



**CINEC**  
**CAMPUS**  
*Beyond A Graduate*

# SYMPOSIUM PROCEEDINGS



Faculty of Engineering | Faculty of Health Sciences | Faculty of Humanities | Faculty of Management  
& Technology & Education & Social Sciences

## CINEC STUDENT RESEARCH SYMPOSIUM 2020

On 27<sup>th</sup> November 2020

Virtual symposium

# **Symposium Proceedings on Engineering/ Health Sciences/ Education and Language/ Management and Social Sciences**

**CINEC Student Research  
Symposium  
2020**

**On 27<sup>th</sup> November 2020**

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## Introduction

The CINEC Student Research Symposium 2020 (CSRS 2020) is the first ever research symposium organized by the CINEC Campus. The symposium was organized by the Faculty of Engineering and Technology together with the Faculty of Health Sciences. The symposium was originally planned to be held at CINEC auditorium as a face to face symposium, but due to the prevailing COVID-19 pandemic situation the symposium was decided to be taken on a virtual platform prioritizing our presenters' safety. The main scope of the symposium is to create opportunities for young researchers to interact with senior scientists, leading professionals and fellow researchers in their disciplines to discuss their innovative ideas, exchange knowledge, strengthening professionalism and broadening networking opportunities.

The keynote address on “Natural Science Vs Artificial Science” was delivered by Prof. Rangika Halwathura, an outstanding academic professional from the University of Moratuwa, Sri Lanka who can be considered as an inspiration for the young researchers. Moreover, a pre-symposium workshop was held on 29<sup>th</sup> of September by Prof. Veranja Karunaratne, the Consultant of Academic Affairs and Research of the CINEC Campus and a Webinar was conducted on 30<sup>th</sup> of July by Dr. Ashani Ranatunga, a Senior Lecturer of University of Moratuwa.

Symposium includes 14 technical tracks in the disciplines of Engineering, Health Sciences, Management & Social Sciences and Humanities. Over 100 technical abstracts were received from students of the CINEC Campus, fellow academic institutions and state universities. About 70 abstracts were selected for oral and poster presentations. The accepted abstracts have been published in the proceedings of the CINEC Students Research Symposium 2020.

## Message from the President, CINEC Campus



It gives me great pleasure to write a few words on the occasion of the CINEC Campus undergraduate research symposium to be held on the 27th of November 2020. CINEC Campus initiated programs to foster research among the Faculty and Students and this year's symposium is a stepping-stone in achieving this goal. Through their undergraduate courses, students discuss and critique research findings in their chosen field. On the other hand, students when involved in research-based learning would learn more and better. Here the students would move from users of knowledge to producers of knowledge. Gradually as they approach the final year, the emphasis is on engaging in Faculty designed and led research or research based on their ideas. The main purpose here is that students enhance evidence-based knowledge through research. This hands-on experience will make them fully understand how learning becomes holistic as they become knowledge generators.

The research work carried out by the students would become invaluable to them as they search for internships and employment. In this increasingly competitive job market, employers are looking for students who possess not only academic excellence but also for their ability to solve problems. Therefore, this research symposium no doubt will enhance the employability of CINEC graduates.

During the coming months, CINEC Campus will establish a dedicated office for research which will further enhance and enable research.

I wish your deliberation during this research symposium a great success.

**Capt. Ajith Peiris**  
**President**  
**CINEC Campus**

## Message from the Consultant of Academic Affairs and Research



I am pleased and honoured to convey this message to the CINEC Campus undergraduate research symposium 2020. Research is an important human activity which we as humans have carried out as far back as when we were hunter gatherers. Research allowed them to leave their caves and make possible the agricultural revolution which led to the modern human civilisation. According to the Organisation for Economic Co-operation and Development, research is "any creative systematic activity undertaken in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this knowledge to devise new application".

Scientific research provides scientific information and theories to explain natural phenomena. Research makes practical applications for the advancement of humanity possible. Moreover, scientific research is a widely used for judging the standing of an academic institution and I have no doubt that this symposium would become a forerunner to CINEC Campus becoming a research enabled higher educational institute. I hope that this symposium will allow the participants a productive discussion not only in acquiring excellence in research but also to engender curiosity. I know that the success of this activity depends eventually on the many people who have been a part of this symposium, in planning and organizing. A big accolade goes out to the organizing committee for making this symposium possible. In addition, I am gratified by the support given by the President of CINEC Campus Capt. Ajith Peiris in making research a part of its culture. No doubt, the Deans, have a very clear wish to upgrade research in the community of the CINEC Campus.

A special note of appreciation goes to the academic staff members for their thorough and timely reviewing of the papers. Most of all, I thank you, the presenters, and participants, for elevating the symposium by your participation.

I hope you will enjoy the proceedings, rekindle old friendships, make new fellowships, acquire new ideas, and above all, enhance your knowledge.

**Prof. Veranja Karunaratne**  
**Consultant of Academic Affairs and Research**  
**CINEC Campus**

## Message from the Keynote Speaker



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 the 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 recent past. Nature has started responding and that will hint us to recheck our actions. It was well known that any civilization cannot exist without novelty. However, if that goes against the nature and natural justice, a reversal of 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. Nothing has no meaning unless human factor is added into it and except, we move from auto mode to human mode this so-called development ends with a disruption.

**Prof. Rangika Halwathura**

**University of Moratuwa**

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**Mr. Lasantha Basnayake**

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# Abstracts

# Engineering

## Track 1A

ET-65

## Evaluation of Pedestrian Normal Walking Speed on Sidewalks in Galle, Sri Lanka

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**Abstract:** Pedestrian walking speed is important to the transportation engineering designs and sidewalk is also important part of urban walking traffic system. This study focused on evaluation of pedestrian normal walking speed on sidewalks. Pedestrian walking speed on sidewalk is has a significantly impact on transportation system. In Sri Lanka, the traffic signal designs had been designed based on foreign manuals. Therefore, the pedestrian normal walking speed on sidewalk study is useful in our country order to improve the local traffic signal systems. In this study, we analyze that the pedestrian normal walking speed effect by age and gender. The main objective of the study is to evaluate of pedestrian normal walking speed on sidewalks in Sri Lanka and also determine the effect of age and gender. In this study, older pedestrians were defined as those who 60 years of age or over that and also younger pedestrians were defined as less than 60 years of age (15-59 years of age). For data collection process each sidewalk was limited to consider appropriately length distance for this study. Each sidewalk was temporarily defined and marked some of points. In this study pedestrian walking times were recorded by using a camera. The final video footages were broken into frames by using video editing software and analyze the data of the pedestrian normal walking speed on sidewalks. This research found that the mean normal walking speed of male and female pedestrians are 1.11 m/s and 1.07 m/s, respectively. The mean normal walking speed of younger pedestrians and older pedestrians are 1.21 m/s and 0.97 m/s, respectively. So, the signal timing design will be designed to consider pedestrians normal walking speeds as well.

**Keywords:** *Walking speed, Pedestrians, Pedestrians behavior, Sidewalks speed*

## An Investigation into Stability of Landslide Prone Slope in Peradeniya

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**Abstract:** In tropical countries such as Sri Lanka, slope failures are often triggered by rainfall. The effect of rainfall can lead to different failure mechanisms such as loss of suction, development of perched water table, rise of ground water table and seepage erosion. These landslides are particularly threatening to the people in central hills of Sri Lanka and several adjoining districts. Therefore, identification of slopes with critical conditions, taking preventive measures, devising monitoring programs and establishing warning systems can definitely reduce the risk possible hazards. This particular study was conducted on a slope which was failed in Peradeniya town, Sri Lanka. Slope stability analysis for this was carried out using student version of Geo Studio 2020 software package. Slope geometry, soil/bedrock profile, ground water conditions were modeled using the data acquired from National Building and Research Organization. Only saturated conditions were modeled in this analysis and factor of safety of the slope has been analyzed using Bishop's method under varying ground water levels. As the outcome of the study, the critical ground water levels for the slope were identified. This outcome suggest that close monitoring of ground water level is of extreme importance. Also, the critical section of the slope which may require improvements, were determined and recommendations for such improvements have been presented in this study. In addition, approximated sliding volumes in an event of failure was determined in order to visualize the possible damage. These outcomes suggest that careful monitoring, prioritizing necessary improvements of the slope and establishment of warning mechanism is imperative to minimize the risk.

**Keywords:** *Landslides, Ground water, Factor of safety*

## Study of the Shaft Friction on Bored Piles on a Selected Pile Using Finite Element Simulation

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**Abstract:** Before starting any construction project, it is a must to do a proper site investigation to have an economical and a safe design. By having this site investigation report, it allows the client and the contractor to identify the sub soil profiles, and more importantly it allows the design engineers to see a clear picture about the project, such as whether the site is suitable for the project or not and the problems may arise in future. Then it will allow the design engineers to have an economical and safe design. Depending on the type of the construction which will be carried out, it must be decided the number of boreholes to be carried out and the locations of the boreholes to be tested. During last few decades a rapid development of the construction industry has taken place within the western province of Sri Lanka and specially within Colombo district, the heart of the economy of the country. most of them are high-rise structures such as multi storey buildings. Majority of those structures are constructed on pile foundations since there has a shallow bed rock in most areas of the country. Testing of piles is a must, to check the suitability of the pile for the given project. But conducting pile tests and interpretation of test data is not an easy task. Since there has many numerical simulation methods such as finite element methods (FEM) and software available, it will be beneficial to use them to predict the pile behavior. The main aim of this research is to study and compare skin friction distribution along pile shaft using numerical simulation and bored pile test results. For that a selected pile in Wellawatta area was modelled using PLAXIS 2D and compared test results with the PDA results done for a test pile on the same construction site. According to the FEM results, it shown that skin friction results obtained from numerical simulation method almost compatible with the PDA test results. Soil properties were calculated using borehole investigation data done for the same site by KD piling (pvt) ltd. Shear strength and compressibility properties of the soil were calculated using energy correction method. Rock shear strength and compressibility properties were calculated using Hong Kong geo guidelines and Hoek and Brown failure criterion and used as the input data in PLAXIS 2D. At the end it was evident that the Finite element simulation using PLAXIS 2D can use to predict the skin friction of the soils.

**Keywords:** *Site Investigation, Pile Dynamic Analyzer, PLAXIS 2D, Bore Hole, Finite Element Simulation, Hong Kong Geo guideline*

ET-79

## Awareness of Climate Change Pattern among the Community of Bopitiya Coastline, Gampaha

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**Abstract:** Coastal hazards can be identified as one of the frequent threats reported throughout the last two decades in Sri Lanka. Sri Lankan coastline is threatened under climate change because of factors linked to the vulnerability of society and the sensitivity of the environment. This study aims to investigate the community awareness towards coastal changes of Bopitiya (Wattala pradeshiya sabha, Sri Lanka) and to measure the chronological changes to the coastline. A remote sensing tool (Google Earth Satellite images) and field observations are the main methods to measure the coastline changes while questionnaire surveys were carried out to check the community awareness. Questionnaire primarily focuses on the impact of coastal hazards on community lifestyle, past experiences of severe hazards, involvement of local and government authorities, and community suggestions on preparedness against coastal changes. Coastal erosion has become a serious threat for this attractive coastal area and the artificial structures built along the coastline have highly damaged to the typical conditions of the coastal environment in this area. Results extracted an average rate of -13.14m in change of shoreline displacement. Authorities and Government have taken multiple options to prevent this damage occurred with the tidal pressure which was increased after the construction of Port city Colombo project in 2014. Community responses revealed the adverse impacts happen with the unsuccessful structural solutions provided by authorities which have become an extra damage to the livelihood of the coastal residents. Questionnaire survey extracted the general problem as the main Groin which was built in 2018 as a prevention method for tidal pressure which leaded to increase coastal erosion by damaging the natural coastline. Finally, the gathered data and resources from this case study concluded the threats to the community in the above area and methods they need from authorities and governments to remediate damages from coastal hazards.

**Keywords:** *Climate Change, Coastal hazard,; Community awareness towards coastal changes, Community response, Coastal hazards*

## Track 2

ET-69

## Usability of Soil Mixed Bentonite as a Replacement of High Plasticity Clay in Irrigation Structures

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**Abstract:** Currently, it is impossible to find sufficient high plastic clay soil in Jaffna to construct an Earth dam for clean water storages. The aim of this research was to check if bentonite can be used with low plasticity clay (and clayey sand) in Jaffna to obtain the properties of high plastic clay. Jaffna soil mixed with bentonite was tested for use as an impermeable core layer in earth dams replacing high plastic clay. Due to complications in the site investigation, the structure was changed to an impermeable layer (bentonite soil mix) on the tank surface. Bentonite and soil are the main materials because bentonite is a well-known water proofing material with low permeability and is more economical. Soil was chosen because it is a common backfill material used at sites, easy to find and less expensive. In the past, soil/sand mixed bentonite was successfully used to reach low permeability. However, there were reasons for these to fail as well. The objectives were to analyse the properties of high plastic clay and compare with bentonite sand mix and compare with results from the methodology including tests in conformance to relevant standards. Particle size distribution, Atterberg limits test, compaction test and permeability tests (falling head test) were conducted. Soil samples from Jaffna were used for testing with 0%, 5%, 10%, 20%, 30% and 40% bentonite. The results were compared with high plastic clay from the control sample (Kudawillachchiya sample – a high plastic clay with similar properties to impervious material with permeability 10-8cm/s usually used in earth dams). 10% bentonite showed the possibility to convert low plasticity clay to high plastic clay. However, 20% bentonite was able to provide a permeability lower than 10-8cm/s. This was concluded because the water did not seep through the sample even though it passed through the control sample which had a permeability of 10-8cm/s. Further, 20% can convert low plasticity and clayey sand to high plasticity clay (Liquid limit and Plastic Limit reached the range of typical high plastic range). Hence, the aim and objectives of the research were acquired.

**Keywords:** *Soil Mixed Bentonite, high plastic clay, low plastic clay, earth dam, low permeability*

## An Assessment of Compressed Stabilized Earth Bricks as an Alternative to Conventional Burnt Bricks

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**Abstract:** Due to extensive availability of raw materials and reasonably low-cost manufacturing process, use of burnt bricks as a building material is widely accepted in local construction industry. Meantime it is also known that conventional burnt bricks causes serious damage to the environment by emitting a large amount of toxic gases as well as consuming extensive amount of firewood in the manufacturing process.

Furthermore, conventional brick masonry requires additional improvements to maintain its' aesthetic value such as plastering and painting. In recent past, engineers and researchers have inspired to explore alternatives to conventional burnt bricks which could reduce the impact on environment and also improve the convenience and economy in construction applications. Over the past few of decades the use of compressed stabilized earth bricks (CSEB) has been noticeably increased around the world as a replacement conventional burnt brick. Aim of this research is to assess the suitability of CSEB in comparison to conventional burnt bricks using strength, environmental impact, and economy in construction applications as key indicators. Compressive strength test was conducted on samples of both CSEB and conventional bricks to compare the strength. The average compressive strength of CSEB shown 2.67N/mm<sup>2</sup> while a higher value of 4.41N/mm<sup>2</sup> was achieved for conventional bricks. Even though the average compressive strength of CSEB is considerably lower than the conventional bricks, it has been able to reach acceptable value of 2.2N/mm<sup>2</sup> according to National Engineering Research and Development center of Sri Lanka. A questionnaire survey was conducted among all relevant parties such as clients, engineers, quantity surveyors, contractors, brick manufacturers and CSEB manufacturers. The questions were compiled to mainly evaluate respondent's opinion on the suitability in construction applications, economy, and environmental impact in both qualitative and quantitative manner. From the questionnaire's responses it was determined that CSEB contributes to environmental impact, more economical and exhibits higher aesthetic value than conventional burnt bricks. To evaluate the economy in construction applications, cost comparison was carried out for two identical wall panels made of both CSEB & conventional bricks. From the cost comparison, it was evident that the use of CSEB is far more economical as the total cost of CSEB wall panel amounts to almost half of the total cost of conventional burnt bricks.

