MMU
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Sustainable Development Goals
REPORT 2020

SUSTAINABLE DEVELOPMENT GOALS

Contents

Foreword by the President

In my personal opinion, it is a great honour for one to be able to influence and improve society. While occupations provide us with a sense of purpose that enables us to feed, clothe, and shelter ourselves, pursuing a goal that benefits society and those beyond our immediate circle of influence yields an incomparable level of satisfaction.

Upon joining Multimedia University, I felt extremely elated. This is an institution that aims to transform society through innovation. I have always looked at the bigger picture wherever I go, but to work with an entire organisation predisposed to a similar mind-set gives me a sense of adventure, that there is no limit to what could be achieved.

PROF. DATO' DR. MAZLIHAM MOHD SU'UD
President / CEO, Multimedia University

Now, a world-changing phenomenon has come to our doorstep. Adopted by all members of the United Nations in 2015, the 2030 Agenda for Sustainable Development presents a shared blueprint for lasting peace and prosperity not just for humanity, but for the planet itself.

At the heart of the agenda are 17 Sustainable Development Goals (SDGs). While they were created as calls to action for countries, in application, these goals cascade beautifully towards the grassroots. Government agencies and departments; private institutions and firms; philanthropic bodies and for-profit corporations alike, could align their activities towards realising each of the 169 outlined targets.

At MMU, we have also chosen to align our activities to the realisation of the agenda. It is our calling. Of course, some of the goals are more applicable to our areas of expertise than others. Nevertheless, within the areas where we have a presence, we have done our best, and hopefully made it easier for others to do the same or even better. It is a concerted effort, after all, and success could only be ascertained long after the event itself becomes a memory.

> **"This report is a record of how we, the citizens of MMU, have done our part in making the world a better place, not just for ourselves, but for future generations."**

This report is a record of how we, the citizens of MMU, have done our part in making the world a better place, not just for ourselves, but for future generations. Hopefully, years from now, whoever flips through these pages, would be able to attest that what we have done was indeed meaningful. May Allah SWT bless us with the success that we seek, and grant us fulfilment for all our good deeds.

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Highlights of Activities, Events, and Initiatives in 2020

“End poverty in all its forms, everywhere."

In addition to providing quality education that would transform students into driven and competent adults who, in turn, would help improve the country economically, socially, and spiritually, MMU has chosen to undertake the University Social Responsibility (USR), a set of activities meant to ease the burden of the underprivileged, while educating MMU citizens to be socially responsive and proactive.

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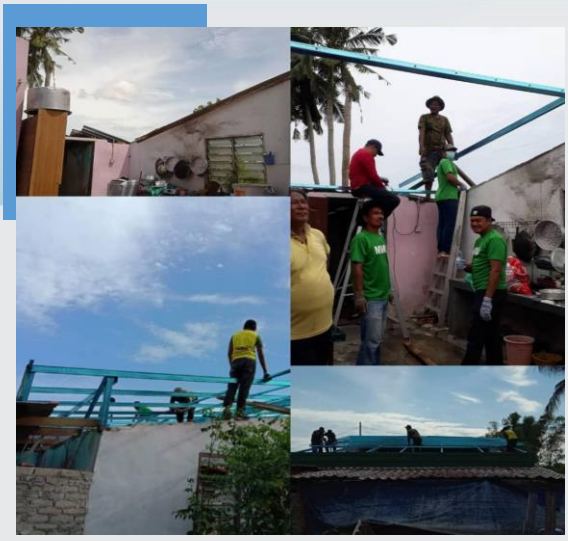


Volunteers Join Hands to Help Roof Repair

A group of MMU volunteers helped repair the roof of a villager's home, which was affected by a heavy storm in Kampung Kandang, Melaka. The repair work was led by Mr. Bahari Yusop from Human Capital Management (HCM), together with other MMU staff from various units and departments. This noble effort was made possible due to the contribution received mostly from MMU staff and their close contacts. It is hoped that this effort can be continued to help needy people.

MMU Volunteers Extend Help to Flood Victims in Negeri Sembilan

A group of MMU volunteers together with the NGO, Pertubuhan Kebajikan Sedekah Subuh (PKSS) joined hands to distribute aids to help the affected residents from flood at Kampung Dato Mansor, Rasah and Kampong Semarak, Rahang in Negeri Sembilan.

The team managed to distribute stoves, mats, pillows, mattresses, slippers, groceries items, toiletries inclusive of sanitary pads and undergarments. The volunteers also provided cleaning equipment such as brooms and detergent to the flood victim.

Volunteers Launch Sanitary Napkin Donation Drive

A group of lecturers from the Faculty of Business (FOB) launched a sanitary napkin donation drive for underprivileged women during the Movement Control Order (MCO) period. The collection started from May until July 2020 and they managed to collect RM1,470 together with a few packets contributed by donors. The volunteers distributed sanitary napkins from July to September 2020 to Bukit Baru Hope Orphanage, City Community Church, and AgapeCARE. It was heartwarming to see Malaysians eager to help these unfortunate people.

YUM Presents the Donation Drive to MMU Staff

On 14 February 2020, Yayasan Universiti Multimedia (YUM) presented the donation to two recipients namely Ms. Noor Haslina Shahid from President's Office and Mr. Muhammad Zakki Zahri from Facilities Management Department (FMDC) in Cyberjaya. A total amount of RM12,500 was successfully collected and mostly generated from the generosity of MMU staff since October last year.

Baby Zayyan has been diagnosed with Choroid Plexus Carcinoma and is currently receiving treatment at the Pusat Perubatan Universiti Malaya, while Mr. Muhammad Zakki is still undergoing treatment due to a stroke attack at the Rehabilitation Hospital in Cheras

MMU Volunteers Partake in Flood Relief Mission

A group of volunteers from Multimedia University (MMU) and *Pertubuhan Gabungan Bantuan Bencana* (BBNGO) a Malaysian NGO, made a flash trip to Kampung Air Lanas and Kampung Gemang at Jeli District, Kelantan for a flood relief mission.

The flood affected about 15 families and an appeal for help was made by Tuan Mohd Shamsul Baharin, Assistant District Officer of Jeli to Mr Shafiee Mohd, the coordinator of MMU Volunteers. Fortunately, all went well, as the team divided into groups and managed to clean up about 15 houses and the surrounding area within two days.

YUM Launches Covid-19 Relief Fund

Yayasan Universiti Multimedia (YUM) has initiated the Covid-19 Relief Fund to ease the financial burden by staff and students affected in this critical situation. Besides that, the fund will also be used to support those in need. The contribution can be in terms of cash or any necessary items such as hand sanitizer, face mask, food items, and others.

STAD Initiates Effort to Help the Underprivileged

Student Affairs Division (STAD) through its University Community Transformation Centre (UCTC) initiated several efforts in helping out those affected by the Covid-19 situation. 28 underprivileged families from Kampung Limbungan and Permatang Pasir, Melaka received essential items on 23 March 2020.

Kechara NGO requested UCTC to provide the items for single mothers, elderly people and low-income earners from the donation drive worth of RM1,500. Ms Hani Ramli, Head of UCTC led the team which consists of volunteers from Pergerakan Pemuda UMNO Bahagian Kota Melaka and NGO Briged Negaraku.

MMU Students Give a Helping Hand to the Unfortunates

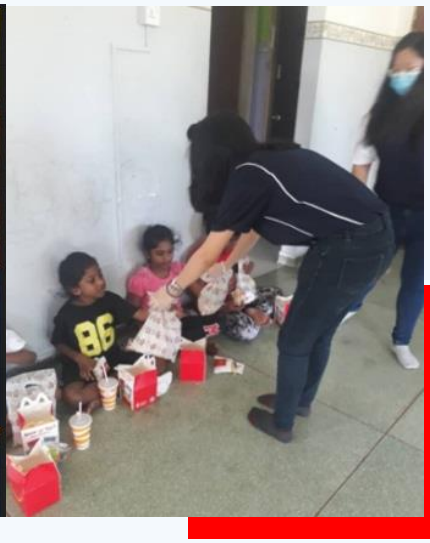
A group of students from the Faculty of Business (FOB) involved in organising the PSR project to help unfortunate families and senior citizens in Selangor and Melaka. It is a unique project where 15 students from five different states and they were divided into three teams namely Team Melaka, Team Selangor and Report Team. The students from Team Melaka distributed grocery items to 20 families in Bachang, Alai, and Telok Mas, meanwhile, Team Selangor distributed packed food and groceries to Pusat Jagaan & Rawatan Orang Tua Al-Ikhlas, a senior care centre in Puchong. The PSR project received a donation from team members and relatives and packed groceries set sponsored by Fazil Group and Hana Rizq Enterprise.

This programme was also supported by MMU representatives namely Ms. Nur Haslinda Mohd Nasir and Ms. Nurainiah Abu Hassan. It is hoped that this effort will be continued to help others in need.

Conducting Activities with Orphan

Multimedia University (MMU) through its University Community Transformation Centre (UCTC) had organised an event with orphans from Kompleks Anak Yatim Fatimah Al-Zaharah (KAYFAZ) and Rumah Anak-Anak Yatim Sultan Salahuddin Abdul Aziz Shah Al-Haj (RAYSS) on 12 September 2020, which was a part of SukaRia Charity Event mainly organised by Mini Malaysia. The event was graced by Toh Puan Datuk Wira Hajah Asmah binti Abdul Rahman, the spouse of Yang di Pertua Negeri Melaka (TYT); H.R.H Tuanku Hajah Lailatul Shahreen Akashah Khalil,Tuanku Raja Puan Muda Perlis; and YBhg Datin Seri Utama Hajah Munira M. Yusop, the Chief Minister's Wife.

UCTC MMU, conducted several interesting activities namely colouring contest, storytelling and Hand Stamp Banner in celebrating Malaysia Day. Prior to the event, H.R.H Raja Muda Perlis, Tuanku Syed Faizuddin Putra ibni Tuanku Syed Sirajuddin Jamalullail and TYT Tun Seri Setia (Dr.) Hj. Mohd Ali B. Mohd. Rustam Yang Dipertua Negeri Melaka ,with the delegates cycled around Melaka town in CycleJom Perlis Ride. A total of 5 cyclists from MMU also joined the event, which was collectively organised by Taman Mini Malaysia & ASEAN, Tourism Melaka, AGIBS Sdn. Bhd., Elo Water and MMU.

FOB Students Bring Smiles to Orphans

A total of 15 students from the Faculty of Business (FOB) brought in cheer for 23 children at Hope Children Care, Bukit Baru. The event aimed to increase the Personal Social Responsibility (PSR) amongst university students and to give back to society especially during the phase of Recovery Movement Control Order (RMCO). Under the supervision of Ms. Fathiah Hashim, the students worked together to prepare and donate daily necessities including milk powder, diapers, masks, disinfectants, and dry food to the centre.

The students also spent some time sharing their university life experiences with the children. During the activity, the students complied with the Standard Operating Procedure (SOP) while engaging with the children. The children also received McDonald's and a gift bag, hoping to bring them happiness. This experience elevates awareness to help people in need, and our students took this opportunity to practice and learn communication and social skills.

During the Pandemic time, MMU had engaged several parties in ensuring all affected students on campus have enough food and well nutrition, likewise providing food to those underprivileged and frontliners who fight for the wellbeing of the community.

“End hunger, achieve food security and improve nutrition and promote sustainable agriculture."

Food is a continuous necessity for us humans. Considering that even temporary emergencies are capable of causing severe hunger, drawn-out predicaments, such as the Covid-19 pandemic, could potentially cause lasting trauma, if not malnourishment, among the affected.

During the pandemic-driven lock-down, MMU took the effort and collaborated with several parties to help ensure that everyone under the university’s care had enough food and were in good condition.

Students, the underprivileged, and even front-liners combating the disease were among those who received provisions from MMU.

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UCTC Gives Away Raya Aid to 700 Needy Families

The University Community Transformation Centre (UCTC) of Student Affairs Division (STAD), in collaboration with non-government organizations (NGO), contribute Hari Raya Aidilfitri gifts to 700 underprivileged families. These NGOs comprised of Persatuan Sukarelawan Budi (BUDIFORWARD) and Pertubuhan Kebajikan Satu Kumpulan Global (One Group Global) Pahang. UCTC gave away the food and household goods worth about RM60,000 to the communities of Program Perumahan Rakyat (PPR) Lembah Subang, Muhibbah, Cempaka, Kampung Kerinchi, Pangsapuri Bandar Tasik Selatan, Sungai Bonus, Pahang, Pak Mahat Kuantan and Tehel, Melaka.

The contributions were collected from the donation of individuals, corporations, and the Ministry of Housing and Local Government. The Hari Raya Aidilfitri contribution was one out of 94 initiatives in the university's Social Responsibility (USR) initiative during the Movement Control Order (MCO). Other USR initiatives included the delivery of free online learning classes to school teachers in Melaka, food distribution to 261 students stranded at MMU Melaka and Cyberjaya, as well as the distribution of face shields to the frontliners.

Helping to Ease Burden during Ramadan

Sebakul Senyuman Ramadan 1449H, was a programme organised by MMU Melaka campus in collaboration with Pertubuhan Kebajikan Sedekah Subuh and MESRA to distribute basic necessities to the needy. The program commenced throughout the month of Ramadan and managed to reach 433 families from all races and religious background around Melaka and Kelantan. Meanwhile, Semarak Syawal event was organised to help 140 cleaners, landscape workers, security guards and drivers who were also affected by the COVID-19 situation. The event was organised by MMU Melaka campus in collaboration with MESRA, Pertubuhan Kebajikan Sedekah Subuh, Masjid Al Irsyad, STAD, and BAKIT. A similar event was also conducted at MMU Cyberjaya campus in collaboration with TM CSR, STAD, UCTC STAD, Unit Agama STAD, Surau Al-Hidayah, BAKIT and individual donors for 130 affected workers.

MMU Students Stranded on Campus Received Meals and Basic Necessities amid MCO

A total of 200 students were stranded on MMU's campuses during the implementation of Movement Control Order (MCO) starting in 18 March 2020. Through an initiative by Student Affairs Division (STAD), the students received meals and basic necessities for them to get through this challenging time.

The initiative materialised with the support of donors from Yayasan Food Bank Malaysia, Nandos Chicken, Kembara Kitchen, Pusat Zakat Melaka, TM MSC, Abdullah Initiative, OUM and many more in sustaining students' needs in Cyberjaya, Melaka and Johor. On top of that, STAD also distributed food items to international students who are living nearby the campus area.

Extend A Helping Hand to Frontliners amid Covid-19 Situation

To support frontliners on duty, Dr.Mohd Rizal Abdul Razak ,Director of Melaka campus has initiated a joint project with MESRA called **"MMU Prihatin Covid-19"** starting from 21 March. A total of 40 volunteers involved in distributing the food items to Hospital Melaka and Hospital Serdang. Among the food items distributed are crackers, 3 in 1 drinks, bread, energy booster and packet drinks. The frontliners also received meals for their breakfast, lunch and dinner. The volunteer team also made DIY face shield to aid frontliners to face Covid-19 pandemic. On top of that, the organiser also extended the support to the underprivileged people by providing essential items such as rice, sugar and cooking oil. These efforts help the frontliners to focus on saving lives and people in need to survive in this challenging phase.

STAD Initiates Effort to Supply Food

Student Affairs Division (STAD) through its University Community Transformation Centre (UCTC) initiated several efforts in helping out those affected by the Covid-19 situation on 24 March 2020. They supplied food to 150 volunteers of Angkatan Pertahanan Awam and 100 Patient under Investigation (PUI) at CREATE JKR Simpang Ampat, Melaka.

This initiative was a joint effort between UCTC and Yayasan Food Bank Malaysia. Among items distributed were mineral water, biscuits, instant food, rice, cooking essential and others. AGIBS Group Sdn Bhd, a construction company helped in logistic arrangement from Yayasan Food Bank's warehouse in Kajang.

