depths (scaled from zero to one), the depths are relative, and purpose was to deliver significant information about area's bathymetry. The yield must still be calibrated to field information to assess the real depth. According to the analysis, it was evident that the coral reef has changed around 48.5% over past 25 years (1995 to 2020) due to relative significant changes of bathymetry. By summarizing real depth values, it can be analyzed that between 2002 and 2019, the coral reef debased around 5%, depending on increasing of average depth within the study area. This has led to create a new tool for the use of multispectral satellite image data to map shallow water bathymetry, referred to as satellite derivatives bathymetry. But there was no enough data available to evaluate the performance of satellite-derived models. And with lack of high resolution and undisturbed (i.e., without cloud disturbances) multispectral satellite imageries, it limits the derivation of bathymetry data.

Keywords: *Bathymetry, Coral reef, Multispectral, Remote sensing, Shallow water*

Intellectual Capital on Financial Performance: Evidence from the Insurance Industry in Sri Lanka

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Intellectual capital is considered as an important asset for an organization to achieve its competitive advantage and sustainable corporate performance. However, these assets are not recognized in the financial statement of an organization. This study emphasized the importance of modified intellectual capital on the financial performance of insurance companies in Sri Lanka. Thus, the main objective of this study was to identify the impact of modified value-added intellectual capital on the financial performance of the insurance industry in Sri Lanka. Data was collected from the audited annual reports of seven insurance companies within the period of 2011-2018. Return on asset was calculated to measure the financial performance and also the Modified Value-added Intellectual Capital Method (MVAIC) was used to measure the intellectual capital of the insurance companies in Sri Lanka. The study employed, panel data regression analysis as the main analytical method to achieve the objective of the study. Accordingly, the findings revealed that the components of the MVAIC such as human capital efficiency, structural capital efficiency, relational capital efficiency and capital employee efficiency have a positive and significant impact on the financial performance of the insurance industry in Sri Lanka. Finally, the study came into the conclusion that intellectual capital has a significant and a positive impact on financial performance of the Sri Lankan insurance industry. Further, these findings will enable the knowledge management in the insurance industry in Sri Lanka and will guide them the accurate way of investing on the intellectual capital.

Keywords: *Financial performance, Insurance Industry. Intellectual capital*

Perceived Reasons and Consequences of Workplace Ostracism: Victims' Perspectives

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In recent years there is considerable attention on inclusion among researchers and practitioners. However, exclusion takes place in different forms in organizations. Workplace Ostracism (WO), which denotes 'an employee's perception of being ignored or excluded by another employee or group of employees is a way that has threatened the practice of inclusion in organizations. Although WO's existence in the Sri Lankan context has been proven through some preliminary investigations, it is a heretofore under-investigated phenomenon in Sri Lanka. In this backdrop, the present study aimed to explore the perceived reasons and consequences of WO from the victim's perspective. Following the qualitative research methodology, ten semi-structured, in-depth interviews were conducted among professional employees working in private and government sectors. Participants were selected purposively based on their experiences of WO. After transcribing the interviews, we carried out initial coding and categorizing based on the prior studies and Organizational Behaviour (OB) models. Our findings report that the professional employees perceive that perpetrator related reasons such as misperception, prejudice, and desire to dominate as the reasons for the perpetrators to engage in WO. Also, organizational related reasons such as informal cliques, weak organizational processes and practices, competitive work setting were perceived to be the reasons for WO. Further, our study found several psychological consequences of WO, which vary from highly negative to low negative in nature. Our study contributed to the literature by expanding the knowledge on the perceived reasons for WO and the consequences of WO in a novel and collectivist context, Sri Lanka. The adverse outcomes of WO imply to practitioners that the WO is a malicious behavior, which needs to be mitigated to make organizations more inclusive.

Keywords: *Inclusion, Sri Lanka, Workplace ostracism*

Impact of Financial Literacy on Individual Savings Behavior: Evidence from the Western Province in Sri Lanka

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Even though, Sri Lanka is a developing country, educational statistics depict that primary, secondary and tertiary school enrolments are significantly greater than most of the other developing countries in the world. Meanwhile, the saving ratio of the country shows a downward trend over the years. Thus, the positive relationship expected between financial literacy and savings might not stand in the Sri Lankan context. This may be due to the lack of intention to savings. Therefore, this study investigated the relationship between financial literacy and individual savings behavior in the Sri Lankan context by considering the mediation effect of intention to saving. The research was conducted using primary data, collected via a structured questionnaire distributed among 206 respondents who are executive level employees both from government and private sector organizations. A Structural Equations Model (SEM) was used when analyzing the hypothesized mediation effect. The result of the study reported that there is a direct positive relationship between financial literacy and individual saving behavior while intention to saving is a positively significant mediator in the above relationship. Thus, findings of the study further confirm that financial literacy creates an intention to saving, which eventually leads to a higher saving ratio.