**Keywords:** *Compressed stabilized earth bricks, Conventional burnt bricks*

## Analyzing the Effect of Waste High-Density Polyethylene(HDPE) Plastic as Partial Replacement for Coarse Aggregate in Concrete

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**Abstract:** The plastic industry is one of the fastest-growing industries and currently various types of plastic are used around the world. HDPE, it exists one- third of all production worldwide. HDPE is proof against many various solvents and it's well known for its high strength to density magnitude relation. The application of HDPE plastic is industrial products, piping for fluid, fluid containers, and building materials. It exposed that thousands of years are necessary for the biodegradation of plastic. Therefore, finding a nature-friendly methodology of disposal is important. Concrete is the most commonly used construction material in and around the earth nowadays. According to this situation, the disposal problem of plastic waste its usefulness in concrete. Application of waste HDPE plastic is a solution to reduce the disposal problems of plastic as much as possible by reusing the recycled plastic in concrete. In the manufacture of concrete, waste plastics of different types may be used as partial substitutes of aggregates (Mostafizur et al., 2012). Expanded polystyrene (EPS)-based waste, high-density polyethylene (HDPE), polyethylene terephthalate (PET) waste bottles, polypropylene fibers, and polyethylene bags were all used by concrete researchers in various types. The aim of this analysis is to find an optimum mixed proportion of plastic waste as coarse aggregate of concrete. This study explores the possibility of using High-Density Polyethylene (HDPE) waste as a partial substitute for coarse aggregate in concrete formulation for different plastic compositions (0%, 10%, 40% and 70% coarse aggregate by volume). The Workability test and Compressive strength test for the plastic aggregates were performed. The effect of the HDPE waste on the concrete's fresh and hardened state properties, workability, compressive strength, and weight was invaluable. For compressive strength and workability checks, twelve cubes will be cast. For the compression test on the 7th ,14th and 28th regular, standard 150 mm concrete cubes will be cast & cured. The results show that the weight and strength of concrete decreased with the amount of waste HDPE plastic percentage increased. Concrete compressive strength in increased waste inclusion of is observed up to 10% After the compressive strength is reduced. Workability is decreased by an increase in the amount of waste HDPE plastic. Based on these results, waste HDPE plastic in the production of both light and structural concrete can partially replace conventional aggregates.

**Keywords:** *Waste HDPE, Coarse Aggregate, Compressive Strength, Workability, Superplasticizer*

## A Study into Suitability of Asphalt Aggregates in Concrete Paving Block Production

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**Abstract:** Demand for structurally sound, economically viable and aesthetically pleasing concrete paving blocks have been consistently growing throughout the past couple of decades. Therefore, it is imperative to come up with a suitable mix design which attain those characteristics as much as possible. The fine and coarse aggregates used in paving block manufacturing are prepared specifically for that purpose. If aggregates used in any other purpose can be adapted to serve the requirements of concrete paving block manufacturing, efficiency and economy of the production process can be certainly improved. The aim of this study was to investigate suitability of aggregate products from asphalt industry in fabrication of concrete paving blocks while understanding the effect of aggregate sizes on strength and appearance of concrete paving blocks. The main contrast in aggregates produced for paving blocks and asphalt, is the size difference of fine aggregates. For existing mix design of paving blocks, fine aggregate size range of 0-5mm being used while in asphalt production it is being produced in the range of 0-6mm. In order to replace 0-5mm conventional aggregates of existing design with 0-6mm asphalt aggregates, two different approaches have been employed in this study. Two mix designs; A & B employed for strength class C (25N/mm<sup>2</sup>) paving blocks based on matching surface area index (design A) and particle size distribution (design B) of total aggregate mix of the existing design and the proposed design. Compressive strength and the overall appearance of the paving blocks were used as the main indicators of the study. Compressive strength of both designs were shown almost similar results for 7, & 14 days. However, design A shown a higher 28 day compressive strength than design B. Both, design A & design B have achieved a higher average compressive strength (larger than 40N/mm<sup>2</sup>) than the existing paving block design. When it comes to the overall appearance, design B exhibited better results as it contains less cavities in final product compared to design A and even manifest similar appearance to existing design. By taking these results in to account it was concluded that the design B can be successfully adopted in order to use asphalt aggregates in the production of concrete paving blocks.

**Keywords:** *Paving blocks, Asphalt aggregates, Particle size distribution, Surface area index*

ET-72

## Investigation on Mechanical Characteristics of Fiber Reinforced Concrete Repair Grouts

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**Abstract:** The idea of reusing materials has become a major concern as the production rate is increasing in many industrial sectors. When it comes to the civil engineering industry, Carbon Fiber Reinforced Polymer (CFRP) usage is commonly seen, as it is beneficial for post and pre-strengthening of structures. CFRP is available in the industry in different formations such as CFRP fabrics, strips and rods. Depending on the purpose of usage, the type of CFRP can be selected. The generation of CFRP fiber waste during such construction processes has now drawn attention because, the waste is non-degradable and hazardous. Therefore, it is high time to introduce a proper way to dispose the fiber wastes. The most ideal way of disposing the CFRP fiber waste is to use the beneficial characteristics of it in another material while saving the use of resources, money and time. Therefore, using CFRP fiber in the process of developing an innovative in-situ concrete grout can be suggested as a sustainable way of fiber waste disposal. Preparing an in-situ grout by using waste CFRP is economically and environmentally beneficial. In this study, the aim is to prepare an innovative fiber reinforced concrete repair grout and investigate for mechanical properties awhile evaluating the economic and environmental benefits. Since that time now the world is moving towards a sustainable future for the building industry, this approach would be quite convenient. The study presents the impact from CFRP percentage (%) on the concrete performance in compression, tension and the workability of concrete. Compressive strength test, tensile strength test and workability test will be conducted for this innovative grout. Further, the grout will be made with different percentages of CFRP fiber fabric and silica fume to enhance the mechanical characteristics.

**Keywords:** *Grout, CFRP, Economic, Environmental*

## Track 3

*ET-ET-38***Smart Doormat for Home Automation**

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**Abstract:** Home Automation's rapid growth over the past decade highlights the growing demand for intelligent devices to provide convenience and peace of mind at home. As doormats are universal in houses, research was conducted to explore the viability of a smart mat as a home automation device. Preliminary research showed that previous attempts at smart door mats were unsuccessful. This was due to the mats being weight-based and wired which were noted to be inconvenient and unreliable in use. The primary focus of the research was data-gathering and determining entries and exits of persons through the footsteps on a contact-based mat. This would be used for automatic room light control upon entries and exits. A sensor matrix was developed to be placed inside the mat along with a microcontroller for real-time data processing and a Bluetooth chip for wireless communication. The sensor matrix contained a matrix of contact sensors consisting of rubber dome switches. Our research revealed entries and exits were differentiable by the order and pattern of sensor activations and algorithms were written to do so. The size of the contact sensor chosen (50x50mm) was determined by a survey conducted on adult foot-sizes. This sensor size allowed for clear identification of footsteps and distinction between heels and toes within steps. A 1:10 prototype was designed and developed to test the working principle and algorithm. Upon its success and material testing, a standard 100x60cm rubber mat was developed with a 12x8 sensor matrix underneath. In testing and data collection, the mat was deemed successful in differentiating entries and exits irrespective of footwear with a success rate of over 90%. It was concluded that contact-based wireless smart mats would be viable as home automation devices. This was the first instance that a contact-based smart mat was used in this application.

**Keywords:** *home automation, mat, smart, sensor, contact*

ET-ET-39

## Autonomous Delivery Multirotor UAV using GPS

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**Abstract:** Drone technology is currently used for different purposes and it is imposing significant change in present society because of its features. Drones are used as a vehicle for obtaining delivery purposes efficiently. Ability to use easily, high efficiency, less time, low cost, less manpower and able to reach any place are main advantages compared to manual delivery process. Delivery drones currently deliver parcels to the ground and quickly go to the start point. Therefore, there are few problems caused due to this process. They are, the delivered place is suitable or not, ability to damage the parcel and the important thing is the parcel is received by the relevant person. In this research, parcel is released by maintaining a predefined height and releasing process is over within 10s. Designing a control system for drone using Simulink, connecting GPS to drone, creating a gripper using Solidworks, connecting it to drone and checking the releasing process with conditions are the objectives of research. Gripper was designed using Solidworks and it is built with use of PLA (Polylactide) material. Simulation is based on MATLAB/Simulink. C2000 Delfino Launchpad is used as the microcontroller. Adafruit 9-DOF absolute orientation sensor is used to obtain orientation and velocities. The commands sent from the flight controller, controls 4 BLDC motors through the ESC and GPS is used for detecting delivery location. Proposed payload capacity, flight time are 136kg and 67 minutes. Releasing steps were successfully done with a 100g weight and without weight by using the Simulink model. The grand purpose of this research is to deliver parcels for customers with safety and the drone technology is exploited for transporting items efficiently. As a result of using drones, it is a solution for complex traffic congestion as decreasing vehicles. Using a quadcopter with mentioned features is significant here.

**Keywords:** *Quadcopter, Autonomous, Delivery, GPS, MATLAB/Simulink*

ET-ET-40

## Impact on Sri Lankan Hydro Energy Production Industry by Integrating Vortex Mini Hydro Power Plants

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**Abstract:** Due to the aggressively grown global energy crisis, the global focus has shifted on renewable and sustainable means of energy production. Considering the Sri Lankan economy and the power supply according to the CEB statistical report, 65% of energy production is done by non-renewable sources, specifically coal and fuel thermal power. 30% of power is produced by traditional high head HPP. As an agricultural country with numerous natural and artificial hydro sources, integrating modern SHPP could revolutionize the energy industry of Sri Lanka. This research focuses on the impact for the SL energy industry by integrating the developed SHP concept, GWVPP invented by Austrian inventor Franz Zolotterer in 2006, which utilizes hydrokinetic energy with the ultra-low head flow instead of hydro potential energy with a high head. For large/medium scale HPP has high costs in the range of 1000 – USD3500/kW and GWVPP costs approximately USD500/kW. By analyzing the data and facts from the previous works of literature regarding HPE & GWVPP, the following point was made. GWVPP required a minimum head and flow rate of 0.7m & 500l/s, with an efficiency of 43% and the optimal position for the turbine is 0.65 – 0.75 of the basin's height. The efficiency of GWVPP fluctuates in the range of 30% - 50% depending upon the size, number & the shape of the blades, the exceptional versatility in the construction process proves the high possibilities utilizing water resources in rural electrification projects. Zero CO<sub>2</sub> emission energy production, cost-effectiveness and renewability are the main factors which make GWVPP an alternative green energy production concept. Sri Lanka, an agricultural country which has more than 52.8 km<sup>3</sup> of renewable water resources can utilize the concept of GWVPP to optimize the energy production and improve the quality of life in the local community in both urban & rural communities as well.

**Keywords:** *Hydro energy, Gravitational vortex hydro power (GVHP), Low head turbine, Rural electrification, Micro hydro power (MHP), renewable energy*

ET-ET-42

## Smart Blind Stick

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**Abstract:** With the help of technological modernization, human disabilities can be neutralized by utilizing sensors and microcontrollers to comfort sightless people explore the world using a smart blind stick. The initial research was conducted by visiting a blind society in Seeduwa and a blind school in Ratmalana. Based on the list of questionnaires, about 98% of blind people prefer their stick, to be warned from being attacked, to be sturdier, to be identified by others at night and to find their stick once they drop it. The prototype was made to sense obstacles in front of them using ultrasonic sensing technology and also forewarned with vibration. In comparison with other object detecting sensors, like the Lidar sensor and the sharp IR, ultrasonic sensors have a large distance, angle range of 30 degrees that can detect anything within the perimeter and are also more cost effective. Around 80% of blind managed to walk safely from ultrasonic sensing. In case, if the stick drops, it will alert the person where it is located to easily pick it up, so that the buzzer will stop alarming, once the touch sensor has been touched. The microcontroller controls the stick according to how the sensors detect obstacles and calculates the distance, which sends data to it and alerts the blind person. For recognition, a special tape that glows in the dark was wrapped around the stick as a part of an archetype design. An experiment was investigated on blind persons' walking patterns in staircases, slopes and pedestrian crossings. Results showed that 65% was successful from the test and to conclude, the stick should be made more sensible, robust and weightless for their use. Further implementation involves GPS tracking, that allows the blind person's guardian to trace down their location in case of an emergency to avoid accidents.

**Keywords:** *Smart blind stick, Sensors, Blind person, Detect, Alert*

ET-ET-43

## Automatic Thermal Dehydrator and Compressor (ATDAC) Dumpster

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**Abstract:** With rapid growth and urbanization of the Sri Lankan population, waste generated has been rising exponentially. Statistical data from the Ministry of Environment revealed that the average waste generated in the country stands at 6 million kgs per day of which only 2.8 million kgs are collected by local authorities. This imbalance is linked to improper management, unavailability of technology and funds to dispose, sort, collect, and recycle waste. ATDAC (Automatic Thermal Dehydrator And Compressor) dumpster addresses the problem technologically by automating the process of securing and compressing of refuse for efficient storage, and by providing a decent method of waste handling and disposal for collectors by dint of dehydrating organic waste to eliminate odor by reducing moisture thereby preventing decomposition. ATDAC has 3 compartments for plastic, paper and organic waste. From the opening and closing of the dumpster lid via lift-gate struts and doppler sensor, to a built-in dehydrator-fan with a complimentary exhaust (to get rid of excess heat) in the organic waste chamber only, to temperature sensing for the dehydration process, to compression systems powered by a linear actuators in all partitions, to notifying the waste collection authorities (after the ultrasonic sensor senses that the compartments are full) via WIFI, GSM module and embedded systems on-board the dumpster, all mechanisms are automated and powered via solar panels for off-the-grid operation. The mechanical design was modelled and simulated on AutoCAD Inventor for frame stress and strain analysis under twice the realistic constant mechanical and thermal load. Structural integrity has been considered by checking margin of safety as per ASME BPVC Section VIII, Div. 1 and Factor of Safety as per ASME Section VIII-1 & VIII-2, hence concluding that the structure and its components are viable and safe for prototyping, however product should be further evaluated on before public utilization.

