



EdHat INTERNATIONAL
CONFERENCE
29TH NOVEMBER 2019



EdHat INTERNATIONAL RESEARCH CONFERENCE ON
TECHNOLOGY AND INNOVATION

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Editorial Foreword from the Conference Chair

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Through over twelve years of international educational contribution of cross-national achievement, EdHat International, UK has contributed substantially to the development of higher education and research in number of fields such as Technology, IT, Computer Science, Management, Law, Sports Science, etc. The aim of the EdHat International Research Conference on Technology and Innovation (IRCTECiN) is to provide an international recognized academic forum for researchers to present their research and scholarly knowledge. Because of its international scope, issues can be examined in both a comparative and global context.

The main objective of this research conference is to assemble scholars, researchers & practitioners who are involved in the field of Technology and to employ related theories and methods in understanding the advancements in technology in various fields. We aim to bring together many attendees, some as presenters, some as discussants, and others as active participants or observers for a day event in Colombo - Sri Lanka.

Innovations and new technologies are changing the world and the daily lives of each and every one of us. Many things that were mere visions of the future yesterday are now reality. Meanwhile, we are surrounded by technology at every moment of our lives. Therefore, we expect to open a forum to discuss innovations of new technologies through this conference on Technology and Innovation.

International conferences are great opportunities not only for researchers and scientists, but also for experts, policy makers, stakeholders and students. Here are six reasons for you to attend International conferences in your field. International conferences are great opportunities not only for researchers and scientists, but also for experts, policy makers, stakeholders and students. Here are six reasons for you to attend International conferences in your field. They are learning, discussion, presentation, visiting a new place, networking and academic reputation.

By attending this international conference, you get the chance to listen to different points of view and learn new ideas and trends in Technology and Innovation. It provides you with new techniques, new types of research approaches, data that is yet to be published, and investigators that you may not have heard of.

Therefore, I expect this conference will be a worthwhile and useful one for all the presenters, participants as well as partner universities and organizers.

I must thank to all partner universities, IDM Nations campus as the key organizer of the event, organizing committee, research paper presenters, reviewers, participants and members of the conference office for their great contribution in making this conference a successful one.

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CONFERENCE CHAIR



Prof (Dr.) Rohana P Mahaliyannarachchi Conference Chairperson and Editor in Chief

Prof Rohana P Mahaliyannarachchi is the former Vice Chancellor of the Sabaragamuwa University of Sri Lanka. He is the Senior Professor (Chair) of Agri Business Management of the Department of Agri Business Management of the Faculty of Agricultural Sciences of the Sabaragamuwa University of Sri Lanka.

He had participated as a quality assurance reviewer for more than 25 subject reviews during the first round of QA reviews in the university system in Sri Lanka. Further, he has given his contribution as a QA reviewer in Library reviews, Postgraduate Institutions and Graduate faculties reviews in number of Universities in Sri Lanka.

Most important, he has given his expertise as an Institutional QA reviewer for Institutional reviews in 6 universities in Sri Lanka in 10 occasions. He chaired the review team in four occasions. Apart from Sri Lanka, he has contributed his expertise as a QA reviewer in the Universities in Bangladesh. Prof Mahaliyannarachchi has involved in preparation of code of practices and other QA documents in Sri Lanka and he worked as senior consultant of Quality Assurance of EdHat International, UK that is a UK based educational body during his sabbatical period.

Further, he has worked as a member and chair of the reviewing panel of recognizing degree programmes for private higher education institutes appointed by Ministry of Higher Education, Sri Lanka. He was a member of the panel of preparing the Higher Education Policy of Sri Lanka during 2008/2009.

He has published 7 books and there are more than 30 Research papers which are published in reputed referred journals and more than 40 conference papers presented in national and international research forums under his name.

INVITED SPEAKERS

Chief Guest



MR. MIAN IMRAN MASOOD

Vice-Chancellor,
The University of South Asia Lahore,
Pakistan
Chairman - Gandhara Association of
Art and Culture, Pakistan.

Mian Imran Masood Former Minister Education of Punjab, Pakistan is a senior parliamentarian who has held many important positions in the Government of Pakistan. He has been involved in the policy making as being the elected member of the provincial assembly Punjab, Pakistan holding different portfolios in different times.

His focus has been in the areas of Education, Health, Human Rights, Women Empowerment, Environment, Culture and Heritage.

He has been a strong supporter of enhancing and strengthening the concept of Public private Partnership. Working in the education sector has been his strength in his long career of hard work and achievements. He has the honor of launching the biggest education reform program of Punjab in 2002 which was then adopted throughout in Pakistan. Free education for every child, free text books for Public sector students and stipends for girl students were announced for the first time in the history of Pakistan. The World Bank supported this education Reform Program as a partner. This reform program was rated as one of the best program in the World in achieving the Millennium Development Goals.

Mian Imran Masood also made a policy for the quality enhancement and research in the education Institutes. Higher Education Commission was promoted and strengthened in his time to monitor the universities of Pakistan. Many private universities were established in his time.

He is representing various organisations in different capacities. He has travelled extensively all over the World attending Conferences and Seminars.

Currently he is the Vice-Chancellor of The University of South Asia Lahore, Pakistan and the Chairman of Gandhara Association of Art and Culture, Pakistan.

Recently Mian Imran Masood has been notified as a member of the Punjab Higher Education Commission(PHEC) by the Government of the Punjab .

Inauguration Keynote Speaker



PROFESSOR RANJITH DISSANAYAKE

Senior Professor in Civil Engineering
Chairman, Green Building Council of Sri Lanka

Prof. Dissanayake was a Fulbright Scholar in USA, Endeavour Fellow in Australia, and JASSO Research Fellow in Japan during 2008-2007. He was awarded the Young Scientist Award in 2007 for Excellence in Scientific Research by the NSTC of Sri Lanka. He received the Overseas Prize of the ICE in 2007, UK and the Australia Alumni Excellence Award in 2012. He has published over 100 journal papers. He has chaired ten international conferences. He is a fellow of the Institution of Engineers, Sri Lanka (IESL).

He is the Chairman of the Green Building Council of Sri Lanka (GBCSL) and Civil Engineering Sectional Committee of Institution of Engineers, Sri Lanka (IESL).

In private sector he is Chainman for Lego International (Pvt.) Ltd, ICB (Pvt.) Ltd, Lanka AAC (Pvt.) Ltd. and IPS (Pvt.) Ltd.

He is chairing of the 10th International Conference on Structural Engineering Construction Management which will be held at Earl's Regency Kandy Sri Lanka in 2019

SESSION KEYNOTE SPEAKERS



DR. KAVEENGA RASIKA KOSWATTAGE
Senior Lecturer
Faculty of Applied Sciences
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Head
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DR. CHANDRAWANSHA PATHIRAJA
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Adjunct Professor, Linton University College,
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Visiting Research Fellow, De Montfort University,
United Kingdom

SESSION KEYNOTE SPEAKERS



MR. VIJAY REDDY
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Malaysia



DR. CHALINDA K. BENERAGAMA
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Chairman,
Workgroup Postharvest in Emerging Countries,
International Society for Horticultural Sciences,
Belgium

RELEASE KINETICS OF CURCUMIN ENCAPSULATED NANOPARTICLES DEVELOPED FOR TOPICAL APPLICATION

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Key words: Alginate, Artificial sweat, Curcumin, Encapsulation, Release kinetics

Introduction and objectives

Protection of the skin, the largest organ of the human body, from various skin diseases caused by bacterial or fungal infections is vital. Curcumin, a major phytochemical extracted from the rhizome of turmeric (*Curcuma longa*), has shown skin protecting abilities against diseases and exogenous harmful agents. However, topical delivery of curcumin is challenging due to poor solubility and fast degradation of this compound. Therefore, nano-encapsulation of curcumin in alginate can be effective in facilitating prolonged activity of curcumin in topical formulations. The aim of this study was to evaluate the release kinetics of the curcumin encapsulate in skin pH (5.5) and in artificial sweat pH (4.7).

Research methods

Development of curcumin encapsulated nanoparticles

Curcumin encapsulated particles were prepared according to the method described by Katuwavila et al., (2016). Briefly, a sodium alginate (1.0 % w/v) solution was prepared and the pH was adjusted to 5. Sorbitane monooleate (span 80) was added as a non-ionic surfactant. Then, 5 mg of curcumin (≥ 65 %, HPLC) dissolved in 5 ml of ethanol was introduced to the solution and the cross linker, CaCl₂ 1.5 % w/v, was added drop wise. Centrifugation followed by freeze drying was carried out to obtain a free flowing powder.

Characterization of the encapsulated particles was carried out by measuring the particle size, polydispersity index (PI), zeta potential, encapsulation efficiency, loading capacity and Fourier Transform Infrared Spectroscopy.

In vitro release

In vitro release studies were carried out using phosphate buffer media of pH 5.5 which reflects the average skin pH and of artificial sweat (ISO 3160/2-1882) of pH 4.7 at 37 \pm 2 °C using the dialysis bag method. Spectrophotometric quantification was carried out for the released curcumin from the particles.

Release profiles were fitted into 8 different drug release mathematical models: Zero order, First order, Higuchi, Hixon-Crowell, Korsmeyer-Peppas, Baker-Lonsdale, Weibull and Gompertz. All data were analyzed statistically.

Results and discussion

Encapsulation efficiency and loading capacity

A high encapsulation efficiency of 94.55 \pm 0.53 % and a low loading capacity of 0.472 \pm 0.003 % were obtained. The loading capacity needs to be improved through incorporating an increased initial amount of curcumin.

Particle size, polydispersity index and zeta potential

The particle size was found to be 186.8 nm and polydispersity index was 29.2 %. The zeta-potential of the particles was -15.4 ± 8.13 mV.

FTIR analysis

The IR spectrum of pure curcumin shows the functional groups of phenolic O-H stretching at 3500-3300 cm^{-1} , C=O stretching which shows the peaks at 1625-1640 cm^{-1} and aromatic C=C at 1520-1400 cm^{-1} (Ariyathna and Karunarathne, 2016). These significant peaks show a slight shift to the right side in the encapsulate.

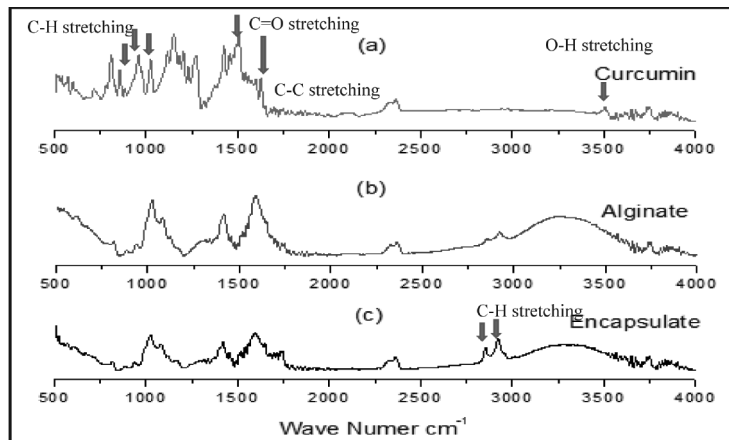


Figure 1. FTIR (a) Curcumin (b) Alginate (c) Curcumin encapsulated particles

C-H stretching can be seen prominently at 2858 and 2928 cm^{-1} in the encapsulate (see Figure 1). FTIR reveals that curcumin resides fully within the alginate matrix.

In vitro release study

Alginate is a pH-dependent water soluble polymer. Therefore, the release of drug occurs after alginate undergoes hydration, swelling, and relaxation of the chains. However, in low pH levels alginate chains tends to shrink to a considerable percentage and at higher pH levels these chains tend to relax which finally leads to a swelling of alginate matrix with an enhancement of the porosity of the structure. Due to the above reason, in this study, the maximum release values of curcumin at pH 5.5 and 4.7 were significantly different and were approximately 64 % and 27 % respectively (see Figure 2), exhibiting controlled release properties of alginate nanoparticles. Always, encapsulated curcumin showed slower release than free curcumin. Thus, nano-encapsulation may be utilized to facilitate slow release of curcumin at both skin pH and artificial sweat, while skin deposition or penetration may be required for satisfactory release of curcumin during sweating.

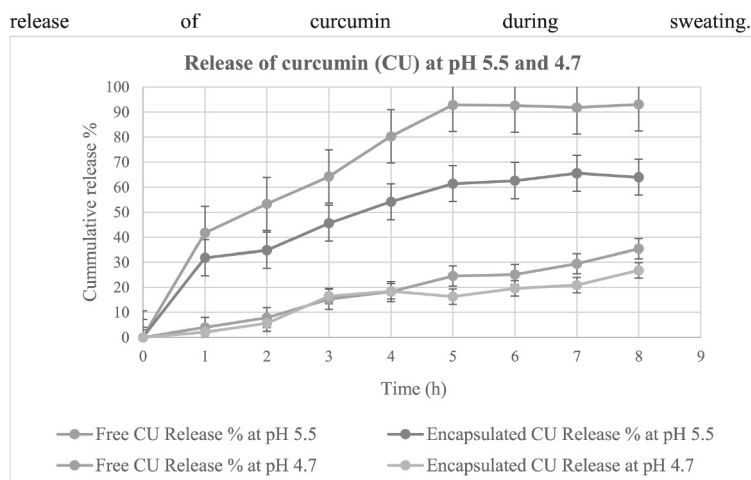


Figure 2. Release of FA at pH 5.5 and 4.7

Release kinetics of encapsulate at pH 5.5 fitted well with Weibull model with an adjusted R² value of 0.9161 while at pH 4.7 release kinetics of encapsulate fitted well with Gompertz model with an adjusted R² value of 0.8693. Both models depicted a sigmoidal release pattern.

Conclusion

Nano-encapsulation can prolong the release of curcumin on skin giving sustained effect. However, to elevate the delivery of curcumin during sweating, skin deposition or skin penetration of the curcumin nanoparticles may be necessary. Therefore, the extent of curcumin penetration into the skin via nanoparticles across the skin barrier and the state of the skin that might be affecting the degree of skin penetration of curcumin should be assessed for a better understanding of the overall delivery of curcumin via nanoparticles. Simultaneously, a risk assessment of the nanoparticles on skin exposure may be necessary.

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A FULLY AUTOMATED AND UNIVERSALLY ACCESSIBLE PILL DISPENSER

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Key Words: Pill Medicine Dispenser, Universally Accessible Containers, Automatic Dose Preparation, Cloud Database

INTRODUCTION AND OBJECTIVES

An automated medicine dispenser is a device which is capable of releasing correct doses of medication to the patient according to a prescribed schedule. With complex medication regimes, many patients tend to neglect prescribed doses unintentionally. These issues are prominent among elderly and disabled people. They have difficulties in self-administering medications leading to unfavorable situations such as forgetting to take pills and taking overdoses. Additionally, some prescriptions may require taking part of a tablet, posing difficulties for these patients.

An automated medicine dispenser provides solutions for above problems. Several pill dispensers have been developed during the past few decades. However, these are not universally accessible as they do not address needs of patients with special physical, cognitive and sensory needs such as those with visual and hearing disabilities, memory impairment, and poor coordination of hands. Visually disabled patients are unlikely to be able to use existing devices without the help of a caretaker or a pharmacist. The aim of this research was to design and develop a fully-automated and universally accessible pill dispenser using high accuracy pill dispensing techniques.

METHODOLOGY

The proposed pill dispenser contains a horizontal tray which contains multiple compartments where the pills are stored, and its rotation is controlled using a stepper motor. A linear actuator with a suction head which is controlled by another stepper motor picks up pills from compartments according to the prescription entered into the system. The device can be configured via three methods; using the touch screen, USB device or online application. After the pill is picked up, the tray rotates so the arm can drop the pill into the nearest hole it meets, and the pill goes to another chamber inside the device. After that, the tray rotates to the next required position and the same operation continues until all pills to be taken at a particular time are selected and prepared. When the time for the scheduled dose arrives, the alarm in the device sounds. This alerts the user to press the 'issue' button on the device to obtain the prepared doses of medicines into the cup. A concept of the overall design is presented in Fig. 1. If the user does not press the button the device automatically disposes the pills into another chamber after a predefined time, in order to prevent them getting mixed-up with the next dose. The proposed system is implemented using a Raspberry pi controller.

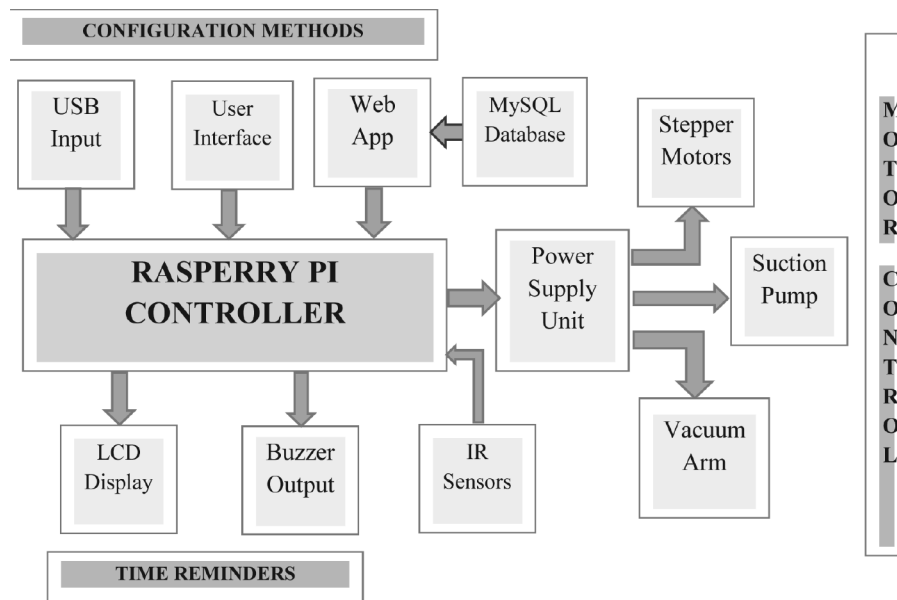


Figure 1: Conceptual Design for Pill Dispenser

RESULTS AND DISCUSSION

The pill dispenser can accurately pick up capsules and tablets of any size, type or shape. We have tested the device with more than 15 different types of capsules and tablets. The device is designed to pick one pill at a time to avoid errors in counting. The device has been tested for more than 30 times for accuracy of counting pills. If the arm fails to grab a pill at the first time, it goes down again since the fail-safe mechanism always measures the pressure difference at the suction head. Only when it grabs a pill the pressure goes down and indicates as a successful operation. Therefore, the device has ensured its continuous reliability on preparing doses through this unique mechanism. Furthermore, the pill dispenser can prepare many different types of dosage regimes such as after meals, six hourly, eight hourly etc. In the current design, the device can store up to eight different pills and up to 150 pills from each type, which is a much higher capacity compared to the existing devices [4] - [5]. Therefore, patients who are taking medicine daily can use this device for more than a month continuously once the device is filled full.