TM CSR Provides Care Packs to Students

On 24 April 2020, TM Corporate Social Responsibility (CSR) visited Multimedia University and supplied care packs for stranded students on campus. About 250 students received goods worth of RM150 each of which consists of rice packs, sugar, biscuits, and other essentials. The initiative was led by Mr Izad Ismail, Head of Corporate Responsibility.

“Ensure healthy lives and promote well-being for all at all ages."

MMU encourages a culture that is physically active, and actively promotes the importance of holistic well-being to its staff and students, as well as its communities.

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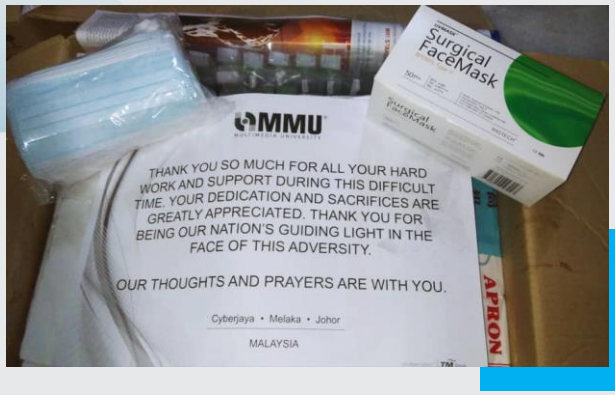


MMU Volunteers Continue to Support Frontliner Workers

As our country is facing a spike in COVID-19 cases especially in Sabah, MMU volunteers continue their effort in producing DIY face shields to the frontliner workers. The team delivered the DIY face shield, face mask and apron to hospitals in Beaufort and Kota Kinabalu.

At the same time, the team also collaborated with Pertubuhan Kebajikan Sedekah Subuh to deliver the full set personal protective equipment (PPE) to Kudat.

Honouring the MMU Frontliners

More than 60 MMU frontliners were honoured in a special ceremony officiated by Prof. Dato' Dr. Mazliham Mohd Su'ud, MMU President at MMU Cyberjaya on 23 September 2020. This event was held at Dewan Tun Canselor, MMU Putrajaya to appreciate the effort given by the frontliners amid COVID-19 particularly in food distribution, sponsorship, donation and others. During the session, the frontliners received their certificates from the President.

STAD Hosts Merdeka Fun Ride 2020

A total of 25 cyclists partook in **MMU Merdeka Fun Ride 2020** in conjunction with the Independence Day celebration on 5 September 2020. Organised by Student Affairs Division (STAD), the ride aimed as an avenue to boost awareness on healthy lifestyle amongst students and staff. The cyclists took four hours to complete the 40 km route from MMU Melaka to Proclamation of Independence Memorial and returned to the campus.

MMU Researchers Win Silver Medal at MTE 2020 SE-COVID-19 International Innovation Awards

We are proud to share the achievement of MMU researchers for winning silver medal at the Malaysia Technology Expo (MTE) 2020 Special Edition- COVID-19 International Innovation Awards on 2nd November 2020. The event is to acknowledge and celebrate all innovations in response to the pandemic situation of COVID-19.

Their project "COV CTX: Lung CT-Scans and X-Rays Artificial Intelligence Enabled Analyzer for COVID-19 Cases" is on application of artificial intelligence, specifically deep learning, for identification of COVID-19 infected lungs. In addition, the team also incorporated patient management system with location tracking ability into the app.

MMU Team Wins Challenge Session at ICIP 2020

Deep Heros, a team representing Multimedia University (MMU) emerged as champion in a Challenge Session at IEEE Signal Processing conference, which was held during IEEE International Conference on Image Processing (ICIP 2020). The team, consist of Nouar AlDahoul, a researcher under supervision of Associate Prof. Ir. Dr Hezerul Abdul Karim and Associate Prof. Dr Mohammad Faizal Ahmad Fauzi, and Mhd Adel Momou.

The conference, which was held virtually in Abu Dhabi, United Arab Emirates (UAE) witnessed our team outperformed other finalist teams from Algeria, Finland, France, and Bangladesh in the Challenge. The challenge session topic was "On Real-time Distortion Classification in Laparoscopic Videos". Laparoscopy, also known as diagnostic laparoscopy, is a surgical diagnostic procedure used to examine the organs inside the abdomen with the aid of camera. The purpose of this challenge was to develop a fast, unified, and effective algorithm for real-time classification of distortions within a laparoscopic video.

Promoting Healthy Lifestyle amid RMCO

The Centre for Business Excellence (CoBE) and the Special Academic Task Force (SATF) from the Faculty of Management (FOM), organised the first **"**On Air with FOM Series"; featuring the nation's Cikgu Fitness, Kevin Zahri. The 30-minutes live session on MMU's Facebook provided a platform for the university's community to interact with Kevin and ask him questions related to health and fitness.

During this fun and upbeat session, Kevin managed to offer his advice and tips on how people can remain fit and healthy, especially during the recent Recovery Movement Control Order (RMCO)

MMU Lecturer Bags Second Place for "Make New Normal A Culture" Campaign

We are delighted to share that Dr. Fauzan Mustaffa, our academician from the Faculty of Creative Multimedia (FCM) was announced as the second winner for logo and tagline competition in conjunction with "Make New Normal A Culture" campaign organised by the Ministry of Communication and Multimedia (KKMM) on 8 August 2020. Dr. Fauzan received a mock cheque worth of RM3,000 from our Prime Minister, Tan Sri Muhyiddin Yassin at the Pagoh Sports Complex in Johor.

The "Embracing New Norms" campaign is an initiative by the KKMM to elevate the awareness and encouraging Malaysians to protect themselves, family members, and communities to fight against the COVID-19 outbreak. The logo and tagline competition attracted more than 1,000 participants with a total of 2,150 logos submission. Also attending the event were Datuk Seri Ismail Sabri Yaakob, Senior Defence Minister; Datuk Saifuddin Abdullah, Communications and Multimedia Minister; Health Minister, Dr. Adham Baba and Johor Menteri Besar, Datuk Hasni Mohammad.

Machine Intelligence in Digital Pathology: Towards Personalised Medicine for Better Healthcare

Dr Mohammad Faizal

Pathology is a branch of medical science primarily concerning the examination of organs, tissues, and bodily fluids in order to make a diagnosis of disease. It is used extensively in forensic investigations, autopsy, diagnosis, as well as in education and training. Histopathology and cytopathology are two branches of pathology for the diagnosis and study of diseases at the tissue and cellular levels respectively, both involving the examination of tissues and cells under a microscope. Digital pathology is an image-based information environment which is enabled by computer technology that allows for the management of information generated from digital slides. With the advent of whole-slide imaging (Figure 1), the field of digital pathology has gained considerable interests and is currently regarded as one of the most promising avenues of diagnostic medicine in order to achieve even better, faster and cheaper diagnosis, prognosis and prediction of cancer and other important diseases. While imaging tests such as X-rays, Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) are helpful in detecting masses or areas of abnormality, they alone cannot differentiate cancerous cells from non-cancerous cells. For most types of cancer, histopathology remains the 'gold standard' for the diagnosis of cancer.

Figure 1: Whole-slide scanner for scanning glass slides.

Histopathological examination of tissues starts with either surgery, biopsy, or autopsy. These involve removing a piece of tissue or a sample of cells from the body so that it can be analysed in a laboratory. The tissue is placed in a fixative which stabilises the tissues to prevent decay, and is then stained and prepared for viewing under a microscope. Staining is carried out to enhance visualisation of the cell or certain cellular components under a microscope. One of the principal stains in histology as well as the most widely used stain in medical diagnosis is the haematoxylin and eosin (H&E), in which haematoxylin stains cell nuclei blue, and eosin stains cytoplasm, connective tissue and other extra-cellular substances pink or red (Figure 2). Other staining techniques include immunohistochemistry (IHC) and in situ hybridisation (ISH). The glass slides obtained after the fixation and staining processes are then converted into digital slides via whole-slide scanners that can be viewed, managed, and analysed on a computer monitor.

Computer-aided diagnosis (CAD) employs machine learning and computer systems that assist medical professionals in the interpretation of medical images. CAD systems do not aim to replace medical professionals but instead attempt to assist them by providing computer interpretations to enhance confidence in making the final diagnosis. In digital pathology, CAD helps in reducing the diagnosis time (can be several hours for a single case manually), reducing errors and inaccuracies (due to human factors such as tiredness and distractions), and removing sampling bias and subjective interpretations. CAD systems in digital pathology will not only be valuable to doctors and pathologists but will also benefit cancer patients and general population directly. CAD systems are applied to histopathology images in many ways for cancer diagnosis, amongst others to detect and segment Region-of-Interests (ROI) such as mitotic counts, nuclei and stroma characteristics; to classify tissue samples as diseased or normal; to classify between different sub-types of a particular type of cancer; to determine tumor grade; and to score predictive markers in tumor cells. There are also many types of cancers (bone, brain, breast, cervix, colorectal, gastric, kidney, lung, pancreas, prostate gland, skin, etc.), each of which require different diagnostic criteria which machine intelligence can be trained to apply. Additionally, with image resolutions of up to 100,000 pixels by 100,000 pixels, digital pathology lends itself very well in the state-of-the-art deep learning architecture as it can easily handle huge amounts of required training samples consistently.

Of the many CAD applications in digital pathology, perhaps the most interesting is its role in personalised medicine. Personalised medicine is the tailoring of medical treatment to the individual characteristics of each patient. The approach relies on scientific breakthroughs in the understanding of how a person's unique molecular and genetic profile makes them susceptible to certain diseases or amenable to various treatment modalities. Taking breast cancer as an example, a crucial step in the breast cancer treatment algorithm is to test the tumor tissue to determine if it expresses estrogen receptors (ER), and progesterone receptors (PR), and has amplification of human epidermal growth factor receptor 2 (HER2), collectively known as tumor predictive markers. These markers provide key information about how the cancer may behave. Along with tumor grade and cancer stage, the tumor markers status helps determine the best treatment options for breast cancer patients. For example, breast cancers that are ER positive are much more likely to respond to treatment that block estrogen while those that have HER2 amplification are likely to respond to HER2 inhibitor targeted therapy. The determination of ER, PR and HER2 status is currently a pre-requisite for establishing treatment strategies for breast cancer patients, regardless of disease stage. CAD systems in digital pathology, by reducing examination time, errors and inaccuracies, as well as eliminating bias and inconsistencies, pave the way in this era of personalised medicine. Multimedia University, in collaboration with many national and international pathologists, and funded by several national and international grants, is working on developing algorithms and systems for various cancer types, including a prototype system for breast cancer evaluation and treatment.

Acknowledgement: The author would like to thank all of his collaborators for supporting the past and on-going projects conducted at Multimedia University. Special thanks to Dutuk Professor Dr Loo Lai-Meng from University Malaya for her valuable input and suggestions for this article.

Figure 2: Digitised slide showing different magnification of two different regions.

Dr Mohammad Faizal Ahmad Fauzi (MIEAM, SMIEEE) received the B Eng Degree in Electrical and Electronics Engineering from Imperial College, London, UK in 1999, and the PhD Degree in Electronics and Computer Science from University of Southampton, UK in 2004. He is currently an Associate Professor at the Faculty of Engineering, Multimedia University. His main research interests are in the areas of signal and image processing, pattern recognition, computer vision and biomedical informatics. He was first exposed to digital pathology, especially on cancer and diseases analysis, during his attachment at the Clinical Image Analysis Lab at the Ohio State University Wexner Medical Center, USA, from May 2013 to June 2014, and again in 2017 (Fulbright Award). He has published more than 80 journal and conference articles to date. Dr Mohammad Faizal is a Senior Member of the Institute of Electrical and Electronics Engineers (IEEE), which he first joined in 2000. He is currently serving as the Chair for IEEE Region 10 Newsletter Committee, Past Chair of the IEEE Malaysia Section as well as the Advisor for the IEEE Signal Processing Malaysia chapter. He can be reached at faizal1@mmu.edu.my

Publishing A Research Article on TEEAM Magazine

An article written by Assoc. Prof. Dr. Mohammad Faizal Ahmad Fauzi, entitled **"Machine Intelligence in Digital Pathology: Towards Personalised Medicine for Better Healthcare"** published in the 79th Issue of SUARA TEEAM. The article discusses digital pathology, which is currently regarded as one of the most promising avenues of diagnostic medicine, and how machine intelligence in digital pathology can help paves the way towards the era of personalised medicine.

This publication reflected on Dr. Faizal's professional expertise and knowledge in the biomedical informatics field as well as recorded recognition for the Faculty of Engineering and Multimedia University (MMU). TEEAM or known as The Electrical and Electronics Association of Malaysia is a representative body of the electrical and electronics industries in Malaysia. Established in 1952, TEEAM works closely with all government departments, statutory bodies, and the private sector to promote the electrical and electronics industries.

MMU, PENGASIH Sign Pact to Raise Community Awareness on Mental Health & Substance Abuse

On 9 July 2020, MMU through its Student Affairs Division (STAD) has signed a Memorandum of Understanding (MoU) with Persatuan PENGASIH Malaysia (PENGASIH) at Cyberjaya campus. The MoU was signed by Prof. Dr. Ho Chin Kuan, the Acting President of MMU and Tuan Haji Ramli Abdul Samad, President of Persatuan PENGASIH Malaysia.

Through this two-year agreement, both parties will collaborate to explore ways of using digital information technology and communication champion on the issues of mental health and overcoming substance abuse. They have also agreed to focus on four areas namely Special Activities, Seminar and Education and Awareness Programme; Research and Publication; Community Engagement Programmes; and Management, Humanity and Law.

MMU Volunteers Make Face Shield and Help Needy People

Sahabat Sukarelawan Melaka Campus in collaboration with MMU MESRA Club has raised significant donations and contributions for Prihatin COVID-19 fund. The fund was utilised to assist the needy and frontliners on duty during this pandemic. A total of 40 staff volunteers was involved in making DIY face shields from home. The face shields were distributed to the Royal Malaysia Police (PDRM Melaka), Bank Simpanan Nasional (BSN Melaka), Hang Tuan Jaya Municipal Council (MPHTJ, Melaka), 514 Territorial Army Regiment, Melaka Civil Defense Force as well as Melaka and Kelantan hospitals.

FCM Designs Face Shields for Frontliners

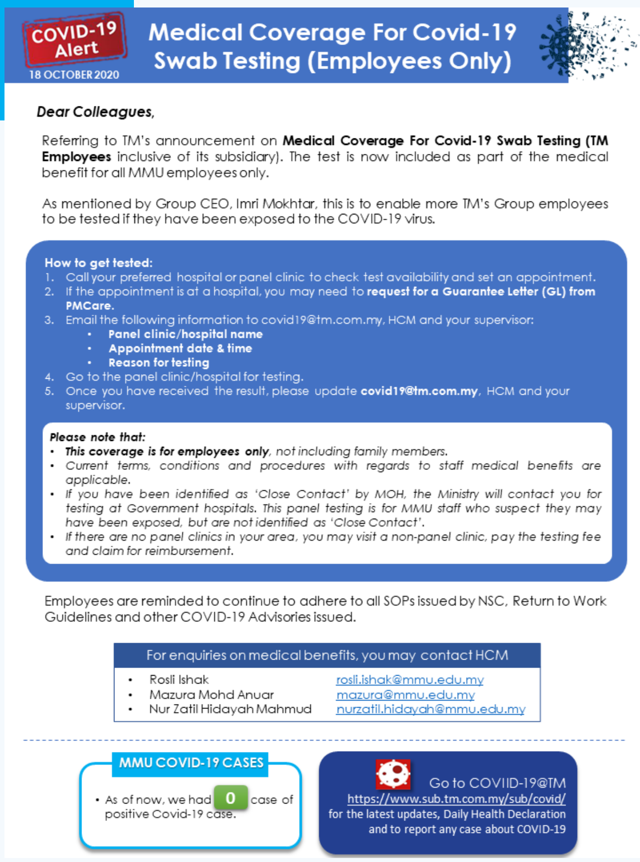
Faculty of Creative Multimedia (FCM) through its Department of Interface Design collaborated with TeaMa COVID-19 to produce 3D printing face shield frame to the frontliners. This effort was initiated by Prof. Dr. Hairul Azhar Abdul Rashid, the Vice President of Research and Innovation (R&I).