Keywords: *Financial literacy, Intention to saving, Saving behavior, Structural equations model*

The Study on Greening Event Management Practices of Meeting, Incentive, Conference, and Exhibition (MICE) Organizations in Sri Lanka

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The event industry is one of the most rapidly expanding service industries in Sri Lanka. The meeting, incentive, conference, and exhibition events are important components in the event industry. It has become popular with its growth and expansion within the country as it generates more benefits to the economy. The MICE industry creates a negative impact on the environment. Therefore, it should be an increased number of green practices that help to minimize the negative environmental impacts. This study aims to investigate the awareness of green events management practices, MICE organizations in Sri Lanka. The objectives of the study are to identify the current greening practices, to identify the obstacles associated with implementing green practices, and to identify the factors that affect to improve the green practices of the MICE industry in Sri Lanka. The study was based on a qualitative research approach and open-ended questionnaires were used to collect data. These were sent to MICE organizations in the format of Google forms. Fifteen out of twenty respondents answered the questionnaire that has the membership of the Sri Lanka Association of Professional Conference, Exhibition and Event Organizers. The results reveal that waste management, energy efficiency techniques, and biodiversity protection techniques as current greening practices implemented by companies. The mentality of clients, lack of infrastructure facilities, cost, lack of technology, and lack of government support are the obstacles associated with implementing green practices. Further, this study found that marketing advantage, positive reputation, social and environmental benefits as the pros of the company. Education and changing the mind of clients, development of technology, and government support are the factors that influence the improvement of greening practices in the MICE industry in Sri Lanka. Finally, the researcher recommended that significant changes in client mentality and introduction of new technology related to green initiatives can increase the demand for green events in the future.

Keywords: *Green practices, MICE (Meeting, Incentive, Conference, and Exhibition) industry, Sustainability*

Quantification of Lifecycle Impact of Secondary Packaging: An Empirical Study with Special Reference to Milk Powder Carton in Colombo District, Sri Lanka

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In the recent past, packaging is considered as one of the most vital functions in the product distribution owing to the worldwide customer base and product security. Nonetheless, augmented packaging, packaging only for marketing; most of the time, the secondary packaging fetches numerous embedded negative issues especially in terms of environment throughout its life cycle; from raw material extraction to disposal stage. Identifying and quantifying such alarms would rope in mitigating the impacts in a significant proportion. Life Cycle Assessment is one of the best tools for achieving this purpose and in attaining defined intentions in this study. The main objective of the study is to quantify the adverse environmental impact of the 400g full cream milk powder carton throughout its lifecycle in the Sri Lankan context. Apart from that, the study compared the environmental impact of the end disposal scenarios with landfilling and recycling and quantifying the monetary saving that goes parallel with environmental saving; it further engaged focusing on the avoidance of the secondary packaging with reference to milk powder carton. A cradle to grave analysis was carried out with the declared unit of one milk powder carton which is 30g of weight. Questionnaires, databases, interviews, literature reviews were useful in data collection for accomplishing the defined objectives. The methodology has followed ISO 14040 and ISO 14044.The SimaPro faculty version was used as the tool for analyzing the life cycle impact and ReCiPe 2016 is the characterization model used for generating midpoint impact categories and endpoint damage categories. The resulted major characterized figures are 0.431 kg1,4-DCB for terrestrial ecotoxicity, 0.417 kg 1,4-DCB for human non-carcinogenic toxicity, 0.146 kg CO2eq for global warming, 0.053m2a crop eq for land use and 0.036 kg oil eq for fossil resource scarcity per milk powder carton. From two disposal scenarios considered, recycling and landfilling results suggest that proper recycling would reduce the damage on the environment in a considerable proportion. If milk powder secondary packaging are eliminated from Sri Lanka, the resulting characterized the end point damage savings as 93.57 DALY (human health), 1,839,960 USD 2013 (resources) and 0.205 species yr (ecosystems). In monetary terms, a consumer saves Rs. 1.5 billion and manufacturers can have a cost reduction of Rs. 1.2 billion annually. Considering the results, it is recommended to follow proper recycling as end-of-life treatment and practicing a minimalist approach with possible products is the best way to minimize the total impact. As per the further recommendations for research it is suggested to quantify the direct and indirect benefit that a manufacturer and a consumer receive by practicing minimal secondary packaging for products.