Universally accessible automated pill dispensers are not reported in research literature and not available in the marketplace. Several semi-automated designs have been implemented with the requirement of pre-filling manually prepared doses according to the prescription by a caretaker or a patient. However in the proposed design, the device does not need to be pre-filled with doses, it only needs to store different pills in bulk in separate compartments so the device itself counts and prepares the dose according to the configuration. Moreover, the proposed system can be configured and operated by any person using the wide variety of configuration methods and time reminders. This is a user-friendly device due to its advanced features such as LCD display, voice output, touch screen and web application interface.



Figure 1: Conceptual Design for Pill Dispenser

CONCLUSIONS

We developed a universally accessible automated pill container and dispenser. The biggest challenge in developing the pill dispenser was designing a fully accurate dose preparation mechanism; the rotating pill tray attached with a vacuum arm. Moreover, multiple IR sensors have been used in particular places to increase the reliability of the product. Another innovative feature of the pill dispenser was the cloud database which is used to maintain the end to end connection between the doctor, the pharmacist and the user. Looking at the overall design it can be concluded that, the design provides numerous advanced and unique functionalities compared to the existing products in the market.

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UNIVERSALLY ACCESSIBLE MEDICINE CONTAINERS: A FULLY AUTOMATED LIQUID MEDICINE DISPENSER

K.S.M.T.N. Samarakoon¹, G.S.P.P.S. Abayatilake¹, D.P. Jayasuriya¹, H.K.G. Zoysa¹, C.L. Weeraratne², and, N.W.N. Dayananda¹

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²Department of Pharmacology, Faculty of Medicine, University of Colombo, Colombo, Sri Lanka.

Key Words: Liquid Medicine Dispenser, Personalized Medicine, Automatic Dose Preparation, Universally Accessible Devices.

INTRODUCTION AND OBJECTIVES

Prescription medicine should be taken regularly and correctly on time. Many patients are on long term complicated medication administration regimes on a daily basis. Persons with visual/hearing, memory and physical disabilities face more difficulties in taking medications as prescribed. Therefore, researchers around the world are experimenting on smart medicine dispensers for improving medication adherence of patients.

There are several pill dispensers developed during past few years, but an automated dispenser for liquid medicine has not been presented in literature or as a commercial product. Elderly or disabled patients find it difficult to measure the correct amount of liquid by themselves with a regular medicine measuring cup. Therefore, the main objective of this study was to design and develop a liquid medicine dispenser which could provide a mechanism for any patient to receive their medication accurately, reliably and safely as prescribed by their physician.

METHODOLOGY

The proposed liquid medicine dispenser has a storage tank which would be filled with the prescribed liquid medicine. When the time for the dose comes, a linear actuator which is controlled by a stepper motor measures the prescribed volume of liquid into a syringe from the container and then alerts the user by the inbuilt alarm system. The volume of the liquid to be filled into the syringe is calculated by the controller, which controls the stepper motor to move the actuator accordingly. When the syringe gets decompressed the liquid is filled from the main container and when the user presses the 'issue' button, the syringe gets compressed and the liquid is filled into a cup. This operation is controlled using two one-way valves. The concept of overall design is presented in Fig. 1. The device can be configured using two methods; using pin push buttons or an android application connected via a Bluetooth module. If the user forgot to take the medicine, it will be stored inside the syringe to be issued for the next dose. The system was implemented using Atmel Atmega 328p microcontroller.

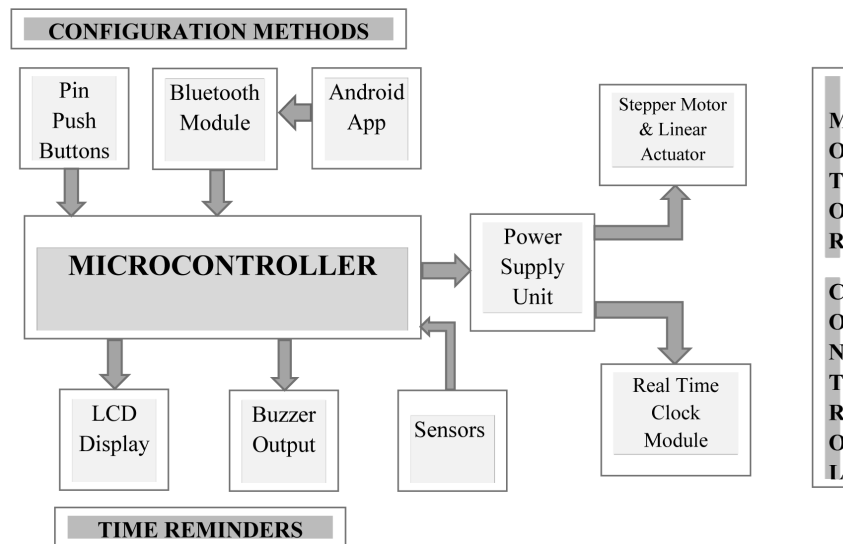


Figure 1: Conceptual Design for Liquid Dispenser

RESULTS AND DISCUSSION

The liquid dispenser can be used for almost any type of liquid medicine. We have tried liquid medicines with different densities and viscosities, which are frequently used in Sri Lanka and the device operated with an acceptable accuracy at all times. Since the liquid measurement is done by a syringe, 5ml, 10 ml, 15ml or 20 ml syringe can be used according to the precision. A syringe with 5ml and 10 ml is precise up to 0.2 ml while a syringe with 20ml and 50ml is precise up to 0.5ml. This system can be setup with either type of syringe as per the requirement.

We conducted experimentations using multiple liquid medicines which have different viscosity levels, with syringes of different sizes (5ml, 10ml, 20ml, and 50ml). Following table shows test results of each trial. It describes that 10ml and 20ml syringes measured medicine with highest accuracy across all types of liquid medicine while 5ml and 50ml syringes failed to achieve expected accuracy level at times. The accuracy of 50ml syringe dropped more when high viscous fluids were used. Therefore, 10ml and 20ml syringes were selected for the proposed system.

Table 1: Results Obtained from Different Sizes of Syringes and Liquid Medicines

Liquid Medicine	Viscosity	Syringe Volume	Results
A	Low	5ml	Accepted
		10ml	Accepted
		20ml	Accepted
		50ml	Accepted
B	Moderately high	5ml	Not Accepted
		10ml	Accepted
		20ml	Accepted

		50ml	Accepted
C	Moderately high	5ml	Accepted
		10ml	Accepted
		20ml	Accepted
		50ml	Accepted
D	High	5ml	Not Accepted
		10ml	Accepted
		20ml	Accepted
		50ml	Not Accepted
E	High	5ml	Accepted
		10ml	Accepted
		20ml	Accepted
		50ml	Not Accepted

*Accepted -

- 5ml and 10ml syringes: Maximum difference between the actual and expected measurement was less than or equal 0.5ml.
- 20ml and 50ml syringes: Maximum difference between the actual and expected measurement was less than or equal 1ml.

The manual measurement of liquid medicine using dispenser cups are prone to errors leading to inaccurate dosing of important medicine. However, with this design, the user can take the medicine which is already accurately measured and poured into the cup. Furthermore, this design contains two methods to issue the medicine, in order to provide special assistance for visually disabled people to drink it without spilling. While normal person can take out the medicine after it pours into the cup, visually disabled persons can take the measured medicine dose through a tube in the device directly into his mouth. In addition to that, to maintain the universal accessibility, the device contains audible and visual alarms which are programmed to start when the time for medication has arrived. Therefore, a visually disabled person can hear the alarm and hearing disabled person can see the alarm signal and take the medicine at the correct time. Moreover, the device is easily movable because of its small size and light weight, so even an elderly or disabled person can handle the device with ease.



Figure 2: Prototype of the Liquid Medicine Dispenser

CONCLUSIONS

We have developed a universally accessible, automated liquid medicine container, which is low cost and easily portable, to assist patients to receive their liquid medication accurately at the correct time in a more user friendly and attractive way. The major strengths of this design are syringe which is controlled by a linear actuator and a stepper motor and an Android application which can connect to the device via Bluetooth. Using the proposed design, medicine measured with 10ml and 20ml syringes showed highest accuracy across all types of liquid medicine while measurements with 5ml and 50ml were seen to need further improvement in accuracy. In order to enhance the reliability and accuracy of medicine measuring, we hope to include more sensor modules to measure the available liquid medicine in the container and to detect placements of medicine container and the cup. Furthermore, we hope to use a buzzer to shake the medicine before measuring it, as some liquid medicines require to be mixed before use.

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BIOETHANOL PRODUCTION FROM LIGNOCELLULOSIC MATERIALS

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Keywords – Bioethanol, Elephant grass, Enzymatic hydrolysis, Fermentation

ABSTRACT

Energy crisis associated with continuous depletion of fossil fuel is one of the prime concerns in the world. It associated with large scale utilization of fossil fuel with increasing population and problem of global warming due to CO₂ and other greenhouse gas emissions. There is an increasing interest for renewable energy sources such as biofuels, as environmental friendly alternatives for replacing fossil fuel. Among that, bioethanol is one of the most promising alternative energy sources for the limited crude oil which can be produced by bioconversion of variety of feedstock. Lignocellulosic feedstock is most abundant source for renewable energy which can be used for the production of second generation biofuel without compete with the production of food crops. The main objective of this study was production of bioethanol using elephant grass (*Pennisetum purpureum*) and rice straw (*Oryza sativa*) as feedstock by the method of alkaline peroxide pretreatment with enzymatic hydrolysis and fermentation in order to compare the ethanol content. The enzymatic hydrolysis was done by using cellulase enzyme. Fermentation was done by using *Saccharomyces* and samples were incubated at room temperature inside a space sterilized glass container for 5 days. Ethanol content in each replicate was determined by measuring absorbance values of fermented liquid at 600nm using a spectrophotometer. The maximum ethanol content of both feedstock types was recorded in the third day of fermentation. Among two tested feedstock types, higher ethanol content was recorded in rice straw as 62.77 g/L compared to elephant grass, 51.70 g/L.

INTRODUCTION

Energy crisis is one of the biggest problems in the world. Energy consumption of the world has increased steadily over the last century as the population has grown and more countries have become industrialized (Sun & Cheng, 2002).

The biofuels which derived from biomass are a promising alternative to partly replace fossil fuels. Biofuels can be used to meet the energy requirements in a sustainable manner. Bioethanol is one of the promising biofuel which can be used to replace gasoline for transportation. Ethanol is a clean-burning renewable resource and it does not add to a net-CO₂ atmospheric increase, thus there is no contribution to global warming (El-Nagar, et al., 2014)

The second generation production of ethanol is derived from lignocellulosic materials. Lignocellulosic biomass is the form of plant materials such as grass, woody materials and crop residues which has the possibility to act as a relatively greenhouse-gas favoring source of sugars for ethanol production (Mutreja, et al., 2011).

The present study aims to produce bioethanol using elephant grass and rice straw as feedstock by the method of alkaline peroxide pretreatment with enzymatic hydrolysis and fermentation in order to compare the ethanol content.

METHODOLOGY

Elephant grass (*Pennisetum purpureum*) is a fast grown in marginal lands, widely available perennial grass crop which can be utilized as a lignocellulosic feedstock for ethanol production. Rice straw (*Oryza sativa*) is one of the abundant agricultural residues which contain high cellulose and hemicellulose content and has a potential for bioconversion into fermentable sugars. Samples were dried at 60°C for 3 days and size reduced into 3-4 cm. Grinded samples were treated with alkaline peroxide pretreatment and then incubated at room temperature using a mechanical shaker for 24 hours.

Samples were incubated at 50°C and shaken for 72 hours in a mechanical shaker with adding Cellusoft LT 19500L enzyme for Enzymatic hydrolysis. Filtered samples were sterilized in an autoclave at 121°C for 15 minutes. Fermentation was done by *Saccharomyces cerevisiae* (yeast) in a sterilized glass chamber for 5 days (Bellal, 2013).

Incubated samples were distilled for ethanol separation and distillate were kept in a water bath at 62.5°C for 20 minutes for removing excess water. Ethanol content of each sample were determined by colorimetric method with K₂Cr₂O₇ using absorbance values at 600 nm UV-visible spectrophotometer (UV mini 1240, Shimadzu, Japan) (Sumbhate, et al., 2012). Data were statistically analyzed accomplished using SAS 9.1.3 portable and ANOVA was used to determine whether there were any statistically significant differences.

RESULTS AND DISCUSSION

Variation of pH in two feedstock types during enzymatic hydrolysis and fermentation period was given in following figure 1 and 2 respectively.

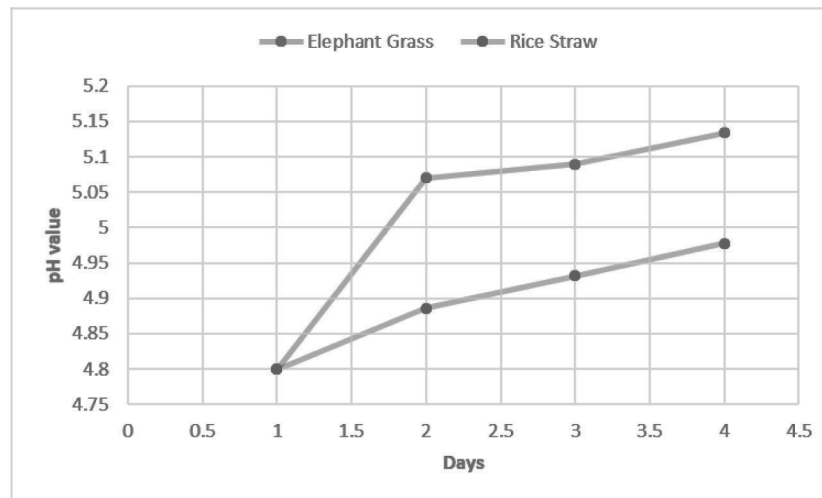


Figure 1. Variation of pH in elephant grass and rice straw during enzymatic hydrolysis

Enzyme activity is greatly influenced by pH during hydrolysis. The optimum pH for cellulase ranges from pH 4-5 (Belal,2013). The elephant grass showed higher pH values compared to rice straw.

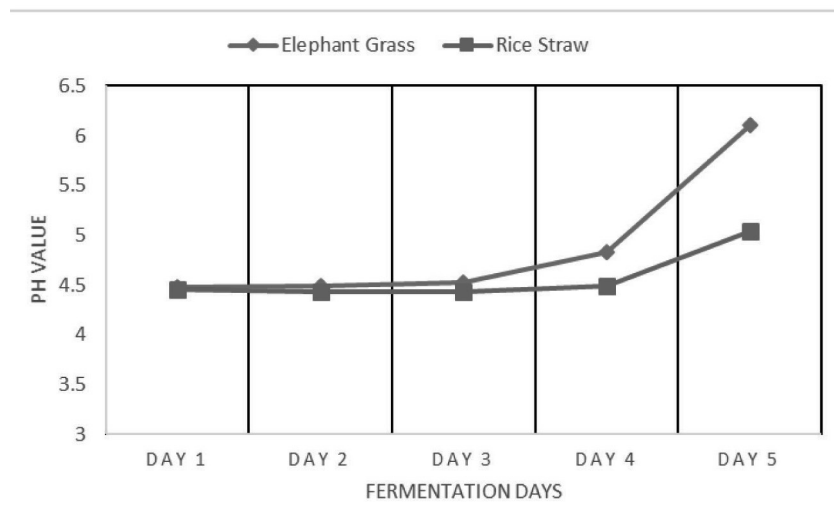


Figure 2. Variation of mean pH in elephant grass and rice straw with fermentation period

The pH is one of the most important factors for the fermentation process which depends upon microorganisms. Each microorganism possesses suitable pH range for its growth and activity. Increase or decrease in pH from the optimum value resulted in decrease in growth and activity of microorganism. Higher pH value was observed in the fifth day of fermentation.

Ethanol content in elephant grass and rice straw during fermentation period was given in figure 3.

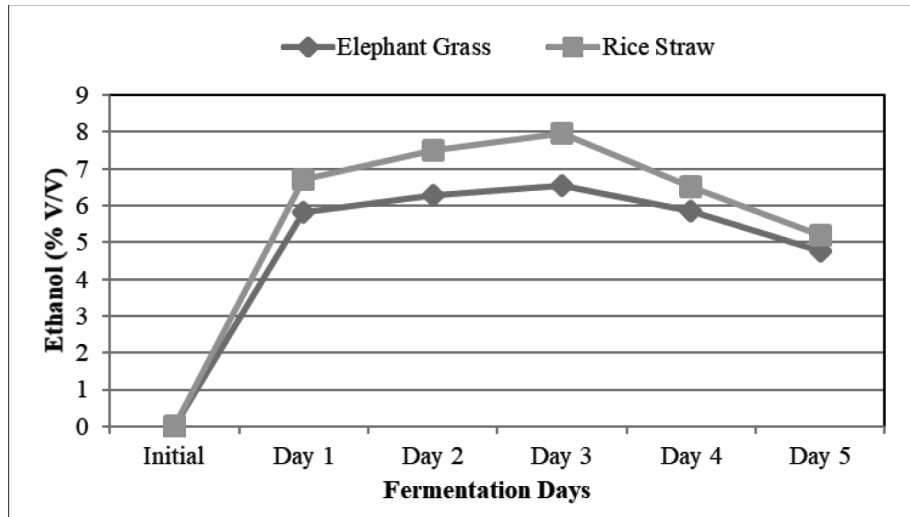


Figure 3. Variation of ethanol content (% v/v) in elephant grass and rice straw during fermentation period.

There was a maximum ethanol content at three days fermentation period in each of the feedstock. It was observed that the ethanol content increased steadily reaching the peak value at third day of fermentation and was declined after this optimum day of fermentation. The reason for this could be that the yeast was progressing to the stationary phase and could not able to utilize the limited sugar present in the sample. An energy deprivation would occur due to limited composition of fermented solution and the fermentative capacity will drastically reduce.

Ethanol content of different feedstock type was given in figure 4. The highest ethanol content was recorded in rice straw as 62.77 g/L compared to elephant grass, 51.7 g/L. With reference to the results, ethanol content in rice straw was significantly higher than elephant grass ($P=0.05$). The reason for this difference in ethanol production was due to the availability of fermentable sugars from cellulose present in biomasses.