The team which consisted of Mr. Zainuddin Siran, Mr. Ahmad Bostami Ahmad, Dr. Khong Chee Wen, Mr. Mazlan Mahadzir and Mr. Ku Azzam produced more than 250 units of face shields and they are still making the face shields to fulfill the requests from Pejabat Kesihatan Putrajaya and Klinik Kesihatan Seri Kembangan. The team also are working on R&D stages in producing masks and intubation box as their upcoming project to help out the frontliners to curb the COVID-19 spread.

Raising Cancer Awareness Among Young People

On 12 February 2020, an event called “Campuses Against Cancer” was held at Faculty of Creative Multimedia’s (FCM) E-Theatre and Atrium in conjunction with Cancer Awareness Month. Twenty volunteers led by Ms. Raja Razana, a lecturer from the Faculty of Applied Communication (FAC) contributed to a good cause.

The main objective of the event was to create pre-cancer awareness, and it also served as a good platform for the students to improve their writing ability as they have to promote the organisation through written articles and encourage students to volunteer for activities organised by NGO organisations such as National Cancer Society Malaysia (NCSM).


COVID-19 Alert
18 OCTOBER 2020

Medical Coverage For Covid-19 Swab Testing (Employees Only)

Dear Colleagues,

Referring to TM's announcement on **Medical Coverage For Covid-19 Swab Testing (TM Employees** inclusive of its subsidiary). The test is now included as part of the medical benefit for all MMU employees only.

As mentioned by Group CEO, Imri Mokhtar, this is to enable more TM's Group employees to be tested if they have been exposed to the COVID-19 virus.

How to get tested:
1. Call your preferred hospital or panel clinic to check test availability and set an appointment.
2. If the appointment is at a hospital, you may need to **request for a Guarantee Letter (GL) from PMCare.**
3. Email the following information to covid19@tm.com.my, HCM and your supervisor:
   - **Panel clinic/hospital name**
   - **Appointment date & time**
   - **Reason for testing**
4. Go to the panel clinic/hospital for testing.
5. Once you have received the result, please update **covid19@tm.com.my**, HCM and your supervisor.

Please note that:
- ***This coverage is for employees only****, not including family members.*
- *Current terms, conditions and procedures with regards to staff medical benefits are applicable.*
- *If you have been identified as 'Close Contact' by MOH, the Ministry will contact you for testing at Government hospitals. This panel testing is for MMU staff who suspect they may have been exposed, but are not identified as 'Close Contact'.*
- *If there are no panel clinics in your area, you may visit a non-panel clinic, pay the testing fee and claim for reimbursement.*

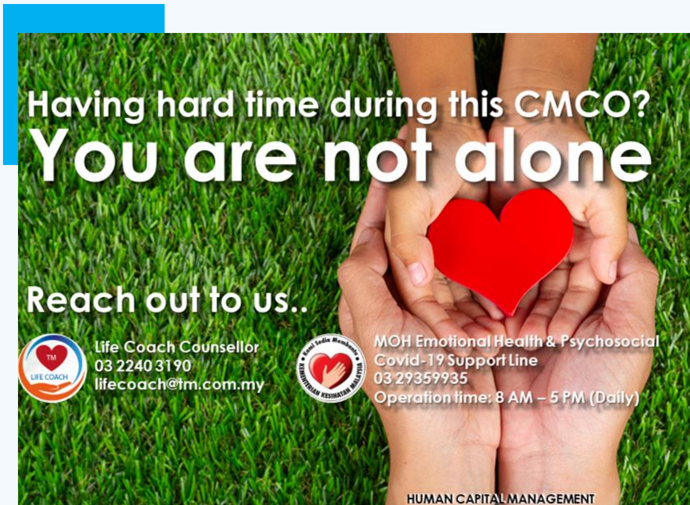
Employees are reminded to continue to adhere to all SOPs issued by NSC, Return to Work Guidelines and other COVID-19 Advisories issued.

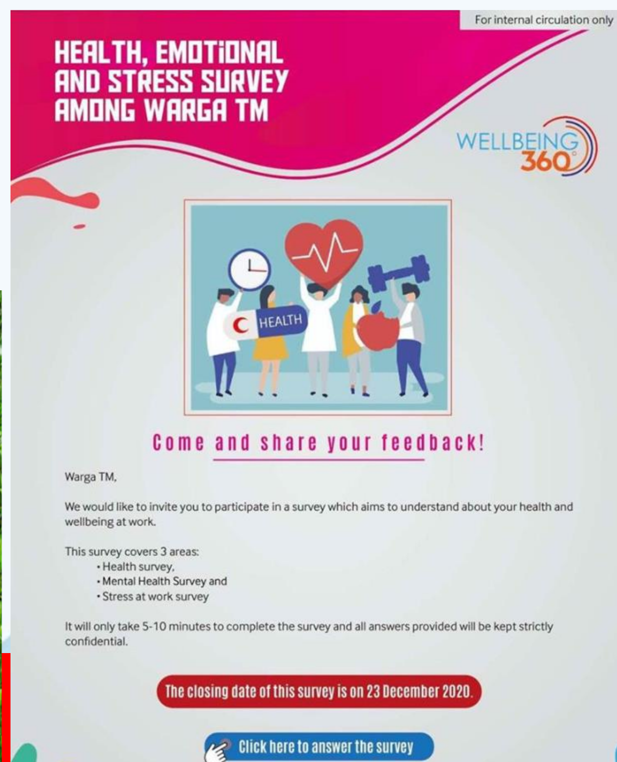
For enquiries on medical benefits, you may contact HCM	
• Rosli Ishak	rosli.ishak@mmu.edu.my
• Mazura Mohd Anuar	mazura@mmu.edu.my
• Nur Zatil Hidayah Mahmud	nurzatil.hidayah@mmu.edu.my

MMU COVID-19 CASES
• As of now, we had 0 case of positive Covid-19 case.

Go to COVID-19@TM
https://www.sub.tm.com.my/sub/covid/
for the latest updates, Daily Health Declaration and to report any case about COVID-19

MMU ensured staff good health and well-being during the pandemic time by providing financial and counseling supports.





“Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.”

The university has made its expertise available to as many people as possible, for the purposes of community development, knowledge sharing, and lifelong learning.

Over the years, this has been done in a few ways, including by providing financial assistance to reduce economic barriers, by creating short courses to remove academic restrictions, and by introducing workshops to help even those who have only basic education.

Despite the pandemic, we are ensuring that the knowledge dissemination continues by providing the quality tertiary education via online learning and encourages lifelong learning to enhance the education and skills of the Rakyat.

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4 QUALITY EDUCATION

MMU MULTIMEDIA UNIVERSITY

348 New Students Received full Scholarship

New Students Received Financial Assistance **3221**

9 Internal Scholarships offered and supported by **29** External Scholarships

YUM YAYASAN UNIVERSITI MULTIMEDIA

Biasiswa JPA JABATAN PERKHIDMATAN AWAM

YAYASAN TELEKOM MALAYSIA

Star EDUCATION FUND

YAYASAN KHAZANAH KHAZANAH WATAN SCHOLARSHIP PROGRAMME

YAYASAN PENERAJU PENDIDIKAN BUMIPUTERA

KUOK FOUNDATION BERHAD

sarawak energy

Kingdom of Saudi Arabia

星洲日报教育基金 SIN CHEW DAILY EDUCATION FUND

PNB Permodalan Nasional Berhad

MMU Hosts GLU Collaborative Alumni Talk

On 17th December 2020, Centre for Alumni (CFA) and Student Affairs Division (STAD) organised an alumni talk with a theme on Youth Nation Alumni Network at MMU Studio in Cyberjaya campus. The talk featured successful alumni from Government Linked Universities (GLU) comprising of Multimedia University (MMU), Universiti Teknologi Petronas (UTP),Universiti Kuala Lumpur (UniKL), and Universiti Tenaga Nasional (UNITEN).

The invited speakers were Dato' Dr. Nazri Khan, CEO & Fund Manager, Interpacific Asset Mgmt. Sdn. Bhd.; Ms. Lim Chia Wei @ Cempaka, Founder of Spice your CV; Mr. Mohamad Hanif Shamsuri, Quality Manager, Taj Food Factory, Jeddah and Mr. Muhammad Ibrahim Khalil, SAP Consultant, NTT Data Business Solutions. The speakers shared their insights on an interesting topic on **"Influencers of Change: What's next for 2021"** and also shared some tips on how to face challenges as we move into the year 2021.

899 Form 5 Students Participated in Online Quiz

A total of 899 Form 5 students from 41 secondary schools participated in an online quiz, "Quizzard Genius 2020". Hosted by National Marketing and Enrolment, the participants needed to answer 60 questions related to History, Science, Mathematics, general knowledge as well as about MMU.

As a result, Lee Kok Long from Sekolah Menengah Jenis Kebangsaan (SMJK) Seg Hwa, Johor was announced as champion of the competition and walked away with cash of RM300 and e-certificate. Meanwhile, Chua Xing Shun from SMJK Gajah Berang, Melaka won the first runner up and Lim Xoa Yang from SMJK Yok Bin, Melaka took the second runner up. The winners received the cash prize of RM200 and RM100 respectively together with the e-certificates. In addition, twenty participants also received the consolation prizes of RM50 cash and e-certificates.

MMU Students Bag Gold Award and The Best Young Inventor Award at ISEBA 2020

We would like to extend our heartiest congratulations to our students namely Jeffrey Quek Shue Yew, Tan Jian Wei, and Sio Ling Xian from the Faculty of Business (FOB), who have bagged two awards; Gold Award and The Best Young Inventor Award at the International Symposium & Exhibition on Business and Accounting 2020 (ISEBA 2020) on 18 November 2020. Mentored by Mr. Tan Gek Siang, the students beat other contestants with their innovative idea of a takeaway off-line device that encompasses comprehensive educational programmes and syllabus in rich media format (virtual lectures, ebooks, videos etc.).

The innovation is named as VIRTA which stands for Virtual Interactive Resources for Teaching Academics. The innovation is envisioned to be an ideal solution to provide equal access of quality education to all school children by leveraging ICT. The innovation supports the Malaysia Education Blueprint 2013-2025 to scale up quality learning across Malaysia, as well as one of the 17 United Nations Sustainable Development Goals (SDG) to provide universal access of quality and affordable education regardless of wealth disparities.

The ISEBA 2020 aimed to generate and create a new knowledge through sharing and exchanging research findings from various area, as well as to foster inventiveness and innovations skills among lecturers and school students through poster exhibitions. With the theme of Embracing IR 4.0 towards SDG, the event is opened to all students, academicians, and industry experts who are interested to share ideas and expertise from their respective fields through virtual presentation.

MMU Hosts International Students e-Exchange Programme

A total of 389 participants from 19 universities received warm welcome during the virtual opening ceremony of International Students e-Exchange Programme on 9th November 2020. The participants came from eight countries namely India, Indonesia, Nepal, Thailand, Philippines, United Kingdom, Japan, and Malaysia. This exchange programme is jointly organised by the Faculty of Business (FOB), MMU; Universitas Mercu Buana, Indonesia; Birla Global University, India and Universitas Pakuan, Indonesia.

The opening ceremony witnessed the welcoming remarks from the organisers including Assoc. Prof. Dr. Goh Guan Gan, Dean of FOB; Dr. Ponco Budi Sulistyo, Dean of Faculty of Communication Science, Universitas Mercu Buana; Prof. Dr. Parameswar Nayak, Dean of Birla School of Management; and Dr. Hendro Sasongko, Dean of Faculty of Economics, Universitas Pakuan.

The ceremony also was enlivened by the cultural performance by Universitas Pakuan, Indonesia. With its theme, "Making an Impact via Social Innovations", the programme promotes collaborative efforts among participants to generate the best social innovations idea in addressing economic, social, and environmental issues faced by the local communities.

This two-week programme is also filled with a series of exciting and insightful activities including expert talk sessions, panel discussions, and group work. One of the participants, Ethan Street from Manchester Metropolitan University sharing his positive remark on the virtual exchange programme and taking this valuable experience to widen his perspective and connect with other participants from different countries.

FOE Hosts a Virtual Industry Forum on Cybersecurity

More than 530 participants joined the Live Webinar of FOE Industry Forum, with the topic, "Cyber Security: Risks, Challenges, and Management Issues" via Microsoft Teams Live Event platform. The two-hour forum aims to promote awareness and understanding in the cybersecurity issues. The forum was organised by Industrial Linkage Committee of Faculty of Engineering (FOE) and was jointly organised by the Engineering Education Technical Division (E2TD), IEM Malaysia, MMU IEM Student Section and IEEE MMU Student Branch. The session was followed by MMU students, academicians, industry representatives, and secondary school students from Sekolah Seri Puteri, Cyberjaya and Sekolah Menengah Sains Banting.

During the forum, the panellists shared their experience as Cyber security experts and their insights of cybersecurity practices, regulation as well as many interesting issues happening in the world. The discussion also centred around the potential threats that societies must be aware of in the cyber world.

Gaining Insights on the Role of Industry amidst COVID-19 Pandemic

A total of 63 participants participated in a webinar entitled "How the Industry is Helping Participants during this COVID-19 Pandemic" on 29 September 2020. The webinar was a joint effort between the Malaysian Takaful Association (MTA) with the Faculty of Business (FOB). The webinar was conducted by Mr. Wearn Qian Soon, an assistant manager (STMKB Actuarial Valuation) from the MTA.

The objective of the webinar was to boost awareness on the role of the industry as well as to guide students on how to deal with challenging situations amid COVID-19 outbreak. The speaker elaborated on several measures that the company had implemented to help the affected parties including providing an extension of their Takaful payment, conveying possible solutions to the clients as well as having a series of talks to the public in creating the awareness on the importance of financial health.

Inspiring Alumni Speak on Social Media Branding

On 24 September 2020, our two successful Permata Dunia namely Ms. Eyqa Sulaiman and Mr. Adha Izhan were invited to share some insights on how social media branding impacts businesses. The talk was streamed live through Facebook and Instagram in Cyberjaya. Moderated by Ms. Sophiya Rose Elena, a student from Faculty of Applied Communication (FAC), the event managed to attract 850 viewers. As a founder of Sugarcraft, Ms. Eyqa shared her experience of managing her business through online campaigns. Meanwhile, Mr. Adha Izhan, a founder of Madre emphasised that finding and solving a problem is important in order to start a business. The event was organised by Centre for Alumni (CfA) and aimed to motivate students and alumni to utilise social media as the tools to support business especially during COVID-19 pandemic period.

FOB Hosts International Webinar by Argentinean Professor and Trade Specialist

On 9th September 2020, the Faculty of Business (FOB) has organised an international webinar entitled 'Challenges and Opportunities in International Business' with the purpose of informing academicians, students, and practitioners on the rising difficulties the future of international trade in the currently chaotic world economy. There were 145 attendees at the session.

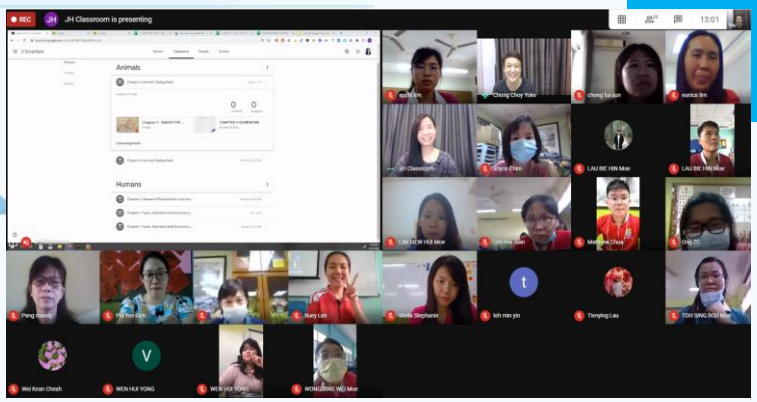
The speaker of the day was Prof. Sebastian Sterzer, Head of the International Relations Area for the Observatory of International Trade at the National University of Lujan, Argentina. Since January 2015, Prof. Sterzer has been actively researching issues on sustainable development, with an emphasis on socio-cultural and economic trends that links Latin America and South East Asia.