**Keywords:** *ATDAC dumpster; Dehydrator-fan; Off-the-grid operation; Compartments; Compression*

ET-ET-45

## Contactless Laser Dendrometer

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**Abstract:** Dendrometer is a type of device used to measure the Standing Tree Height (STH) and Standing Tree Diameter (STD). There are two different types of dendrometers, called contact and noncontact. They both accomplish the same result but have different measuring methods. Contact dendrometers are the type where the device is in contact with the tree trunk to measure while noncontact dendrometers measure by sending a laser beam. Both of the methods give the same result, but the measurement difficulty is very easy and need less training for noncontact dendrometers. These devices are widely used and important during Forest Surveys. The objective of this project was to make a handheld, cost efficient, real-time measuring, non-destructive dendrometer. The Measurement is carried by 2 scenarios, by initially measuring the STH then the STD, it is able to find the STV. The device measured by using Accelerometers, Gyroscope and Laser Distance Measuring Sensor, when measuring the height. The device will ask to point the device to the top of the Tree and press the button, then it will ask to point at the bottom of the tree, the device will automatically measure the angle between them, the device will automatically calculate the height using the Cosine rule and the Tree height is found. Likewise, to find the Tree Diameter the laser has to be pointed to the sides of the tree and the device will calculate the Tree Diameter, Later the device would calculate the Volume and can be exported to an Excel Sheet. The Sensors were calibrated, and the measurements were error corrected. For experimental approaches known lengths and diameters were measured which successfully had very low error range. Results were taken and plot on a graph, this showed that the device calibration and experiment was successful.

**Keywords:** STH (Standing Tree Height), STD (Standing Tree Diameter), STV (Standing Tree Volume)

## Track 4

*ET-ET-47***An Automated System for PCB Manufacturing**

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**Abstract:** Printed circuit boards (PCB), play a major role in the rapidly developing electronic industry as it is being utilized in electronic components vastly. However, due to the expensiveness of these circuit boards, few can easily afford them. This research discloses the evaluation of different methods of fabricating PCBS, comparison and combination of the most productive and cost-effective techniques to form a system that would automate the manual process of the build of a PCB with the combination of mechanical, electromagnetism, chemical, and electronic theories in order to make it affordable. Primarily based on the Photolithography theory. Experiments on chemical, thermal reactions and optimization has been carried out manually prior to designing the system. This system utilizes a UV exposure box (UV-Box) to transfer the circuit pattern to the board with uniform which also allow the absorption of UV rays through the material of the box. Two LED panels has been used to avoid the high cost of florescent bulb, is positioned inside the UV-box will be functioning according to the timer and the details entered through the keypad on the UV-Box by the user. A tank with four separate sections has been developed with low cost glass material for the chemical soaking and the four sections consisting of water nozzles, IR sensors, a temperature control system, and an air pump were utilized for tasks namely; to develop the UV exposed parts, to wash off the developed board, to etch the excess conductive material away and to strip the photoresist. The carrier mechanism has two main linear motions combined together to work along with two stepper motors where the horizontal movement is attained by the tread bar mechanism while vertical movement is attained by the timing belt mechanism in order to limit the unwanted expenses in the budget the motors, belts, thread bars, etc was chosen with weigh-force-speed calculations. Arduino has been employed to drive the whole system. This is a novel and optimized system where the PCB manufacturing process can be carried out effectively and efficiently. Hence this system can be utilized for industrial purposes, research purposes, etc.

**Keywords:** *Printed Circuit Boards, Automated System, PCB Manufacturing, Photolithography*

ET-ET-48

## Boxed Electric Kick Scooter

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**Abstract:** The world human population has increased so rapidly and urbanization has followed closely behind over the last few decades that today, pollution levels and the demand for fossil fuels worldwide have skyrocketed. A major contributor to both aforementioned issues, is the escalation in the number of fuel-powered vehicles globally. This is where electrically powered vehicles come into the equation. BOXED is a one-of-a-kind electric kick scooter(e-scooter) designed solely for the purpose of providing people with an affordable, fun and most importantly a much more environmentally friendly medium of transport when compared to fuel-powered vehicles. The name 'BOXED' comes from its innovative folding mechanism which allows the e-scooter to be folded down into a box shape, making it ultra-portable. The powertrain of the e-scooter is a 250W BLDC Motor, along with an ESC allowing a safe top speed of around 20kmh-1. The material used for the body is the lightweight 6061 aluminum alloy which has a high Young's modulus and good mechanical properties. The battery pack used to power the BLDC motor has an 8 series-6 parallel configuration for 48 cells in total. Type 26650 cells, each having a capacity of 2.4 Ah, are used making the total battery capacity 115Wh. Additionally, a BMS is used to optimize the working of the battery pack. This results in a range of 30km per single charge. Mini solar panels will be used to charge USB electronic devices such as smartphones. CAD Simulations done for the deck of the e-scooter using SolidWorks software showed that a maximum load of around 1500N could be withstood, which was greater than the expected 1000N. This gives a safety factor of 1.5. In conclusion, our team would like to inaugurate BOXED to the world as the first electric kick scooter to ever be designed and made in Sri Lanka.

**Keywords:** *BLDC Motor, ESC, BMS, Safety factor, CAD Simulations, Young's modulus*

ET-ET-50

## Fiber Cable Breaking Detection System

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**Abstract:** Fiber related technology can be identified as an emerging technology in the telecommunication industry. A problem that frequently arises in the telecommunication industry is the breaking of fiber lines. The fiber cables break when it exceeds 90 degrees angle as they are made out of glass or plastic. Most of the companies indicate fiber losses between the transmitting and receiving end with the use of red light. This research focuses on the detection of fiber cable breakings with the use of ultrasonic sensors that are connected to Arduino. The system detects the interactions to the fiber cables which cause the breakings and notifies the respective parties with an alarm. Also, this project implements a protection method for the scenarios where a higher number of fiber cables are laid through the ceiling. This protection method applies with the implementation of an esp 32 camera module to three areas: switch to switch fibers, through the ceiling fibers, and fiber lines through the optical network terminal (ONT). In this system, the protection for the PABX to switch is provided with the use of an ultrasonic sensor to the buzzer with the intention of notifying interactions that cause the breaking of fiber cable. The shelf fiber where the ONT is presented, is protected with the use of two buzzers connected to the sensors and the multiple fibers in the ceiling are protected with the use of six ultrasonic sensors. This novel setup can be utilized to identify the causes for the fiber cable breakings before it occurs, and it helps in notifying it to the respective parties. Hence, this novel system can be applied to the telecommunication industry where the fiber cables are utilized.

**Keywords:** *Fiber Cable Breaking, Fiber Cable Protection, Breaking Detection, Interaction Detection*

ET-ET-51

## An Automated Guided Vehicle Utilizing Visual Perception

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**Abstract:** An automated guided vehicle is a movable robot that navigates through a specified path without any human intervention. Autonomous navigation has become a reality nowadays due to fascinating technologies and has revolutionized the industries by reducing a tremendous amount of labor. This research was conducted on developing an AGV (Automated Guided Vehicle) that uses only visual perception for navigation and transports a load from one place to another. The mechanical model was designed with a length of 0.45 m and width of 0.3 m. It was built using iron box bars and sheets, consisting of a carriage to hold a load. It was a chassis with four wheels. Two wiper motors were chosen as the actuators to provide a high torque to the two rear wheels, while in front were two castor wheels. Raspberry Pi was selected as the controller for the system. For the visual navigation, stereo vision was planned to be used and image processing played the most vital part. Image processing was utilized mainly for two tasks, edge detection of the path and obstacle detection. A large track was built with taped lines, for experimenting. The AGV was expected to take photos of its forward path at a specific rate via its cameras. For all the image processing tasks the OpenCV Python interface was utilized. For obstacle detection, simple thresholding was applied. On the other hand, for edge detection, various techniques such as simple thresholding, adaptive thresholding and the Canny edge detection algorithm were used, and results were obtained. The outcome of the Canny edge algorithm did not contain any noise and detected the edges effectively, whereas other methods resulted in some noise. When comparing it with the results of the adaptive and simple thresholding methods, it could be concluded that Canny edge detection was found out as the most suitable technique for detecting edges of the path.

**Keywords:** *AGV, Image processing, Edge detection, Canny edge algorithm, OpenCV*

ET-ET-52

## Elder Care Nursing Assistance Robot

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**Abstract:** This research is about a robot designed for elders who require assistance in maintaining their health. These types of robots can help check an elders' heartbeat status, remind the time to take medicine and supply medicine for the elders according to the scheduled time. The literature review contains information regarding heart rate detector projects, medicine reminder projects and elder care robots' projects. Additionally, research on blood pressure sensing mechanisms and devices were carried out at the same time. The study of this project was focused on giving a technical solution to one of the rising problems in the world. Certain objectives were required to be fulfilled such as the robot providing highly accurate results and efficiency for the nursing staff, robot acting as a companion to elders. This is a line follower robot in which the hardware and software implementation was done based on Arduino. The testing phase consisted of 6 sections: the line follower unit, radio communication unit, heartbeat detector unit, time reminder unit, medicine supply unit and finally the entire product was tested. Each individual device was tested 4 to 6 times and the entire project was tested more than 6 times. Results for the robot were not 100% as expected but it was functional. Some proposed methods were not used. Therefore, some new features were implemented into the robot. During the testing, final observations showed that the robot travelled 10 meters within 30 seconds. This speed was applicable for a nursing assistant robot. The heart rate status per minute of a person was displayed within 30 seconds after placing his/her finger on the sensor. The time reminder was successful in notifying the user when to consume the medicine according to the set time. Afterwards, the prescribed medicine was supplied via the medicine supply unit. Finally, this robot can be potentially developed into a humanoid robot by using Artificial Intelligence. Therefore, the demand for this robot would increase due to its high efficiency in workplaces.

**Keywords:** *Heart rate, Medicine supply unit, Time reminder, Blood pressure*

ET-ET-64

## A Collision Avoidance System with Multiple Features

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**Abstract:** Safety is a very important fact when it comes to transportation. Road accidents are 94% due to human error and bad choices they make behind the wheel. Road accidents on average cause 50 million injuries and 1.2 million deaths around the world each year. These accidents can be avoided or reduce the damage that occurs if the driver has been warned half a second before a potential accident. To do this, task collision avoidance systems have been introduced. This system warns and avoids a collision from happening or it will reduce the damage to the host vehicle and passengers in it when it realizes there is a potential threat. Most sensors face various difficulties when sensing in harsh environmental conditions. This will cause the system to fail when it is needed most. Most systems have only collision warning and there is no auto braking. The work presented in this research is concentrated on a safety system that has many capabilities with good efficiency that can face harsh environmental conditions. Sensors are chosen after research as to which sensor is suitable for what purpose particularly. For example, for range and cruise control an ultrasonic sensor and a laser radar is chosen and for 3600 coverage a LIDAR sensor has been chosen as the main sensor. Lidar has a high refresh rate, within that refresh rate any obstacle cannot be missed. The system will indicate the distance for an obstacle and the RPM of the motor on a display. An alarm will turn ON when an obstacle is getting closer and closer by reducing the sounding time delay implying a risk of crashing. From this system, a relative or close person can know if an accident occurs from an SMS message with the GPS location. The system has a system check onboard itself to reduce system malfunction. This system has warning and auto braking systems altogether which provide greater results than a warning system.

**Keywords:** *RPM (Rounds per Minute), GPS (Global Positioning System), LIDAR (Light Detection And Ranging).*

## Track 5A

*ET-ME-56*

## **Improving Efficiency on Central Air Conditioning System via the Implementation of a HEAT RECOVERY System**

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**Abstract:** Efficiency in any industry is a positive approach, so improving efficiency of a central air conditioning system by the implementation of a heat recovery system may sound complex, but it is rather not. Having to introduce a new system to coexist with another system to improve on efficiency alone may sound risky however this opens another gateway. Firstly, let us understand how it works, a central air conditioning system as the name suggests consists of several parts, the chiller being the heart of the whole system is what cools it and as the basic cooling cycle will tell you that heat is a by-product created in the process. Now, it is this heat which opens another opportunity as it helps us to redirect it for another use, being a boiler. So, the thermal energy or heat is directed to a boiler via a heat recovery system, with copper pipes around the boilers calorifier fresh water in line it will increase the water temperature from 28°C up to a range of 34°C to 36°C, the result of this minor temperature increase is a major efficiency boost to the boiler. Now as for the central air conditioning system the heat transfer helps reduce the load for the chiller, this load reduction helps improve efficiency and takes stress off the system overall. Armed with improving efficient on two systems, I backed this idea up and gathered important results by looking into studies such as those by Mostafa A. Abd El-Baky and Mousa M. Mohamed, who wrote articles under the journals in which they reuse heat off the duct works in air conditioning system with a similar approach. My envision of this system is an easy installation by using existing components of the chiller, simple modifications, a smooth trouble-free and smart operations.

**Keywords:** *ACMV (Air Conditioning Mechanical Ventilation), Energy Recycling; Chiller, Heat Recovery*

ET-AM-49

## Researching ECO - Friendly Fuel for the Aviation Industries using an Automobile Turbojet Engine

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**Abstract:** The Aviation Industry produces 12% of all carbon emissions within the transport sector. Consequently, they produce up to three times as many as carbon emissions per mile than a conventional petrol car. At the present, many methods have been introduced to reduce these types of emissions as the demand for new efficient and eco-friendly fuels increase with developing technologies. There are many products and solvents in the market that could be a viable replacement for the currently used fuel, Kerosene. In this research we will be focusing on three main objectives: to find products or solvents which could be a viable replacement for Kerosene, to find which fuel produces the most energy density compared to Kerosene, and which solvent or product would produce the least greenhouse gases. In order to carry out this experiment, a working base model jet engine was built from the ground up using a turbocharger from a diesel truck. This scaled down version of a commercial jet engine was built by reverse engineering a turbocharger and creating a Silo-type Combustor externally, then, adding a fuel system for combustion and an oil system for the lubrication. Tachometer, Exhaust Gas Temperature (EGT) sensors and fuel regulators were used for data logging and controlling. In order to perform the experiment, the engine was fitted with caster wheels and placed in a lubricated surface. A newton scale was fixed to a thrust side of the engine, which was then fixed to a stationary mass. Fuel was placed in a transparent container with a scale marked for measurements. During the experiment, the engine was brought up to a certain Revolutions Per Minute (RPM) and was kept constant for a specific time period. During this time period, data was logged from the other sensors, then repeated for different RPM ranges and the whole experiment was performed again in a similar technique with different solvents. The solvents which were used for testing are Kerosene, Paint Thinner, Turpentine, Ethanol, Isopropyl alcohol, Auto Transmission Fluid (ATF), Paraffin oil, Aseton and Penetrating oil. Kerosene oil was used as the control of this experiment. The measured values were tabulated, representing a relationship in which the cleanest, efficient fuel was determined.