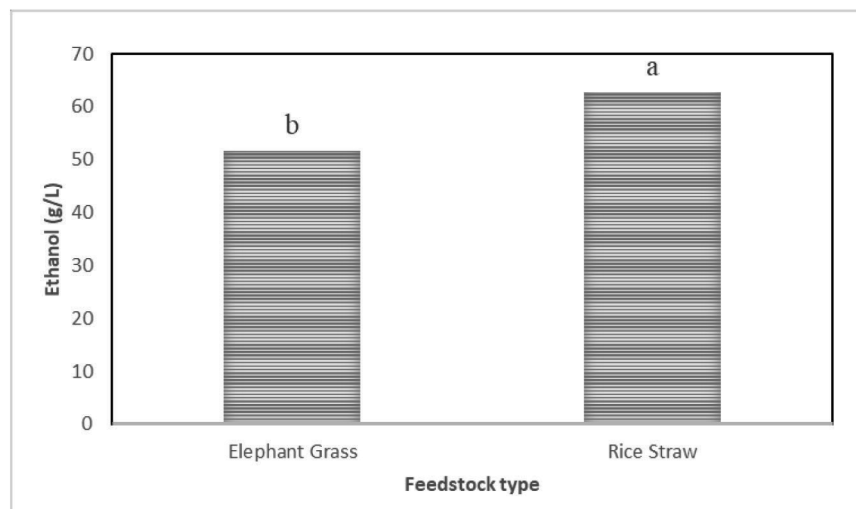


Figure 4 Comparison of mean ethanol content (g/L) in elephant grass and rice straw.

With reference to results of previous research of Irfan et al. 2014, the ethanol content of rice straw from this study (62.77 g/L) was slightly higher than, the ethanol content of pretreated rice straw (62 g/L) with 3% H₂O₂ and 2% NaOH followed by steaming at 130°C for 60 min.

CONCLUSION

The two feedstock types of elephant grass and rice straw can be successfully converted into ethanol by alkaline peroxide pretreatment of NaOH and H₂O₂ with enzymatic hydrolysis and fermentation under activity of *Saccharomyces cerevisiae*. The significantly higher ethanol content was recorded in rice straw as 7.96% (v/v), 62.77 g/L compared to elephant grass, 6.55% (v/v), 51.7 g/L.

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IN VITRO EXPRESSION OF CtsK GENE IN BACTERIAL EXPRESSION SYSTEM, *Escherichia coli*

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Key words- Cathepsin K, CtsK, Human, *Escherichia coli*, Expression Type of article- Research Paper

INTRODUCTION AND OBJECTIVES

Cathepsin K (CatK), encoded by CtsK gene in human (Salminen-Mankonen et al., 2007), is a single copy gene of approximately 12.1kb, on chromosome 1q21 (Littlewood-evans et al., 1997). CatK is principally involved in bone remodeling through ossification (Nishi et al., 1999). Pycnodysostosis, a form of osteoporosis, which is a rare autosomal inherited disorder causing abnormally hardened and denser bone is caused due to a mutation in the CtsK gene (Santamaría et al., 1999). The use of CatK incorporated in therapeutics to heal bone fractures by replacing worn out bone tissues with healthy tissue and on the counterpart, inhibiting the activity of CatK in the geriatric population in order to avoid unnecessary bone tissue degradation causing osteoporosis are novel areas of pharmacology and orthopedics to explore. The objective of the work conducted here was to express a catalytic domain of the CtsK gene in bacterial expression system as an initial step facilitating the recombinant production of human CatK for downstream applications in pharmacology.

RESEARCH METHODS

Four healthy human blood samples were collected. Genomic DNA was extracted using FlexiGene®-QIAGEN® whole blood DNA extraction kit. The DNA was quantified to investigate for purity and quantity through the Nanodrop™ spectrophotometer. CtsK gene was amplified by Polymerase Chain Reaction (PCR) using the forward primer 5'ACGCGTCGACGTGTACCATCAGTACCTCGCAC'3 and reverse primer 5'ACGCAAGCTTCTTCCAAAGTGCATCGTTACAC'3 which were tagged with restriction endonuclease sites of SalI and HindIII respectively, to facilitate molecular cloning. The PCR conditions were as 94oC initial denaturation, 94oC denaturation, 55oC annealing, 72 oC elongation, 72oC final elongation and 4oC final hold for 3 minutes, 30 seconds, 30 seconds, 40 seconds, 5 minutes and infinite respectively. The PCR products were visualized by running on a 1.5% agarose gel made with TAE buffer, providing a voltage of 60V for a duration of 3 hours. The band obtained was gel purified using the Genaxxon™ gel purification and sequentially double digested by the two restriction enzymes obtained from Promega™ which were SalI and HindIII. Simultaneously, the vector PBS was also subjected to sequential double digestion using the same enzymes. The double digested insert and vector were ligated using T4 DNA Ligase obtained from Promega™ and transformed to Top10 *Escherichia coli* competent cells for expression. The cells were then grown in LB media and the transformed cells were screened out using blue white screening.

RESULTS AND DISCUSSION

DNA extraction using the commercial whole blood DNA extraction kit yielded DNA of concentration between 350-500ng/μL. The A260/280 ratios, which indicate the ratio between DNA and proteins were in the range 1.75-1.79, which ideally needs to be 1.8 for DNA. As per the results, the DNA is highly pure and protein associates with the DNA have been well purified. The A260/230 ratios, which indicate the ratio between DNA and organic compounds were in the range 1.66-1.72 which ideally needs to be in the range 1.8-2.2 for DNA. The results indicated that the DNA is sufficiently free of any organic compound too. In addition, an AGE that was performed as a secondary measure indicated that the DNA extracted was intact and not degraded. Accordingly, the results obtained indicated that the DNA samples were suitable to be proceeded with PCR. As far as the PCR results are concerned, a clear band of size in between 200bp-300bp

(actual band size 265bp) was generated on a 1.5% TAE agarose gel. The band was a clear, single band and did not indicate any primer dimer or any other secondary structures like heterodimers or hairpin structures. Gel purification of this band, yielded a concentration of 45.2ng/ μ L that had a purity of 1.57 in terms of the A260/280 ratio. Dissecting the exact band of interest and subjecting to gel purification facilitated the exact product free from any other free nonspecific nucleotides to be used in downstream processes. Sequential double digestion of the purified DNA was done using HindIII first, followed by Sall yielded a band size, similar to the previously obtained PCR band in between 200bp-300bp (actual band size 265bp). Similarly, the sequentially double digestion of the PBS vector yielded a band size in between 3000bp-4000bp (actual band size 3204bp). The bands of the insert and the vector were dissected separately and upon gel purification, yielded a concentration of 4.8ng/ μ L and 4.2ng/ μ L respectively and a purity of 2.26 and 1.95 respectively in terms of the A260/280 ratio. Upon ligation of the double digested insert and the vector and transformation to competent *E. coli* cells, blue white screening white colonies appeared which indicated successfully transformed *E. coli* cells with the recombinant DNA, containing the vector and the insert of interest. Since the insert and the vector were both double digested, it could be confirmed that the white colonies were the *Escherichia coli* cells that were definitely transformed with the desired recombinant vector and is therefore confirmatory.

CONCLUSIONS

In conclusion it could be stated that the objective of the study which was to express a catalytic domain of the CtsK gene in bacterial expression system was successfully achieved. Now with the availability of the protocol for this expression, gradual developments and improvements in the study could be made for the expression of the entire gene coding for the recombinant production of Cathepsin K in bacteria and proceeding towards further downstream applications of production and optimally purifying it to be used in cooperated to therapeutics. Therefore, the authors strongly suggest that this initial work opens up a wide variety of further related potential research prospects.

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CONTROLLED RELEASE OF FOLIC ACID FROM ALGINATE NANOPARTICLES AT GASTRO-INTESTINAL PH CONDITIONS

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Key words: Alginate, Folic acid, Release kinetics, Nutraceutical

INTRODUCTION AND OBJECTIVES

Folic acid (FA), vitamin B9, is involved in many significant biochemical processes such as nucleic acid biosynthesis and protein metabolism in the human body. However, it tends to degrade rapidly at low pH conditions. As a result, ingested FA may suffer from degradation upon contact with gastric pH conditions. Therefore, a proper encapsulation system is desired for slowing down the degradation process of FA, especially, if it is formulated as a nutraceutical. Alginate is a natural polysaccharide which facilitates pH-dependent controlled release of bioactive agents, and thus, it may be ideal for encapsulating FA. The aim of this study was to encapsulate folic acid in alginate to evaluate the release properties and kinetics of the encapsulate in gastric and intestinal pHs so that the appropriateness of the particles in delivering FA into its main site of absorption, intestine, may be assessed.

RESEARCH METHODS

Preparation of folic acid encapsulated nanoparticles

Folic acid encapsulated particles were prepared according to the procedure described by Katuwavila et al., (2016). Briefly, a solution of alginic acid sodium salt (0.3 % (w/v)) was prepared with pH adjusted to 5 and then span 80 was added as a surfactant. Next, FA (USP testing specifications) 0.01 % (w/v) was introduced to the solution and the cross linker, CaCl₂ 0.75 % (w/v), was added drop wise. The solution was refrigerated overnight followed by centrifugation and freeze drying to obtain FA encapsulated particles.

Characterization

Particle size, polydispersity index (PI), zeta potential, encapsulation efficiency, loading capacity, morphology through scanning electron microscopy (SEM), and drug loading through fourier-transform infrared spectroscopy (FTIR) were determined.

In vitro release study

In vitro release studies were carried out according to the method described by Ariyaratna and Karunaratne, (2015) using pH buffer media of Simulated Gastric Juice (SGJ) of pH 2 and Simulated Intestinal Fluid (SIF) of pH 6.8 without enzymes. Quantification of FA was done spectrophotometrically.

Release profiles were fitted into 8 different mathematical models: Zero order, First order, Higuchi, Hixon-Crowell, Korsmeyer-Peppas, Baker-Lonsdale, Weibull and Gompertz. All data are presented as mean ± standard deviation (S.D.) of parallel experiments.

RESULTS AND DISCUSSION

Particle size, polydispersity index and zeta potential

The average particle size and polydispersity index were 488.1 nm and 105.8 %, respectively. The high polydispersity index was due to three populations of size according to the size distribution of the particles. The zeta-potential of the particles was -11.10 ± 7.79 mV.

Encapsulation efficiency and loading capacity

The encapsulation efficiency and loading capacity were $79.67 \pm 5.24\%$ and $2.65 \pm 0.18\%$, respectively. High encapsulation efficiency indicates the appropriateness of the method and conditions used in the preparation of particles. The loading capacity may be increased through increasing the initial amount of FA introduced.

IR analysis

FTIR analysis was carried out to confirm whether encapsulation was successful and to characterize the molecular components and structures of the encapsulated systems.

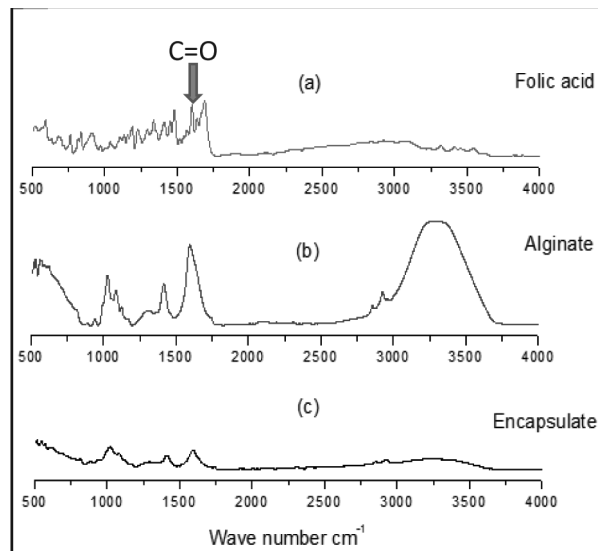


Figure 1. FTIR (a) FA (b) Alginate (c) FA encapsulated particles

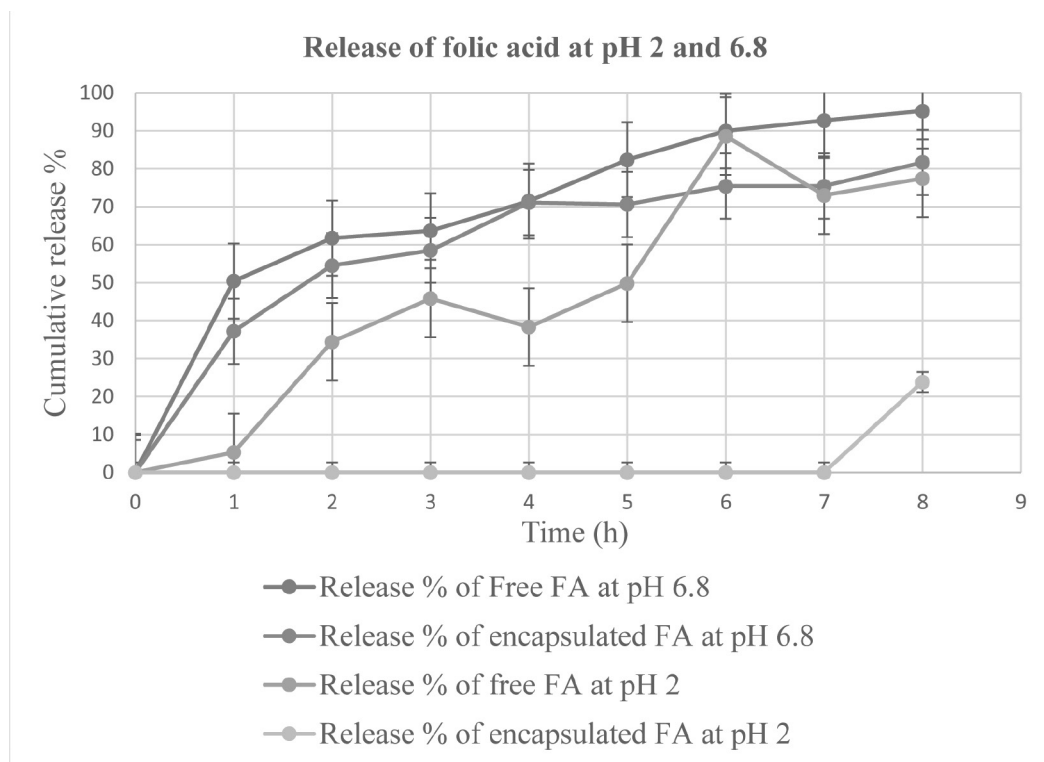
The strong peaks at 1638-1690 cm^{-1} which belong to C=O bond stretching of $-\text{CONH}_2$ (Roauf et al., 2014) of FA were not observed in the encapsulate may be due to the masking of the peaks in the process of encapsulation. A small shift in the peaks of pure FA has occurred to the left side in the FA encapsulated particles. The spectrum of encapsulate obtained from FTIR indicates the presence of FA in the alginate matrix.

Morphological analysis

Nano-particles were detected below the range of 200 nm. The deviation of the particle size from the hydrodynamic diameter may most probably be due to the absence of aqueous medium in the freeze dried samples used for SEM imaging.

In vitro release study

At pH 6.8, FA from encapsulated particles showed a much slower release of 82 % compared to free FA at the eighth hour. Interestingly, pH 2, FA from the encapsulated particles showed no significant release up to seven hours and exhibited a burst release of nearly 24 % at the final hour. However, at pH 2, free FA showed a higher release and the released FA appeared to degrade with time, which was a significant behaviour of FA throughout the study. Alginate matrix seemed to confer a protective effect on FA, specially, in gastric pH, and facilitate sustained release at the intestinal pH.



Graph 1. Release of FA at pH 2 and 6.8

Release profiles of FA encapsulated particles at 6.8 fitted well with Weibull model indicating that alginate encapsulated system is a swellable polymeric matrix (Yang et al., 2000). Anyhow, at pH 2, encapsulated particles showed an aggregation displaying a delayed release of FA, may be due to decrease of hydrophilicity of the polymer which may lead to a decrease of the polymer swellability.

Conclusion

Alginate has ascertained as an efficacious, safe oral delivery vehicle exhibiting controlled and slow release of FA along the gastro-intestinal tract in to its site of absorption, mainly, intestine. Intestinal pH of the medium seemed to have an influence on the polymer relaxation process of alginate, leading to a higher degree of swelling within a short time period whereas gastric pH of the medium seemed to have a controlled swelling influence on it, as alginate becomes less hydrophilic upon protonation in this medium. Therefore, pH dependent controlled release from alginate makes it an ideal carrier for FA.

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ODOR AND PEST PROOF DOMESTIC WASTE COMPOST BIN WITH SOLAR VENTILATOR

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Key words: domestic waste, compost bin, urban households

Abstract

The disposal of domestic waste, especially kitchen waste has been a major problem in urban households. The general objective of this research is to develop a domestic waste compost bin and to test its operation at domestic level. It was aimed at developing a bin that could decompose all the common bio-wastes generated at households both from plant and animal origin while making it compatible for houses with limited space especially in urban areas. The bin was constructed using plastic and PVC accessories in order to make it cost effective. The domestication trial was carried out for a period of 424 days. During the trial period, about 550kg of kitchen waste was fed to the bin on wet basis. The final weight of leftover was 16kg after the trial. It was observed that bin could be operated continuously over a period of one year without any extraction of decomposed material.

Introduction

Over 60% of total municipal solid wastes of Sri Lanka consist of biodegrade materials. According to (Liyanage, Gurusinghe, Herat, & Tateda, 2015) 61.8% of domestic wastes are bio-degradable organic wastes. According to (Balasooriya, Priyankara, & Alag, 2015), on average more than 68% of residential wastes in Galle district are coming from the Kitchen. Littering can be seen as one of the common methods of disposal of household solid wastes. If biodegradable domestic wastes could be decomposed at household level, it would reduce the waste that needs to be dumped on roadsides or used as landfill material. As (Sabry, 2015) reported the Colombo Municipal Council and the Urban Development Authority (UDA) joined hands in solving the garbage problem in the country by allocating a sum of US\$ 107 million. The report claims that an amount of 1,200 metric tons of waste is produced by greater Colombo, and the Colombo suburbs where the collected wastes are dumped at Meethotamulla. However, it is common to see that, residents of Meethotamulla hold protests demanding to remove the garbage dump. It was also reported that the dumpsite has exposed more than 90% of the Meethotamulla residents to diseases including dengue, malaria, gastrointestinal infections and skin disorders. According to (Keerthisinghe, 2016), the existence of the garbage problem in Colombo and the suburbs for a long period of time without a proper solution continued. Further in the report, out of 7,500 tons of waste produced in the country for a day, about 1,000 tons are processed for waste management and the remaining 6,500 tons are said to be expected to manage using new technology. According to (Zon & Siriwardena, 2000) lack of space is the most prominent problem in handling the domestic wastes in urban households. This implies the necessity of implementing more practical solution at the site where the garbage is being produced. However, there is a "list of materials to exclude" from common waste bins. The list includes common kitchen wastes such as fish/meat scraps, coconut scrape dust, fats, dairy products, etc. This "Materials to Exclude" list may be common with all the composting bin designs available in Sri Lanka at present. However, this is the key point to address with a new composting bin design to handle domestic wastes, especially kitchen refuse that contain fish/meat scrapes, fat containing waste such as coconut kernel scrape dust etc. This indicates the existing gap between the practical requirements at domestic composting and the available technology at present.