In the webinar, Prof. Sterzer shared his insights on how differences in culture, economic and political conditions, and bureaucracy of world governments have defined trade among world nations, with an emphasis on South America and Asian trade relations. In his final remarks, Prof. Sterzer also pointed out the importance of stronger political ties, regional ties and bilateral free trade agreements to strengthen trade relations, encourage growth in international business, and to ameliorate the world economy.

Embracing New Normal with Virtual Debate Competition

Multimedia University (MMU) hosted a Virtual Debate competition amongst secondary school students. The event was fully organised by MMU students from “Sekretariat Debat MMU”, which was led by Muhammad Yusri Azpansyah. A total of 20 secondary schools participated in this parliamentary-style debate including Maktab Rendah Sains Mara (MRSM), Sekolah Berasrama Penuh (SBP), Sekolah Menengah Agama (SMA), government and private secondary schools. The event was officiated by Dr. Abdullah Sallehhuddin Abdullah Salim, Director of STAD.

Using Zoom application, the event aimed to improve public speaking skills as well as to cultivate the ability of critical thinking on current issues through linguistic discussions, research, and true facts analysis. In addition, the competition also upholds Bahasa Melayu as the medium of interaction which is one of the key elements of the judgment. The debaters from SMA Persekutuan Labu (SMAPL), Negeri Sembilan emerged as champion defeating MRSM Kuantan in the final stage. The winner received a cash prize of RM1,000 along with the accompanying plaque and certificate of participation. It was a double win for SMAPL when Muqri Hakim Mustazha was announced as the best debater of the competition.

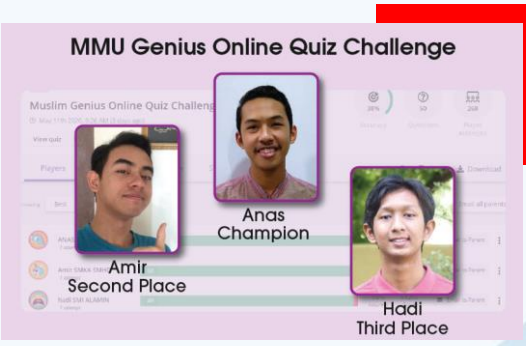


Guiding Educators to Utilise Google Classroom Management

A total of 69 school teachers from two groups- members of the Persatuan Penduduk Taman Sutera and Chung Hwa School partook in the Google Classroom Management training sessions in June and July 2020. The four sessions were conducted by Faculty of Management (FOM) through its Centre of Business Excellence (CoBE) with the involvement of six members namely Dr Hasni Mohd Hanafi, Dr Chong Choy Yoke, Dr Kwan Jing Hui, Assoc Prof Dr Nahariah Jaffar, Madam Azleen Shabrina Mohd Nor and Madam Zarehan Selamat.

The programme aimed at assisting the participants to adapt with a new style of teaching through an online platform amid COVID-19 situation and the Movement Control Order (MCO). This new norm has become a challenge to some educators as they have to maneuver their teaching and learning methods into an online platform. The training sessions were interactive, whereby after every segment, the participants were given tasks to gauge whether they understand and manage to perform the functions in the Google Classroom. Based on the evaluation that was given, participants appreciated the coverage of functions available in the platform, smooth conduct of the sessions as well as the way the trainers handled the training. The participants also received their e-certificate to mark the completion of the training.

MMU Hosts Genius Online Quiz Challenge



A total of 237 Form 5 students from various religious secondary schools participated in an online platform, Quizizz. The first ever online quiz hosted by MMU for school students received warm responses when there were 15 schools registered namely Sekolah Menengah Kebangsaan Agama (SMKA) Sharifah Rodziah Melaka, Sekolah Menengah Agama (SMA) Persekutuan Kajang, SMKA Maahad Muar, Maahad Integrasi Tahfiz Sepang, Kolej Islam Sultan Alam Shah Selangor, Sekolah Menengah Islam (SMI) Al Irshad Pulau Pinang, SMI Al Ihsan, Pahang and others.

Making Headway with Online Classroom Management Sharing Sessions

The Faculty of Business (FOB) conducted two online sharing sessions on the management of online classes with delegates from the Bahagian Matrikulasi Kementerian Pendidikan Malaysia (BMKPM) and Sofa Education Group held in June 2020. The sharing sessions focused on two main areas, which is the introduction of an online classroom management framework, and best practices of online classes for subjects of various disciplines. The online classroom management framework, known as KENDALI, is a framework that was conceptualised as a model for the design and delivery of higher education programmes from the current face-to-face learning (which includes blended learning) to online/remote learning. It aimed to foster student-centered learning environment, student-lecturer interactions and student engagement in a fully online learning environment.

MMU Organized Inter-MRSM Online Quiz

A total of 492 students from eight Maktab Rendah Sains MARA (MRSM) schools participated in the inter-MRSM Online Quiz. The selected MRSMs were MRSM Alor Gajah, MRSM Terendak, MRSM Tun Ghafar Baba, MRSM Tun Dr. Ismail, MRSM Johor Bahru, MRSM Gemencheh, MRSM Kuala Klawang and MRSM Serting. The participants were required to answer 60 questions related to English, History, Physics, Mathematics, General Knowledge and MMU through an online platform.

Building Your Career in Creative Industry

MMU's staff Mr. Chemat and Mr. Ghazi have delivered a talk live on MMU Facebook on the 12th May 2020. The talk was about building career in the Creative Industry.

Che Ahmad Azhar (aka Chemat) is a lecturer from the Faculty of Creative Multimedia (FCM) and he is a 'street photography' listed as the 30 Most Influential Photographer in Asia 2014 by the Invisible Photographer Asia.

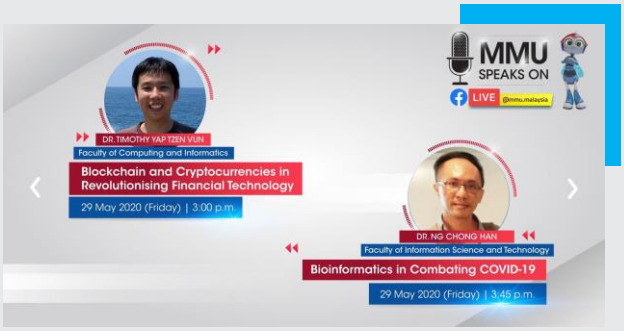
Mr. Ghazi Alqudcy is a lecturer from MMU's Faculty of Cinematic Arts (FCA), he is also a director cum producer for more than 50 short films and 2 fiction films with international recognition.

MMU Speaks On: Fake News – A Media Consumer Perspective

On the 15th May 2020, MMU's staff delivered an episode of MMU Speaks On, live on MMU Facebook. The talk was delivered by Mr. Hafidz Hakimi Haron from Faculty of Law (FOL) and Mr. Aznul Fazrin Sujak from Faculty of Applied Communication (FAC) on Fake News : A Media Consumer's Perspective.

MMU Speaks On: Engineers – True Leaders of IR 4.0 and Let's Engineer Your Future

On the 22nd May 2020, MMU's staff delivered another episode of MMU Speaks On, live on MMU Facebook. The talk was delivered by Prof. Ir. Dr. Koo Voon Chet from the Faculty of Engineering and Technology (FET) on Let's Engineer Your Future, and Ir. Siva Priya Thiagarajah from Faculty of Engineering (FOE) on Engineers: True Leaders of IR4.0.



MMU Speaks On: Blockchain and Cryptocurrencies in Revolutionising Financial Technology and Bioinformatics in Combating Covid-19

On the 29th May 2020, MMU's staff delivered another episode of MMU Speaks On, live on MMU Facebook. The talk was delivered by Dr. Timothy Yap from the Faculty of Computing and Informatics (FCI) on Blockchain and Cryptocurrencies in Revolutionising Financial Technology, Dr. Ng Chong Han from Faculty of Information Science and Technology (FIST) on Bioinformatics in Combating Covid-19.

Helping Entrepreneurs Rebound from the Covid-19 pandemic

A group of final year students of Event Planning and Management class together with students of Intercultural Communication class and Academic Writing class of the Faculty of Applied Communication (FAC) successfully organised e-Bazaar in helping entrepreneurs affected by Covid-19 pandemic. The e-Bazaar was an online interactive platform for all entrepreneurs to promote their home-grown brands under specified categories namely Perkampungan Preneurs, Summer Artisan, and Pasar Pujangga.

The event aimed at helping local entrepreneurs to bounce back from the recent pandemic of Covid-19 while learning about the struggles and hardships that these entrepreneurs went through during these tough times. This e-bazaar was funded by the Entrepreneur Development Centre (EDC) under the Embedding Entrepreneurial Learning Scheme 2020.

Focusing on *EL3 – Empathy with the life-world of the entrepreneur* and with the tagline #ReboundfromCovid19, the e-Bazaar was a livestream event conducted via faculty's Facebook live. The one-day event which was aired for five hours, was filled with various interactive contents, including live stream talk shows with MMU Permata Dunia such as the CEO of Celebrate TV, Mr. Fariz Hamdi, and Nexagate, Tuan Faisal Azmy. Viewers, especially secondary school students, also had the opportunity to take part in a writing competition.

The e-bazaar also featured a special appearance of Suhaimi Sulaiman, the Media Strategist and an entrepreneur during the live stream interview session and viewers also had the opportunity to see him giving advice especially to entrepreneurs who were affected by the recent pandemic. Attractive prizes such as TGV vouchers and local products were lined up during games segment for the LIVE audience. All in all, the event is a major success with students having to experience on how to plan, manage and coordinate a real-life event in the "new normal".

"Achieve gender equality and empower all women and girls."

MMU is fully aware of the potential and prospects provided by both genders. In fact, the university was established as a means of developing high quality human capital, regardless of their gender, ethnicity, and backgrounds. Consideration and opportunities are both a function of capability and merit.

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MMU Student Excels in Karate E-Championship

Wannur Syazwani Mohamad Nazar, our student from the Faculty of Management (FOM) has made us proud by emerging as the champion for Open Female Category in the Vice-Chancellor Cup Karate E-Championship 2020. She also won third place for Senior Female Category at the same event, which was organised by the Universiti Malaysia Perlis (UniMAP).

In addition, Wannur proved her track record of excellence in karate when she won third place in the Japanese Karate Association-JKA India Karnataka Open Online Champion, which was held in September 2020. This international competition with 50 categories, managed to gather 180 participants from different countries. Malaysia was represented by more than 20 participants and Wannur won third place under the individual category of Black Belt Girls.

Wannur also bagged two golds in the Classic Northern Karate-Do Open E-Kata Championship 2020 for two categories namely Kata over 18 years and Individual Kata Open in November 2020. It is hoped that Wannur, who is also a recipient of a sports excellence scholarship, will continue to shine in the karate sports competition as well as her academic success!

A virtual talk on Awareness on Sexual Harassment at Workplace

A virtual talk on Awareness on Sexual Harassment at Workplace delivered by Mdm. Hezlina Hashim was conducted via Google Meet on the 14 October 2020. The talk was organized by the Human Capital Management Division for all MMU staff.

"Ensure access to affordable, reliable, sustainable and modern energy for all."

Modern life has become dependent on energy. However, at our current level of technology, the supply of energy is limited and its production harmful to the environment, in most cases. Cognizant of these facts, MMU actively pursues efficiency in its power utilisation. To this end, it has established its own Energy Policy, frequently checks for compliance, and encourages its citizens to be conscious of their power usage.

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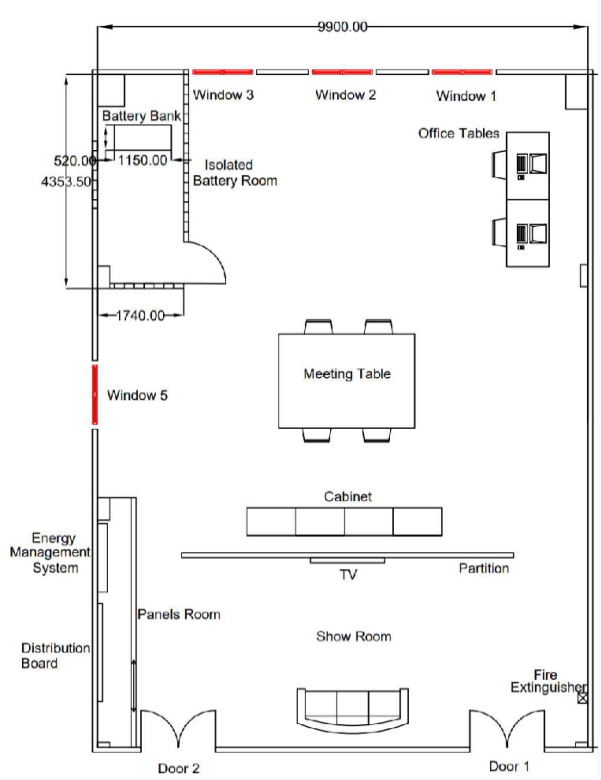
MMU Receives Special Awards of National Energy Awards 2020

It is with a great pleasure to announce that Multimedia University (MMU) was selected to receive Special Awards (Institute of Higher Learning) of the National Energy Awards (NEA) 2020. The announcement was made by the Ministry of Energy and Natural Resources (KeTSA) on 19 November 2020. The NEA winners were evaluated through a rigorous assessment with three categories namely Category 1- Energy Efficiency, Category 2- Renewable Energy, and Category 3- Special Awards.

NEA is an annual recognition to acknowledge outstanding achievements and best practices in driving the country's sustainable energy agenda. For 2020's edition, three Special Awards for Institute of Higher Education (IHE), Sustainable Energy Financing, and Energy Performance Contracting (EPC) were introduced for the first time. As for IHE, this effort is to encourage private and public universities to undertake Renewable Energy (RE) and Energy Efficiency (EE) initiatives.

For this year, three Special Awards for Institute of Higher Education, Sustainable Energy Financing, and Energy Performance Contracting (EPC) were first introduced to encourage private and public universities to undertake Renewable Energy (RE) and Energy Efficiency (EE) initiatives, to recognise financial institutions' support in financing RE and EE Projects, as well as to foster the EPC effort in Malaysia.

Establishment of a PV Energy Storage Lab



A PV Energy Storage Lab was established in 2020 under the Centre for Electric Energy and Automation (CEEA) at Faculty of Engineering. The project was led by Assoc. Prof. Ir. Dr. Gobbi Ramasamy and his team members Dr. Ngu Eng Eng, Ir. Dr. Siva Priya, Ir. Lee Yuen How, Mr. Lee Jia Woon and Mr. Mohammed Hussein Mohammed Haram.

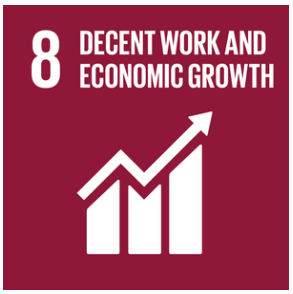
The objectives of the project are:

1. To study technical feasibility and economics of using second-life batteries for energy storage.

2. To collect data and analyse the performance of second-life batteries for energy storage system in tropical climate conditions in Malaysia.

3. To study technical feasibility of using second-life batteries for maximum demand shaving in industry.

4. To perform economic assessment on using second-life batteries for maximum demand shaving in industry.



“Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all."

MMU is an institution training future workers, and at the same time, a workplace where careers are built and advanced.

The university strongly encourages a healthy attitude towards work, and this approach is shared with students whenever possible, directly as well as indirectly.

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MMU Ranked as Top 3 in Education for Most Attractive Graduate Employers to Work For in 2021

In November 2020, MMU was awarded the 2021 Graduates' Choice Award, or GCA, from TalentBank, best known as an organiser of career fairs.