**Keywords:** *GreenHouse Gases, Jet Engine, Turbocharger, Silo-type Combustor, EGT Sensor, RPM, Energy Density*

## Designing and Implementing Smart E-Brake System for Formula and Road Race Cars

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**Abstract:** The number of accidents are increasing by the day, so safety is very important. The improper usage of the braking system is a major reason for an accident. The idea of this project is to improve safety parameters and implementation regarding the brake system. Increasing Driver Reaction Time (DRT) and Detecting Brake Fade (DBF) is the main objective of this project. Quick reaction of any objective Infront panic the driver at that situation, drivers fail to use brakes which leads to accidents considering (DRT). (PIR) Sensor detect the movement of the driver's feet and gives Digital signal to Arduino Mega MCU. MCU unit control the Stepper DC motor. That motor is controlling the brake pedal due to the vehicle speed and sensor's signals. By applying this system can avoid accidents easily. Brake fluid has a boiling point. When applying the brake, kinetic energy will convert to the heat energy. When heat increases it will cause a brake fade. When a system is made by using an LM 35 temperature sensor and an LCD display, it can measure the boiling temperature of the brake oil and display on the LCD. This brake system is also controlled by the MCU. This system shows the brake fade in vehicle running condition. Modern vehicles use the BBW system. When Drivers Apply force to the brake paddle, the brake ECU calibrates the Vehicle speed and the pressure of the master pump and applies the brake. This system has an advanced ABS System. All the calculations are solved under the brake Features and parameters. Aim of this paper is to decrease the road accident and prove that the systems are applicable for automotive.

**Keywords:** (DRT) Driver Reaction Time, (DBF) Detecting Brake Fade, (BBW) Brake By Wier, (ABS) Antilock Brake System, (MCU) Micro Control Unit, (ECU) Electronic Control Unit, (LCD) Liquid Crystal Display

## Track 5B

*ET-MT-53***Dynamic Modelling & Controller Design for 3DOF Quadcopter**

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**Abstract:** The simulation-based research of this paper aims to provide a comparative dynamic model for a quadcopter. It was done by deriving an accurate dynamic model of a quadcopter and developing the control algorithm for control autonomous trajectory tracking of quadcopter by using MATLAB Simulink. The quadcopter's dynamic model has a high nonlinear and time varying behavior and they are constantly affected by aerodynamic disturbances. It is recognized that quadcopters have underactuated mechanical systems and therefore quadcopter's models are subject to unmodeled dynamics and parametric uncertainties. In order to overcome the above challenges, it is required to develop control strategies for the quadcopter platform. Therefore, an advanced control strategy is required to achieve a good performance in autonomous flight with high maneuverability and robustness with respect to external disturbances. The quadcopter's dynamic model is developed via the Newton Euler System; the effects of rotor dynamic and effects of aerodynamic are comprehensively included in the mathematical model. The quadcopter action can be separated into two subcomponents, a rotational subsection and a translational subsection. While the quadcopter is a six degree of freedom device and it is underactuated. The rotational subcomponent is completely actuated while the translation subcomponent is much underactuated. The quadcopter's mathematical model is derived by the process of the creation of four control methods for monitoring the quadcopter's speed, disposition, heading, and location in space. The principal solution is focused on the Proportional-Derivative Integral (PID) linear system. The PID controller's gains were optimized using a manual PID technique to boost dynamic reaction to the systems. Simulation-based tests were performed to test and compare open loop dynamics system output, closed loop trajectory tracking device, and trajectory tracking operator with characteristics of efficiency of dynamic system, potential disruption effect and stability. Novelty of this research is to stabilize all four altitudes, attitude, heading and position controllers of closed loop dynamic systems under various tuning parameters by including a PID controller. Going from the simulation results of research, it shows that the PID controller performed much better for tracking rotational and translational movements of a quadcopter.

**Keywords:** *Quadrotor, PID controller, Dynamic model, Newton Euler System*

ET-MT-55

## Development of a Dye Dosing and Dispensing System

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**Abstract:** The research project is to determine, design, and to develop a solution to reduce the lean time of the production process. The project is highly focused on the development and implementation of a highly precise, low cost and affordable dye dosing and dispensing system with higher safety interests. The system is fully automated with the collaboration of a self-regulating weighing mechanism. The user has only to feed a sample batch and select the required recipe on HMI. The recipes have been hardcoded to the PLC controller. The system automatically calculates the dosage according to the weight. Here, the chemicals and dyes will be stored in conical shaped containers with a compressed storage design. That is to cater to a limited space allocation and easy maintenance activities. As safety precautions along with the fully automated mechanism, the whole system is fabricated using Stainless steel to avoid reactions and leakages. The cost reduction procedure is accomplished through inventing a special dispensing valve that dispenses crystals, liquids, and powders simultaneously without alterations by replacing expensive pumps and valves available in the market. The chemicals and dyes are conveyed through gravimetric dosing. Specially designed valve and load cells that are deployed inside a vacuum, participate in feedback controlling with a dedicated PCB. The feedback controlling mechanism involves achieving an accuracy of 99% in dispensing where the tolerance rate is 0% for each recipe. Dedicated PCB enables faster response of the controlling algorithm. Also, the system comprises a self-cleaning mechanism with the help of pneumatics. Analysis of previous and present process data results in the saving of 2 hours lean time; where the previous process consumes 6 hours while now it's only 4 hours; including 4 overhead savings. The key success of the project is the invention of the special vibratory capillary valve with an accuracy of 99%. Now the project is at the commercialization level at similar facilities.

**Keywords:** *Dosing system, Dispensing system, Low cost dispensing, Highly accurate dosing, Innovative dispensing, Safe dispensing and dosing*

ET-MT-59

## Soft Inflatable Manipulator

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**Abstract:** In present society, the robots are made of hard materials like metals. The soft inflatable manipulator (SIM) which has advantage of safe physical interactions, flexibility, low weight and this is the development of humanoids robotic industry which will give more efficiency, safety, ecologically and economically profits for the whole environment. This manipulator has been designed to achieve the industrial activity called 'pick and place' which is mostly applied in the food production (FP). The gripper made with Eco flex silicone, soft actuator is designed by using Neo-Hooke model theory, which is a hyper elastic material model. Theory can be used for forecasting the nonlinear stress-strain performance of materials experiencing large deformations. The mold chamber has been designed by using Solid Works according to the inverse calculation of bending angles of the soft actuator for different actuator widths. The Gripper consists of four silicon actuators which are controlled by an electro-pneumatic valve. The Manipulator can have nearly one-meter radius movements. If the manipulator controls in a small space which cannot have horizontal working space, then we have to consider the selection of screw type, cylindrical or prismatic joint type. It is harder to control the manipulator movement with any universal joints. If there is enough working space for free movements, as a robot manipulator which is controlled by a DC servo motor, which is very easy to work with the revolute joints. Controlling the robot manipulator is the most responsible thing when dealing with inflatable manipulators. The purpose of the trajectory planning is to ensure some smooth variation of the robot joints and making the manipulator intelligent on the other hand. The brain actions have controlled by supervisory logic. Input raw data for the supervisory logics have transmitted by inverse kinematics and inverse dynamics. The reason of using both joint controlling methods was for the results verification. The oscillation readings proved that end effector results do not have tolerance with the given trajectory coordinates. Designed SIM can deal with FP very precisely and safer as well as humans.

**Keywords:** *Soft, Manipulator, Waypoint, Pick and Place, Pneumatic*

# Health Sciences

## Track 1

HS-86

**Analysis of Neutrophil-Lymphocyte Ratio in Full Blood Count Reports in Patients Confirmed with Fever**

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**Abstract:** Patients with fever become a diagnostic challenge to clinicians. Hence, Neutrophil-Lymphocyte Ratio (NLR) is used as an effective tool in discriminating between different causes of fever. The aim of this study was to analyze the pattern of NLR in patients suffering from fever. Fifty-five Full Blood Count (FBC) reports were collected from patients confirmed with fever with unknown cause, from Ceymed Laboratories, Nugegoda on 19<sup>th</sup> and 24<sup>th</sup> of February 2020 after obtaining the written consent. FBC reports were collected from both males and females between 18-60 years. The neutrophil and lymphocyte counts were obtained from the blood reports and results were analyzed using SPSS version 23.0. The results showed that the mean neutrophil and lymphocytes percentages were 56.98% and 31.01% respectively (Normal reference range: neutrophils- 40-60%, lymphocytes- 20-45%). The mean NLR was 2.95 in the total population. There was no significant difference ( $p = 0.538$ ) between the NLR values of males ( $3.28 \pm 0.8$ ; mean  $\pm$  SEM) and females ( $2.68 \pm 0.53$ ; mean  $\pm$  SEM). Considering the normal reference range of NLR (0.78 - 3.5) it was observed that NLR value was significantly higher ( $p = 0.028$ ) in 23.64% of patients ( $7.45 \pm 1.33$ ; mean  $\pm$  SEM) compared to 5.45% patients ( $0.48 \pm 0.16$ ; mean  $\pm$  SEM) who showed NLR below the reference range. Higher NLR is generally associated with bacterial infections, while lower NLR is associated with viral infections. Considering this with the observed results, it can be assumed that 23.64% of patients with confirmed fever might be due to bacterial infections, whereas 5.45% of patients with confirmed fever might be due to viral infections.

**Keywords:** *Neutrophil-lymphocyte ratio, NLR, bacterial infection*

HS-88

## Pilot Study of Variation of Neutrophil Counts in Full Blood Counts in Relation to The Age; Sri Lankan Perspective

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**Abstract:** Neutrophils are the most abundant type of human white blood cells which act as primary defense against infections. Neutrophil level in blood increases in response to infections, injuries and stress. The objective of this study was to analyze the variation of neutrophil counts in patients belonging to the age between 18-65 years. Hundred Full Blood Count (FBC) reports were collected from patients attended Ceymed Laboratories, Nugegoda during February 2020. Reports were collected after obtaining the written consent. Neutrophil counts of patients were recorded from FBC reports and data was categorized into different age groups (18-30, 31-45, 46-55, 56-65 years). Data was statistically analyzed using SPSS version 23.0. The average percentage of neutrophils in the total population was  $53.30 \pm 1.4\%$  (mean  $\pm$  SEM). There was no significant difference ( $p = 0.348$ ) between the neutrophil percentage of females (mean  $\pm$  SEM =  $54.38 \pm 1.95\%$ ) and males (mean  $\pm$  SEM =  $51.68 \pm 1.93\%$ ). When the neutrophil percentages were compared between age groups, no significant difference was observed between the age groups ( $F = 1.82$ ,  $p = 0.149$ ). Out of 100 patients, 31% exhibited higher neutrophil percentage (mean  $\pm$  SEM =  $68.41 \pm 1.39\%$ ) which is above the reference level (Reference range of neutrophils is 40- 60%), while 13% of patients (mean  $\pm$  SEM =  $28.93 \pm 2.14\%$ ) showed neutrophil percentage below the reference level. The findings of this study concluded that there was no significant variation in neutrophil percentages observed in this study group, with respect to age or gender.

**Keywords:** *Neutrophil percentage, full blood count, primary defense*

HS-95

## Gender Based and Age Related Comparison of Fasting Blood Glucose and Lipid Levels in Lab Reports Obtained from Accredited Laboratory

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**Abstract:** Fasting Blood Glucose (FBG) and lipid levels are commonly tested as routine and monitoring parameters of many non-communicable diseases. The aim of this study was to identify the variation of FBG and lipid parameters; High Density Lipoproteins (HDL), Low Density Lipoproteins (LD) and Triglycerides (TG) with the gender and the age. After obtaining ethical clearance, 100 fasting blood glucose and lipid profiles were collected from an accredited laboratory. The mean lipids and FBG values were calculated based on gender for each age group. The age groups were categorized as follows; 40 years and below (Group 1), 40 to 60 years (Group 2) and above 60 years (Group 3). In Females, the highest levels of LDL ( $147.00 \pm 17.80$  mg/dL) and TG ( $150.00 \pm 97.62$  mg/dL) were observed in Group 1 and highest levels of HDL ( $54.52 \pm 19.80$  mg/dL) and FBG ( $126.71 \pm 56.56$  mg/dL) were shown by Group 2. Comparatively, the Males showed the highest levels of LDL ( $137.46 \pm 26.74$  mg/dL), HDL ( $49.21 \pm 5.61$  mg/dL) and TG ( $156.42 \pm 85.44$  mg/dL) in Group 1 and the highest FBG ( $130.00 \pm 54.98$  mg/dL) level in Group 3. The results of this study highlight the gender and age-based differences of these levels. Nevertheless, these findings cannot be used to determine the susceptibility of the genders and their age groups to certain disease conditions. However, this pilot study could potentially pave the way for further studies on the aforementioned diseases and conditions.

**Keywords:** *High Density Lipoproteins (HDL), Low Density Lipoproteins (LDL), Fasting Blood Glucose, Triglycerides*

HS-96

## **Analysis of Randomly Selected Fasting Blood Sugar (FBS) Reports to Determine the Number of Diabetic Patients Related to Their Age Groups and Gender; Pilot Study**

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**Abstract:** Type 2 Diabetes Mellitus (DM) is a metabolic disorder in which prevalence have been steadily increasing in Sri Lanka. The aim of this research was to determine the relationship between gender and age to the development of DM. Study was approved by the ethics committee. Consecutive of hundred samples of fasting blood sugar (FBS) reports were collected from accredited diagnostic laboratory in Kelaniya after obtaining the informed consent. Reports were categorized as Nomo-glycaemic and hyperglycaemic using the relevant reference range used by the laboratory kit. Reports were further categorized as per the age groups and the gender difference. Out of hundred FBS reports 59% identified as hyperglycaemic ( $\geq 126$  mg/dL) and 41% identified as normoglycemic (70-99 mg/dL). When diabetic patients were indicated in forms of percentages according to their age groups 0%, 1.69%, 50.85%, 45.76 %, 1.69% diabetic patients were under each group: 1-20, 21-40, 41-60, 61-80 and above 80 years, respectively. It indicates that the age group which is at high risk in developing the symptoms of diabetes is, 41-60 age group. According to the gender analysis, 57% hyperglycaemic patients were females and 42% were males. We found that females show hyperglycaemia more than male in this group of reports. Our pilot study was conducted to analyze the variation of pattern of DM among different age and gender groups.

**Keywords:** *Diabetes mellitus, hyperglycaemia*

HS-85

## Haematological Analysis of Variations in Platelet Count in Laboratory Reports; Pilot Study

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**Abstract:** Platelets are small anucleated cell fragments that circulate in blood and important for vascular integrity and regulation of haemostasis. Analysis of platelet counts is essential in clinical diagnostic haematology in diagnosis and evaluation of prognosis. The objective of this study is to perform qualitative pilot analysis of platelet count variation in selected samples of 100 individuals. Full blood count reports were obtained after obtaining informed consent from clinical laboratories in Colombo, Gampaha and Galle districts from patients' age of 18-35 years and the platelet counts were recorded separately in data sheets. All data were analysed using IBM SPSS version 20.0 software and platelet reference range was considered as  $150-400 \times 10^9/L$  as recommended normal range to identify the percentage of thrombocytopenia and thrombocytosis. Our results showed that 63 out of 100 were from males and the rest of the reports, 37 were from females. Platelet count ranged from  $6 - 605 \times 10^9/L$  among the 100 individuals and demonstrated that a majority (54%) showed normal platelet count and 42% was identified as patients with thrombocytopenia. Only 4% of blood reports showed thrombocytosis. We further conducted the gender-based analysis of thrombocytopenia and thrombocytosis and it showed no significant difference in platelet counts among male and female ( $p = 0.654$  and  $p = 0.590$  respectively). Among the healthy individuals, males had higher mean platelet counts (mean =  $246.63 \times 10^9/L \pm 10.52$  SEM) compared to females (mean =  $233.82 \times 10^9/L \pm 15.61$  SEM). However, the difference in platelet count between healthy male and female is statistically insignificant ( $p = 0.483$ ). The results of this study concluded, there is no gender-based difference in platelet counts despite the wide range of the value.