Objectives

The general objective of this research is to develop a domestic waste compost bin and to test its operation at domestic level.

Research Method

The components of the new bin were fabricated mainly using plastic, PVC tubes and general plumbing items and fittings. The outer container was made out of a 50 liter plastic bin slightly conical in shape; the inner container is a perforated 30 liter container conical in shape both ends cut open. The compost removal vent was attached to the outer container equipped with two lids where the outer lid was a screw type which could almost seal the vent. The inner lid was placed at the opening of the inner container to avoid spilling of decomposing materials between inner and outer containers. The raised feeder was attached to the lid of the outer container while keeping 4-inch gap between inner container and the bottom of the feeder to prevent larvae and other beneficial organisms reaching the feeder. At the base of the outer container, drain holes were cut with the diameter of 1 ½- inch for the fast draining of fluid from wastes. The aeration to decomposing materials was facilitated by a solar ventilator, of which the parts were fabricated using PVC tubes and fittings. The top ½ of the outer container, feeder and the solar ventilator were coated with black weather shield paint in order to heat the surfaces by absorbing more solar radiation. The lower half of the outer container is coated with white weather shield paint in order to make a temperature gradient to facilitate upward air movements. Black soldier fly larvae was introduced to gulp the waste.

Results and Discussion

This bin was placed near the house where adequate sunlight was available on 18th December 2016. During a sunny day, the surface temperature of the white paint coated surface was not different from the ambient temperature, while the black coated surface shows +15 0C to +20 0C gradient. This temperature gradient pushes the additional air trapped at gap between the inner and outer container towards the exhaust end of the ventilator. The solar heating cut down the energy requirement for the operation of the bin. The average kitchen waste input was 1300g per day from a family of four members (SD ±436g). The bin was continuously operated for a period of 424 days. The approximate total kitchen waste input on wet basis was 550kg. After the trial period the left over was kept to settle for a period of 2 months. The final weight of leftover was 16kg that could be readily used as compost for domestic plants. During the trial period it was observed that the bin could decompose all common bio-wastes (plant and animal origin) without any odor and pest problems.

Conclusion

This composter was especially designed to suite the conditions at urban houses with limited space where the bin could be placed at any convenient place near the house (balconies, corridors, etc). The bin could be operated continuously over a period of one year without any extraction of decomposed material.

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MOBILE APP TO PROVIDE A RELIABLE LEGAL ADVISORY SERVICE FOR THE CLIENTS IN SRI LANKA

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Keywords: Legal advice, Legal issues, Mobile app, Lawyer

Abstract

When we listen to the news, read newspapers, visit news websites, can find ample examples of legal violations such as accidents, crimes, land issues, cyber-crimes, robberies, Legal advice, Mobile app, Legal issues, etc. Thus, people seek legal assistance for their varieties of legal issues. However, it is difficult an ordinary citizen to find an appropriate and registered lawyer at the Bar Association of Sri Lanka (BASL) to get legal advice for their issues as they use traditional approaches in selecting lawyers such as through someone's recommendation.

During the literature review, it was able to find a few similar types of apps available in other countries. However, there was no such mobile app available in Sri Lanka. At present, most people carry smartphones in Sri Lanka. Hence, this mobile app provides effective and efficient solutions to solve their legal issues in a very feasible manner. The main objective of the research was to develop an app which provides a reliable legal advisory service for the clients in Sri Lanka. Further, it provides emergency legal access for the people who look for legal advice (clients) and lawyers who provide legal advice in 24/7/365.

Sample (N=150) consisted of lawyers and the general public. Online questionnaires and interviews were the main techniques used to gather requirements. The Waterfall methodology was used to develop the app as the requirements were well defined.

Check availability of the lawyers, make appointments, search results enable users to find the most recent and relevant results, add appointments to the lawyer diary, appointments confirmation and attach case-related documents and it can also be as an emergency app to directly contact lawyers and relevant departments such as nearby police station, hospitals, and ambulance services are the main features available in the app. Smart mobile phone with Android OS, IONIC platform, PHP, typescript and MySQL are the main hardware and software requirements used to develop the app.

Introduction and Objectives

When we listen to the news, read newspapers, visit news websites, can find ample examples of legal violations such as accidents, crimes, land issues, cyber-crimes, and robberies, etc. Thus, many people seek legal assistance for their varieties of legal issues. However, it is difficult an ordinary citizen to find an appropriate and registered lawyer at the Bar Association of Sri Lanka (BASL) to get legal advice for their issues as they use traditional approaches in selecting lawyers such as through someone's recommendation.

There are similar types of apps available in other countries (DYSART, 2015). However, there was no such mobile app available in Sri Lanka. The main objective of the research was to develop an app which provides a reliable legal advisory service for the clients in Sri Lanka. Further, it provides emergency legal access for the people who need legal advice and lawyers who provide legal advice in 24/7/365.

Research Methods

Sample (N=300) consisted of lawyers and the general public. Online (Google forms) questionnaires and interviews were the main techniques used to gather requirements (D. O. F. F. T. I. T. E., n.d.). Requirements collected from clients using google forms and lawyers were interviewed to collect their requirements. The Waterfall methodology was used to develop the app as the requirements were well defined (CIO guide to project management basics, DevOps and Agile, 2018).

Smart mobile phone with Android OS, IONIC platform, PHP, typescript and MySQL are the main hardware and software requirements used to develop the app (ionicframework.com, n.d.).

Results and Discussion

This mobile app includes two different interfaces for clients as well as for lawyers as the app provides different facilities based on their requirements. Features of the app were identified based on the literature (similar types of the app available in other countries) and requirements gathered from the analyzed results of the questionnaire.

Check availability of the lawyers, make appointments, search results enable users to find the most recent and relevant results, add appointments to the lawyer diary, appointments confirmation are the main features available in the developed app. Following figures (Figure 1 to figure 14) illustrate user interfaces of the developed app for clients and lawyers.

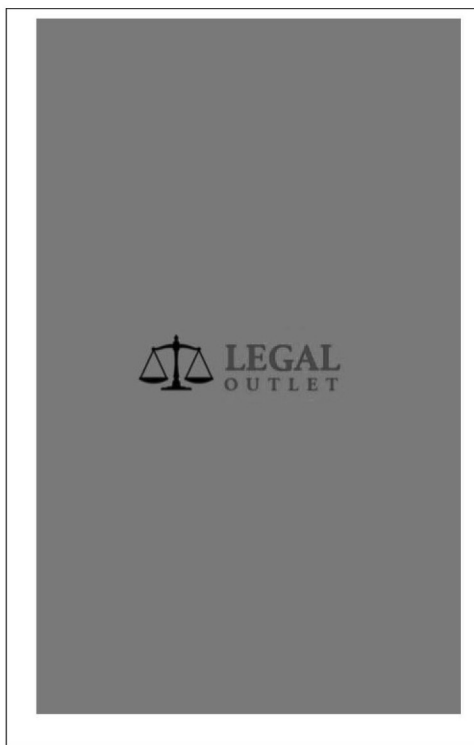


Figure 1: Splash screen of the app

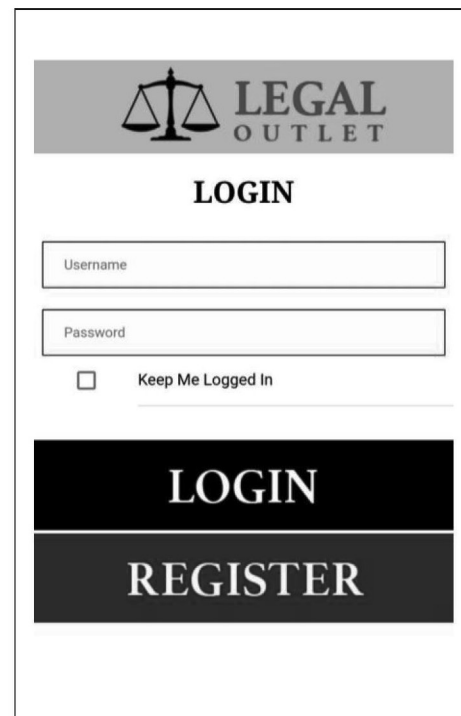
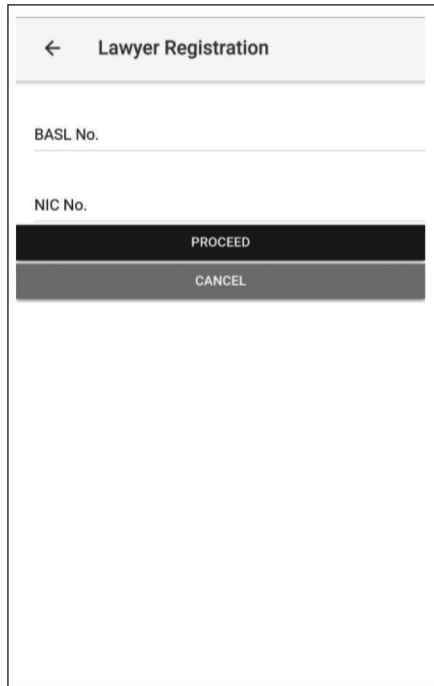
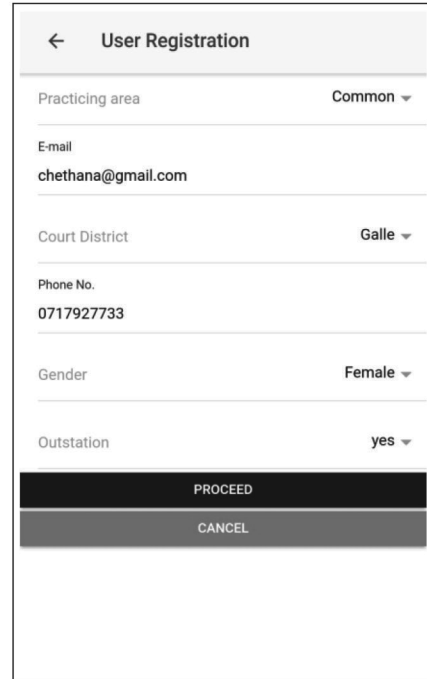


Figure 2: Register for your user account registration



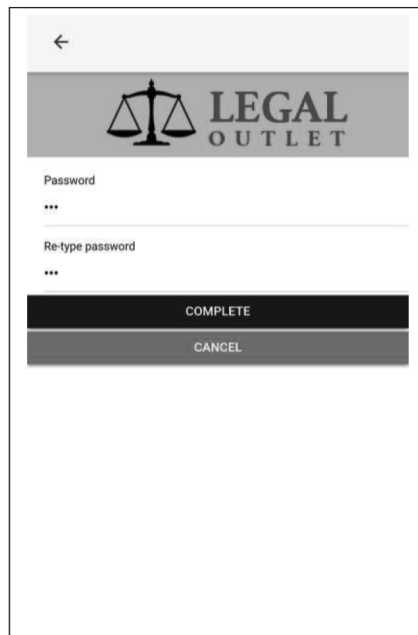
A mobile application screenshot titled "Lawyer Registration". At the top left is a back arrow. Below the title are two input fields: "BASL No." and "NIC No.". At the bottom, there are two buttons: "PROCEED" (black with white text) and "CANCEL" (grey with white text).

Figure 3: Enter BASL and NIC number to proceed



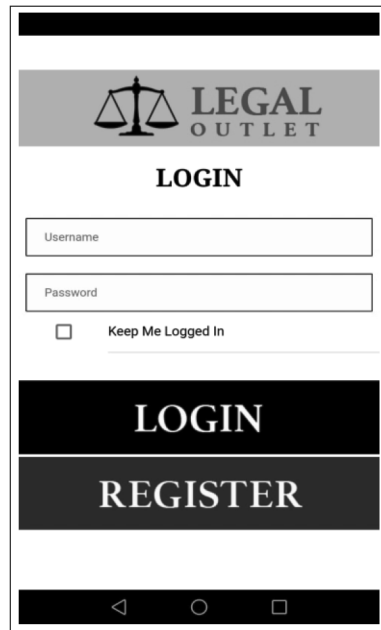
A mobile application screenshot titled "User Registration". At the top left is a back arrow. Below the title are several fields: "Practicing area" with a dropdown menu showing "Common"; "E-mail" with the text "chethana@gmail.com"; "Court District" with a dropdown menu showing "Galle"; "Phone No." with the text "0717927733"; "Gender" with a dropdown menu showing "Female"; and "Outstation" with a dropdown menu showing "yes". At the bottom, there are two buttons: "PROCEED" (black with white text) and "CANCEL" (grey with white text).

Figure 4: Client Registration



A mobile application screenshot for password confirmation. At the top left is a back arrow. Below it is the "LEGAL OUTLET" logo. The screen contains two input fields: "Password" and "Re-type password", both with masked characters (dots). At the bottom, there are two buttons: "COMPLETE" (black with white text) and "CANCEL" (grey with white text).

Figure 5: Type Your "Password" and click "Complete"



A mobile application screenshot for login and registration. At the top is the "LEGAL OUTLET" logo. Below the logo is the word "LOGIN". There are two input fields: "Username" and "Password". Below the "Password" field is a checkbox labeled "Keep Me Logged In". At the bottom, there are two large buttons: "LOGIN" (black with white text) and "REGISTER" (black with white text). The Android navigation bar is visible at the very bottom.

Figure 6: Type your "Email and Password" for login

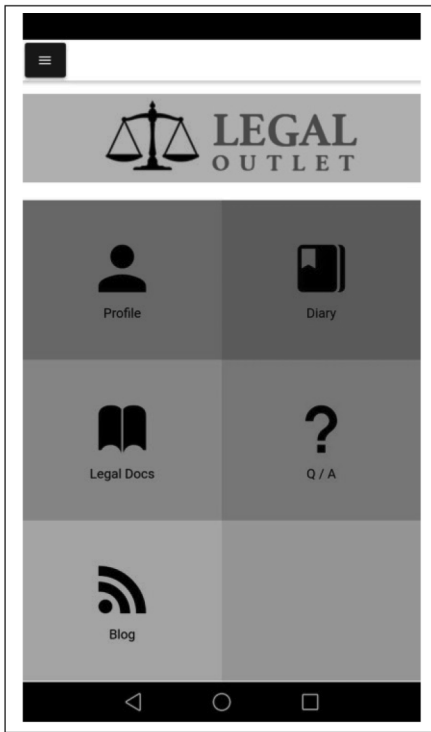


Figure 7: Main Menu

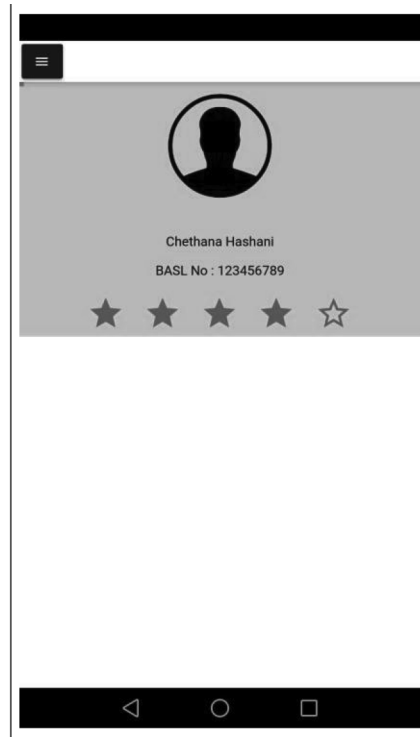


Figure 8: Profile Page

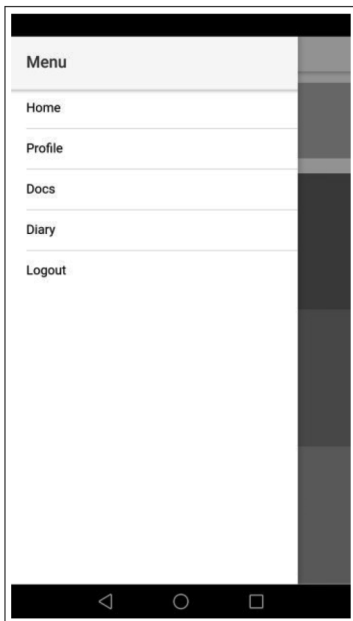


Figure 9: left side Menu



Figure 10: Calendar Option

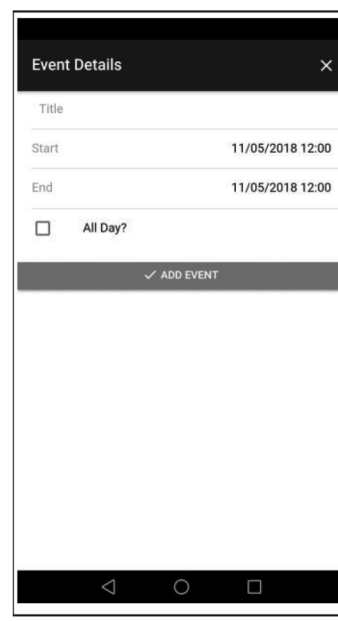


Figure 11: Add your case detail into the event details

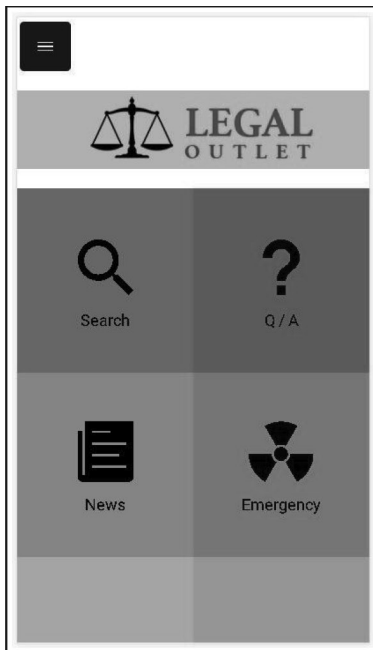


Figure 12: Main menu of Clients



Figure 13: Search for Lawyer



Figure 14: Select lawyers under different category

In addition to the above features, the app is also provided an emergency facility (Figure 15 and 16): to directly contact lawyers and relevant divisions/institutes such as nearby police station, hospitals, and ambulance services.