The award recognises "Best Graduate Employers" in Malaysia, which covers across 26 industries including accounting and professional services, telecommunications, e-commerce, education, and many more.

MMU was ranked third in Education for the category of Most Attractive Graduate Employers to Work For in 2021. The ranking was based on the outcome of a poll which exclusively targeted university students. That's certainly a very welcome piece of news to hear of in these times.

CFA Hosts Alumni Talk to Inspire Young Entrepreneurs

The Centre for Alumni (CFA) with Yayasan University Multimedia (YUM) hosted an Alumni Talk entitled "Career Reengineering: from Engineer to Entrepreneur" featuring two successful Permata Dunia as speakers. The event was broadcasted via Permata Dunia Facebook live with about 800 viewers during the session and the number kept rising to more than 1,000 viewers when the live event was over.

The first speaker, Mr. Yani Hardinata Hairuddin, who has a degree in Bachelor of Engineering (Honours) Electronics from the Faculty of Engineering (FOE), has diverted his career from being an engineer to becoming a successful halal organic chicken producer with comprehensive distribution channels around Malaysia. He is now one of the major players in the halal organic poultry industry. The second speaker, Mr. Johan Irwan Kamarozaman, who has a degree in Bachelor of Engineering (Honours) Electronics from Faculty of Engineering and Technology (FET), is now a prominent motivator and speaker for his own Leap Leadership Academy training centre. The speakers shared eye-opening thoughts and insights on career detour that definitely inspired others to view knowledge, not as a ticket for getting jobs but to be used to solve problems for society and the country.

IBIC 2020 Cultivates Entrepreneurship Mindset among Youth

A total of 185 teams participated in the International Business Idea Challenge (IBIC 2020) that was held virtually from 7th until 9th December 2020. The teams came from 27 institutions across 9 countries including Malaysia, Indonesia, United Kingdom, India, Bangladesh, Philippines, Japan, Thailand, and Nepal. Jointly organised by the Faculty of Business (FOB) and Entrepreneurship Development Centre (EDC), IBIC 2020 also featured two major annual events; eBES and IYSEC in conjunction with Global Entrepreneurship Week (GEW). The event also received support from ICAEW as the Strategic Partner for this event

“ Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation."

As an institution concerned with ICT, a niche sector, MMU is witness to the hyper-rapid growth of various industries. The university understands that the key to sustainable development is constant innovation. As such, MMU inculcates within its students and staff a desire to innovate, by means of continuously seeking better methods to achieving goals and overcoming challenges.

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MMU Students Present Business Ideas at Hult Prize On Campus Challenge 2020

A total of 20 qualifying teams from Cyberjaya and Melaka campuses presented their business ideas during the final round of Hult Prize on Campus Challenge 2020. The final round was held virtually in separate sessions, on 12th and 14th December 2020. The Hult Prize is a global competition hosted and partnered between the Hult International Business School and the United Nations Foundation. With its theme "Food for Good" this year, the competition challenges young people to solve social issues by empowering them to make money, do good, and make life better for millions of people.

As a result, Team Hak was announced as the winner for Cyberjaya campus, and Sagolicious, a team from the Faculty of Business emerged as the champion for Melaka campus. The team came up with an idea to make butter using sago worms. The winning teams will represent MMU in the next regional round of the Hult Prize. The qualifying teams were assessed and evaluated by a group of amazing judges from government agencies and industries. Prof. Dato' Dr. Mazliham Mohd Su'ud was also invited to deliver his remarks during the closing ceremony.

MMU Team Bags Gold Award at IWIS 2020 in Poland

MMU team won Gold Award at the 14th edition of the International Warsaw Invention Show- IWIS 2020. The team was represented by Assoc. Prof. Ts. Dr. Ervina Efzan Mohd Noor, Low Zhen Hao, Siti Syazwani Nordin, Nur Haslinda Mohamed Muzn, Hana Ahmed ElBashir AbdelMagid Abdalla, and Zuriel Shee Da En had invented 'R-Glass', producing glass from rambutan leaves.

The event, which was held online, received more than 250 submissions in various fields from 20 countries. The event was jointly organised by the Association of Polish Inventors and Rationalisers, the Polish Patent Office, and the International Federation of Inventors' Association (IFIA). This event is regarded as one of the largest international events which fostering creativity and innovation in Poland.

MMU Students Bag First Prize at IDE-A Competition

Students from the Faculty of Management (FOM) namely Ghazi Arif Zarilan (project leader), Mohammad Amin Mazli Zakuan, and Kamarul Ikram Zulkefli with their project, "Buah Angkat" won first place at the Islamic Digital Economy Accelerator (IDE-A) competition. They received the honour during the Virtual Award Ceremony on 5 June 2020. The team is guided by Dr. Kamarulzaman Abdul Aziz, a lecturer from FOM.

"Buah Angkat" is a platform for customers to experience owning a fruit tree without having to go through any physical work. Not only that, fruit farmers can also utilise this platform to market their products and use it as their main source of income. The platform is also served as an avenue for the customers to get updates on their "Buah Angkat" and they are also able to enjoy the ripe fruit and ready to be consumed which will be delivered to their doorsteps.

Organised by Fintech Lab and Malaysia Digital Economy Corporation (MDEC), the competition aimed at finding new ideas and making it a reality in the Islamic digital economy. It also offered attractive prizes to Top 3, Top 10, and Top 30 winners including cash prize worth up to RM1,500, 6 months free business mentoring, and coaching worth of RM50,000 and 3-day bootcamp of Youth Entrepreneurial School Prize Award by Fintech Lab respectively.

The competition received warm responses from participants whereby many pitch decks were submitted by participants from various varsities in Malaysia. A total of 12 participants was selected to do their online pitching and "Buah Angkat" was crowned as the winner for this competition.

Selected MMU's New Projects Contributing to Sustainable Development Goals Exhibited at the Research Innovation Commercialization & Entrepreneurship Showcase 2020.

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Edcraft Gamified Learning (EGL) – An Online Recycling Workshop

By Assoc. Prof. Dr. Koo Ah Choo

Edcraft Gamified Learning (EGL) is a project to spread green awareness in Malaysia and hopefully to the world through "online crafting workshop" by using recycle materials. The gamified elements are integrated in the real context of online workshop to engage learners.

Edcraft envisages to reach more participants for inculcating green lifestyle and upcycling creativity which is also an action to support SDG#11 for creating Sustainable Cities and Communities. The upcycling and crafting creativity are endless for transforming waste to wealth. Edcraft platform has an ecosystem to monetize the upcycling products and to promote green community through social enterprise.

Energy Harvester Using Piezoelectric Transducer

By Dr. Sin Yew Keong

Electrical energy is a basic need in the modern life and its demand is increasing. In the past 25 years, researchers have the interest in converting mechanical energy from human motion into electrical energy. This energy harvesting produces a very small amount of power that can be used in recharge batteries of low-energy electronic devices.

Piezoelectricity is the electricity generated from mechanical pressure. The deformation of lattice structure in piezoelectric material due to the applied mechanical stress will generate electric potential. Barium titanate is a lead-free piezoelectric material which does not have very high piezoelectric constant but high in permittivity.

Energy Supply & Sustainability in Rural Areas

By Dr. Palanichamy Naveen

The Phasor Measurement Unit (PMU) is important for the function of Smart Grids by evaluating the essential electrical parameters. However, the development of PMUs at all locations would be unrealistic and unaffordable for large systems.

The currently available methods require a substantial volume of data to be used and processed in real time. As a result, this project proposes a cloud-based optimal PMU placement tactic for full observability and maintainability of Smart Grids in a cost-effective manner. The simulation results of IEEE 14 bus and 24 bus systems demonstrate the effectiveness of the proposed algorithm for optimal PMU placements.

Scalable Aquaculture Monitoring System

By Dr. Tan Wooi Haw

In this project, a prototype to proof the concept of a scalable aquaculture monitoring system is proposed. The main focus of this project is to develop our nation's aquaculture industry towards greater heights. Compared to agriculture, aquaculture activity is lagging in technology adoption and volume of production.

Among the problem is the need for constant monitoring of environmental variables such as water temperature and dissolved oxygen. It poses a huge challenge that grows correspondingly to area that need to be monitored. The solution proposed is based on Low power wide area networks (LPWAN) technology, specifically Long-Range Wide Area Network (LoRaWAN).

Rehabilitation Using Biofeedback System

By Prof. Ir. Dr. Sim Kok Swee

Most of the rehabilitation is done in a traditional way in hospitals and is a time-consuming session for patients. The patients do not feel motivated as they have to travel to hospital from their home. A newly home-based application which is a virtual reality rehabilitation embedded with a biofeedback system is introduced.

The patients can choose a rehabilitation activity at home without any need of on-site supervision by a medical caregiver. There are 4 activities programed in the application: Pick and place, Mirror Pick and place, Wall Climbing, and Hit the ball. Each of the activities is set for rehabilitation of upper limb motor function.

Automated Diagnosis of Chronic Wounds for E-Health Applications

By Assoc. Prof. Dr. Mohammad Faizal Ahmad Fauzi

A wound exhibits a complex structure and may contain many types of tissue such as granulation, slough, eschar, epithelial, etc., each with different colour and texture characteristics. The current state of the art approach in measuring wound size using digital images requires the clinician to identify wound borders and wound tissue type within the image.

This is a time-intensive process and is a barrier to achieving clinical quality benchmarks. There is a need for an intelligent tool to analyse wound images, characterize wound tissue composition, measure wound size, and monitor changes in wound over time.

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

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Early Detection and Prediction of Forest Fire From the Machine Learning Perspective

By Dr. Ooi Shih Yin

Forest fire (wildfire) is one of the devastating disaster that will contribute harmful impacts to the environment, living things and human. Thus, early detection is definitely crucial. Studies showed that the fire can be triggered by multiple factors including climate changes, wind speed, temperature, and human factors.

With the advent of AI, it is possible to analyze these factors in predicting the occurrence of fire. In this poster, 11 promising machine learning algorithms are explored and tested. Experiments showed that the Random Forest is very competitive in this task.

In-Vehicle Active Monitoring Tool (iV-Active)

By Ts. Sumendra Yogarayan

Driving is a complex task that involves interacting adequately with the vehicle and the environmental changes at the same time. Drivers' health is an important factor in determining performance outcomes and enhancing road safety. It is a known reality that drivers with sudden health complication are most likely to be involved in road accidents and suffer several injuries.

Apart from that, drunk driving is another aspect with a significant public health issue, where drivers under the influence of alcohol show a clear loss of vision and vehicle control. The Internet of Things (IoT) is nothing but devices (things) that connect with each other through the use of the Internet.

IoT is a trend-setting advancement in which all sensor data is collected in the cloud. In this project, an active monitoring tool is developed to record the heart rate of the driver if these readings reach vital values while on the move. In addition, the tool also measures the alcohol level of the driver, where if it goes above the standard value, and an alert is sent to the emergency contact.

Survivability Model for Osteosarcoma

By Prof. Dr. Saravanan Muthaiyah

Improving survivability prediction for cancer significantly improves decision making of families, patients, caregivers and the health care medical team. This includes decisions to continue with life sustaining treatments that includes chemotherapy and radiation therapy. This study is focused on survivability prediction or better known as prognosis for Osteosarcoma. The study employs machine learning techniques that are based on binary classification methods with the aim to develop a more accurate prognosis model.

The prediction model employs a supervised machine learning techniques. Given that the tumor develops in areas of rapid bone turnover, most frequently occurring in the distal femur and proximal tibia of adolescents. To resolve the overfitting problem, cross-validation method was used to provide a more accurate performance estimate for the prognosis model.

Construction Waste Management: A Systematic Literature Review Of TPB & NAM

By Ms. Maria Maiyus

Construction waste is continuously become main problem to the increase in solid waste to the environment as a direct consequence of rapid urbanisation around the world. The aim of this research is to review the application of the two widely used theories which is the Theory of Planned behaviour and Norm Activation Model that influencing the construction players towards construction waste management behaviour. This paper considers the following; factors affecting construction waste management, the usage of application of the TPB and NAM in the influencing industry players towards waste management.

Love Sharing App

By Dr. Tan Choo Kim

Love sharing app is a mobile application that provides a platform for users to raise money for charity. The platform is committed to using of the internet, a seamless link between various public institutions and people together to promote the good to the society.

This application provides users with detailed information about those who need help. The charity is categorized into many areas, such as single parent, orphanage, etc. Each area has relevant information for users to make their own donation decisions. Findings showed that users found the app could help more needy people.

Smart Toilet 2.0: IoT implementation for Resources Optimization Driving a User-Centric System Design

By Dr. R. Kanesaraj Ramasamy

A magical system with integration of Internet of Things (IoT) and cloud-based technology designed for smart building implementation. It tracks public toilet usage to enable optimization of toilet cleaning resources and provides toilet occupancy status updates to individual application users.

Cyberbullying: Time to Tackle the Bullies

By Dr. Bahma Sivasubramaniam

The Internet plays a significant role in our lives. The ubiquitous nature, the perceived anonymity and the ease of access it offers is prone to abuse. One example is cyberbullying. Studies show that Malaysia ranks highly in the list of countries that experiences cyberbullying.

Perpetrators must know that the law will hold them responsible for their criminal conduct in the virtual realm. The research objective is to examine the necessity for a specific anti cyberbullying law for Malaysia. This research is timely to combat legally cyberbullying cases. It will be the basis for the enactment of a piece of legislation.

Edutainment Game About Pandemic in an Virtual Environment

By Mr. Yap Wen Jiun

An education game OVERXPOSED is developed in this project to help players to prepare for upcoming pandemic by educating the players the importance of their safety and hygiene during the Covid-19 pandemic. The player will take the role as Mikael, a caring husband, to solve all given tasks in an simulated virtual neighbourhood to save his sick wife.

By solving those tasks players will learn about the knowledge to prevent themselves infected by corona virus such as social distancing, using tools such as sanitizer and complying with the government rules to prevent spreading corona virus to the public.

Health Education for All: A Creative Creation Research Project

By Dr. Vimala Perumal

Given the high number of asylum-seekers and refugees in Malaysia, United Nations High Commissioner For Refugees (UNHCR) are in need of "health education service", such as health media creation and production, to support their "Health Education Programmes".

The media such as graphics, brochures, posters, animation and videos are always a better means to convey health messages. Multimedia with visual, audio, or interactivity are more attractive and easy to communicate health messages to younger audiences/children. Project created are used for Health Education for Refugee Learning Centres.

Micro Courses for Mental Wellness Priorities

By Ms. Elyna Amir Sharji

(WHO, 2018) defines mental health as state of well-being and is an integral part of overall health. The current Covid-19 situation has even triggered more burdens on workers' mental health. Result from a study during MCO in Malaysia shows that about half of the 1084 respondents were experiencing high level of negative emotional states.

Therefore, this project aims to develop micro courses to address the demand for raising awareness and skills on this mental health aspect. There is potential that e-learning can be an effective intervention that will help the employees (or anyone) in this uncertain time.

Modelling the Relocation of Older People to a Smart Retirement Village: A Push-Pull Framework

By Dr. Tan Book Chen

With the increasing growth in the ageing population of Malaysia, providing older people with suitable housing has become a significant focus of policy and practice. Although research associated with retirement villages involves a wide range of topics, little attention has been paid to the inclusion of Internet of Things (IoT) in the early stages of planning a Smart Retirement Village (SRV) development from the perspectives of older people.

This project aims to propose a framework based on the push-pull approach to understand the salient factors that influence the older people's relocation intention to a SRV in Malaysia.

Technology Innovation : Evaluating the Extent of Awareness Among Agriculture and Agro-Based Industry Under Asnaf Category

By Ms. Nur Baiti Shafee

To determine the awareness of technology adoption in agriculture industry among smallholders and factors associated with it, a total of 245 smallholders under asnaf category and field officers from selected areas in Selangor were given a questionnaire to answer.