**Keywords:** *Platelets, thrombocytopenia, thrombocytosis*

HS-87

## Age and Sex Related Variations in Haemoglobin Level; A Pilot Study

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**Abstract:** Haemoglobin (Hb) is the functional protein in Red Blood Cells, which is mainly involved in transportation of Oxygen from lungs to peripheral tissues. The objective of this study was to analyse the age and sex specific variations of haemoglobin level in a group of individuals. Complete blood count reports of 100 individuals were collected from Ceymed Healthcare Services laboratories, Nugegoda, Sri Lanka after obtaining the written consent. The collected blood reports were categorised into 5 age groups (18 to 29, 30 to 39, 40 to 49, 50 to 59 and 60 to 70 years) and Hb levels were recorded. The severity of anaemic individuals was considered as mild (11-12.9 g/dL in males and 11-11.9 g/dL in females), moderate (10-10.9 g/dL in both sexes), and severe (<10.0 g/dL in both sexes) as per the World Health Organization classification. Data was statistically analysed using IBM SPSS version 20.0. Among the 100 individuals, 51 were males and 49 were females. The analysed data showed that the average Hb level was  $12.27 \pm 2.05$  g/dL (mean  $\pm$  SD). It was lower in females;  $11.73 \pm 1.51$  g/dL (mean  $\pm$  SD) than in males;  $12.79 \pm 2.37$  g/dL (mean  $\pm$  SD). Haemoglobin level of 45% of individuals (24% male and 21% female) were within the normal range (Reference range - males 13.5-17.5 g/dL; females 12.0 -15.5 g/ dL) while 54% (27% in both) had low haemoglobin levels (anemia) and 1% (only female, no males) had high haemoglobin levels. Prevalence of anemia in the studied population was equal (27%) among both sexes. The prevalence rates of mild, moderate and severe anemia were 41% (12% in males and 10% in females), 41% (10% in males and 12% in females) and 18% (5% in both males and females) respectively. Most of the anaemic males belonged to the age group 60-70, whereas most female anaemic patients belonged to age group 30-39. Anaemic patients exhibited a decrease in Hb level with the age, where the lowest average Hb levels were recorded in the age group of 60-70 in both sexes (average Hb level of female is 9.95 g/dL and 10.24 g/dL in case of males). The new findings of this study showed the distribution of Hb levels relate to age and gender.

**Keywords:** *Anemia, Haemoglobin, Red blood cells*

HS-90

## Pattern of Serum Electrolytes and Blood Urea Levels Performed in an Accredited Laboratory in Kelaniya Area, Sri Lanka; A Pilot Study

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**Abstract:** There is a large number of laboratory requests for serum electrolytes and blood urea all-over for different investigation purposes. Routine screening, suspected renal diseases, metabolic changes, dehydration are common among some causes. Objective of this study was to calculate the mean values of serum electrolytes and blood urea levels tested and the variations of  $\text{Na}^+$ ,  $\text{K}^+$  and blood urea levels in each report. Fifty blood reports were collected from an accredited laboratory to understand the pattern of serum electrolytes and blood urea levels after obtaining the informed consent. The collected data was used to calculate the abnormal percentages of  $\text{Na}^+$ ,  $\text{K}^+$  and blood urea. Mean value of serum  $\text{Na}^+$ ,  $\text{K}^+$  and blood urea were 138.842 mmol/L (Normal range- 136-145 mmol/L), 4.3022 mmol/L (Normal range- 3.5-5.1 mmol/L) and 39.51 mg/dL (Normal range- 15-39 mg/dL) respectively. Hypernatremia was observed in 2% of the reports while 6% of reports showed hyponatremia. Two percent of reports showed hyperkalaemia when a similar percentage had hypokalaemia. Eight percent of reports showed high blood urea levels. This research found that abnormal serum electrolytes and blood urea levels are not common observations in the private laboratory settings on a daily basis. Out of the three blood investigating parameters, elevated blood urea level is the commonest finding type seen in this cohort.

**Key words:** *Blood urea, serum electrolytes, hypokalemia, hypernatremia*

HS-91

## Comparison of Urine Full Reports of Male and Female Analysed by The Accredited Laboratory in Gampaha District; Pilot Study

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**Abstract:** Urinary tract infection (UTI) is a common infective disease seen among women in reproductive age group and commonly caused by gram negative bacteria. Our research mainly targeted to estimate the frequency of UTI among females of the reproductive age group and to relate it with socio demographic factors. As per the European guidelines general total pus cell field count should be 10-15 / H.P.F and red blood cell field count 1-2 / H.P.F Data was collected from 50 urine full reports presented to accredited laboratories in Gampaha district and found that 33 were from females and 17 were from males. Further, eight urine reports showed laboratory evidence of UTI with field pus cell count more than 15 /H.P.F and field red blood cells more than 2 / HPF. Out of these reports, we found that mean red blood cell count is 33.3/H.P.F in female reports and 11.8/HPF in male reports. Mean pus cell count is 15.5/H.P.F in female reports while 9.6/H.P.F in male urine reports. Therefore, we identified that more than 80% of UFR request reports are free of evidence for UTI in this pilot study. However, data of this pilot study cannot make any conclusive decision on UTI.

**Keywords:** *UTI (Urinary Tract Infection), RBC (Red Blood Cell)*

## Track 2

HS-33

**Analysis of Phenolic & Flavonoid Contents and *in Vitro* Antioxidant Activity of Aqueous Extract of *Osbeckia octandra* L. (DC.) (Heen Bovitiya) Leaves Grown in Sri Lanka**

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**Abstract:** The aim of the present study is to evaluate total phenolic, flavonoid contents and *in vitro* antioxidant activity of aqueous extract obtained from *Osbeckia octandra* L. (DC.) (Heen bovitiya) leaves. The crude extracts were prepared by steeping method in the dark conditions from oven-dried *O. octandra* leaves collected from Galle District in Sri Lanka. The freeze-dried powder of the crude extract was obtained and subjected to preliminary phytochemical tests. The total phenolic, flavonoid contents and *in vitro* antioxidant activity of the aqueous extract were evaluated by Folin-Ciocalteu assay, aluminium chloride colorimetric method, 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay and ferric reducing antioxidant power (FRAP) assay respectively. The results of the preliminary phytochemical screening exhibited the presence of phenolic compounds, flavonoids, tannins, diterpenes, triterpenes, terpenoids, phytosterols, saponins, alkaloids, carbohydrates, proteins and amino acids. The total phenolic content for the aqueous extract was  $5356.50 \pm 59.552$  mg Gallic acid equivalents (GAE)/100 g dry weight (DW) of leaves. Total flavonoid content for the aqueous extract was  $2004.514 \pm 2.2058$  mg Catechin equivalents (CAE)/100 g DW of leaves. Antioxidant capacity for the aqueous extract was  $11.279 \pm 0.516$  mmol Trolox equivalents/100 g DW of leaves and  $33.366 \pm 0.674$  mmol Fe(II) equivalents/100 g DW of leaves. The results indicated that *O. octandra* leaves have a high amount of total phenolic and flavonoid content which is exhibited through its promising antioxidant activity. Hence, it is concluded that *O. octandra* is a medicinally important herb with significant antioxidant activity.

**Keywords:** *Osbeckia octandra* L. (DC.), Antioxidant activity, Phytochemical screening, Total phenolic content, Total flavonoid content

HS-35

## ***In Vitro Anti-Inflammatory Activity of Different Solvent Extracts Obtained from *Leea Indica* (Burm.F.) Merr. (Burulla/Gurulla) Leaves Grown in Sri Lanka***

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**Abstract:** The present study was aimed to evaluate *in vitro* anti-inflammatory activity of *Leea indica* (Burm.f.) Merr. (Burulla/Gurulla) leaves grown in Sri Lanka. Two different defatted crude extracts namely, 70% aqueous acetone and 80% aqueous methanol extracts were prepared by steeping method and they were subjected to preliminary phytochemical screening. *In vitro* anti-inflammatory activity of the extracts was determined using human red blood cell (HRBC) membrane stabilization assay (Heat-induced hemolysis method). Percentage inhibition of heat-induced hemolysis was obtained for 70% aqueous acetone extract, 80% aqueous methanol extract and Aspirin was used as the reference drug, at different concentrations. Half maximal inhibitory concentrations (IC<sub>50</sub>) were determined by plotting dose-response curves (percentage inhibition versus log concentration of inhibitor). The phytochemical screening of tested extracts revealed the presence of alkaloids, flavonoids, phenols, tannins, saponins, terpenoids, carbohydrates and phytosterols in both extracts. Both of the *Leea indica* leaf extracts showed significant inhibition of heat-induced hemolysis of human erythrocytes in a concentration-dependent manner. IC<sub>50</sub> values obtained by the membrane stabilization assay were 431.500 µg/mL and 442.100 µg/mL for 70% aq. acetone and 80% aq. methanol extracts respectively and their responses were significantly greater than that of reference drug, Aspirin which showed IC<sub>50</sub> value of 1062.000 µg/mL. It is concluded that the leaf extracts of Sri Lankan grown *Leea indica* possess promising *in vitro* anti-inflammatory activity which should be further investigated.

**Keywords:** *Leea indica*, anti-inflammatory, HRBC membrane stabilization assay, heat induced hemolysis

HS-36

## ***In Vitro Evaluation of Anti-Inflammatory Activity of a Novel Balm Formula***

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**Abstract:** The objective of the present study was to formulate novel herbal balm using *Leea indica* (Burm.f.) Merr. (Burulla/Gurulla) leaves grown in Sri Lanka by evaluating *in vitro* anti-inflammatory activity. Different formulae (Fb1- Fb4) were prepared by incorporating freeze-dried powder of 70% aqueous acetone leaf extract to balm bases and tested for *in vitro* anti-inflammatory activity by human red blood cell (HRBC) membrane stabilization assay. *In vitro* anti-inflammatory activity of formulae was expressed by calculating their percentage inhibition of heat-induced hemolysis of human erythrocytes. Formulae were tested for their physicochemical stability parameters such as pH, appearance, odor, homogeneity, spreadability, phase separation and washability for period of 20 days. Commercially available two herbal balms were used as the positive controls. Among the formulated herbal balms, Fb4 was found to be the best formula with the highest *in vitro* anti-inflammatory activity compared to the positive controls. At the concentration of 12.5 mg/mL, Fb4 showed percentage inhibition of  $75.084 \pm 0.193\%$  of heat-induced hemolysis of erythrocytes. All formulated herbal balms were found to be semi-solid, homogenous, washable with water, pleasant in odor, easily spreadable, good in appearance with no phase separation and pH in the range of 6 to 7. Physicochemical stability parameters of all formulated balms showed no remarkable variation during 20 days. It is concluded that the formulated balms have promising *in vitro* anti-inflammatory activity and formula Fb4 can be recommended for commercialization as a novel herbal balm.

**Keywords:** *Herbal balm, anti-inflammatory, burulla plant, heat induced hemolysis*

HS-37

## Dietary Habits of Patients with Thyroid Cancer: A Preliminary Study

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**Abstract:** Thyroid cancer (TC) is one of the most common endocrine disorders. It was identified that there is a significant reduction of incidence of TC after implementation of the iodination program in Sri Lanka. Currently, TC is the third most common cancer among females in Sri Lanka. Dietary habits are mostly associated with the level of dietary iodine intake lead for the occurrence of TC. Hence, this study was aimed to assess the dietary habits among patients with TC in Southern Sri Lanka. A retrospective cohort study was conducted after obtaining ethical clearance. Newly diagnosed TC patients who attended the Oncology Clinic at the Teaching Hospital, Karapitiya from 01st of November to 31st of December 2019 were enrolled. A pre-tested interviewer-administered questionnaire was used. Data were analyzed using SPSS 25. A total of 165 newly diagnosed TC patients were identified. Of them, 97% were females and mean ( $\pm$ SD) age was 48.96 ( $\pm$ 12.90) years. The majority were presented with papillary carcinoma (72%). All the patients had consumed iodized salts and most of them had consumed 2-5 teaspoons of salt/day (84%). The 56% of the patients had a habit of the addition of salt into rice when cooking. The 81% had a habit of adding salt into meals before cooking and only 10% added salt when the foods reached to the room temperature after cooking. Patients had consumed seafood (97%), dairy products (98%) and goitrogenic foods (94%). Nearly half (52%) had a habit of consumption of fried foods. In the present study, the most prevalent dietary habits of the study participants had created an iodine deficient environment due to the addition of salt into meals before cooking and high intake of iodine-restricting foods. Hence current study participants had a risk of getting TC despite they had consumed iodized salts.

**Keywords:** *Thyroid cancer, dietary habits, iodine deficiency, papillary carcinoma, endocrine disorders*

HS-89

## Qualitative and Quantitative Analysis of Dispensing of OTC Medicine Usage in Community Pharmacy Outlets, Sri Lankan Perspectives; A Pilot Study

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**Abstract:** The usage of over the counter (OTC) drugs in all over the world is high, despite many regulatory guidelines. Therefore, this study was done to do a quantitative and qualitative analysis of the dispensing pattern of OTC drugs. A cross-sectional study was carried out for seven days at selected pharmacies and data was recorded using data sheets in outlets. 75 registered medicines were dispensed as OTC drugs and the data were identified as age below 25 (40%), age category 25 - 45 (35%), age category 45-65 (16%) and over 65 years (9%). Clients had requested analgesics (15%), multivitamins (15%), others like dental care products were 15%. Only 1% of clients had requested the non-steroidal anti-inflammatory drugs. In age above 65, highest OTC drugs were analgesics and antitussives (29% equally), antipyretics (25%) for 65-45 category, and analgesics (15%) and antacids (15%) for 45 - 25 category. The most commonly prescribed OTC analgesics was Paracetamol. We found that antitussive was highest as analgesics and it needs a more detailed analysis of the commonly used composition types of antitussives to prevent drug-induced side, adverse and toxic effects. This study warrants further qualitative analysis of patients decision to use of OTC relate with symptoms.