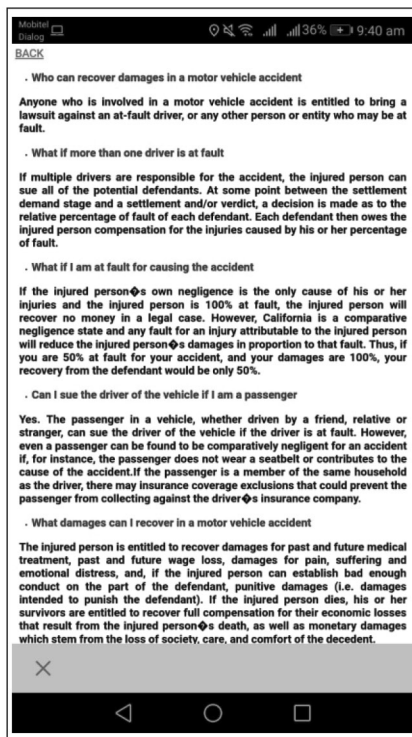


Figure 15: Available answers for FAQs

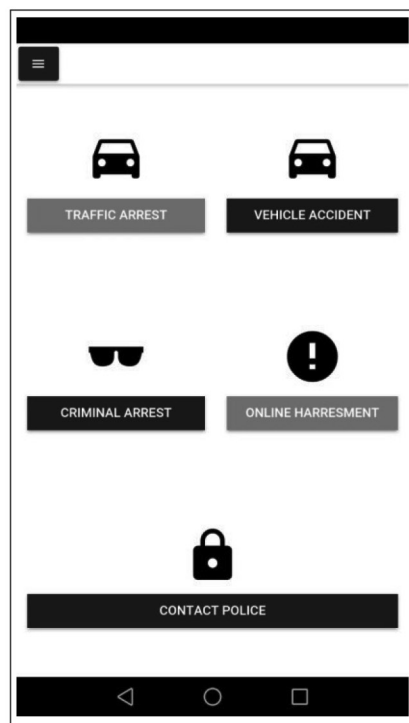


Figure 16 : Emergency alert detection menu

Conclusions

It is difficult for an ordinary citizen to find a suitable and reliable lawyer to get legal advice for their issues. Through the developed mobile provides a reliable legal advisory service for the clients in Sri Lanka in 24/7/365.

Check availability of the lawyers, make appointments, add appointments, appointments confirmation are the main features available in the app. Besides, the app is also provided an emergency facility to directly contact lawyers and relevant divisions/institutes such as nearby police station, hospitals, and ambulance services. The payment gateway feature will be implemented in future which will be useful for clients.

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ARCHITECTING ADVANCED DEVOPS ENGINE WITH DOCKER BY USING MICROSERVICES FOR ENTERPRISE SOFTWARE APPLICATIONS

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Keywords: Docker, Containerization, Microservices, DevOps

INTRODUCTION AND OBJECTIVES

In the industry approach, bare-metal hardware, virtual machines (VMs) or cloud infrastructure are using to launch enterprise-ready applications. At the time of using those platforms, the main problems that occur are the difficulty of scaling the infrastructure and maintain the infrastructure, long-time data persisting issues, the difficulty in archiving the systems and large payments on cloud services. To overcome the identified problems, an advanced DevOps engine was developed on the Docker container management system with microservices applications. The objectives of this study are to develop conceptual and technical DevOps engine module, to apply the containerization platform on Docker engine for enterprise-ready microservices applications and to make an agile DevOps platform. The proposed system was analyzed over the cloud infrastructure with the same configurations. Jha, et al. (2018) describes that Docker is a better approach for microservices applications but there are no existing researches for microservices architecture for the enterprise-ready platform with Docker.

RESEARCH METHODS

The proposed engine was deployed with the Docker container management system on top of the Ubuntu 18.04 LTS host. To design the engine, microservices architectural enterprise-ready software applications were used. The applications were deployed by using Apache Tomcat and NGINX as web-server containers. For database services, MySQL container and deployment purposes, Jenkins and Aartifactory containers were used. Above discussed each software application and software service was deployed on separated Docker containers by using Docker trusted images from local Docker registry. All container was mounted with a Docker volume to archive most key data in each container for long time data persistency [1]. All data, applications and log directories of each container were attached to particular data volume on the Docker. For source code controlling it was used GitHub repository. Each Docker volume attached with the path /var/lib/docker/volume/ on the host operating system (OS) to data persistence and archive. Periodically each Docker containers were archived on both Docker local registry and converted them into portable modules. Meanwhile, cloud instances (CIs) were also archived to images.

Internal architecture for the proposed engine is shown in below Figure 1.

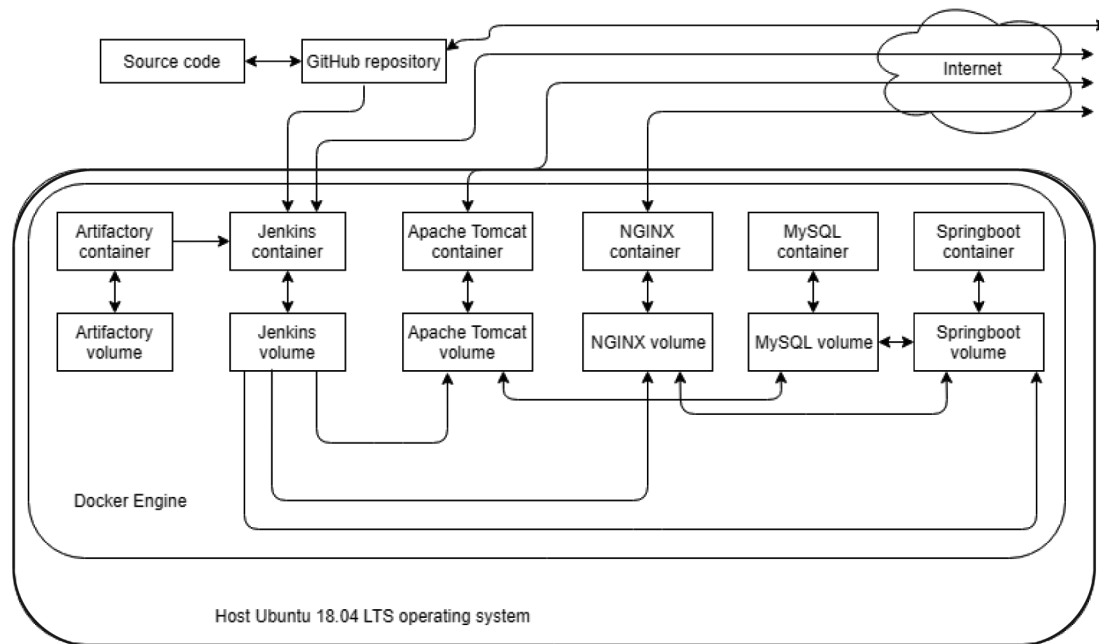


Figure 1: Proposed DevOps engine architecture on Docker

All the containers were communicated through an internal Docker network. Container ports and host ports were used for internal and external communications respectively. To compare the features of the proposed engine, the same configuration was deployed on cloud infrastructure. To orchestrate the proposed engine, portainer.io tool was used instead of the command-line interface to create an easy platform.

RESULTS AND DISCUSSION

The data in the containers were communicated through each volume inside the host OS. The data which was not in the mounted volumes, were transferred through internal IP addresses of containers and internal container ports. In the proposed engine, all data transmission happened inside the local Docker environment without opening to outside. Therefore, data transmission was more secured in the proposed engine. Host operating system IP address and host port of particular container were used to access the data/service of containers from outside world.

To analyze the proposed system infrastructure, the engine has experimented over the same infrastructure on the CI. Restarting time was measured in each container against to the particular CI as presented in below Table 1., by calculating the mean-restart time of each container-CI paradigm for ten times.

Table 1: Time to restart containers and VMs

Service name	Time-consuming for restart (s- seconds)	
	Container on Docker	Cloud instance
MySQL service	3.25	17.26
Artifactory service	3.45	21.21
Apache Tomcat service	4.26	23.14
NGINX server	3.15	15.37
Springboot service	4.49	21.22
Jenkins service	6.05	31.47

According to the Table 1, the performance of mean-restarting time was presented 1:5 ratio between containers and CIs for each service. This depicts, approximately 83% of performance increment in presented containerized engine approach than CIs. To analyze the proposed engine further, all containers and corresponding CIs were archived: tabled archived image size is shown in below Table 2.

Table 2: Archived Image size of containers and VMs

Service name	Archived image size (MB)	
	Container on Docker	Cloud instance
MySQL service	372.10	2176.14
Artifactory service	1312.88	3207.24
Apache Tomcat service	513.46	2269.48
NGNIX server	504.15	2039.47
Springboot service	734.14	2656.57
Jenkins service	3790.11	6638.54

According to the generated results in Table 2, containers were presented more lightweight than corresponding CIs. The lightweight of the containers were affected to the increment of the performance and fast execution of containers.

Due to created portable Docker images; all archived container images were able to migrate from one platform to another. But CIs were not able to migrate from one platform to another. Therefore, the proposed engine was consisted with fast and simple migration features. For the proposed engine, all the resources were open-source software services and tools. Therefore, it did not cost large amount of payments for services.

CONCLUSIONS

In this research study, an enterprise-ready system infrastructure was launched on top of the Docker container management service by using software applications and services which are commonly used in the enterprise-ready environment. The portainer.io was a better orchestration solution with a user-friendly, web-based interface for Docker containers to govern the Docker platform than the command-line interface. Therefore, portainer.io tool was recommended for Docker management. It recommends mounting a Docker volume before launch a Docker container, to archive key data, logs and applications on the host. It helps the Docker volumes to recover the most important data of the container although the container was crashed or destroyed. To face for the upcoming challenges successfully in the DevOps environment, these microservices architectural solutions with Docker containers are adding more advantage to the DevOps industry with faster software delivery for the production.

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GUIDELINES TO UPGRADE THE STANDARD AND ACCEPTANCE OF EXERGAMES

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Key words: Exergames, Regular, Demerits, Guidelines

ABSTRACT

Exergames or active video games are a means of integrating physical exertion with video game play. Exergames have become popular among children and youth in the recent years. Yet, there are certain factors which reduce the popularity of exergames. This research reviews exergames, investigate their demerits and provides a set of guidelines to promote the usage of exergames.

INTRODUCTION AND OBJECTIVE

Overweight and obesity are considered an epidemic in today's world. One main reason lies in the fact that the amount of routine exercise performed by an individual is insufficient, while the time spent on leisure activities such as movie viewing and playing of sedentary video games is immense. As a remedy to this scenario, exergames, also known as, active video games (AVGs) were introduced (Tanaka et al., n.d.). These games integrate physical body exercise with video games, and have been recognized as a means of moderate physical exercise. AVGs are more popular among children and adolescents, yet have been also used as rehabilitation exercises among the elderly population.

Even though exergames have their advantages, some of their demerits prevent them from being popularly used as a routine means of exercise. Literature has proposed suggestions in this account (Baranowski, Maddison, Maloney, Medina, & Simons, 2014), (Chokchaisiripakdee, 2014). This research identified exergames as an ideal tool to promote physical activity in the general public. Yet, literature revealed that there have been certain factors which have caused a drop in the demand of AVGs in the recent past. These demerits need to be overcome in order to make exergames more acceptable. The main purpose of this research is to investigate the factors in detail and formulate a set of guidelines, which exergame designers can adapt in order to promote AVGs as a regular physical exertion tool.

RESEARCH METHODS

Procedure for Analysis

The initial step of this research was to investigate the various types of exergames that were designed. Certain exergames involved activities such as cycling (Müller et al., 2018). Others involved sports such as tennis and boxing. There were exergames which were spread out over a large terrain using GPS systems. Certain exergames involved dancing (Tanaka et al., n.d.). The second step of the research was focused on comparing the games for their positive and negative attributes. Certain literature revealed the comments of exergame users regarding their pros and cons. The comments of the users were studied in detail (Dixon et al., 2010)(Skjæret et al., 2014), (Baranowski et al., 2014).

The third step of the research was to sum up the expectations of users and propose a set of guidelines. These guidelines are focused on increasing the regular usage of exergames and in addition, cause the exertion to be more effective. Further the guidelines were classified into two groups. Classifying the guidelines into two categories gives a clearer view on how to adapt to these guidelines in the process of designing an AVG.

RESULTS AND DISCUSSION

The literature was examined in depth to understand the perspectives of those involved in exergames. The perspectives of players, as well as their guardians and coaches, (Lin & Zhang, 2011) were listed in order to investigate the reasons for the lack of acceptance of exergames as a regular means of exercise. Based on these findings, a set of guidelines was proposed, for an exergame designer to incorporate when designing an AVG.

The guidelines for the successful design of an exergame were categorized, in order to ease the process of adapting to guidelines during design. One category is the guidelines that are considered in the initial design, or in other words, the guidelines which lay the foundation for the exergame, which can be introduced as “Foundational Guidelines”.

The second category is the guidelines which are addressed while playing the exergame, for the exergame to be customizable from player to player. These guidelines enhance the adaptive nature of the exergame and are therefore named as “Adaptive Guidelines”.

Foundational guidelines

Exergames must be built on a realistic story or scenario and must cater for both genders. Effective feedback should be provided during gameplay. Tailored messaging must be incorporated. Motion sensing must be precise with minimum time delays. The space limitation of the environment needs to be considered. A mechanism to optimize the users per station is necessary, while targeting a reduction in setup time and cost. Clinical guidelines and player’s health record must be integrated. Sustained exercise must be incorporated instead of short bursts of exercise. Monotonous activities must be omitted to prevent boredom in prolonged use.

Adaptive guidelines

The level of challenge needs to be customizable. Precise detection is necessary to verify that the player is not cheating the game. Facial recognition is necessary to judge emotions, anxiety and engagement. A method to detect full body motion must be integrated. Multiplayer options must be customizable. Temporal variation and adaptive game speed must be incorporated. Step length variation and movement direction variation must be integrated. A mechanism to encourage the user to focus on the task instead of the stepping must be added.

CONCLUSION

The literature exposed many reasons which make AVGs suitable as an interesting mode of moderate exercise. Yet, there were some characteristics of current exergames, which cause them to be less popular as a regular method of exercise. The demerits were studied while paying attention to the perspectives of those who were involved in exergaming. According to the facts that were revealed, a set of guidelines were proposed to overcome the demerits. The guidelines were categorized as foundational guidelines and adaptive guidelines, depending on how they are incorporated.

Further research is necessary to incorporate these features in the design of an AVG and testing must be carried out to verify that the objectives have been met.

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EFFECTIVENESS OF ASSURING INTERNAL QUALITY OF NON-STATE HIGHER EDUCATION SECTOR IN SRI LANKA TOWARDS GRADUATE EMPLOYABILITY

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Keywords: Higher Education, Internal Quality Assurance, Graduate Employability.

Abstract

The demand for higher education has been increased significantly, and in consequence to this, the public universities are not in a position to cater for that demand fully. The main objective of this particular research study was to develop a framework that supports enhancements in graduate employability through a well-established internal quality assurance (IQA) system which is directly applicable to the existing structure and policy environment of non-state universities in Sri Lanka.

The study has chosen survey strategy because it seeks the opinion of employers on graduate attributes and effectiveness of IQA process in NSHEIs. Positivist research is the most commonly aligned with quantitative methods of data collection and analysis. The deductive method is used to construct a relational hypothesis and to find answers. The unit of analysis is the individual as a researcher interested in individual employers in the organization for data collection. Data collected through a questionnaire survey among 150 employers in nearly 30 companies (as a pilot survey) which have industry partnerships with those 19 Non-state HEIs based on convenience sampling.

The research outcomes revealed that all independent variables are having a strong positive association with graduate employability. Hence, graduate employability can be increased through a well-established IQA framework that consists of teaching, learning, assessments and professional development. Further, Academic performance and Field of specialty have a mediating and moderating effect on the relationship between IQA framework and graduate employability respectively.

INTRODUCTION AND OBJECTIVES

The demand for higher education has been increased significantly, and in consequence to this, the public universities are not in a position to cater for that demand fully (University Grants Commission, 2018). The non-state higher education institutes (NSHEI) have a key role to play in this context by creating more and more opportunities. Nevertheless, one must take care of the potential employability of those graduates to pass-out to make sure that need is addressed in the best and sustainable manner (Barrie, 2007). The main objective of this particular research study was to develop a framework that supports enhancements in graduate employability through a well-established internal quality assurance (IQA) system which is directly applicable to the existing structure and policy environment of non-state universities in Sri Lanka.

RESEARCH METHODS

Following (Barrie, 2007) potential relationship between a number of factors (i.e. independent variables), including Teaching, Learning, Assessments, and Professional Development and Graduate Employability (Dependent variable) was developed into a conceptual framework (Figure 1)

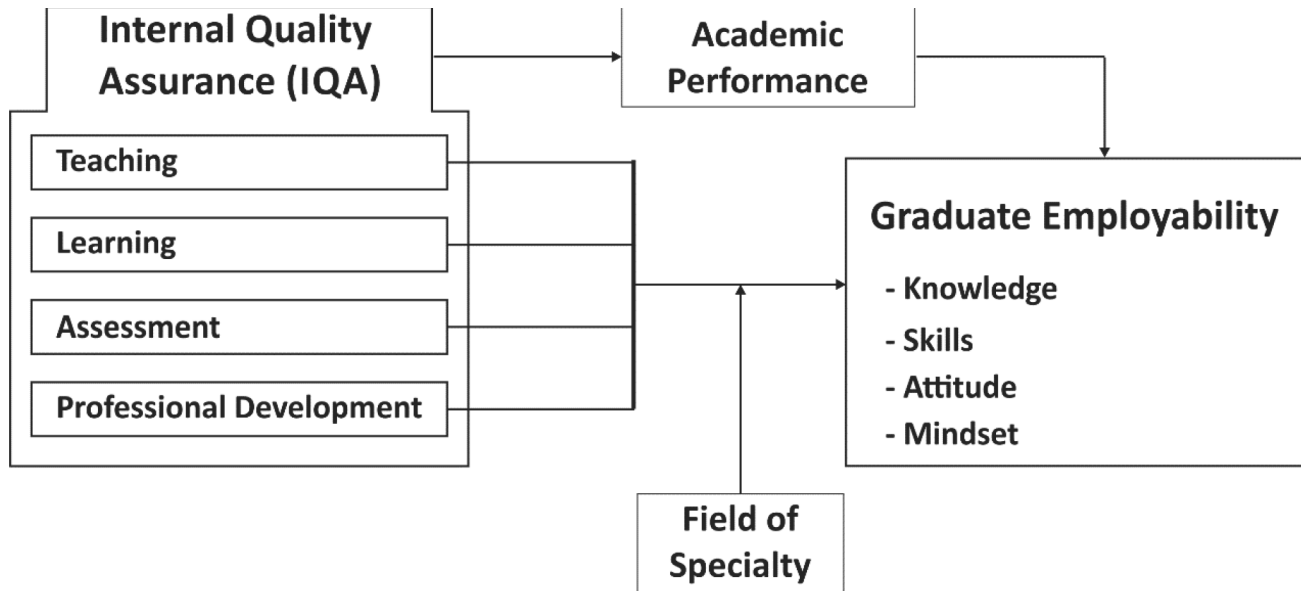


Figure 1 – Conceptual Framework for the Research (Source: Literature Review)

The study has chosen survey strategy because it seeks the opinion of employers on graduate attributes and effectiveness of IQA process in NSHEIs. Positivist research is the most commonly aligned with quantitative methods of data collection and analysis. The deductive method is used to construct a relational hypothesis and to find answers. The unit of analysis is the individual as a researcher interested in individual employers in the organization for data collection. Data collected through a questionnaire survey among 150 employers in nearly 30 companies (as a pilot survey) which have industry partnerships with those 19 Non-state HEIs based on convenience sampling. Quantitative data were analyzed using descriptive statistics. Regression analysis was used for testing hypotheses and concluding. Several diagnostics tests such as normality, linearity, and multicollinearity were carried out. Further, the researcher utilized the Durbin Watson test and multicollinearity test.