The result from the survey shows that economy, knowledge and attitude were found significant with the awareness of the smallholder in using technology in the agriculture industry.

The Deadly Human Papilomavirus(HPV) Infection: Influencing Factors Towards Cervical Cancer Awareness Among Muslim Youths

By Ms. Shadia Suhaimi

There is a heavy burden of cervical cancer in Malaysia because the screening rate remains low. Despite efforts to raise awareness about cervical cancer, it is still the third most common cancer among Malaysian women. Therefore, this study aimed to assess e-knowledge, social influences and attitudes about cervical cancer among rural Muslimah women aged 35 to 50 years in higher education institutions of Selangor and Melaka.

A sample of 300 residents has complete a questionnaire on the understanding of the link between Human Papillomavirus (HPV) and a cervical cancer and analysed using SPSS.

Three Dimensional (3D) Printed Face Shield During covid19: A Community Response.

By Mr. Muhammad Asyraf Mohd Pauzi

On 11 March 2020, the World Health Organization declared the “coronavirus disease 2019” (Covid-19) a global pandemic. This pandemic has led to the shortages of personal protective equipment (PPE) at a global level. This paper presents the process of producing face shields using fused deposition modelling (FDM) in three-dimensional (3D) printing.

The 3D file for the face shield was obtained from an online portal, 3D printed and finished by attaching a transparent PVC rigid sheet. A quickly fabricated and low-cost solution, this face shield proved to be feasible to be used for Malaysian front liners in combating the pandemic.

“ Make cities and human settlements inclusive, safe, resilient and sustainable."

MMU supports the sustainability, safety and resilience of the cities through research, innovation and creativity. The university is directly involved in research that would lead to better living conditions, where arts and culture flourish. We envision the smart city with preservation of arts and cultural heritage.

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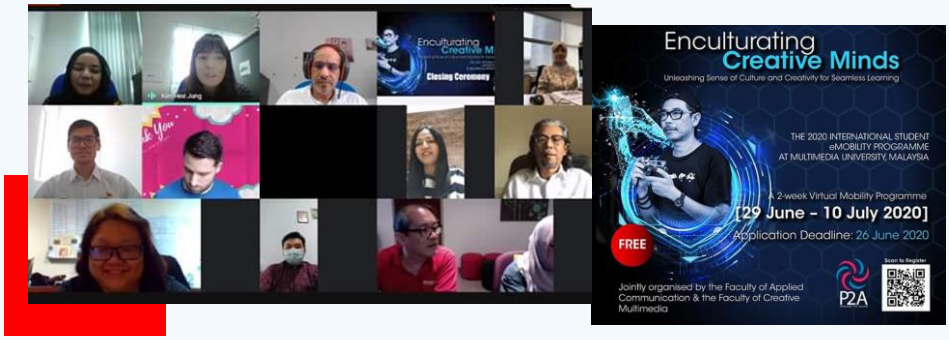
Signing Pact to Collaborate for Virtual Reality and Augmented Reality

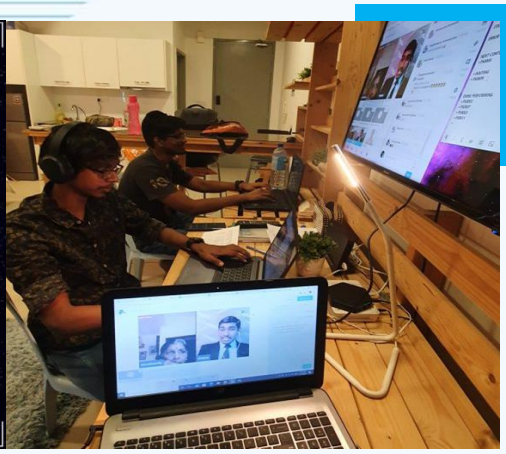
On 9th October 2020, Multimedia University (MMU) signed a Memorandum of Understanding (MoU) with Digital Perak at WEIL Hotel, Perak. The agreement was signed by Prof. Dato' Dr. Mazliham Mohd Su'ud, MMU President and for Digital Perak, its CEO Mr. Meor Rizal Fitri Dato' Dr. Hj. Meor Redwan. The ceremony was also witnessed by Dato' Seri Ahmad Faizal Dato' Azumu, Perak Menteri Besar. Both parties agreed to initiate a collaboration in the field of virtual reality and augmented reality. This effort will help Perak Museum to go digital, and our institution is proud to be part of this endeavour.



Enculturating Creative Minds via e-Mobility Programme

A total of 75 students from 18 countries partook in the closing ceremony of the MMU 2020 International Student e-Mobility Programme on Enculturating Creative Minds, held on 10 July 2020. The 2-week programme is the first time ever held virtually and has successfully unleashed the sense of culture and creativity for seamless learning among participants. The Faculty of Applied Communication and Faculty of Creative Multimedia took the lead in organising this event with the support from the International Relations Office.

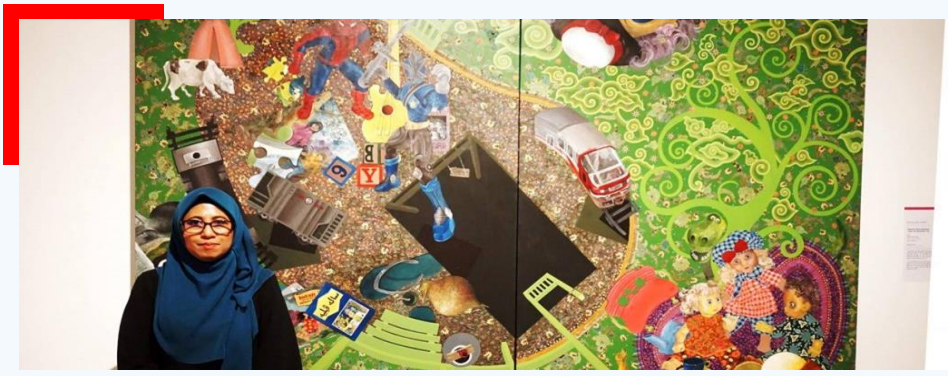
The virtual mobility programme offered participants the sneak peek at cultural diversities & experiences, enriching knowledge sharing sessions and the interesting Up & Close on photography with Chemat Azhar, MMU lecturer who is one of the 30 most influential photographers in Asia. There was a showcase of their photography works as an e-gallery and participants presented their grand finale with their group cultural projects. Invited guests from Education Malaysia Beijing, Education Malaysia Dubai, and partner universities in the UK, Riyadh, Indonesia and Philippines made time to be with the participants in this virtual closing ceremony.



Appreciating Tamil Heritage with Muthamizh Vizha 2020

As an effort to preserve and promote the Tamil heritage and language, the Indian Cultural Society (ICS) organised one of its major annual event, Muthamizh Vizha 2020. The virtual event had attracted students from primary and secondary schools as well as the Indian community with 9 competitions including drawing, role play, poetry, public speaking, singing, recitation of Thirukural, storytelling, essay writing, and short film making.

Muthamizh Visha 2020 served as an avenue in appreciating the elements of Tamil literature, knowledge as well as the richness of the language. The closing ceremony was enlivened with the presence of Malaysian actor and producer Mr. Denes Kumar, who is also a board director of National Film Development Corporation Malaysia (FINAS). The winners for the competitions were also announced during the closing ceremony.

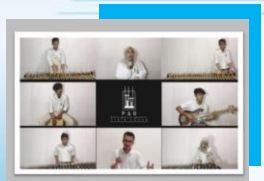


FCM Lecturer Receives RM45,000 of CENDANA Grant 2020

Ms. Mastura Abdul Rahman, a senior lecturer from the Faculty of Creative Multimedia (FCM) received a grant in the amount of RM45,000 for her project, “The Garden of Delights- Cik Siti Wan Kembang”. The grant was awarded by the Cultural Economy Development Agency or CENDANA under Visual Arts Inspire Funding Programme 2020.

CENDANA provides the funding programmes to increase the opportunity and quality of Malaysian works of art. It also offers learning programmes to foster the growth of the arts community and to deepen understanding of Malaysian arts and culture. The received grant includes creative/research journey with activities data collection, a small art exhibition, the publication of art exhibition catalogue (statements, essays), a short documentary on the making process and others.

Garnering Social Innovation Ideas from e-Exchange Programme



A total of 387 students from 19 universities attended the closing ceremony of the International Students e-Exchange Programme on 22nd November 2020. Jointly organised by the Faculty of Business (FOB, Multimedia University (MMU), Universitas Mercu Buana,Indonesia; Birla Global University, India and Universitas Pakuan, Indonesia, the programme aimed to promote collaborative efforts among participants to generate the best social innovations idea in addressing economic, social, and environmental issues faced by the local communities.

With its theme "Making an Impact via Social Innovations", the participants who came from India, Indonesia, Nepal, Thailand, Philippines, United Kingdom, Japan, and Malaysia worked together to garner ideas on social innovation as well as to experience a series of interesting activities including workshops, talk on sustainability and social entrepreneurship by successful social enterprises and academicians, as well as panel discussion on social innovation featuring remarkable panelists from the join-organising universities.

Representatives from the organisers also delivered their closing remarks, and the ceremony was enlivened with cultural and contemporary performances. The closing ceremony also witnessed the announcement of awards namely Six "Most Outstanding Social Innovation Ideas" and "The Most Popular Facebook Post Awards" for both categories: 'Local Food Culture and Heritage' and 'Iconic Cultural and Heritage Attractions: Issues and Challenges'. It is evident that this event has successfully achieved its goals and benefitted the participants in terms of knowledge acquisition and network building.

FCM Students' Artwork Chosen for IMDES 2020

A total 24 creative artworks produced by our students from the Faculty of Creative Multimedia (FCM) were showcased in the International Conference of Innovation in Media and Visual Design (IMDES) 2020 from 10th until 11th November 2020. Organised by Universitas Multimedia Nusantara,Indonesia, the conference was aimed at discussing the relationship between mass media, people, design and technology as well as digital media creation. The conference, which was held virtually, entailing the call for paper and student poster submission.

The students' participation came from two classes; Visual Research & Communication 1, under the supervision of Mdm. Sri Kusumawati and Ms. Khairun Niza and Market & Design Studies for Interface Design which was under the supervision of Mdm. Hanafizal Hussein.

MMU Researcher Bags Gold Award at MTE 2020

Mr. Dendi Permadi from the Faculty of Creative Multimedia (FCM), Multimedia University (MMU) led his team to win Gold Award for their invention entitled "Virtual Reality Game for National Historical Heritage: Tribute to the Malay Regiment". He received the award at the 19th International Expo on Innovations and Inventions, Malaysia Technology Expo (MTE) at Putra World Trade Centre (PWTC) Kuala Lumpur. Furthermore, five other projects by MMU researchers were also recognised when they bagged silver awards in the event namely Assoc. Prof. Dr. Kamarulzaman Ab Aziz, Dr. Lew Sook Ling, Dr. R. Kanesaraj A/L Ramasamy, Assoc. Prof. Ir. Dr. Hezerul Karim, and Assoc. Prof. Dr. Mohamad Faizal Ahmad Fauzi. A total of 275 inventions from 22 countries from Europe and Asian participated in the event, which was organised by Professional Trade Exhibitions & Meeting Planners and supported by the Ministry of Entrepreneur Development (MED).

Business School Celebrates Pongal with Students from India

Although they were far away from their families, a group of 45 participants from PSF Institute of Management, India, still felt at home when they celebrated the Pongal festival an MMU Cyberjaya campus. The students, who attended the Global Immersion Programme by Business School MMU, woke up as early as 6 A.M to prepare for the festival.

Thai Pongal is a harvest festival of South India, particularly in the Tamil community. It is observed at the start of the month Thai according to the Tamil solar calendar, and this is typically around mid-January. The students enjoyed the "Pongal", which means "to boil, overflow" and refers to the traditional dish prepared from the new harvest of rice boiled in milk with jaggery (raw sugar). The overflow of milk symbolises the abundance that we welcome in our lives.

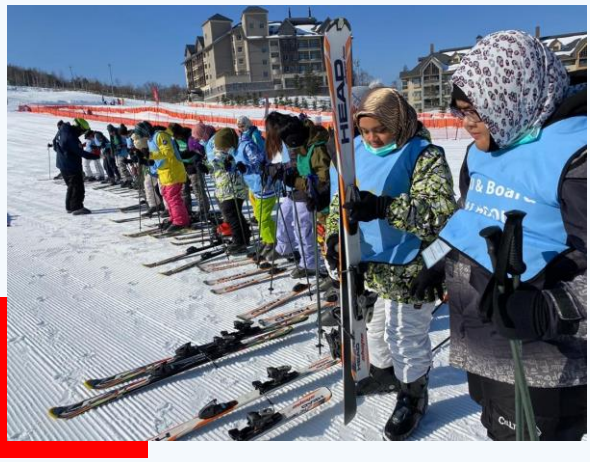
Celebrating CNY with “Fortune Rat of the Spring”

On 16th February 2020, a group of club members from Chinese Language Society (CLS), MMU Cyberjaya made an effort to organise “Fortune Rat of the Spring” in conjunction with the Chinese New Year celebration at Sekolah Jenis Kebangsaan (Cina) Serdang Baru 1. The main highlight of the event was carnival and cultural night which attracted more than 400 people to attend this event. The committees also hosted few game booths for participants to enjoy and rewards can be redeemed after collecting sufficient points.

The organiser had also arranged interesting performances including 24 festive drums, diabolo, drama, Chinese martial arts and many more. The event was also enlivened with two special guests namely Jeryl Lee and KeXin which are both well-known artists. The ceremony was also attended by Yang Berhormat Tuan Ean Yong Hian Wah (Selangor State Legislative Assembly for Seri Kembangan), Mr. Lee Seang Hock (President of Malaysian Young Graduates Association), Dr. Ng Kok Why, representative of the Advisor of CLS MMU, Mr. Nicholas Wong Tian Shun (Chairperson of 23rd Chinese New Year Extravaganza) and Mr. Pang Jie Xin (President of the 23rd Executive Council of CLS).

MMU Students Run Their PSR Project at Zoo Melaka

A group of students completed their Public Social Responsibility (PSR) subject by painting the tunnel for almost three weeks in Zoo Melaka. The initiative, which was led by Student Affairs Division (STAD), is part of a continuous effort to collaborate with Majlis Perbandaran Hang Tuah Jaya (MPHTJ), Melaka. The students beautified the crossway between Taman Buaya and Zoo Melaka, and it is hoped that this will be a new attraction for the public to visit the area. The effort was also supported by Ybhg. Tuan Shadan Othman, Yang Dipertua of MPHTJ when he also joined to paint the decoration with the students and staff.



Experiencing Local and Modern Korean Culture through Outbound Mobility Programme

A total of 19 students and 4 staff from Multimedia University (MMU) partook in the second Global Youth Leaders Exchange Programme in South Korea from 8 February until 11 February 2020. The programme was also attended by more than 200 universities from Indonesia, Philippines, Japan, Cambodia and South Korea. GoGo (Global Leaders + Go Again to Gangwon) programme is a project by Gangwon Province for youth global leaders to experience the local and modern cultural ambience in Gangwon Province, South Korea.

The MMU outbound mobility team from VPAI Office, Faculty of Computing & Informatics (FCI), Faculty of Creative Multimedia (FCM), Faculty of Applied Communication (FAC) and Faculty of Management (FOM) had the wholesome journey which started with the Sancheoneo Ice Festival for fishing, ice skating; snow and skiing experience at PyeongChang and had good moments at their Winter Olympic legacy – Ski Jumping Centre.

The team became guests at the PyeongChang Forum 2020 (PPF) for the Special Speech & Peace Leaders' Dialogue with speakers from United States, United Kingdom, Norway and South Korea on creating and preserving peace amongst nations as well as SDG. At Jeongganwon the team experienced the Korean Traditional Food Culture workshop for the preparation of 'tteok' sweet snack in a traditional way.