Keywords: *Life cycle assessment, Milk powder carton, ReCiPe characterization model, Secondary packaging,*

Impact of Tourism on the Lifestyle of the Kaffir Community in Sirambiadiya Village

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Sri Lankan culture has been a major attraction to the tourists who visit Sri Lanka. Sometimes, culture is also the main identity of a community. Ceylon Kaffir community is also a group of people with a unique cultural heritage and an identity. They are a modern-day community who are descending from the African people brought by the Portuguese. Today most of these Kaffir live in Sirambiadiya village. Among the heritage values they were endowed from their homeland, art is the only legacy that is remaining today. Today, many tourists visit here to experience the Kaffir culture in their village based on the Ceylon African Manja Group. Similar to how other cultural contexts were approached, tourist industry approached the Ceylon Kaffir culture as well, some time ago and was an influence in changing their lifestyles. The purpose of this research is to study how tourism affected their lifestyle. A qualitative research design was used to advance this research study. The data were gathered through interviews with Seven Ceylon kaffir people in Sirambiadiya, using the convenient sampling techniques. These data were then categorized under four parental themes. Those themes were life before tourism, involvement in tourism, life with tourism, and tourism in Sirambiadiya. Those themes were identified using a thematic analysis. Findings show that their past lives were difficult in comparison to what they are today and that they used their art to temporarily escape from their oppressive lives. Although many of them were employed in the government sector, in the past, they have been persecuted on many occasions due to past life story related to slavery. They turned to the tourism industry to preserve their traditional art. In doing so, the communities have been advised and guided by tourism experts. Their communities have had different opinions about tourism at the beginning. Although their art has been a tourist attraction, they have had issues about controlling tourist arrivals and inequality of the income distribution. However, with tourism they exposed their culture to outside and they could build new positive relationships with other cultures as they happily interacted with tourists. They all have ideas to develop the tourism in Sirambiadiya but there is lack of assurance as to whether the new generation will continue to engage in tourism. According to the results, tourism has affected positively as well as negatively over the lifestyle of the Kaffir community. The finding of this study can be applied to develop tourism in Sirambiadiya village while protecting the Ceylon Kaffir tradition by addressing the problems and issues faced by the community.

Keywords: *Cultural tourism, Ceylon Kaffir, Sirambiadiya, Tourism and lifestyle*

The Impact of Characteristics of Instagram Influencers on Customers' Purchase Intention towards Fashionable Clothing in Sri Lanka

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Instagram is a visual-based social media platform and currently people tend to purchase through Instagram. Fashionable clothing is a significant sector in Sri Lanka which is active on Instagram as well. While the global fashionable clothing companies have gained success through the influencer marketing concept and through influencers on Instagram, the performances of the Sri Lankan fashionable clothing sector on Instagram are not up to the standard with that of traditional promotions. Hence, the purpose of this research is to identify the impact of the characteristics of Instagram influencers on the customers' fashionable clothing purchase intention in Sri Lanka. The study observed the impact of trustworthiness, expertise, and attractiveness on customers' fashionable clothing purchase intention. This is a quantitative study and structured questionnaires were distributed among 384 female Instagram users who are following at least one fashion clothing influencer in Sri Lanka using the snowball sampling method. The findings elaborated that trustworthiness and expertise have a positive impact on the customers' fashionable clothing purchase intention while attractiveness negatively impacts on customers' fashionable clothing purchase intention. Trustworthiness has been identified as the most influential factor in this regard. Due to the lack of effectiveness of the traditional media, the study has identified the impact of Instagram influencers' trustworthiness and expertise on customers' purchase intention to uplift fashionable clothing companies' performances. The study emphasized that it is necessary to identify and engage with the Instagram influencers who have reliable personalities, experience and knowledge in the field of fashionable clothing such as micro-celebrities and fashion designers to increase customers' purchase intention towards fashionable clothing in Sri Lanka.

Keywords: *Fashionable clothing, Instagram influencers, Purchase intention*

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