RESULTS AND DISCUSSION

All the variables are having Cronbach's alpha values more than 0.6. It indicates that there is an internal consistency between the variables. Therefore, variables can be created to the corresponding items included in the questionnaire.

Mean values of variables are very close to the Likert scale 4. Hence, responses concerning to the variables are in agree with level. The highest variance belongs to 'learning' as the minimum standard deviation is 0.63. Minimum variance belongs to 'assessments' as the minimum standard deviation is 0.54. All the coefficients of skewness are between -1 and +1 which indicates that the data are normally distributed. Absolute values of kurtosis are less than three (3) times of standard error of kurtosis that also represents that data is normal. All the probabilities are highly significant between the Graduate Employability (Dependent variable) and independent variables. Coefficients of correlation between them are positive. Their values are more than 0.7 which means that teaching, learning, assessments and professional development are having a strong positive association with graduate employability.

Multiple correlations "R" is 0.920, which indicates that there is a strong joint association between the individual factors and graduate employability. R-square is 0.846, this indicates that 84.6% of graduate employability (dependent variable) has been covered by the model. As the value is more than 60%, the regression model is nicely fitted. Adjusted R-square is also representing that 83.9% of the dependent variable has been covered by the model. Durbin-Watson test statistic is 1.918, which is very close to 2 and will be between 1.5 and 2.5. Therefore, residuals are independent and the model is valid.

Probability of F test statistics of the regression ANOVA is highly significant as the P-value is 0.000. This means that the model is jointly significant and independent factors jointly influence on graduate employability. Therefore, the model is appropriate. Probabilities of Teaching, Learning, and Assessments are highly significant (less than 0.01) with positive beta values and significantly influence positive on graduate employability. Professional Development is marginally significant and positively influence on employability.

All the Variance Inflation Factors (VIF) are less than 10 and it indicates that independent factors are not highly correlated. Therefore, no multicollinearity problem in the regression model and the model is highly valid. As the p values are insignificant, residuals are normally distributed with zero mean values. Thus, the results are highly valid. According to all these diagnostic tests, regression results are highly valid.

CONCLUSIONS

The research outcomes revealed that all independent variables are having a strong positive association with graduate employability. Hence, graduate employability can be increased through a well-established IQA framework that consists of teaching, learning, assessments and professional development. Further, Academic performance and Field of specialty have a mediating and moderating effect on the relationship between IQA framework and graduate employability respectively.

Therefore, the model is directly applicable to the existing structure and policy environment of NSHEIs in Sri Lanka. Further, it is suggested that, to be effective, an IQA system needs strong leadership and institutional commitment towards quality enhancement.

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RELATIONSHIP BETWEEN THE KNOWLEDGE MANAGEMENT PROCESSES AND THE RESEARCH MOTIVE OF THE ACADEMIC STAFF MEMBERS: CASE STUDY OF THE ABC HIGHER EDUCATIONAL INSTITUTE IN SRI LANKA

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Key Words: Knowledge economy, knowledge, HEI, KM processes and the human motivational factors

INTRODUCTION AND OBJECTIVES

The recognition of Knowledge Management (KM) has become popular in today's global context as the global economy is rapidly moving towards a knowledge – based economy. Sri Lanka also does not have any escape from this knowledge – based economy due to the globalization. Higher Educational Institutes (HEI) can be identified as main constituent of contributing to the knowledge of a society. Many HEI can be identified within the Sri Lankan educational sector but scholars and practitioners say that still there is a lack of knowledge and experience in the Sri Lankan industrial sector. But creating new knowledge through research being one of the prime duties of any HEI, arouses the doubt whether this purpose is not being met by HEI to fill the knowledge gap in the industry. This research argues that the motivation of the academic staff members in HEI plays a vital role of the research output from HEI because academic staff members are the main building blocks of conducting research and contributing to the new knowledge. Therefore, the overall objective of this research is to identify whether there is a relationship between the KM processes and the research motive of the academic staff members in HEI. The research focuses on the private – sector HEI due to the high emergence rate of HEI in the private sector. Using the case study methodology, the academic staff members of the ABC HEI have been selected as the target population to gather data. The SECI model of knowledge conversion by Nonaka and Takeuchi (Nonaka & Takeuchi 1996) has been used as the KM Model to investigate this relationship.

Research objectives

Main objective

To identify whether there is a relationship between Knowledge Management (KM) processes and the research motive of the academic staff in the ABC private – sector Higher Educational Institute (HEI) within Sri Lanka.

Sub objectives

- To find an appropriate KM Model which can be applied to find the relationship between KM processes and the research motive of the academic staff in the ABC HEI
- To develop a questionnaire to gather data from the academic staff within the ABC HEI
- To statistically analyze the gathered data set to identify whether there is a relationship between KM processes and the research motive of the academic staff within the ABC HEI

RESEARCH METHODS

The case study research design has been used along with the Deductive Approach to explore the impact of four modes of knowledge conversion: socialization (from individual tacit knowledge to group tacit knowledge), externalization (from tacit knowledge to explicit knowledge), combination (from explicit knowledge to systematic explicit knowledge), and internalization (from explicit knowledge to tacit knowledge) on research motive of the academic staff. These four modes of knowledge conversion processes have been derived from the Nonaka and Takeuchi's KM Model.

This KM Model has been identified as the suitable KM Model to investigate the relationship between the KM processes and the research motive of the academic staff, through a comprehensive literature review. Data collection has been conducted using both the primary and secondary data collection.

Primary data has been collected using the observational and questionnaire data. Questionnaire data has been gathered using the informal discussions and a self – administered questionnaire. Secondary data was collected by literature review on the research topic by referring research articles, journals, text books and monographs. The adapted questionnaire has been updated by the researcher. A reliability test has been conducted to check the reliability of the questionnaire. Data was statistically analyzed using SPSS to identify the relationship between the KM processes and the research motive of the academic staff and also to measure the impact of KM processes upon the research motive of the academic staff.

RESULTS AND DISCUSSION

Hypothesis were built according to the conceptual framework derived from the theoretical foundation and literature. Figure 1. 1 shows the variables of interest in this study, and the relationships between them (hypothesis). The model includes one dependent variable (research motive of the academic staff), and four independent variables (socialization, externalization, combination and internalization) which are derived from the Nonaka and Takeuchi's SECI Model.

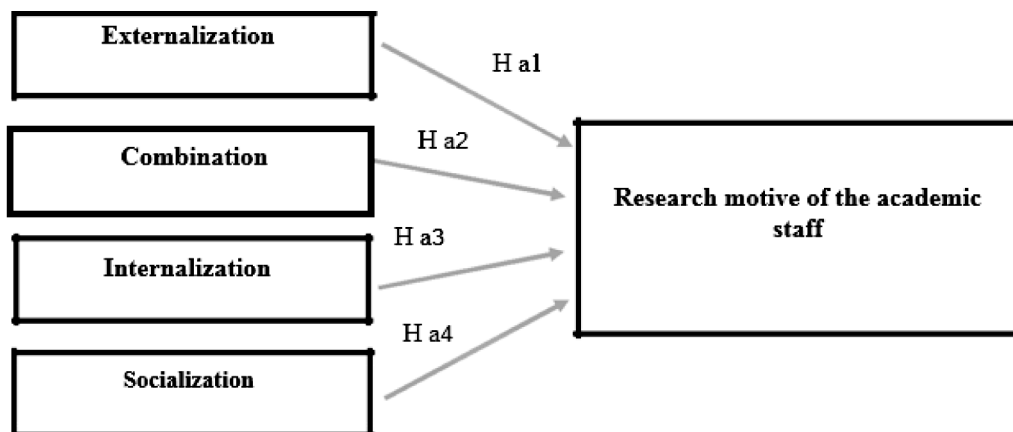


Figure 1. 1 Hypothesis building (Source: Survey Data)

- H01: ➔ There is no correlation between Externalization and Research motive of academic staff
- Ha1: ➔ There is a positive correlation between Externalization and Research motive of academic staff
- H02: ➔ There is no correlation between Combination and Research motive of academic staff
- Ha2: ➔ There is a positive correlation between Combination and Research motive of academic staff
- H03: ➔ There is no correlation between Internalization and Research motive of academic staff
- Ha3: ➔ There is a positive correlation between Internalization and Research motive of academic staff
- H04: ➔ There is no correlation between Socialization and Research motive of academic staff
- Ha4: ➔ There is a positive correlation between Socialization and Research motive of academic staff

The statistical population consisted of 139 academic staff members in the ABC HEI from Dec 2017 to Dec 2018; from the 139 of study population, 61 were chosen by using stratified random sampling. The sample was selected by stratified random sampling proportional to the volume of 61 respondents where the researcher has employed the convenient sampling to select respondents from each strata.

Table 1. 1 The Sample of Faculty Members in the ABC HEI (Source: Calculations by the Author)

Faculty	Population	Sample
Faculty of IT	41	18
Faculty of Management, Humanities & Social Sciences	34	15
Faculty of Health Sciences	23	10
Faculty of Engineering	25	11
Faculty of Maritime Sciences	16	7
Total	139	61

Table 1.2 Correlation Analysis Summary (Source: Survey Data)

		Externalization	Combination	Internalization	Socialization	Research motive
Externalization	Pearson Correlation	1	.769**	.795**	.611**	.519**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	61	61	61	61	61
Combination	Pearson Correlation	.769**	1	.758**	.758**	.462**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	61	61	61	61	61
Internalization	Pearson Correlation	.795**	.758**	1	.756**	.452**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	61	61	61	61	61
Socialization	Pearson Correlation	.611**	.758**	.756**	1	.367**
	Sig. (2-tailed)	.000	.000	.000		.004
	N	61	61	61	61	61
Research_motive	Pearson Correlation	.519**	.462**	.452**	.367**	1
	Sig. (2-tailed)	.000	.000	.000	.004	
	N	61	61	61	61	61

Table 1.3 Regression Analysis (Source: Survey Data)

Model		Coefficients ^a				
		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.580	.339		7.613	.000
	Externalization	.242	.137	.373	1.773	.082
	Combination	.108	.170	.137	.633	.530
	Internalization	.033	.132	.057	.250	.803
	Socialization	-.005	.134	-.007	-.036	.972

a. Dependent Variable: Research_motive

Table 1.4 Analysis Summary (Source: Survey Data)

Hypothesis	P-value	Null Hypo.	Correlation Coefficient	Strength of the relationship	Reg. Sig.	Impact
Externalization and research motive	.000	Rejected	.519	Avg relationship	.082	No
Combination and research motive	.000	Rejected	.462	Avg relationship	.530	No
Internalization and research motive	.000	Rejected	.452	Avg relationship	.803	No
Socialization and research motive	.004	Rejected	.367	Weak relationship	.972	No

The results of the hypothesis testing indicate that there is a significant relationship between the KM processes and the research motive of the academic staff of the ABC HEI because P – values are lesser than 0.05 ($p < .05$) for the relationship between KM processes and the research motive. The value of the Correlation Coefficient (r) between the three KM process; externalization, combination and internalization and the research motive are relatively closer to 0.5, based on the output of Pearson correlation coefficient test, and it can be said that there is an average and positive correlation between these three KM processes and the research motive. When one variable moves higher or lower, the other variable moves in the same direction with the same magnitude. But there is a weak positive relationship between the socialization and the research motive as the r value is 0.367. This indicates the lack of communication between the junior staff members and the experienced staff members, absence of the knowledge sharing culture within the ABC HEI, absence of independent research teams and the less opportunities to make suggestions based on their experiences. Therefore it can be said that there may be lack of interactions between individuals which hinder the shared experience which may not support the research motive of the academic staff. When compare the r values between externalization and research motive with the internalization and the research motive as $0.519 > 0.452$ it can be said that results are in favour to enhance the research motive of the academic staff by facilitating the externalization where they tend to express

their tacit knowledge using concepts, diagrams and frameworks rather than trying to internalize the know – how. According to the analysis of results from the second hypothesis, the relationship between knowledge combination and the research motive is 0.462 at $P < 0.05$ which indicates that the staff members have tendencies in re-combining the available discrete pieces of explicit knowledge into new formats in an organizational environment which values the new thoughts and creativity. Overall the results of this research suggest KM as an informed approach for the knowledge creation process which consists of externalization, combination, internalization and socialization, which deals with the research motive of the academic staff of the ABC HEI.

CONCLUSIONS

Even though the HEI have been identified as the main centers for creating new knowledge due to very little attention being paid for the KM in education sector with regard to its main capability of creating new knowledge through research, this research is useful for the administration of the HEI to get start with KM to be successful in their research ability. Further this research reveals what elements of the KM processes enable the research and how those elements trigger the research motive within HEI context. This research simplifies and makes sense of KM to use in a practical way to benefit the HEI as well as to the society at large because it has studied a KM framework with regard to a specific aspect of the academic context. Further applying frameworks like SECI Model, will provide a compass for the strategic activities within HEI to gain the sustainable competitive advantage. Also, it is worth to identify how technology can assist to rectify shortcomings of in implementing KM in HEIs. As information technology (IT) is being identified as the main enabler for KM, HEIs can think of applying IT infrastructure and tools for KM dimensions. For an example ABC HEI can think of deploying technologies such as intranet, extranet and groupware with the academic staff's work context which would further enhance the externalization process. Amin Al-Sulami, Mohammed Rashid & Ali (2014) highlight some of the main IT facilities and tools as mentioned below which can be used by HEIs to implement KM.

Externalization: Knowledge repository (to store rules, policies, solutions, workflows, processes, research reports, the result of discussion by academicians in workshops)

Socialization: video conferencing, Knowledge directories, advice electronic discussion forum/collaborative tools

Internalization: electronic discussion forum/collaborative tools, Blog – story telling method of sharing experiences social media opinions, ideas and feedback

Combination: Portal Blogs Electronic document management systems- access information, store new knowledge

Overall, as findings suggest that KM and its dimensions are significantly associated with research motive of the academic staff and direct and positive relationship is dominated between them, ABC HEI could focus on how the tacit knowledge of the academics could be used for the competitive advantage, how to be successful in KM and to contribute to the knowledge required by the society for the development of the country. This research could be used as a foundation for the future research which may focus on to investigate to which extent the KM processes are being understood within the academic context and how to utilize the KM processes in combination with the human motivational factors and thereby to help promoting learning and improving theory and practice of KM. The research provides a unique perspective of KM readiness, which is not much covered in the KM literature.

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FACTORS INFLUENCING ATTRACTION OF AUDIENCE FOR LATEST LOCAL MOVIES: A STUDY ON FILMMAKING INDUSTRY IN SRI LANKA

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Keywords: Attraction of Audience, Local Movies, Movie Promotions, Digital Cinema, Motivation for Cinematography

INTRODUCTION AND OBJECTIVES

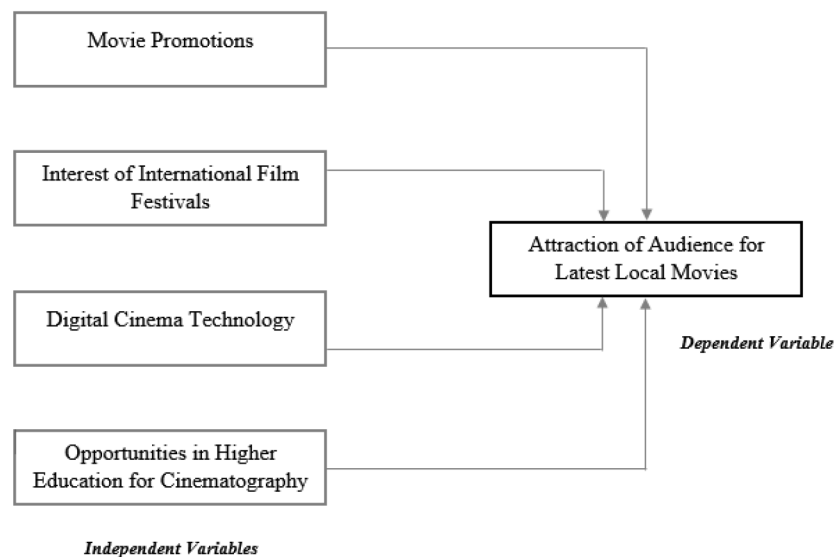
Cinematography can be defined as an art of visual storytelling (Heiderich, 2018). Cineastes engage with the senses of visual languages. Images or the visuals should be in supreme quality in movies. That is what our local audience demand from Sri Lankan films.

Local cinema audience are not much interested with existing local movies because those are not going to be exceeded the viewer's satisfaction. Internationally recognized cinema standards have not been established in local filmmaking process from scriptwriting to finished good screening. In past decades, both local theater audience and amount of film halls in the country have been extremely declined. Along with these negative occurrences on local cinema, newcomers have discouraged to select this industry as their professional field.

Upgrading all aspects of local cinema for long-term success is the meaning of doing this study. Significant features adopted in top filmmaking countries are explored here to establish artistically, technically and commercially full-grown cinematic culture in Sri Lanka. Accordingly, proposing the most viable technological solutions to enrich entire filmmaking industry in Sri Lanka and motivation of young generation for Cinematography are the key values of this study.

RESEARCH METHODS

Conceptual framework of the research has been developed with the findings of Literature Review. Movie promotions, interest of international film festivals, digital cinema technology and opportunities in higher education for Cinematography were taken as independent variables and attraction of audience for latest local movies was the dependent variable as follows.