The team journeyed through the DMZ Peace Tour to view the Hwajinpo History & Security Museum and the Goseong Unification Observatory. They did not miss the Peak, Peonghwa Cable Car ride to drink the beauty of nature with snowfield. As a gesture of its closure, they were greeted at the EDM party – 'thank you for coming award' ceremony with the accompaniment of Korean artists. The good memories from this outbound mobility program bestowed them with values through cultural diversity, sports as a unifying vehicle, and networking spirit as global youth leaders.

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FOM Expert Speaks to Address National Agenda

Dr. Ridzwan Bakar, an academic staff from the Faculty of Management (FOM) was invited as a guest speaker in the Integrity Forum to address national agenda on 6th October 2020. The event was jointly organised by Kolej Professional Baitulmal (KPBKL), the Malaysian Anti-Corruption Commission (MACC), and Royal Malaysia Police (PDRM). A total of 220 participants from government and corporate sectors, intellectuals, academics, and representatives from non-governmental organisations attended the forum. Whilst addressing the need to improve corporate governance, Dr. Ridzwan shared the spirit of “amanah” and integrity based on his 21 years’ corporate experience.

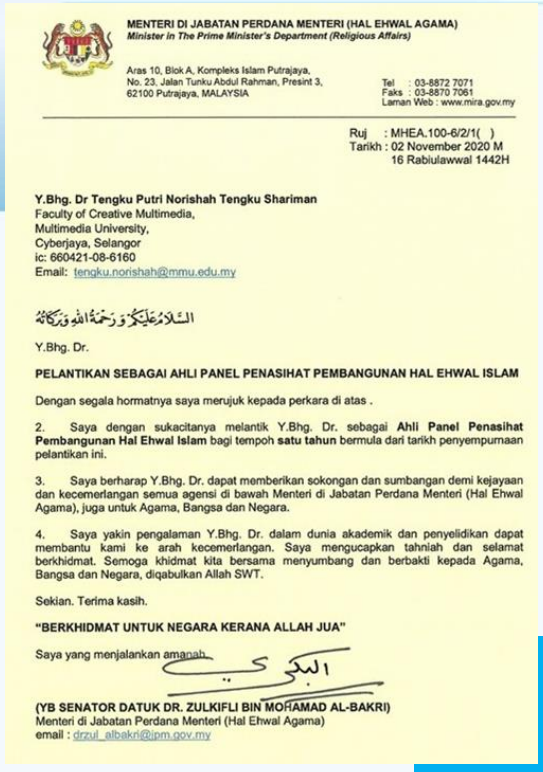
On another event, Dr. Ridzwan was also honoured to address a crowd of 80 practitioners in a workshop entitled Sustainability through Islamic Social Finance. The event took place at PICOMS University College Kuala Lumpur. In the workshop, Dr. Ridzwan explained the Corporate Waqf University model (CoWU) which has been developed and tested for the university. It is a practical sustainability model to assist universities in their transformation process. He also elaborated on the challenges on waqf and endowment in the current state of economy.

Garnering Insights on Cyberbullying through a Round Table Meeting

Multimedia University (MMU) has the prestigious distinction of being appointed by the Minister of Communications and Multimedia, YB Dato' Saifuddin Abdullah to spearhead research on the feasibility of anti-cyberbullying legislation for Malaysia. In furtherance of this, MMU Research Team with assistance by the Malaysian Communications and Multimedia Commission (MCMC) organised a round table meeting with stakeholders and other interested parties at MCMC, Cyberjaya.

More than 60 participants from Government Ministries, agencies, Royal Malaysia Police, law-focused agencies, Non-Governmental Organisations convened to seek feedback, views, and experiences on issues related to cyberbullying. Discussions were held on various pertinent topics such as problem statement, the adequacy of existing laws, future action plans, and other related matters. The one-day event kicked off with the official opening by Mr. Zulkarnain Mohd Yasin, the Chief Officer Compliance from MCMC, and was officially closed by Prof. Ir. Dr. Hairul Azhar Abdul Rashid, the Vice President of Research and Innovation, MMU.

All in all, the event was a success and achieved its aim of stimulating fruitful discussions between the relevant stakeholders, regulators and subject matter experts, NGOs and other parties on the current state of cyberbullying and important issues arising therein. MMU would like to put on record the appreciation to MCMC and all participants for the successful execution of the first stage of our research journey.



MENTERI DI JABATAN PERDANA MENTERI (HAL EHWAL AGAMA)
Minister in The Prime Minister's Department (Religious Affairs)

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Tarikh : 02 November 2020 M
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السلام عليكم ورحمة الله وبركاته

Y.Bhg. Dr.

PELANTIKAN SEBAGAI AHLI PANEL PENASIHAT PEMBANGUNAN HAL EHWAL ISLAM

Dengan segala hormatnya saya merujuk kepada perkara di atas .

2. Saya dengan sukacitanya melantik Y.Bhg. Dr. sebagai **Ahli Panel Penasihat Pembangunan Hal Ehwal Islam** bagi tempoh **satu tahun** bermula dari tarikh penyempurnaan pelantikan ini.

3. Saya berharap Y.Bhg. Dr. dapat memberikan sokongan dan sumbangan demi kejayaan dan kecemerlangan semua agensi di bawah Menteri di Jabatan Perdana Menteri (Hal Ehwal Agama), juga untuk Agama, Bangsa dan Negara.

4. Saya yakin pengalaman Y.Bhg. Dr. dalam dunia akademik dan penyelidikan dapat membantu kami ke arah kecemerlangan. Saya mengucapkan tahniah dan selamat berkhidmat. Semoga khidmat kita bersama menyumbang dan berbakti kepada Agama, Bangsa dan Negara, diqabulkan Allah SWT.

Sekian. Terima kasih.

"BERKHIDMAT UNTUK NEGARA KERANA ALLAH JUA"

Saya yang menjalankan amanah,

(YB SENATOR DATUK DR. ZULKIFLI BIN MOHAMAD AL-BAKRI)
Menteri di Jabatan Perdana Menteri (Hal Ehwal Agama)
email : drzul_albakri@jpm.gov.my

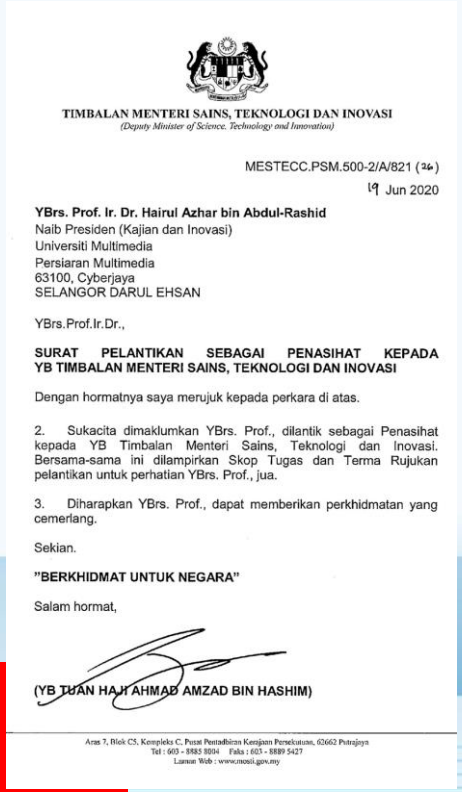
MMU Academic Appointed for Islamic Affairs Development Advisory Panel

Dr. Tenku Putri Norishah Tenku Shariman, a lecturer from the Faculty of Creative Multimedia (FCM) has been appointed as a member of the Islamic Affairs Development Advisory Panel. The letter was signed by Yang Berhormat Senator Datuk Dr. Zulkifli Mohammad Al-Bakri, the Minister in the Prime Minister's Department (Religious Affairs). Dr. Tenku will offer her support and advisories to all agencies under the Ministry through her extensive experience in academic as well as research.

Prof. Ir Dr. Hairul Azhar Appointed as Advisor to Ministry of Science, Technology and Innovation

We would like to extend our hearty congratulations and best wishes to Prof. Ir. Dr. Hairul Azhar Abdul Rashid, our Vice President of Research and Innovation, on his appointment as the Advisor to the Deputy Minister of the Minister of Science, Technology and Innovation (MOSTI), Yang Berhormat Amzad Hashim,.

The appointment letter signed by YB Amzad, also encapsulates on Prof. Hairul's role and responsibility as the advisor to the said ministry.



TIMBALAN MENTERI SAINS, TEKNOLOGI DAN INOVASI
(Deputy Minister of Science, Technology and Innovation)

MESTECC.PSM.500-2/A/821 (24)
19 Jun 2020

YBrs. Prof. Ir. Dr. Hairul Azhar bin Abdul-Rashid
Naib Presiden (Kajian dan Inovasi)
Universiti Multimedia
Persiaran Multimedia
63100, Cyberjaya
SELANGOR DARUL EHSAN

YBrs.Prof.Ir.Dr.,

SURAT PELANTIKAN SEBAGAI PENASIHAT KEPADA YB TIMBALAN MENTERI SAINS, TEKNOLOGI DAN INOVASI

Dengan hormatnya saya merujuk kepada perkara di atas.

2. Sukacita dimaklumkan YBrs. Prof., dilantik sebagai Penasihat kepada YB Timbalan Menteri Sains, Teknologi dan Inovasi. Bersama-sama ini dilampirkan Skop Tugas dan Terma Rujukan pelantikan untuk perhatian YBrs. Prof., jua.

3. Diharapkan YBrs. Prof., dapat memberikan perkhidmatan yang cemerlang.

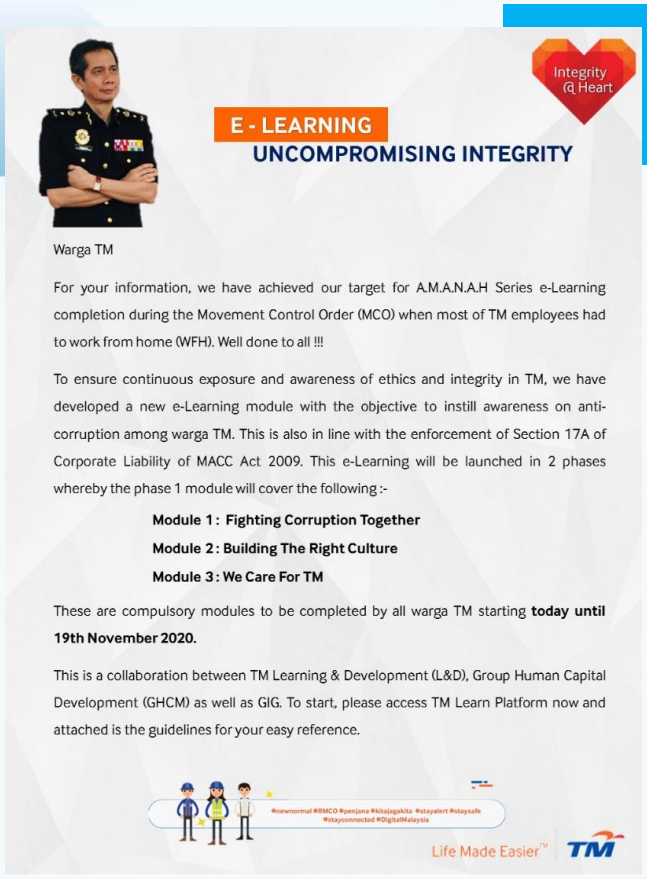
Sekian.

"BERKHIDMAT UNTUK NEGARA"

Salam hormat,

(YB TUAN HAJI AHMAD AMZAD BIN HASHIM)

Aras 7, Blok C5, Kompleks C, Pusat Pentadbiran Kerajaan Persekutuan, 62662 Putrajaya
Tel : 603 - 8883 8004 Faks : 603 - 8889 5427
Laman Web : www.mosti.gov.my



Integrity @ Heart

E - LEARNING

UNCOMPROMISING INTEGRITY

Warga TM

For your information, we have achieved our target for A.M.A.N.A.H Series e-Learning completion during the Movement Control Order (MCO) when most of TM employees had to work from home (WFH). Well done to all !!!

To ensure continuous exposure and awareness of ethics and integrity in TM, we have developed a new e-Learning module with the objective to instill awareness on anti-corruption among warga TM. This is also in line with the enforcement of Section 17A of Corporate Liability of MACC Act 2009. This e-Learning will be launched in 2 phases whereby the phase 1 module will cover the following :-

Module 1 : Fighting Corruption Together

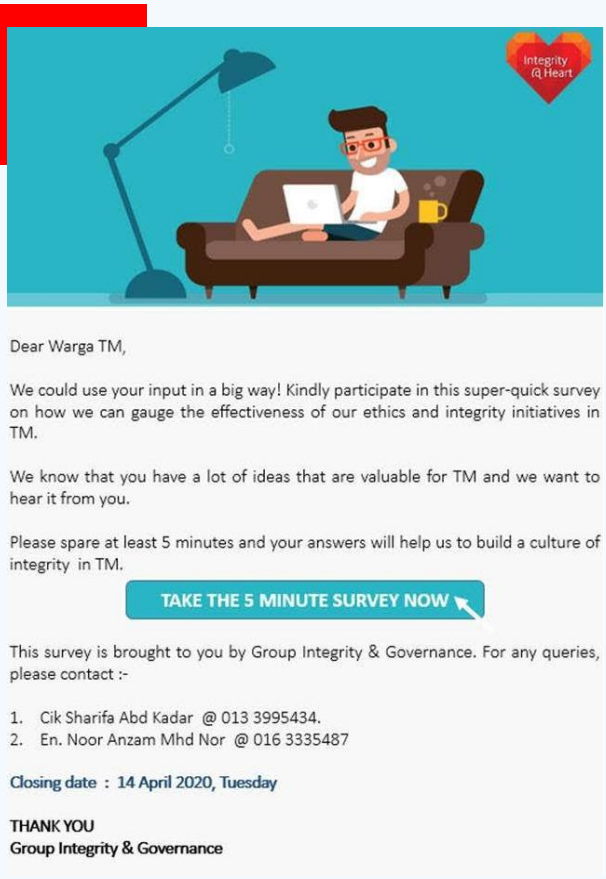
Module 2 : Building The Right Culture

Module 3 : We Care For TM

These are compulsory modules to be completed by all warga TM starting **today until 19th November 2020.**

This is a collaboration between TM Learning & Development (L&D), Group Human Capital Development (GHCM) as well as GIG. To start, please access TM Learn Platform now and attached is the guidelines for your easy reference.

Life Made Easier™ TM



Integrity @ Heart

Dear Warga TM,

We could use your input in a big way! Kindly participate in this super-quick survey on how we can gauge the effectiveness of our ethics and integrity initiatives in TM.

We know that you have a lot of ideas that are valuable for TM and we want to hear it from you.

Please spare at least 5 minutes and your answers will help us to build a culture of integrity in TM.

TAKE THE 5 MINUTE SURVEY NOW

This survey is brought to you by Group Integrity & Governance. For any queries, please contact :-

1. Cik Sharifa Abd Kadar @ 013 3995434.
2. En. Noor Anzam Mhd Nor @ 016 3335487

Closing date : 14 April 2020, Tuesday

THANK YOU
Group Integrity & Governance

As the subsidiary of TM, all MMU's staff are required to complete a series of Uncompromising Integrity course. It was with the objective to instill awareness on anti-corruption among all TM staff.

"Strengthen the means of implementation and revitalize the global partnership for sustainable development."

MMU recognizes that undertakings made in collaboration with partners have greater chances for success than alone. Hence, MMU engaged and partnered with various local and international parties in achieving the Sustainable Development Goals.

MMU®
MULTIMEDIA UNIVERSITY

MMU Hosts 2020 CTPR Master Class

Multimedia University (MMU) is certainly honoured to gain the trust in sustaining the collaboration with GSMA, London, and Malaysian Communications and Multimedia Commission (MCMC), in organising the professional programme known as the Converged Telecommunications Policy and Regulations (CTPR) Master Class.