**Keywords:** *Over the counter, community pharmacy, quantitative and qualitative analysis*

HS-97

## Antimicrobial Efficacy of Novel Hand Scrub with 4% Chlorhexidine Gluconate and Medicinal Aloe Against Selected Pathogens

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**Abstract:** Hand hygiene is effective in preventing healthcare-associated infections. Aim of this study was to develop a novel hand scrub and evaluate the antimicrobial efficacy against selected pathogens. The formulation was prepared using 4% chlorhexidine gluconate, aqueous extract of medicinal aloe (moisturizing agent) and distilled water. Agar well diffusion method was performed against selected standard cultures of microbes (*Escherichia coli* (ATCC 25922), *Enterobacter cloacae* (ATCC 23355), *Acinetobacter baumannii* (ATCC 19606), *Pseudomonas aeruginosa* (ATCC 27853), *Klebsiella pneumonia* (ATCC 70603), *Salmonella typhi* (Clinical isolates), *Shigella sonnei* (Clinical isolates), *Proteus mirabilis* (ATCC 12453), *Candida albicans* (ATCC 10231), *Streptococcus pyogenes* (ATCC 12384), *Enterococcus faecium* (ATCC 29212) and *Staphylococcus aureus* (ATCC 25923)) to evaluate *in-vitro* antimicrobial efficacy of the freshly prepared formulation. The stability was also studied by evaluating the physical parameters for three months at room temperature. Formulated hand scrub was found to be homogenous, liquid, and reddish with a pleasant odour. The mean values of inhibition zones for formulation were  $23.10 \pm 1.00$ ,  $21.67 \pm 0.58$ ,  $20.00 \pm 1.00$ ,  $22.67 \pm 0.58$ ,  $17.67 \pm 0.58$ ,  $25.00 \pm 1.00$ ,  $23.50 \pm 0.71$ ,  $18.00 \pm 1.00$ ,  $34.33 \pm 0.58$ ,  $23.67 \pm 0.58$ ,  $24.33 \pm 0.58$ , and  $27.33 \pm 0.58$  mm against *E. coli*, *E. cloacae*, *A. baumannii*, *P. aeruginosa*, *K. pneumonia*, *S. typhi*, *S. sonnei*, *P. mirabilis*, *C. albicans*, *S. pyogenes*, *E. faecium* and *S. aureus* respectively. Zero values were obtained for the inhibition zones for distilled water (Negative control) while the market product (Positive control) showed the inhibition zones of  $8.00 \pm 0.00$ ,  $9.33 \pm 1.15$ ,  $11.33 \pm 1.53$ ,  $10.00 \pm 0.00$ ,  $10.00 \pm 0.00$ , and  $12.33 \pm 1.15$  mm against *E. cloacae*, *S. typhi*, *C. albicans*, *S. pyogenes*, *E. faecium* and *S. aureus* respectively. In conclusion, the formulated hand scrub is having promising antimicrobial activity against the pathogens tested compared to the positive control.

**Keywords:** *chlorhexidine gluconate, hand scrub, medicinal aloe, pathogens*

HS-98

## ***In Vitro Radical Scavenging and Antioxidant Activities of Different Solvent Extracts from Stamens of *Nymphaea Nouchali* (Nil Manel) Flowers Grown in Sri Lanka***

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**Abstract:** The importance of natural antioxidants has been arisen due to the carcinogenic nature of synthetic antioxidants. This research study aimed to evaluate *in vitro* antioxidant activity of different extracts obtained from flower stamens of *N. nouchali* grown in Sri Lanka. Two different solvents were used due to their wide usage for phytochemical extraction namely, acidified 70% aqueous acetone and acidified 80% aqueous methanol were used to prepare extracts of stamens separated from *N. nouchali* flowers, by steeping in each solvent overnight in dark conditions. The percentage freeze-dried powder yield of two different extracts were 1.220% and 1.343% respectively, subjected to preliminary phytochemical tests. The total phenolic, total flavonoid contents, *in vitro* radical scavenging activity and antioxidant activity of the extracts were evaluated by using Folin-Ciocalteu assay, aluminium chloride colorimetric method and 2, 2-diphenyl-1-picrylhydrazyl (DPPH) assay, ferric reducing antioxidant power (FRAP assay) respectively. The results of the preliminary phytochemical screening tests exhibited the presence of phenolic compounds, flavonoids, carbohydrates, reducing sugars, alkaloids, phytosterols and saponins in both extracts. The results of the total phenolic content of the extracts were  $330.608 \pm 0.439$  (acidified 80% aqueous methanol extract of stamens of fresh *N. nouchali* flowers /AAMS) and  $356.461 \pm 4.457$  (acidified 70% aqueous acetone extract of stamens of fresh *N. nouchali* flowers/AAAS) mg Gallic acid equivalent (GAE)/100 g fresh weight (FW) of stamens. Total flavonoid content of the extracts were  $45.909 \pm 0.159$  (AAMS) and  $55.817 \pm 0.366$  (AAAS) mg Catechin equivalents (CAE)/100 g fresh weight (FW) of stamens. Radical scavenging activity of the extracts were  $1.003 \pm 0.003$  (AAMS) and  $1.017 \pm 0.001$  (AAAS) mmol Trolox equivalents/100 g FW of flower stamens. Antioxidant capacity measured by ferric reducing antioxidant power of the extracts were  $1.697 \pm 0.008$  (AAMS) and  $1.549 \pm 0.015$  (AAAS) mmol Fe(II) equivalents/100 g FW of the flower stamens. These findings indicated that stamens of *N. nouchali* flowers have high total phenolic, flavonoid contents and promising antioxidant activity which should be further investigated.

**Keywords:** *Antioxidant activity, N. nouchali, phytochemical screening, total flavonoid content, total phenolic content*

HS-92

## Analysis of Common Dosage Forms of Metformin as Monotherapy or Combined Therapy in Type II Diabetes Mellitus; Pilot Study

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**Abstract:** Type II diabetes mellitus (DM) is a chronic metabolic disease condition in which there is a significant imbalance of blood glucose levels. Prescribing pattern for DM is wide and it is important to keep drug therapy data bank to relate the disease prognosis of the patients in future. As pilot study, we decided to analyse the prescribing pattern of insulin and metformin in the form of monotherapy and combined therapy for the treatment of type II diabetes mellitus. The prescriptions were collected from the patients after obtaining informed consent at randomly chosen community pharmacies. The data were collected and prescription analysis was conducted for identifying the pattern of drug use and dosage form. The results revealed that 60% were of males and 40% of patients were females. 49% of prescriptions were from patients of 51 - 60 years. 87% of prescriptions were under the monotherapy category (metformin) and 13% of prescriptions were under combined therapy (metformin + insulin). The common dosage form of monotherapy was 500 mg of metformin twice a day and it was identified (63%) among the patients of all age categories as well as it has been used both in monotherapy and combined therapy. Our results show the most common dosage form of metformin usage is twice a day dose. Further, double dose per day is the commonest form in the combination of insulin too. Therefore, this study signified the importance of considering the slow-releasing dosage form of metformin instead of double dose. We strongly recommend to compare the slow-releasing form vs normal metformin dosage form with the patient's compliance and therapeutic efficacy.

**Keywords:** *Type II diabetes mellitus, metformin, insulin, mono-therapy, combined therapy*

HS-93

## Pilot Prescription Analysis of Hypertensive Patients at Community Pharmacy Outlet; Sri Lankan Perspectives

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**Abstract:** Prescribing pattern of antihypertensive medicines is much alarmed in the context of treating hypertension. The main objective was to determine prescribing patterns of antihypertensive medicines in a selected population as a pilot study. A hundred prescriptions were collected from one community pharmacy outlet for three days. Out of hundred prescriptions, 57% accounted for female and 43% for male. We found that antihypertensive drugs were highly prescribed for patients (54%) above 60 years while 45% of patients were the next age group of 20-60 years. One patient (1%) was prescribed with anti-hypertensives below age 20. Out of all the prescribed anti-hypertensives, 59% accounted for Angiotensin Receptor Blockers (ARBs) & Angiotensin-Converting Enzyme Inhibitors (ACEIs) followed by Calcium Channel Blockers (16%), Diuretics (13%),  $\beta$ -Blockers (5%) and others (Alpha blockers, potassium channel blockers,  $\alpha$  &  $\beta$  blockers& $\alpha$ -2 adrenergic receptor agonists) (7%) respectively. Losartan was the highly prescribed ACEI and ARBs (85%) followed by HCT, Diuretic (75%) Diltiazem and Nifedipine (36% equally) and Bisoprolol ( $\beta$ -Blocker) (57%) as highly prescribed anti-hypertensives under each category. The study concluded that ACEIs and ARBs were the highly prescribed drug category following the drug Losartan. Nifedipine was the most commonly used drug in young age group (<20). We also found that combined antihypertensives are commoner than monotherapy for the patients > 60 years. Further studies are recommended to analyse the different types of anti-hypertensive combinations among each age category.

**Keywords:** *Community pharmacy, Hypertension, Anti-hypertensives*

HS-94

## **Analysis Frequency, Age-Based Prescription Pattern and Most Prevalent Antibiotic Prescriptions from Community Pharmacy Outlets; Multi-Center Study**

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**Abstract:** There is much consideration about investigating the frequency of antibiotic prescribing with related to different age groups. Objectives of this study were to analyse the frequency of antibiotics (ab), usage and age-based prescription pattern in a selected population. This study was granted ethical clearance and data was collected from Kottawa, Kalubowila and Mawanella. Consecutive prescriptions were collected after informed consent. Results showed that 41% ab prescriptions with penicillin ab, 23% with macrolides, 20% with cephalosporin, 9% with quinolones, 4% with nitromidazoles and 3% with tetracycline. Amoxicillin + Clavulanate Potassium brand, Clarithromycin and Cefuroxime were the highly prescribed drug in penicillin group, macrolide and cephalosporin respectively. We further found that 21 - 40 age group was the highest receivers of ab (46%) and the lowest age group was 61 - 80 (3%). Dosage form for amoxicillin, amoxicillin trihydrate + Potassium clavulanate, flucloxacillin, cloxacillin were three times per day except for the one brand for combination of amoxicillin+potassium clavulanate used for two times per day. Dosage forms of clarithromycin and cefuroxime Axetil were two times per day while for cephalexin brands it is three times per day. Results revealed that the penicillin group was the most commonly prescribed drugs in young age (21-40) and amoxicillin+potassium clavulanate combination was the highly used ab with dosage form of three times per day.

**Keywords:** *Community pharmacy, antibiotics*

# **Education and Language**

## Track 1B

*Education and Language, HE-003*

### **A Study on the Perception of Sri Lankan School Students of English Literature on the Effectiveness of the use Themes in the G.C.E. O/L English Literature Syllabus**

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**Abstract:** English Literature which was introduced to the Sri Lankan school curriculum by the British during colonization mainly consisted classics of British writers such as Dickens and Shakespeare. English Literature was then diminished to a state of secondary importance with the introduction of the Swabasha Policy in 1942, but over time, the subject gained reclamation with open economy. Consequently, Literature was introduced to the school curriculum in 1990 as an optional aesthetic subject moving out of the frame of British writers to expand the scope within an array of literary work by a variety of writers. The most recent syllabus which ceased in 2007 comprised twenty poems by writers of different countries and eras, categorized under five themes; nature, war and violence, life, society, and humour. Progressively, the current syllabus which was implemented from 2015 was designed after the experience of the previous syllabus. Even though the current syllabus claims to have undergone a significant change in the thematic approach for literature design; nature, conflict, society, life and humour, the teachers of literature often encounter problems in teaching poetry under the provided themes and realize confusion and misinterpretations on the part of the learner. Therefore, the aim of this study is to find the perception of students on the thematic classification of poetry in the syllabus, its appropriacy and the effect it exerted on their comprehension of the poem and production of written answers and literary criticism. Henceforth, raising awareness in the field of curriculum designing and implementing on the inefficiency caused in the effective teaching-learning process due to the confinement of poems under a particular theme, is the ultimate endeavor of this study. With the collection of data in the form of questionnaires by twenty students in selected schools who follow/ed English Literature as an aesthetic basket subject, it was discovered that the majority finds the choice of themes and the categorization of poetry under these themes problematic and causing confusion in their comprehension and writing. Thus, the findings of the study propose a revision in the selection of themes in the literature syllabus.

**Keywords:** *Themes, English Literature, Poetry, Curriculum*

# Management and Social Sciences

1 M

MS – 005

## **The Influence of Cultural Values on Impulse Buying Behavior of Consumers for the Fast-Moving Consumer Goods in Sri Lanka**

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**Abstract:** Products purchased on impulse occupy a significant share in the consumers' bin and with new organizations of retail expanding introduction to in-store stimuli, this pattern is on the rise. Notwithstanding, as the quantity of retail locations builds, it gets imperative for the marketer to understand the consumers and what drives their decisions. This research aims to study the impact of the cultural factors such as individualism, collectivism, power distance, uncertainty, masculinity or femininity and long-term orientation on impulse buying in FMCG in Sri Lanka. The discoveries of the examination will improve the comprehension of marketers with respect to how to impact purchasers to purchase rashly so as to drive deals and increment piece of the pie. In addition, data was collected through questionnaires by distributing among 267 participants whose age is between 15-39 years old individuals and as the sampling method of convenience sampling along with the analysis techniques of correlation and regression. In order to analyze the gathered data, SPSS version 25 and AMOS statistical software is used. Our findings indicate that culture generates certain effects on impulse buying behavior and the influence is diverse across Sri Lanka. However, the findings also indicate that there could be other factors such as uncertainty avoidance, masculinity/femininity and long-term orientation that could affect impulse buying behavior for FMCG in Sri Lanka. In contrast to the prior researchers conducted, this study evaluates that uncertainty avoidance, masculinity/femininity and long-term orientation as factors that impact impulse buying for FMCG in Sri Lanka.

**Keywords:** *Culture, Impulse buying, Consumers, FMCG*

MS – 006

## A Study on Commuters' Satisfaction of the Service Quality of PARA TRANSIT; The Case Study of the Traditional Three-Wheeler Taxi Service in Gampaha City Limits

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**Abstract:** In transportation, First and Last-mile connectivity is an important factor, with the rise of new mobility enterprises, delivering real-time information and on-demand and shared mobility, there is potential for integration with public and mass transit to bridge the last mile gap. In Sri Lanka, this gap mostly fulfilled by three-wheelers. The three-wheeler, a Sri Lankan form of paratransit mode, it is a popular and important informal transport mode in Sri Lankan cities. Thus, the objectives of this study are to identify the service quality factors affecting to the independently operated three-wheelers and identify the service quality factors that are affecting to the commuters' satisfaction in Gampaha City limits. Researcher used various methods to find the factors that are affecting to commuters' satisfaction on service quality which is being offered to the client. Online questionnaires and face-to face approach were used for data collecting. Data analyzed using Demographic factor analysis, Cross Tabulation Analysis, Chi Square Test using hypothesis, Reliability Analysis, and correlation analysis. Data collected from 326 respondents were analyzed using the exploratory factory analysis. Finally, researcher was constructed binary logit model for the five factors in conceptual framework, where regression model obtained was statistically significant for three factors as availability, confidence and interrelationship that affected to the commuters' satisfaction in Gampaha city limits and proposed several solutions to increase the service quality related to three-wheeler transportation. This research also provides some recommendations to develop three-wheeler service in near future and recommendations to make a good quality service to the passengers in order to fulfil the passenger satisfaction about service quality of three-wheeler transportation.