Under existing conditions, local cinema has been limited only for Sinhala movies and no much opportunities available to engage with strong Tamil cinematic efforts. Acceptable population of this research should be only Sinhalese because they are the audience who convey real film attraction in local movies. Sinhalese who are in above age 18 years have been considered as legally accepted latest local movie audience. So, Sinhalese who are in above age 18 years are the entire research population. With respect to Morgen's table, sample size of this research is 384 under 95% of confidence level and 5% of confidence interval. The researcher selected above sample as a form of covering 19 Districts in Sri Lanka.

A quantitative research approach has been followed in this study. A questionnaire including 1-5 Likert based questions was prepared to conduct the survey and data collection process. Reliability test, correlation and regression have been performed as data analysis methods using Statistical Package for Social Sciences (SPSS) version 18.0.

RESULTS AND DISCUSSION

Reliability analysis demonstrates that all variables have higher Cronbach's Alpha values in above 0.7. It can be finalized that all constructed concepts have been attained the highest reliability.

Based on conceptual framework of the study, hypotheses have been developed associating with independent and dependent variables. Validity of hypothesized relationships were assessed using Pearson correlation values. It illustrates that all developed alternative hypotheses can be accepted and null can be rejected. Reported results conclude that positive (weak) relationships are demonstrated apiece between the independent variable and dependent variable and all those figures were statistically significant in 0.01 level.

Regression analysis results demonstrate that impact of all independent variables on dependent variable were statistically significant. Proposed conceptual model can be positively accepted using figures of multiple regression analysis.

This research investigates the features affecting for level of attraction of audience for latest local movies in Sri Lanka. Local theater audience, quantity of film halls and amount of movies released per year have been collapsed into very lower level. As a country, Sri Lanka cannot neglect this field because this is very beneficial area for economic development, employments and international recognition.

Majority of researchers who studied this matter have been confirmed that artistically rich, thematically challenging, commercially feasible, technically updated and globally renowned cinematic culture can be constructed with latest technology (Culkin, & Randle, 2003), international affiliation with film festivals (Pedersen & Mazza, 2011), efficient and interesting marketing campaigns (Wilcox, 2012) and productively planned education system.

Filming, directing, editing, sound recording and other aspects on cinema should be followed international standards and technologies around the world. The present generation, especially the youth are not considering the gap between local cinema and international cinema. As a result of globalization, technological enhancements and development of communication techniques, they are thinking that everything is global. Therefore, local cinema audience is demanding the Hollywood and Bollywood picture making quality and stuff from Sri Lankan movies as well.

As per above generated results on questionnaire survey, movie promotions, interest of international film festivals, digital cinema technology and opportunities in higher education for Cinematography have been strongly impact on commercially viable, artistically rich, thematically challenging, technically perfect and internationally recognized film creations.

CONCLUSIONS

This study attempts to demonstrate how strategically develop Sri Lankan cinema for economic growth, employment generation and global appreciation. In line with research objectives, all hypothesized concept using literature review can be positively accepted and correlated with the study. It can be concluded that effectiveness of film promotions, interest of international film festivals, effects of digital cinema technology and higher education opportunities in Cinematography are influenced to enhance the attraction of audience for latest local movies.

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THE RELATIONSHIP OF KNOWLEDGE MANAGEMENT PROCESSES AND ORGANIZATIONAL PERFORMANCE IN SERVICE ORGANIZATIONS OF SRI LANKA

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Keywords: Knowledge Management, Knowledge Conversion, Knowledge Application, Knowledge Transfer

Abstract

In a strategic approach, companies try to find general rules for developing successful and competitive business strategies via knowledge management on business performance. Companies need to innovate to create new processes and products to sustain in the competition. The research was conducted to find out the importance of knowledge management in performance of the Healthcare sector. Healthcare organizations in Sri Lanka was critically criticized for its poor services over the past. The main objective of the study is to: investigate the relationship between knowledge management and organizational performance in service organizations of Sri Lanka.

Based on the literature, Knowledge conversion, knowledge transfer, knowledge application, are identified as independent variables and organizational performance in service organizations is identified as the dependent variable. The study utilizes quantitative data as it sought to identify causes that influence performance outcomes and formulated a set of recommendations. The unit of analysis of the research will be individual. This study seeks to establish how KM influences the performance of service organizations in Sri Lanka. Besides, a cross-sectional study seeks to measure the relationship of variables at a specified time to describe the incidence of a phenomenon and how the variables are related. The effect that knowledge conversion has a positive influence on performance, transfer of knowledge is critical to performance and transfer of knowledge is a critical factor in organizations' success and competitiveness.

In addition to that, the human capital repository partially mediates the relationship between KM and performance. Besides, there is a significant moderating effect of a firm's culture on the relationship between KM and performance.

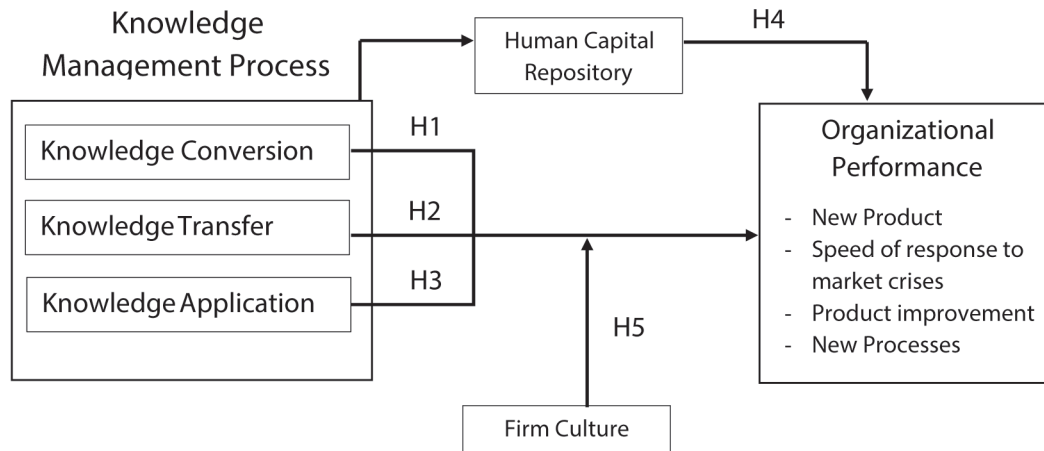
INTRODUCTION AND OBJECTIVES

In a strategic approach, companies try to find general rules for developing successful and competitive business strategies via knowledge management on business performance (Grunert & Hildebrandt, 2004). Companies need to innovate to create new processes and products to sustain in the competition. Without innovation, a company's value proposition will eventually be imitated, eroding its competitive advantage. Knowledge has increasingly been recognized as the new strategic imperative of organizations (Uriarte, 2008). KM in the service sector is even vital as customer service is considered as the driving force of the organization. Well configured Knowledge Management system critical to high perform customer services.

The research has been conducted to find out the importance of knowledge management in performance about the Healthcare sector. Healthcare organizations in Sri Lanka have been critically criticized for its poor services over the past. The main objective of the study is to investigate the relationship between knowledge management and organizational performance in service organizations of Sri Lanka.

RESEARCH METHODS

Based on the literature, Knowledge conversion, knowledge transfer, knowledge application, are identified as independent variables and organizational performance in service organizations is identified as the dependent variable (Feng 2004; Gan, Ryan & Gururajan, 2006; Li & Seidel, 2013). Besides, human capital repository and firm's culture are identified as mediating and moderating variables respectively (Shih, Chang & Lin, 2010). The conceptual framework was developed in the research as shown below.



Five hypotheses were used to validate the conceptual model. H1, H2, and H3 are correlational, H4 mediating and H5 moderating.

This research study adopts a positivist research philosophy. The deductive method is used to construct a relational hypothesis and to find answers (Creswell, 2009). Besides, the study utilizes quantitative data as it sought to identify causes that influence performance outcomes and formulated a set of recommendations. The unit of analysis refers to the level of aggregation of the data collected during the subsequent data analysis stage. Unit of analysis of the research will be individual. This study seeks to establish how KM influences the performance of service organizations in Sri Lanka. In addition, a cross-sectional study seeks to measure the relationship of variables at a specified time to describe the incidence of a phenomenon and how the variables are related.

RESULTS AND DISCUSSION

The human capital repository had the highest reliability ($\alpha = 0.903$), followed by firm's culture ($\alpha = 0.891$), knowledge conversion ($\alpha = 0.886$), knowledge application ($\alpha = 0.841$), performance ($\alpha = 0.712$) and knowledge transfer ($\alpha = 0.700$). The results of the reliability test also revealed that the six variables had an aggregate alpha value of 0.822 for all the 63 items and as such jointly lie within the recommended range for reliability. KMO measures of sampling adequacy values of between 0.524 and 0.733 while Bartlett's test of sphericity had a consistent significance of calculated probability of 0.000 well below the 0.05 threshold. Therefore, the research sample was adequate, factorable and further statistical analysis could be performed.

The results of the regression analysis show that the adjusted coefficient of multiple determination = 0.579 which implies that KM explains 57.9 % of the variations in performance. The proposed regression model fitted the data well as it was statistically significant at $F(3,152) = 72.081$ and calculated probability = 0.000. The research hypotheses were also tested at a 95% level of confidence as a statistical basis for making inferences and drawing conclusions. Analysis of variance was used to test whether the overall models were statistically significant by indicating whether or not R^2 could have occurred by chance alone. The F-ratio generated in the ANOVA table was utilized to measure the probability of chance departure from a straight line.

Hypothesis one: knowledge conversion is statistically significant at $\beta=0.251$; $t = 5.109$; $p = 0.000$, therefore at 95% level of confidence, knowledge conversion has a positive effect on performance. Hypothesis two: knowledge transfer is statistically significant at $\beta=0.071$; $t = 2.316$; $p = 0.019$, thus at a 95% confidence level, knowledge transfer has a positive effect on performance. Hypothesis three: knowledge application is statistically significant at $\beta=0.904$; $t = 14.488$; $p = 0.000$, therefore at a 95% confidence level, knowledge application has a positive effect on performance. Hypothesis four: an adjusted coefficient of determination is 0.425 which indicates that the regression model is statistically significant at $F(1, 154) = 23.071$ and calculated probability = 0.000. Therefore, the proposed regression model fitted the data well and human capital repository partially mediates the relationship between KM and performance. Hypothesis five: regression model without the interaction term is statistically significant at $F(1, 154) = 23.071$ and calculated probability = 0.000. Besides, the regression model with the interaction term is statistically significant at $F(3, 152) = 12.084$ and calculated probability = 0.000. This reveals that there is a potentially significant moderating effect of firm's culture on the relationship between KM and performance.

CONCLUSIONS

The conclusion of the study is consistent with the findings of other researchers such as Tseng (2010) and Zaied et al., (2012) to the effect that knowledge conversion has a positive influence on performance. Also, the findings of the study are consistent with the observations made by Syed-Ikhsan and Rowland (2004) that transfer of knowledge is critical to performance. Further, the findings of the study are consistent with the observations made by Syed-Ikhsan and Rowland (2004) that transfer of knowledge is a critical factor in organizations' success and competitiveness. In addition to that human capital repository partially mediates the relationship between KM and performance. Also, there is a significant moderating effect of firm's culture on the relationship between KM and performance.

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THE CONCEPT OF “MOBILE CAMPUS” TO ENHANCE LEARNER EXPERIENCE

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Keywords: Mobile Campus, Learner Experience, Smart Campus, Academic Management, Public Service Management, Administrative Management, Finance Management

Abstract

There are public, private universities and vocational training institutes under the umbrella of higher education. This research is focused on to explore a specific issue that belongs to the higher education sector.

Most of the higher education institutes in Sri Lanka face an ongoing issue concerning to the less participation of students in extra-curricular activities. Those issues are experienced due to poor communication between students and administration as well as inadequate time that the part-time students spend in the universities. Academic issues are experienced due to miscommunication of lecture schedules, field visits, special events, payment due amounts, and submission deadline. The administrative staff uses different techniques to resolve the problem but most of the issues are still open.

Mobile Campus is the concept that has been proposed in this paper to resolve this problem. Mobile Campus is an application that improves the communication between students (undergraduates & postgraduates) and administrative staff. This research has been designed as correlative types of research by developing relational hypotheses. To identify the influence factors for successful “Mobile Campus” implementation, the above hypotheses have been validated with surveyed data from undergraduate and postgraduate students.

During data analysis, the factors below have been identified as the influential factors to successful mobile campus concept. The research outcomes revealed that Student Public Service Management has a significant impact whereas Academic Management, Administrative Management and Finance Management have a lesser impact to the Enhance the Learner Experience.

INTRODUCTION AND OBJECTIVES

There are many academic-related events and extra-curricular activities are organized by the administration as well as student council. However, less participation of part-time students for academic related and extra-curricular events on campus due to poor communication mechanism. Further, No proper methods to record special events such as examination dates, assignment submission deadlines, lecture schedules, due course fees details.

With the development of technology, the majority of students use smart mobile phones (Yang & Xue, 2017). Therefore, this research has been designed to identify the influencing factors for the successful implementation of “Mobile Campus” concept while enhancing learner experience (Xiong, 2016).

The main objectives of the study were to explore and understand the key dimension of mobile campus concept, determine and identify the relationships of above dimensions to enhance the learner experience, recommend strategies to use the mobile concept to enhance learner experience

RESEARCH METHODS

In conceptualizing, the researcher was able to build a relationship between independent variables and dependent variable. This would enable the researcher to interpret the findings more comprehensively. The conceptual framework used in the research is shown in figure 1.

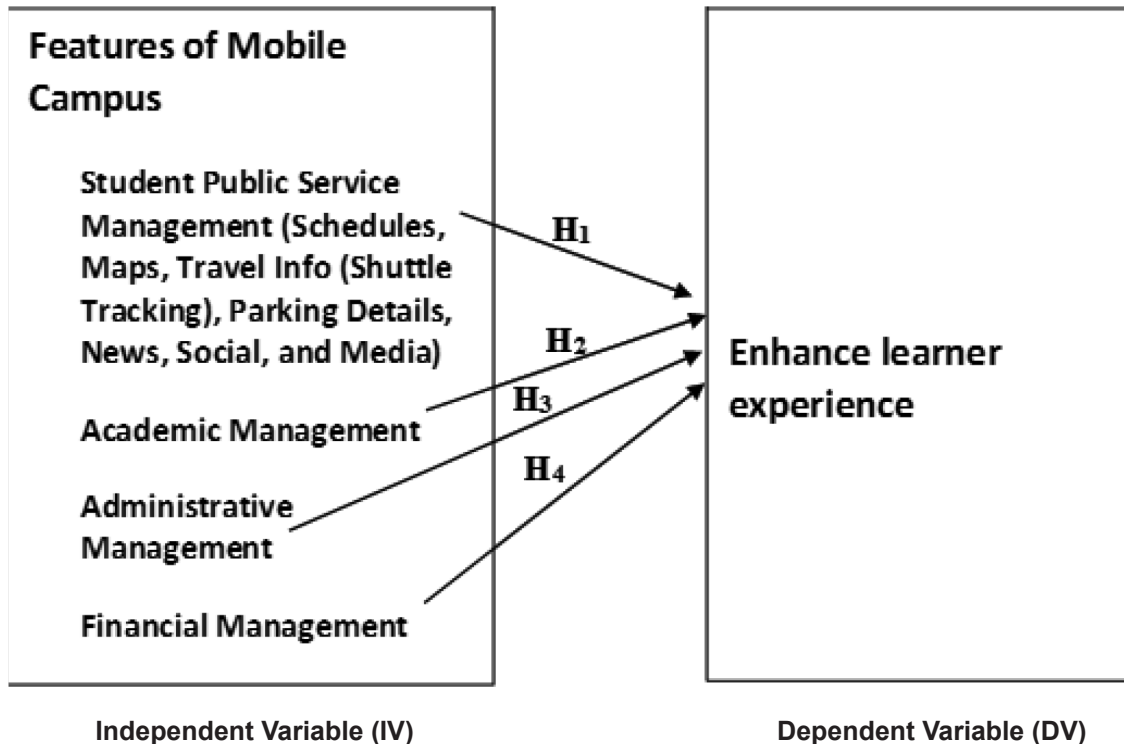


Figure 1 – Conceptual Framework for the research

Four (4) hypothesis are developed based on the literature review and conceptual framework. Alternative (a) hypotheses are listed below.

H1_a: Student Public Service Management has a relationship with Enhance the learner experience.

H2_a: Academic Management has a relationship with Enhance the learner experience.

H3_a: Administrative Management has a relationship with Enhance the learner experience.

H4_a: Financial Management has a relationship with Enhance the learner experience.

The target population of the research was undergraduate and postgraduate students (full-time and part-time) at ABC Institute and the sample consisted of 350 students. The Questionnaire and Interview methods were selected as it enabled to get the complete details from the sample itself. It is also necessary to examine the relationship between key variables influenced the dependent variable. This would enable the researcher to interpret the findings comprehensively.

RESULTS AND DISCUSSIONS

Sample profile consists of 200 full-time and 150 part-time of both undergraduate and postgraduate students in all faculties of the ABC Institute. The study was designed as quantitative research. The Questionnaire distributed among the sample and the responded percentage was 100%.

Descriptive statistics represents table 1, calculated means and standard deviations for the independent variables: Student Public Service Management, Academic Management, Academic Management, Administrative Management, Finance Management, and Dependent Variable: Enhance Learner Experience. The study shows that the mean and Std. Deviation of Enhance Learner Experience is 3.5924 and the standard deviation is 1.09766 respectively.

Table 1 - Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Student Public Service Management (SPSM)	350	1.89	5.00	3.6850	.91298
Academic Management (AM)	350	2.29	4.71	3.9436	.70935
Administrative Management (AdmMgt)	350	1.00	4.83	3.6419	1.15878
Financial Management (FM)	350	1.67	5.00	4.0495	.90578
Enhance Learner Experience (ELE)	350	1.00	5.00	3.5924	1.09766
Valid N (listwise)	350				

The data collected through questionnaire, which are created using 1-5 Likert Scale are presented and analyzed, with the purpose of identifying the impact SPSM, AM, AdmMgt, and FM for ELE. Table 2 illustrates the impact of each independent variables on the dependent variable.