**Keywords:** *Para transit, Three-Wheeler Transportation, Service Quality; Satisfaction, Gampaha city*

MS – 025

## **Evaluating Risk Management Readiness of Organizations Towards COVID-19: A Case of the Tourism Industry**

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**Abstract:** COVID-19, an exogenous shock, is a pandemic outbreak that has disrupted the tourism industry, in particular affecting small-scale boutique hotels. This study identifies the risk-response strategies to analyze business readiness in the face of COVID-19. Which is something that has not been done previously in the context of Sri Lanka. The population considered for the research are the small-scale boutique hotels in Sri Lanka, the sample was derived using convenience sampling method, where four boutique hotels were selected from the Southern province. The data were analyzed using the thematic analysis method. The key variables identified were the managers' perception and resource availability. The study found that 1) the boutique hotels were mainly focused and dependent on foreign customers and thus faced heavy losses and 2) the strategy for continuing their business operations was based on downsizing, pay cuts, and targeting local customers through promotional offers on social media. The efforts to attract local tourism were not successful. The lack of a contingency plan in the case of disruption of foreign tourism was evident. Based on the analysis, the risk-response strategies used for recurring shocks (e.g. floods, fire, etc.) are inadequate to face a crisis that has a long and unpredictable impact in nature (insurance policy, financial budgeting). It was evident that the hotel owners did not understand how to evaluate the risks of their business apart from the risks that they were continuously faced over the years.

**Keywords:** *COVID-19, Tourism, Risk Management, Small-Scale Boutique Hotels*

MS – 026

## Incorporation of Industry 4.0 on Logistical Performance of Apparel Industry in Sri Lanka to Maximize Competitive Edge

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**Abstract:** Apparel companies focus on their logistical performance nowadays to compete with each other by overlooking the prevailing inefficiencies, and attempt to incorporate novel technology such as Industry 4.0 on to the business processes to enhance their performances. Therefore, the main objective is to determine, how Industry 4.0 could be incorporated on logistical performance of apparel industry in Sri Lanka to maximize the competitive edge, along with the sub-objectives of determining the current Industry 4.0 incorporation in the Sri Lankan apparel industry, identifying the logistical performance of established large scale apparel companies, determining the relationship between logistical performance and competitive advantage, investigating how far Industry 4.0 moderates the relationship above and finally introducing suggestions to incorporate Industry 4.0 policies to enhance the logistical performance. Sample base of 69 companies was selected using judgement sampling technique, where data was gathered through questionnaires for the quantitative objectives, and semi-structured interviews to introduce suggestive approaches, along with secondary sources. Findings revealed, Industry 4.0 strategies are already implemented, with partial incorporations and 50% of company processes are digitized by integrating Cyber-Physical Systems, Big Data Analytics and Internet of Things, while incorporations are at a medium level in logistical sectors of companies. Results also showed the overall logistical performance is successful, while in terms of reducing lead and cycle times, it is rather unsuccessful. Furthermore, it was identified that there is a strong positive relationship between logistical performance and competitive advantage, with a positive moderation created by Industry 4.0 where the extent of moderation to be 70%. Long lead times, difficulty in maintaining product quality, unwillingness to invest and documentation difficulties, were identified to be the inefficiencies causing a hindrance to logistical performance, therefore suggestive approaches gathered via interviews with 10 apparel industry experts were elaborated, as a foundation to build up solutions for a company.

**Keywords:** *Industry 4.0, Logistical Performance, Logistical Inefficiencies, Apparel Industry, Competitive Edge*

2 M

MS – 017

## Service Quality and Customer Satisfaction of Sri Lankan Banking Sector during COVID-19

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**Abstract:** COVID-19 has generated significant instability and high volatility in the banking sector globally. The service quality expectations of the customers got changed drastically due to the pandemic. Thus, the current study is an out breaking study in the context of COVID-19; since this examined the gap between customer perception and service quality of banking sector of Sri Lankan during the COVID-19. As community spread of the coronavirus (COVID-19) proliferates, alternatives to in-person banking and physical exchanges have become more in demand. Further, the World Health Organization (WHO) has advised people in using contactless payment and avoid handling banknotes as much as possible, since the coronavirus may continue to live on banknotes for days, accelerating spread of the disease. The study employed the SERVQUAL model of Parasuraman, which can be used to measure customer satisfaction, and the effect of these dimensions (tangibles, responsiveness, empathy, assurance and reliability, access) on customer satisfaction was measured. For each dimension how the banks had ensured the quality during the pandemic was identified using primary and secondary sources and its relationship to the customer satisfaction was empirically tested. The study adopted positivistic philosophy with a deductive approach. Based on the Krejci Morgan technique if the population size is 1000000, sample must be 384. Thus, the current study having adopted random sampling technique 400 responses (island wide) were collected using self-administered online questionnaire which consisted of 22 items. The sample represented 56% clients using public banking services and 44% using private banking services. The sample data were statistically analyzed through SPSS program using the analytical techniques linear regression and multiple linear regression. The results illustrated that SERVQUAL Dimensions had positive impact on the customer satisfaction. The findings suggest that reliability and empathy has been the most important factors that have been influencing the customer satisfaction during the COVID-19 period. Therefore, findings suggest that the customers have been keener on the intangible, timely and quality service provided by the bank rather than being mindful on the attractive, tangible physical presence of the banks during the COVID-19, which is reasonable.

**Key words:** *Covid-19, Customer Satisfaction, Banking Sector, Service Quality, SERVQUAL*

MS – 021

## The Influence of Green Marketing on Consumer Purchase Intention in Colombo District, Sri Lanka

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**Abstract:** The purpose of this research is to determine the impact of Green marketing on the consumer purchase intention of Fast-Moving Consumer Goods (Green products) and to examine the moderator effect of selected demographic variables of consumers on the relationship between green marketing factors and purchase intention. The article focuses on green marketing elements and how it has an overall effect on consumer purchase intention. The intention is to identify the relationship between the dependent variable, “green purchase intention” and independent variables which are the price of green products, ecological packaging and environmental advertisements. Gender has been taken as a moderate variable to examine the moderator effect on the relationship between green marketing and purchase intention. The methodology is to gather primary data through a questionnaire and to collect secondary data through past research papers. Both qualitative and quantitative data have been collected to conduct this research. This study will enhance the knowledge of the researchers, who are studying green purchase intention and will facilitate business managers when organizing their campaigns on green marketing. Further, policymakers may find the recommendations based on this study useful when making decisions on environmental protection and related areas. With the support of literature, the paper concludes that green marketing can have a significant impact on consumer purchase intention. A structured questionnaire has been distributed among 150 consumers who buy Fast Moving Consumer Goods from supermarkets which are located Kaduwela to Baththaramulla along New Kandy road in Sri Lanka to collect primary data. The convenience sampling method has been used to collect data from a sample of 150 consumers. SPSS software is used to analyze quantitative data. The available literature on this area of the study appears to have not addressed the research gap of studying green marketing on consumer purchase intention in Colombo district, Sri Lanka. This study will focus on contributing to fill the above-said gap.

**Keywords -** *Green marketing, Consumer purchase intention, Price of green products, Environmental advertisements, Ecological packaging*

MS – 022

## The Relationship Between Environmental Disclosure of Sustainability Reporting and The Financial Performance in Listed Companies in Sri Lanka

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**Abstract:** Sustainability reporting (SR) is a voluntary endeavor that involves publishing accounts that reflect the economic, social, and environmental performance of an organization. This study was conducted to explore the relationship between environmental disclosure of the SR and the Financial Performance (FP) of listed companies in Sri Lanka. The data was collected from annual reports of listed companies that disclose sustainability, in line with the Global Reporting Initiative (GRI) framework and a quantitative approach has been applied in gathering relevant data for the study. The study has taken two hundred eighty-five (285) companies in the Colombo Stock Exchange (CSE) representing twenty different sectors, from which, fifty-five (55) listed companies were selected through purposive sampling, based on report preparation in line with the GRI framework, consecutively for the period of 2015/16 to 2018/19. Based on G4 and GRI standards, environmental disclosures were gathered through content analysis and measured using the SR index and the FP were measured using Return on Assets (ROA) and Return on Equity (ROE). The collected data were used in exploring the correlation between environment disclosure and the FP by deploying Software for Statistics and Data Science (STATA). Findings revealed that there was an insignificant but positive relationship between environmental disclosure and ROA whereas an insignificant and negative relationship between environmental disclosure and ROE of listed companies in Sri Lanka. In the absence of debt, shareholders' equity and the total assets of the company will be equal. Which indicates that ROE is a component of ROA. Therefore, researchers have identified that environmental disclosure of many companies is deemed to be negatively correlated with the ROE. The findings of the current study confirm that there is no significant relationship between economic disclosure and FP in listed companies in Sri Lanka as the final outcome. Moreover, it is recommended for future researchers that this phenomenon to be observed further. In addition, this study can be further extended by accessing the remaining disclosures and other SR frameworks, while enhancing the sample size.

**Keywords:** *Sustainability Reporting (SR), Global Reporting Initiative (GRI), Environmental Disclosure, Return on Assets (ROA), Return on Equity (ROE)*

MS – 024

## Factors Affecting to Job Satisfaction Among Private and Public Sector Banking Employees

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**Abstract:** The backbone of every company is the employees. They are the most valuable and useful resource of all the resources of every company. Therefore, job satisfaction of employees is the major important problem in the banking sector. Given the banking sector, the degree of satisfaction differs from the public and private sectors due to various factors and various services offered by different banks. Then, the research aims to find the factors affecting employee job satisfaction in both public and private banks in Colombo district, Sri Lanka. The study population was 2448000 workers who work in both sectors of banks in the Colombo district and 385 workers were chosen from them as a research sample based on random sampling techniques using sampling size formula. This study is a quantitative research and conducted using primary data collected by questionnaire. Data were analyzed using SPSS and used Pearson correlation as the analytical method. The results of the study showed that public sector banking workers had a higher degree of job satisfaction than private-sector employees in the Colombo district. Additional research findings emphasized statistically important positive effects on job satisfaction of employees in the banking field of Sri Lanka from pay, work itself, promotion, supervision, working conditions and co-workers. However, pay and allowance have a low significant impact on job satisfaction in both banks. But in private sector banks, the nature of the work has a high positive correlation than other variables and in public sector banks, promotion and nature of work have a high positive relationship with job satisfaction. Finally, the study established the nature of work in both banking sectors in Sri Lanka has the greater explanatory variable of employee job satisfaction. In the Asian context, the research expands our perception of the job satisfaction of employees in Sri Lanka.

**Keywords:** *Job satisfaction, Banking employees, Private sector banks, Public sector bank*

MS – 008

## Commuters Perception Towards the Bus Base Park and Ride Implementation in Colombo City Limit

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**Abstract:** This study was conducted to identify the commuter's perception towards the bus base Park and Ride implementation in Colombo city limit. This study analyses the factors that commuters would consider when selecting park and ride system (PnR) for their travel purpose. For the researcher to achieve the objectives, the conceptual framework was structured based on secondary data which congregated by existing publications and articles. The research questionnaire was developed in order to gather primary data through google forms. Simple random sampling technique was used to distribute the questionnaire among the commuters who use seven corridors to enter Colombo city limit. Three hundred fifty-two responses were taken into consideration and analysis was done by taking them into one data base. The reliability of the collected data was analysed using Cronbach's alpha. The KMO test statistic for sample adequacy. Moreover, factor analysis was created based on the Principal Component Analysis by extracting 3 factors from the 22 variables, the total amount of variance accounted, redistributed over the three extracted factors, renamed using Component Score Coefficient Matrix., Kruskal-Wallis test was conducted for hypothesis testing and binary logistics analysis was conducted to identify the association of factors and for create a model. As per the Kruskal-Wallis test, author has found that most of the demographic variables were impacted to the commuter's perception toward the bus base PnR system. Mean values of the twenty-two variables were concluded that bus frequency, travel time and safety and security of PnR system were mostly influenced for selection of PnR system. Out of the extracted factors, service attribute and travel influences were having positive association toward the commuters' perception on PnR choice while comfortability factor was insignificant. As per the research findings, the overall commuters' perception on PnR can be concluded as strong positive perception.

**Keywords:** *Park and ride, Commuters Perception, Transportation, Congestion, Traffic mitigation*

3M  
MS – 007

## A Study On Private Vehicle Users Perception On Shifting from Private to Public Transport in Kandy City

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**Abstract:** Presently, due to inefficiencies in public transport it has created many complications to users in accomplishing their day-to-day needs. Moreover, due to such inadequacies of public transportation, statistics have proven that many people have shifted to use private transportation modes despite the availability of public transportation, which results in increasing private vehicles on roads. Furthermore, inevitably the increasing of private vehicles has created an ample amount of negative consequences such as congestion, road accidents, as well as lost opportunities in day today lives due to delays. Considering such consequences, the research aimed to identify the determinants of private vehicle users' perception to shift from private to public transportation as well as to identify the impact of the selected factors in governing the perception when shifting from private to public transportation modes. Accordingly, the researcher has utilized the "Theory of planned behavior" as the theoretical framework underlying the study, whereas twenty influencing factors identified from a thorough literature review were examined. Moreover, primary data for the study was collected from structured questionnaires, which were distributed among a sample of private vehicle users in Kandy city limits accounted for 310 responses, by utilizing the simple random sampling technique. However, after data cleaning the total responses of 252, were ultimately utilized for the factor analysis. As per the results obtained through the factor analysis, twenty factors identified through the literature review were able to be grouped into four main factors which motivates the mode shifting decision of private vehicle users namely, features of a good transport system, Convenience in using a transport mode, Passenger Requirements in using a transport mode and the Passenger Expectations from a mode. Finally, author of this research has utilized the aforesaid four factors to conduct a Binary Logistic Regression in accomplishing the secondary objective of identifying the impact of such factors on the mode shifting decision of private vehicle users. As per the results obtained through the Binary Logistic Regression, two highly significant factors having positive relationships in the mode shifting decision of private vehicle users were identified as passenger requirements and passenger expectations. Moreover, the study resulted in recommendations such as digitalizing public transport system, importance of having cashless transactions via cards, and formulating eco-friendly policies. Therefore, this research is imperative to highlight the significant factors which would govern the perception of private vehicle users to shift from private to public transport modes in Kandy City Limits.

**Keywords:** *Modal shift, Kandy city, Private vehicle user's perception, Congestion*

MS – 027

## **A Study On Essential Elements of Human Resource Management Curriculum: Industrial Professionals' Perspective**

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**Abstract:** There are number of specializations related to the Business Administration undergraduate degree program and Human Resource Management (HRM) also one of the significant areas. Furthermore, in the corporate sector, HRM holds a well renowned place. If the foundation of learning is strong, the graduate students are born in the way that corporate sector needs them to be. Therefore, the education discipline should suite better to the industrial's requirements. The objective of this study refers to identify essential elements of Human Resource Management to be included in HRM educational curriculum. Data collection was based on primary data and those data was collected through structured telephone interviews from 5 industrial professionals in respective area. The Thematic Analysis technique was used to analyze collected data associating the NVivo software tool. The findings of the study suggested that modules in existing HRM undergraduate curriculum should be developed by adding some new elements/modules/courses in practical way. It was significantly identified that, modern and digitalized HR practices, Green HRM, Automation, Business English, Analytical and Information Technology (IT) related modules and some practical sessions like Internship Programs, Leadership Programs, Training Sessions should be added to the existing HRM educational curriculum. As an implication of the study, the results can be used to develop the HRM educational curriculum with explored new elements/modules/courses in theoretically and practically, in order to enhance the quality level of the bachelor's degree in HRM.

**Keywords:** *Human Resource Management, Curriculum, Industry Professionals*

MS – 028

## Does Youtubers Help to Build Consumer Trust Through Advertainment?

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**Abstract:** Does YouTubers help to build consumer trust through advertainment? Advertainment is relatively an emerging concept built through combining two elements namely Advertising and Entertainment. When it comes to advertainment created by famous YouTubers, their advertising videos reach over millions of views within a shorter time period. This exploratory study was conducted considering the Sri Lankan and other context too. The purpose of the study was to identify what determinants had impacted upon building consumer trust. Further, aim to understand how to maintain an informal relationship with the brands, by presenting different contents depending on the industry and maintaining a well-connected relationship with the followers through advertainment that has been created by the YouTubers. Comprehensive literature review survey was used as the research approach. Therefore, the data was collected through secondary sources and to identify the relevant determinants, a total of 48 journal articles on advertainment and influencer marketing were referred using the below mentioned keywords from July 2020 to September 2020. The results of this research indicated, the viewer's behavior or how the consumers are active on YouTube, YouTuber's Identification, Credibility and Awareness on consumer's point of view were the 4 determinants that can be used to measure consumer trust on YouTubers' advertainment. These determinants had helped to reveal how much powerful is the followers' engagement with the YouTubers and how the content creators have successfully become social influences with lot of persuasive influences with their fame compared to traditional celebrities.

**Keywords:** Advertainment, *Social media marketing*, *YouTubers*, *Social influencers*, *influencer marketing*

MS – 029

## Most Influential Factors for Business Performance of Boutique Hotels in Sri Lanka with Special Reference to Easter Sunday Attacks

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**Abstract:** Tourism sector of Sri Lanka had a rapid growth and identified as one of the largest sources of income in Sri Lanka. Easter attack which took place in April 2019 resulted a severe hit to the boutique hotel sector in Sri Lanka. This study aims to identify the most influencing factor to increase the business performance of boutique hotels in Sri Lanka. Three major factors were identified based on the past literature. Those can be stated as operators experience and strategies, financial structure and marketing Strategies. The research has analysed how these factors influence on Boutique hotels in Sri Lanka and what is the most influencing factor to increase the business performance of Boutique hotels in Sri Lanka. Data were collected through distributing a questionnaire to the owners and managers of 50 boutique hotels in Western and Southern provinces. Snowball sampling technique was used to select the sample for the research. Collected data were analysed using Statistical Package for the Social Sciences (SPSS) software. Multiple Regression method was used to identify the most influencing factor to increase the business performance. By analysing the data, it was revealed that the operators previous experience & strategies is the most influencing factor towards the business performance of boutique hotels in Sri Lanka. Also results show that the financial structure is the second important factor and marketing strategies are the least important factor to the business performance out of three factors. This study will be helpful for Boutique hotel owners to maximise their profits by focusing more on identified critical factors. It was revealed that Sri Lankan government does not have proper long-term plans and strategies to regain the business performance of Boutique hotels in Sri Lanka. This research will be helpful for Sri Lankan government & responsible authorities to implement long-term plans and strategies to increase the profits of boutique hotels through focusing on key identified factors to improve the hotel performance.

**Keywords:** *Boutique hotels, Business performance, Operator's previous experience & strategies, Marketing strategies, Financial structure*

MS – 031

## The Impact of Generation Gap on Employees of Generation ‘X’ and ‘Y’ on Turnover Intention

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**Abstract:** The generation gap has impacted a much higher turnover in the generation ‘y’ than in generation ‘x’ during the previous years. It has impacted in achieving the corporate goals within organizations. Hence it was needed to identify the causes for this high turnover rate in generation ‘y’ than in generation ‘x’ within organizations and to predict which employees will retain and leave from the organizations during the next year. The researchers were able to identify the different characteristics of the two generations separately. This study is based on a quantitative research type. A survey was used as the main research strategy and the study is based on deductive research approach. The population of the study was 1298 employees who belong to the two generations ‘x’ and ‘y’ of private companies which operate under the service category in Sri Lanka. Hence, the unit of analysis of the study was the individual employees of the selected companies. The Krejcie and Morgan’s illustration showed that the target sample should be 297 and the researchers were able to fulfil their requirement. The collected data were analyzed through descriptive analysis and regression using SPSS. The researchers identified that the social values among employees in generation ‘x’ are higher than generation ‘y’ and the personal values among the employees in generation ‘y’ are higher than generation ‘x’ when compared to the nature of the working styles in both the generations in the Sri Lankan context. Furthermore, the results of the descriptive analysis showed that the generation ‘x’ employees prefer to retain while generation ‘y’ employees prefer to leave the organizations. Based on this, the researchers found that the social values have a positive impact on retention of employees of generation ‘x’ while personal values have a positive impact on the turnover intentions of employees of generation ‘y’. Moreover, the future researchers are recommended to come up with new findings and solutions related to the same research area of other generations as well.

**Keywords:** *Generation Gap, Generation ‘X’, Generation ‘Y’, Turnover Intention*

1E

MS – 111

## Determinants of Entrepreneurial Intentions of Non-State Logistics Undergraduates in Sri Lanka

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**Abstract:** This study was conducted to identify the determinants of entrepreneurial intentions of non-state logistics undergraduates in Sri Lanka and the impact of the identified factors for the perception. For the researcher to achieve the aforementioned objectives and significance of the study, the conceptual framework was structured based on secondary data which congregated by existing publications and found main six factors as independent variables. The research questionnaire was developed in order to gather primary data via google forms. Snowball sampling technique was used to distribute the questionnaire and 361 responses were taken into consideration and analysis was done by taking them in to one data base. The reliability of the identified factors of personal attitudes, personal behavioral control, entrepreneurial motivation, undertake risks, goal orientation and innovativeness were analyzed using Cronbach's alpha. The Mahalanobis Distance test was carried out to remove outliers and Descriptive statistics was carried out to check the means, standard deviations and skewness. After that the hypothesis for testing six variables have done using correlation analysis. It has identified multiple independent factors and the Linear Regression Analysis was carried out to test the model and regression ANOVA table was analyzed too. The individual effect was analyzed and depicted by the coefficient results. Scatter plot for regression model was also carried out to validate the regression model. Personal Behavioral Control (PBC) factor was impacted to the determinants of entrepreneurial intentions of non-state logistics undergraduates in Sri Lanka while Personal Attitude (PA), Entrepreneurial Motivation (EM), Goal Orientation (GO) and Innovativeness (I) were not significant as per the research findings. Final findings stated that Personal Behavioral Control (PBC) factor was more influential than Personal Attitude (PA), Entrepreneurial Motivation (EM), Goal Orientation (GO) and Innovativeness (I) factors to the entrepreneurial intentions of non-state logistics undergraduates in Sri Lanka.

**Keywords:** *Entrepreneurship, Entrepreneurship Development, Logistics Entrepreneurship, Unemployment*

MS-107

## Residents Satisfaction on the Environmental Impacts of the Central Expressway Project Sri Lanka

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**Abstract:** Transportation industry is currently confronting immense change; and this brings both risk and opportunities. There are many ways the sector could develop to meet these challenges, some evolutionary, others more revolutionary. This research study has focused on issues related to the environmental impacts perceived by the local resident satisfaction, resulting from the construction of the Central expressway Project, - Sri Lanka. This study was based on survey data collected among respondents in the Mirigama Divisional secretariat living within 500m from the central expressway construction. Data was collected through a structured questionnaire based on the random sampling technique. 90% of valid responses were used for the data analysis and SPSS V.16.0 used to analyze data. Reliability of the data set was checked through Cronbach's alpha and 86.9% level of reliability was with the data set. Majority of the responses were males having secondary education level. On average, many of respondents reported being affected with environment impacts of the construction project. The factors; water quality and quantity ( $r= -.135$ ), air dust ( $r= -.429$ ) and general lifestyle ( $r= -.315$ ) are comparably importance and seemed to have direct impact on resident satisfaction. However other factors such as noise and vibration level, flood/water supply and drainage pattern and soil erosion and earth stability are important as their impact is long term. People react differently on environment impacts driven by highway construction. The R<sup>2</sup> value is .338, this implies other factors; social and economic should be considered. The Central Expressway has been a sizable social and economic investment for Sri Lanka. It is hoped that this study may add to creating an enabling climate for the mitigation of both social and environmental impacts and be a narrative for projects of similar nature yet to come, particularly in relation to impact management and environment impact assessments.

**Keywords:** *Central Expressway Sri Lanka, Environment impacts; Highway construction, Residents satisfaction, Transport infrastructure*

2E

MS – 019

## Will Seven Domains Affect Quality of Life of Visually Impaired and Blind People?

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**Abstract:** Measuring the quality of life (QoL) in visually impaired and blind (VI&B) people is a generally argued topic but tend to conclude with no actions. Many developed countries tend to measure the QoL of their people, including all of their disabled population but in developing countries like Sri Lanka, there is no acceptable way to measure the QoL of people, including VI&B people. Today the world uses different domains to measure the QoL, but developed countries use seven major domains to define their people's QoL. Respectively Health, Standard of living, Achievement in life, Safety, Relationship, Community connectedness, Future security. This study aims to identify how seven domains effect the QoL in VI&B people and determine the socio demographic characteristics of VI&B which is their vision status, age, gender, marital status and education level. From primary data illustrations reveal among 64 VI&B people from Hambanthota, 34 blinds and 30 visually impaired people represents 53.13% and 46.88% out of the sample population. Accordingly, the satisfaction level of seven domains are measured by using the Likert scale (1-5), where 1 means not at all and 5 means extremely satisfied. Considering the seven domains along with the responses, future security domain has a higher value of VI people than blind people ( $M_{\text{Visually Impaired}} = 0.54 > M_{\text{Blind}} = 0.47$ ). Both men and women are satisfied with their health domain ( $M_{\text{Male}} = 0.84 > M_{\text{Female}} = 0.80$ ). Values in age group 40-59 was higher than the other age groups ( $M_{40-59} = 0.76 > M_{60-80} = 0.73 > M_{20-39} = 0.71$ ). Married people are more satisfied with their standard of living than single people ( $M_{\text{Married}} = 0.78 > M_{\text{Single}} = 0.76$ ). VI&B peoples education level and their QoL have positive relationship ( $M_{\text{No schooling}} = 0.65 < M_{\text{Vocational}} = 0.68 \leq M_{\text{Other}} = 0.68 < M_{\text{Primary}} = 0.72 < M_{\text{Secondary}} = 0.74 < M_{\text{GCE O/L}} = 0.77 \leq M_{\text{GCE A/L}} = 0.77 < M_{\text{Tertiary}} = 0.80$ ).

**Keywords:** *QoL (Quality of Life), VI&B (Visually Impaired and Blind), Seven Domains*

MS – 004

## The Role of Accounting Knowledge and Skills in Defining the Career of Accounting Professionals

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**Abstract:** The Accounting profession plays a major role in the economic advancement. Field of Accounting is changing every day. In order to flourish need of the labour market, not only knowledge, skills play a major role as well. According to the International Accounting Education Standards, there are some Knowledge and Skills identified where it will use to fulfil needs of the labour market. Therefore, this study adopted to identify to which Accounting Knowledge and Skills that employers prioritize when recruiting candidates for the professional career. The population of present study was 290 Finance Managers of listed companies in Colombo Stock Exchange (CSE) and sample was 165 Finance Managers from the selected companies. Researchers selected companies which are in Western Province and were able to gather data only from 122 Finance Managers. Descriptive analysis was used to analyse data through SPSS software. The findings of this study conclude the Accounting Knowledge and Skills that job seekers should be obtained before entering to the labour market. As per the final analyse, Financial Accounting and Reporting, Management Accounting and Taxation are the Knowledge and Professional, Decision Making, and Intellectual are the Skills that employers more tested as respectively. Professional sustainability has become a trending topic discussed by Accountants due to the digital era. Therefore, accounting educators should need to get ready into the background of the problem. As an implication the respected authorities of the educational sector can implement accounting trainings to develop Accounting Knowledge and Skills to build up a proper professional career path.

**Keywords:** *Accounting Knowledge and Skills, Accounting Profession, Accounting Education*

MS – 015

## **Determinants of Customer Perception Towards Diffusion of Mobile Service Supporting E-Grocery Supply Chain Systems in Colombo, Sri Lanka**

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**Abstract:** This study explores the factors that influence consumer perception towards e-grocery supply chain systems in the Colombo district of Sri Lanka. The conceptual framework was structured based on the Theory of Planned Behavior (TPB) and Technology Acceptance Model (TAM) and 32 potential influential factors were explored in this study. Sample sizes of 344 consumers in Colombo district were selected with Convenient Sampling technique. A questionnaire was developed in order to obtain primary data for the study, while the researcher referred secondary data sources to analyze more into the research area. The questionnaire developed based on the factors identified in the literature review and by distribution the questionarire , 405 responses were taken with using convenient sampling method and 299 useable responses were considered in the research. The responses were collected online and the analysis was done by taking them to one database. KMO test proved the sample adequacy of 94.8% resulting strength relationship of variables. The researcher has achieved the primary objective by conducting a survey. Moreover, factor analysis was done and extracted five factors from 32 variables. As the secondary objective to measure the impact of identified factors, an ordinal logit model was constructed for the identified 05 continuous factors. The factors attitude, perceived relative advantage, subjective norms and current trends have significant positive effect while convenience factor has less effect and insignificant impact on the preference of consumers on selecting e-grocery for their future purchases. The outcome of the study is proposed to use as a basis to promote e-grocery supply chain systems and to increase the consumer awareness as with refrence to e-grocery Supply Chain system in Sri Lanka.

**Keywords:** *Consumer Perception, E-grocery, Online Grocery Systems, Retail industry, Supply Chain, Theory of Planned Behavior*

MS – 030

## Impact of Sustainable Logistics Practices On Organizational Performance of Large-Scale Companies in Sri Lanka

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**Abstract:** The purpose of this research is to investigate the impact of sustainable logistics practices on organizational performance of large-scale companies in Sri Lanka. Significance of this study is that, in Sri Lankan context, there is less number of studies carried out related to this study and there are no standard set of sustainable logistics practices for Sri Lankan context. Apart from the subject and the industry, many researchers have used a specific geographical area as a criterion to decide the scope. However, the authors have mainly focused on the environmental certification, ISO 14000 certified large-scale companies in Colombo Stock Exchange as the scope of the study, since it would give a clear and unbiased result. This research uses a quantitative testing approach, using primary data and secondary data sources. Most of the quantitative analysis involves a deductive reasoning approach. This research study also represents the feature of a cross-sectional research design. The total population of this study is 193 ISO 14000 certified large-scale companies. Out of this 193, authors have selected 127 companies as the sample size by using “Krejcie and Morgan” sampling calculation. Therefore, to collect data this study uses questionnaires as the research tool. This study is referring to multiple regression for analysis and uses SPSS version 25.0 as the analyzing software. According to the results, green transportation is found as a null hypothesis and the other six hypotheses are accepted. Finally, according to the research findings, green transportation has no impact on organizational performance, but other dimensions have influenced organizational performance and, there is an overall impact on organizational performance. Therefore, this study recommends for managers and organizations to get a good understanding of sustainable logistics practices and to improve their performances.

**Keywords:** *Green Warehouse Management, Green Transportation, Green Procurement, Green Office Management, Organizational Performance*

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