Table 2 - Impact of each Independent Variables to the Dependent Variable

		SPSM	AM	AdmMgt	FM	ELE
SPSM	Pearson Correlation	1	.607**	.749**	.665**	.642**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	130	130	130	130	130
AM	Pearson Correlation	.607**	1	.744**	.502**	.452**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	130	130	130	130	130
AdmMgt	Pearson Correlation	.749**	.744**	1	.652**	.513**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	130	130	130	130	130
FM	Pearson Correlation	.665**	.502**	.652**	1	.485**
	Sig. (2-tailed)	.000	.000	.000		.000
	N	130	130	130	130	130
ELE	Pearson Correlation	.642**	.452**	.513**	.485**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	130	130	130	130	130

** . Correlation is significant at the 0.01 level (2-tailed).

The relationship between ELE and SPSM (0.642) is “Strong” whereas AM (0.452), AdmMgt (0.513), and FM (0.485) are “Moderate”.

Table 3 - Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.650 ^a	.422	.404	.84758

a. Predictors: (Constant), FM, AM, SPSM, AdmMgt

Table 3 shows 42.2% of the variability in the Dependent Variable (DV) is accounted for all of the Independent Variables (IV) together (it's a multiple R-square).

Table 4 - ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	65.627	4	16.407	22.838	.000 ^b
	Residual	89.799	125	.718		
	Total	155.426	129			

a. Dependent Variable: ELE

b. Predictors: (Constant), FM, AM, SPSM, AdmMgt

Table 4 shows **F-statistics** to find the overall strength of the model. **The value of F-Statistic is 22.838** and it indicates the **model is highly significant**.

Table 5 - Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.247	.497		.497	.620
	SPSM	.646	.133	.538	4.876	.000
	AM	.146	.159	.094	.921	.359
	AdmMgt	-.020	.121	-.021	-.168	.867
	FM	.114	.116	.094	.981	.328

a. Dependent Variable: ELE

Finally, here are the beta coefficients one to go with each predictor. Based on table 5, the equation for the regression line is:

$$Y = 0.247 + 0.646 (\text{SPSM}) + 0.146 (\text{AM}) - 0.020 (\text{AdmMgt}) + 0.114 (\text{FM})$$

The equation for the regression line emphasizes the positive relationship. R²: Coefficient of Determination is the measurement of the closeness of data to the regression line and here it is 0.422, which meant 42.2% variance in "ELE" due to the independent variables SPSM, AM, AdmMgt, and FM. On the basis of Beta coefficients, the model shows that SPSM, AM, AdmMgt, and FM impact 65%, 15%, 2%, and 11% respectively in ELE.

As shown in Table 6, significant (2-tailed) values of all independent variables are less than 0.005 (i.e. $p < 0.05$). Therefore, all four alternative hypotheses of the study can be accepted.

By considering the significance level of factors, it shows that the "p-value" of SPSM (0.000), AM (0.000), AdmMgt (0.000), FM (0.000) which is less than 0.05 ($P < 0.05$) means it is "statistically highly significant".

Table 6 - Summary of Hypothesis Validation Test

Independent Variable	Significant Value	Alternative Hypothesis	Null Hypothesis
Student Public Service Management (SPSM)	0.000	Accept	Reject
Academic Management (AM)	0.000	Accept	Reject
Administrative Management (AdmMgt)	0.000	Accept	Reject
Financial Management (FM)	0.000	Accept	Reject

Therefore, can accept all four alternative hypotheses (H1_a, H2_a, H3_a, H4_a) by rejecting all null hypotheses (H1₀, H2₀, H3₀, H4₀).

CONCLUSION

SPSM, AM, AdmMgt and FM have been identified as the influential factors. SPSM which includes event schedules, maps, shuttle tracking should be well communicated as it has a higher significant impact (64%) to enhance the learner experience AdmMgt (51%), FM (48%) and AM (45%) have a less significant impact.

Therefore, the concept of mobile campus enhances the learner experience by providing anytime, anywhere in a cost-effective and time-saving manner with these features (Dong, et al., 2016): News and Event Schedules, Indoor and Outdoor Map, Travel Information, Parking Details, Lecture Schedules, Accessing Course Contents, Notifications, Examination Details, Student Attendance Tracking, and Due Payment Details.

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THE EFFECTIVENESS OF ELEARNING PRACTICES TO IMPROVE THE LEARNING QUALITY AT ABC INSTITUTE

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Keywords: eLearning, Learning Management System, Virtual Learning, Learning Quality, Higher Education

Abstract

Graduate outputs or the Undergraduate Students' performance is a key quality parameter of any higher education institute. Therefore, management of the ABC Institute annually spends a considerable amount of money as capital and operational cost to provide better teaching and learning environment. However, the major issue at present is that the student performances are not up to the standard as expected in contrast to the allocated funds.

In this research, the main focus was to comprehend how to improve learning quality of students at ABC Institute by introducing eLearning. Undergraduate Student's Pass Rate, Attendance, and Grade Point Average were selected to observe the relationship between eLearning practices and improving learning quality.

Primary data was collected through a questionnaire survey among undergraduate students in the Faculty of Information Technology and Secondary data was collected based on the existing information. The linear regression model, correlation analysis, and descriptive analysis were used to analyze data.

The research outcomes revealed, Accessibility & Usability practice has the highest impact of improving learning quality while other practices (Personalized Learner Interface, Interactivity & Collaborative Tools, and Notifications & Alerts) show comparatively lesser impact. Therefore, it is clear that there is a relationship between the uses of e-learning practices with learning quality. Further, the outcomes evident that those who used Learning Management System have performed well during the examination and maintain high-Grade Point Average.

INTRODUCTION AND OBJECTIVES

"Teacher-Centered" traditional learning methodology has started to move in to "Learner-Centered" methodology. Learning Management System (LMS) / Virtual Learning Environment (VLE)/Moodle/Blackboard is the newest trends of e-Learning to provide a wide range of knowledge and material to their students (Barker & Gossman, 2013).

The study is focused to see the relationship between eLearning practices and learning quality at ABC Institute. During the study, several symptoms have been identified such as high failure rates, poor attendance, and late submission of assignments. However, with all these facilities and inputs it has been noted that the student performance at ABC Institute is very low in contrast to the allocation of funds on the above quality parameters.

The main objective of the research is to examine the effectiveness of e-learning in student performance at examinations and to investigate the feasibility of using e-learning as an effective mode of delivering lectures.

RESEARCH METHODS

The conceptual framework used in the research is illustrated in below figure 1.

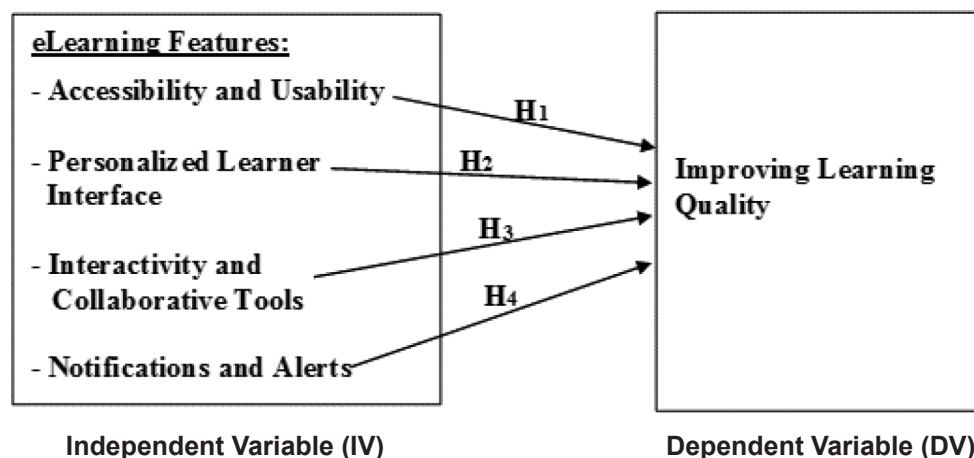


Figure1 - Conceptual Framework for the research

The concepts defined in the conceptual framework needs to be operationalized to testable levels, to establish the focus of the research. Based on literature the researcher has helped in conceptualizing the research problem. The research problem at hand is to investigate the effectiveness of eLearning practices to improve learning quality. In conceptualizing the study, researcher has attempted to build relationship between key variables i.e., Accessibility and Usability (Bhatia, 2011), Personalized Learner Interface (Alturki, et al., 2016), Interactivity and Collaborative Tools (Andriotis, 2014), Notifications & Alerts (independent variable) and Improving Learning Quality (dependent variables).

It is also necessary to examine the relationship between key variables influenced on the dependent variable. This would enable the researcher to interpret the findings more comprehensively. Questionnaire (1-5 Likert Scale) technique is used as fact-finding technique and measurements have been identified based on the literature and expert interviews.

In addition to the primary data, researcher has collected secondary data from existing information on Student Results, GPA and Student Attendance.

RESULTS AND DISCUSSION

Reliability of overall items is 0.947 which shows its "Excellent". Accessibility and Usability, Personalized Learner Interface, Interactivity and Collaborative Tools, Notifications & Alerts, and Dependent Variable: Improving Learning Quality. Study shows that the mean of Improving Learning Quality is 3.5849 and the standard deviation is 1.11228.

The relationship between improving learning quality and Accessibility & Usability (0.611), and Interactivity & Collaborative Tools (0.656) are "Strong" whereas the relationship between improving learning quality and Personalized User Interface (0.532) and Notifications & Alerts (0.461) is "Moderate". Further, Accessibility & Usability can be improved through Interactivity & Collaborative Tools (0.738). Similarly, there is a close relationship between Accessibility & Usability and Notifications & Alerts. Accessibility & Usability can be increased through Notifications & Alerts.

Coefficient of Determination is the measurement of the closeness of data to the regression line and here it is 0.435. Thus, 43.5% variance in improving learning quality due to the independent variables Accessibility & Usability, Personalized Learner Interface, Interactivity & Collaborative Tools and Notifications & Alerts. Based on Beta coefficients, the model shows that Accessibility & Usability, Personalized Learner Interface, Interactivity & Collaborative Tools and Notifications & Alerts impact 57%, 18%, 3%, and 12% respectively in Improving Learning Quality.

The study conducted to investigate the effectiveness of eLearning practices to improve the learning quality at ABC Institute. It is a fact that there is a relationship between the independent and dependent variables. The relationship between improving learning quality and Accessibility & Usability (0.611), and Interactivity & Collaborative Tools (0.656) are “Strong” whereas the relationship between improving learning quality and Personalized User Interface (0.532) and Notifications & Alerts (0.461) is “Moderate”.

By considering the significance level of factors, it shows that the “p-value” of Accessibility & Usability (0.000), Personalized User Interface (0.000), Interactivity & Collaborative Tools (0.000), Notifications & Alerts (0.001) which is less than 0.05 ($P < 0.05$) means it is “statistically highly significant”. Therefore, can accept all four alternative hypotheses (H1a, H2a, H3a, H4a) by rejecting all null hypotheses (H10, H20, H30, H40).

Further, it was attempted to understand how identified eLearning practices (main practices currently available at LMS) are affected to improve learning quality. Fact that the Accessibility & Usability, Personalized Learner Interface, Interactivity & Collaborative Tools and Notifications & Alerts are influenced 57%, 18%, 3%, and 12%, respectively in improving Learning Quality.

CONCLUSION

By analyzing all the indicators which were used to measure the learning quality it can conclude that the effectiveness of eLearning directly affects to increase student performances and improve learning quality. The study outcome evident that those who used LMS heavily have performed well during the examination and maintain a high GPA.

Accessibility & Usability practice has the highest impact of improving learning quality while other practices (Personalized Learner Interface, Interactivity & Collaborative Tools and Notifications & Alerts) show considerably lesser impact. Finally, it can be concluded that there is a relationship between the uses of e-learning practices with learning quality.

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PROGRAMME OF SCIENTIFIC SESSIONS**DATE : 29.11.2019****VENUE : SRI LANKA FOUNDATION, COLOMBO 07****SESSION ONE****Venue: (Main Auditorium)****Session Chair: Dr. Sainey Faye****Rapporteur: Mr. Madhawa Ranawake****Time: 11:00 am – 1:00 pm**

Time	Abstract Title	Authors	Presenter
11:00 am – 11:30 am	NANOMATERIALS FOR FUEL CELL TECHNOLOGY	Dr. Kaveenga Rasika Koswattage	Dr. Kaveenga Rasika Koswattage
11:30 am – 12:00 pm	RELEASE KINETICS OF CURCUMIN ENCAPSULATED NANOPARTICLES DEVELOPED FOR TOPICAL APPLICATION	I. Farrah Shakoor, Geethi Pamunuwa and D. Nedra Karunaratne	I. Farrah Shakoor
12:00 pm – 12:30 pm	UNIVERSALLY ACCESSIBLE MEDICINE CONTAINERS: A FULLY AUTOMATED PILL DISPENSER	Tharindu Samarakoon, Pujani Abayatilake, Dualn Jayasuriya, Kavindu Zoysa, Chamari L. Weeraratne and Nuwan D. Nanayakkara	Dualn Jayasuriya
12:30 pm – 1:00 pm	UNIVERSALLY ACCESSIBLE MEDICINE CONTAINERS: A FULLY AUTOMATED LIQUID MEDICINE DISPENSER	Tharindu Samarakoon, Pujani Abayatilake, Dulan Jayasuriya, Kavindu Zoysa, Chamari L. Weeraratne and Nuwan D. Nanayakkara	Kavindu Zoysa

SESSION TWO**Venue: (Hall 1)****Session Chair: Dr Chandrawansa Pathiraja****Rapporteur: Ms. Mathumitha Maheswaran****Time: 11:00 am – 1:00 pm**

Time	Abstract Title	Authors	Presenter
11:00 am – 11:30 am	GENETIC IMPROVEMENT THROUGH EMBRYO TRANSFER	Dr Chandrawansa Pathiraja	Dr Chandrawansa Pathiraja
11:30 am – 12:00 pm	BIOETHANOL PRODUCTION FROM LIGNOCELLULOSIC MATERIALS	D.G.B.M. Senarathna, C.P. Rupasinghe and W.B.M.A.C. Bandara	D.B.G.M. Senarathna
12:00 pm – 12:30 pm	IN VITRO EXPRESSION OF CtsK GENE IN BACTERIAL EXPRESSION SYSTEM, Escherichia coli	Hasanka Madubashetha, Sachith Wickramasinghe, Nimali De Silva, Lakshan Warnakula and Ruwini Cooray	Ruwini Cooray
12:30 pm – 1:00 pm	CONTROLLED RELEASE OF FOLIC ACID FROM ALGINATE NANOPARTICLES AT GASTRO-INTESTINAL PH CONDITIONS	I. Farrah Shakoor, Geethi Pamunuwa and D. Nedra Karunaratne	I. Farrah Shakoor

SESSION THREE**Venue: (Hall 2)****Session Chair: Dr. A W Wijeratne****Rapporteur: Mr. Chandima Harsha de Silva****Time: 11:00 am – 1:00 pm**

Time	Abstract Title	Authors	Presenter
11:00 am – 11:30 am	TECHNOLOGY, THE SCIENCE OF CRAFT	Dr. A W Wijeratne	Dr. A W Wijeratne
11:30 am – 12:00 pm	MOBILE APP TO PROVIDE A RELIABLE LEGAL ADVISORY SERVICE FOR THE CLIENTS IN SRI LANKA.	Chethana Subasinghe and Samanthi Wickramasinghe	Samanthi Wickramasinghe
12:00 pm – 12:30 pm	ARCHITECTING ADVANCED DEVOPS ENGINE WITH DOCKER BY USING MICROSERVICES FOR ENTERPRISE SOFTWARE APPLICATIONS	W.M.C.J.T. Kithulwatta	W.M.C.J.T. Kithulwatta
12:30 pm – 1:00 pm	GUIDELINES TO UPGRADE THE STANDARD AND ACCEPTANCE OF EXERGAMES	Sakuntala Wipulasundara	Sakuntala Wipulasundara

LUNCH BREAK

SESSION FOUR**Venue: (Main Auditorium)****Session Chair: Assoc. Prof. Dr. Valliappan Raju****Rapporteur: Ms Soumia Balasubramaniam****Time: 2:00 pm – 3:30 pm**

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2:30 pm – 3:00 pm	EFFECTIVENESS OF ASSURING INTERNAL QUALITY OF NON-STATE HIGHER EDUCATION SECTOR IN SRI LANKA TOWARDS GRADUATE EMPLOYABILITY	Samanthi Wickramasinghe and Udith Jayasinghe	Samanthi Wickramasinghe
3:00 pm – 3:30 pm	RELATIONSHIP BETWEEN THE KNOWLEDGE MANAGEMENT PROCESSES AND THE RESEARCH MOTIVE OF THE ACADEMIC STAFF MEMBERS: CASE STUDY OF THE ABC HIGHER EDUCATIONAL INSTITUTE IN SRI LANKA	A. K. Upani Padmila, Lasantha Abeysiri and Chandima de Silva	A. K. Upani Padmila

SESSION FIVE**Venue: (Hall 1)****Session Chair: Dr. E Ramasamy****Rapporteur: Ms. Srinivasini Sasitharasarma****Time: 2:00 pm – 3:30 pm**

Time	Abstract Title	Authors	Presenter
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2:30 pm – 3:00 pm	Factors Influencing Attraction of Audience for Latest Local Movies: A Study on Filmmaking Industry in Sri Lanka	Gardiye Hewawasam Dodangodage Nayani Darshika Dodangoda and Sunesh Hettiarachchi	Gardiye Hewawasam Dodangodage Nayani Darshika Dodangoda
3:00 pm – 3:30 pm	THE RELATIONSHIP OF KNOWLEDGE MANAGEMENT PROCESSES AND ORGANIZATIONAL PERFORMANCE IN SERVICE ORGANIZATIONS OF SRI LANKA	Sunesh Hettiarachchi and Udith Jayasinghe	Sunesh Hettiarachchi

SESSION SIX**Venue: (Hall 2)****Session Chair: Dr. Chalinda K. Beneragama****Rapporteur: Ms. K. A. Buddhika Sulochana Kumari****Time: 2:00 pm – 3:30 pm**

Time	Abstract Title	Authors	Presenter
2:00 pm – 2:30 pm	"USE OF TECHNOLOGY AND INNOVATION TO EMPOWER FLORICULTURE GROWERS IN SRI LANKA"	Dr. Chalinda K. Beneragama	Dr. Chalinda K. Beneragama
2:30 pm – 3:00 pm	THE CONCEPT OF "MOBILE CAMPUS" TO ENHANCE LEARNER EXPERIENCE	Sunesh Hettiarachchi and Samanthi Wickramasinghe	Sunesh Hettiarachchi
3:00 pm – 3:30 pm	THE EFFECTIVENESS OF ELEARNING PRACTICES TO IMPROVE THE LEARNING QUALITY AT ABC INSTITUTE	Samanthi Wickramasinghe, Janaka Wijayanayake and Sunesh Hettiarachchi	Samanthi Wickramasinghe



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