In view of the current Covid-19 pandemic situation, the 2020 CTPR Master Class has set the stage for a change to invite 40 delegates from ASEAN regulatory agencies and ministries in the form of a virtual master class for a total duration of three months. Its official opening ceremony on 14th August 2020 was graced by YB Dato' Saifuddin Abdullah, Minister of Communications and Multimedia with the presence of MMU President, Prof. Dato' Dr. Mazliham Mohd. Su'ud, MCMC Chairman, Dr. Fadhlullah Suhaimi Abdul Malek, and Senior Director of GSMA, Mr. Niall Magennis.

Delegates had the opportunity to participate through the GSMA capacity building online learning platform from 13 August until 15 October and the accompaniment of 10 Online Forum Sessions from 19 August till 21 October — all of which had a focus on 5 modules encompassing Competition Policy in the Digital Age; Internet of Things; Big Data & Artificial Intelligence for Impact; Spectrum Management for Mobile Telecommunications; and Leveraging Mobile to Achieve SDG Targets.

Highlights of the Selected Publications by MMU Researchers in 2020

Highlights of MMU Publications in 2020

The effects of services by microfinance institutions on the Welfare of Urban Households in Malaysia

Loke K.H., Adebola S.S., Ramasamy S., Dahalan J.

DOI: 10.17576/pengurusan-2020-58-09

The primary aim of this paper is to investigate the impact of financial (microcredit and microinsurance) and nonfinancial services (training), services by microfinance on the welfare of their urban clients in Malaysia. We contribute to the existing literature by using income as a mediating variable in the analysis. Questionnaires were distributed to 400 respondents across three different urban areas in Malaysia in order to collect the relevant data for this study. We have adopted the quota sampling to collect the data. The results show that most of the services provided by the microfinance institutions including microcredit, micro insurance and training have assisted the urban households to earn more income and enhance their socio-economic welfare.

The recommendations arising from the results of this study are:
1) an environment that promotes cooperation between microfinance institutions and households should be enhanced
2) well-diversified and dynamic microfinance programs and specific skills-building training programs should be created.

Microfinance services and socio-economic welfare of urban households in Sabah, Malaysia

Solarin S.A., Loke K.H., Ramasamy S.A.P., Yen Y.Y., Gan G.G.

DOI: 10.1002/pa.2528

This study examines the impact of microfinance services on the socio-economic welfare of urban households in Sabah, which is considered as the poorest state in Malaysia. The data were collected from recipients of microfinance services through self-administered questionnaire and were analyzed using Smart Partial Least Squares (PLS). The results of this study show that microcredit, microinsurance, savings, training, and social intermediation service have significant effects on socio-economic welfare of urban households in Sabah. The empirical findings can be used as a guideline for microfinance institutions to provide the best services that will reduce vulnerability of the households in Sabah. It can also assist the government to provide the best microfinance blueprints in the region.

Highlights of MMU Publications in 2020

Economic and environmental sustainability through green composting: A study among low-income households.

Mamun A.A., Hayat N., Malarvizhi C.A.N., Zainol N.R.B.

DOI: 10.3390/su12166488

Climate change hinders economic growth across the globe, whereas green products and/or the adoption of green practices can effectively mitigate the deteriorating conditions of climate. A large proportion of the world population is living in remote areas with low income, and they should be included in the mitigation efforts to reduce the damaging effects of climate change. Therefore, this study intends to examine the intentions and behaviors towards green composting among low-income rural households to generate income, improve agricultural productivity, and reduce dependency on chemical fertilizers. This study adopted a cross-sectional research design and used structured interviews to collect quantitative data from 420 low-income households living in rural areas in Peninsular Malaysia.

This study adopted the Theory of Planned Behavior (TPB) and extended the TPB by embedding the constructs of perceived benefits and eco-literacy into the attitude towards the environment, normative beliefs by extending the subjective norms, and perception of startup resources by extending the perceived behavioral control. The study outcomes revealed that eco-literacy and perceived benefits had a significantly positive effect on attitude towards the environment; normative belief on subjective norms; perception of startup resources on perceived behavioral control; attitude towards the environment on subjective norms; perceived behavioral control on intention towards green composting; and intention towards green composting on green composting adoption behavior. The findings may serve as a guideline to policymakers for the adoption of composting, which can mitigate environmental issues in addition to generating economic activities for low-income residents in Peninsular Malaysia. The study's limitations and future research opportunities are reported as well.

Highlights of MMU Publications in 2020

The impact of microfinance programs on monetary poverty reduction: Evidence from Sudan.

Elsafi M.H., Ahmed E.M., Ramanathan S.

DOI: 10.1108/WJEMSD-05-2019-0036

The purpose of this paper is to examine the impact of microfinance programs sponsored by Sudanese microfinance institutions (SMFIs) on monetary poverty reduction in Sudan where poverty is widely spread. Design/methodology/approach: The study adopted the control group approach, where income and expenditure are taken as welfare indicators. The updated World Bank's international poverty line of 1.90 per person per day was adopted to separate the poor from non-poor. The data were collected by the means of a questionnaire distributed to a random sample of beneficiaries in the institution under study. The study adapted the Foster, Greer and Thorbecke (FGT) model to evaluate the role of microfinance programs in poverty reduction. Furthermore, to gain more insight into the impact of the program, a preliminary analysis was conducted using the independent-samples t-test to examine the difference in the welfare indicators for the sample of the control group and treatment group as well as that of the small loan group and micro-loan group.

Findings: The findings show that the microfinance program provided by SMFIs has reduced the monetary poverty among the participants. The results also reveal that beneficiaries who had received a larger volume of loan were noted lesser poverty than those who had received very small loan size. Moreover, the results demonstrate that poverty indices based on expenditure as a welfare indicator are far lower than those based on income for both groups. Originality/value: This study contributes to the available literature by filling the gaps through including income and expenditure as monetary variables, which included separately in previous studies adopted the FGT model in the area of microfinance, in addition to exploring the role of loan size in the effect of microfinance on poverty reduction.

Highlights of MMU Publications in 2020

Enhanced CNN Based Super pixel Classification for Automated Wound Area Segmentation.

Biswas T., Fauzi M.F.A., Abas F.S., Nair H.K.R.

DOI: 10.1109/R10-HTC49770.2020.9357010

With the increasing prevalence rate of diabetes and obesity worldwide, chronic wounds are becoming a significant burden for world health and economy. The treatment of a chronic wound goes through complex and time-intensive process. During the healing period, continuous wound measurement helps clinicians to predict the healing time and monitor the treatment efficiency. Current clinical techniques such as ruler-based or tracing-based methods are inaccurate, time-consuming and also subject to intra- and inter-reader variability that does not satisfy a comprehensive clinical benchmark.

In this paper, we proposed a method for wound boundary demarcation and estimation based on Super pixel segmentation and classification using an enhanced convolution neural network. An overall accuracy, sensitivity, and specificity of around 90% was observed, which fared much better against traditional methods.

Genome sequence analysis of multidrug-resistant Mycobacterium tuberculosis from Malaysia.

Tan J.L., Simbun A., Chan K.-G., Ngeow Y.F.

DOI: 10.1038/s41597-020-0475-x

Mycobacterium tuberculosis (MTB) is commonly used as a model to study pathogenicity and multiple drug resistance in bacteria. These MTB characteristics are highly dependent on the evolution and phylogeography of the bacterium. In this paper, we describe 15 new genomes of multidrug-resistant MTB (MDRTB) from Malaysia. The assessments and annotations on the genome assemblies suggest that strain differences are due to lineages and horizontal gene transfer during the course of evolution.

The genomes show mutations listed in current drug resistance databases and global MTB collections. This genome data will augment existing information available for comparative genomic studies to understand MTB drug resistance mechanisms and evolution.

Highlights of MMU Publications in 2020

Online collaborative workflow for creating learning videos on mental health.

Tan C.-H., Cheng K.-M., Koo A.-C., Alexius Weng-Onn Cheang, Rahmat H., Siew W.-F., Sharji E.A.

LINK:
https://www.scopus.com/inward/record.uri?eid=2-s2.0-85099600025&partnerID=40&md5=083a634ec47af62e8b5754330119c8b8

This paper describes an online collaborative workflow to facilitate the process of creating digital learning videos on mental health. Online collaboration allows more convenient ways for people to connect to each other anywhere and anytime. With the rapid development of technologies, online collaboration has become common and widely used for various purposes.

The aims of this paper are two-fold, (1) To discuss how online collaborative workflow facilitates the overall creation processes of two digital learning videos on mental health knowledge and management and, (2) To identify key facilitative and impeding factors for a successful online collaborative workflow for creating digital learning videos on mental health. This paper presented the workflow and the findings of facilitating and impeding factors of online collaboration.

Based on a qualitative data analysis of comments from collaborative members, four facilitative factors were identified as (a) individual commitment, (b) affective team support, (c) consensus and empowerment, and (d) clear instructions. There were also five impeding factors perceived by the collaborative members which are (a) lack of time, (b) challenges inherent to virtual communication, (c) technology and resource constraint, (d) lack of clear and tight guidelines, (e) lack of structured steps. Based on these findings, recommendations are provided for a more efficient online collaborative workflow to initiate group projects in online environments which is increasing in demand in the new normal era.

Highlights of MMU Publications in 2020

Tumor budding detection in HE-stained images using deep semantic learning.

Banaeeyan R., Fauzi M.F.A., Chen W., Knight D., Hampel H., Frankel W.L., Gurcan M.N.

DOI:10.1109/TENCON50793.2020.9293732

Tumor buddings (TB), a special formation of cancerous cells that bud from the tumor front, are fast becoming the key indicator in modern clinical applications where they play a significant role in prognostic and evaluation of colorectal cancers in histopathological images. Recently, computational methods have been rapidly evolving in the domain of digital pathology, yet the literature lacks computerized approaches to automate the localization and segmentation of TBs in hematoxylin and eosin (HE)-stained images.

This research addresses this very challenging task of tumor budding detection in HE images by presenting different deep learning architectures designed for semantic segmentation. The proposed design for a new Convolutional Neural Network (CNN) incorporates convolution filters with different factors of dilations. Multiple experiments based on a newly constructed colorectal cancer histopathological image collection provided promising performances. The best average intersection over union (IOU) for TB of 0.11, IOU for non-TB of 0.86, mean IOU of 0.49 and weighted IOU of 0.83 were observed.

Comparison of microarray breast cancer classification using support vector machine and logistic regression with LASSO and boruta feature selection.

Ali N.M., Aziz N.A.A., Besar R.

DOI: 10.11591/ijeecs.v20.i2.pp712-719

Breast cancer is the most frequent cancer diagnosis amongst women worldwide. Despite the advancement of medical diagnostic and prognostic tools for early detection and treatment of breast cancer patients, research on development of better and more reliable tools is still actively conducted globally.

The breast cancer classification is significantly important in ensuring reliable diagnostic system. Preliminary research on the usage of machine learning classifier and feature selection method for breast cancer classification is conducted here. Two feature selection methods namely Boruta and LASSO and SVM and LR classifier are studied. A breast cancer dataset from GEO web is adopted in this study. The findings show that LASSO with LR gives the best accuracy using this dataset.

Highlights of MMU Publications in 2020

Potential use of plasma focus radiation sources in superficial cancer therapy.

Poh H.S., Lee M.C., Yap S.S., Teow S.Y., Bradley D.A., Yap S.L.

DOI: 10.35848/1347-4065/ab7c10

The new multidisciplinary field of plasma medicine combines plasma physics, electrical engineering, life sciences and clinical medicine. Bekeschus et al. [Plasma Processes Polym. 16, 1800033 (2019)]. Here we explore potential uses in medicine, most particularly cancer therapy, the plasma source being brought out of the field of industrial applications into the life sciences, the focus being on superficial cancer radiotherapy strategies. Existing radiotherapy practices for such cancers rely on the use of rather large facilities, most popularly the electron linear accelerator and X-ray tube-based devices.

Conversely, a compact plasma radiation source can be housed in a relatively small space, there being considerable promise for such devices to produce the fluence requirements of radiotherapy for treatment of skin cancers. The present study of feasibility investigates the plasma focus device, with the emission produced by a single discharge shown to generate an X-ray dose of few tens of mGy. The X-ray dose is the integration of emission in the discharge durations of less than a μs, it is therefore possible using these devices to build up fractional irradiation dose through repetitive operation of the discharge system.

A review on sparse Fast Fourier Transform applications in image processing.

Ghani H.A., Malek M.R.A., Azmi M.F.K., Muril M.J., Azizan A.

DOI: 10.11591/ijece.v10i2.pp1346-1351

Fast Fourier Transform has long been established as an essential tool in signal processing. To address the computational issues while helping the analysis work for multi-dimensional signals in image processing, sparse Fast Fourier Transform model is reviewed here when applied in different applications such as lithography optimization, cancer detection, evolutionary arts and waster water treatment. As the demand for higher dimensional signals in various applications especially multimedia applications, the need for sparse Fast Fourier Transform grows higher.

Highlights of MMU Publications in 2020

The influence of servicescape and service credibility on older adults' intention to recover: A study of rehabilitation services in Malaysia.

Lai K.P., Chong S.C.

DOI: 10.1108/JHOM-07-2019-0215

Based on the stimuli-organism-response (SOR) model and relationship marketing theory, the paper aims to examine whether servicescape influences trust, service credibility and affective commitment amongst older adults, and their effects on the intention to recover in a rehabilitation setting. Design/methodology/approach: The study takes a quantitative approach, applying confirmatory factor analysis and structural equation model to examine the responses. A total of 400 data were collected using questionnaires distributed to older adults in Malaysia. Respondents were selected based on two criteria: they should be over 65 years, and they should have been visiting the rehabilitation centres in the last 12 months. Findings: The results suggest that trust and affective commitment play significant roles in increasing the intention of older adults to recover. Contradicting previous research findings, service credibility does not have any significant impact on the intention to recover as hypothesised.

The direct effect of service credibility on trust and affective commitment enhances the premise further that the relationship between service credibility and intention to recover is primarily indirect. Even though we expect servicescape to be a significant driver in forming the behaviour of older adults, its impact on intention to recover, trust and affective commitment remain non-significant, with the exception of service credibility. Originality/value: Past studies have focused on the roles of servicescape and service credibility separately. We have extended the literature by examining the combined effects of both servicescape and service credibility. The findings, therefore, contribute to a deeper understanding of the literature on the intention–behaviour relationship in the context of healthcare, as well as in service marketing.

Highlights of MMU Publications in 2020

FLIR vs SEEK thermal cameras in biomedicine: Comparative diagnosis through infrared thermography.

Kirimtat A., Krejcar O., Selamat A., Herrera-Viedma E.

DOI: 10.1186/s12859-020-3355-7

Background: In biomedicine, infrared thermography is the most promising technique among other conventional methods for revealing the differences in skin temperature, resulting from the irregular temperature dispersion, which is the significant signaling of diseases and disorders in human body. Given the process of detecting emitted thermal radiation of human body temperature by infrared imaging, we, in this study, present the current utility of thermal camera models namely FLIR and SEEK in biomedical applications as an extension of our previous article.
Results: The most significant result is the differences between image qualities of the thermograms captured by thermal camera models. In other words, the image quality of the thermal images in FLIR One is higher than SEEK Compact PRO. However, the thermal images of FLIR One are noisier than SEEK Compact PRO since the thermal resolution of FLIR One is 160 × 120 while it is 320 × 240 in SEEK Compact PRO. Conclusion: Detecting and revealing the inhomogeneous temperature distribution on the injured toe of the subject, we, in this paper, analyzed the imaging results of two different smartphone-based thermal camera models by making comparison among various thermograms. Utilizing the feasibility of the proposed method for faster and comparative diagnosis in biomedical problems is the main contribution of this study.

Vulnerability and Readiness of Malaysian Economy in the Context of Environment Degradation.

Tan C.-H., Ho S.-B.

DOI: 10.1088/1755-1315/505/1/012036

The threat of climate change and environment degradation has influenced tourist activities. The purpose of this study is to quantify the effects of climate change on tourism and economy in Malaysia. The vulnerability and readiness to climate change that impact tourism and economy are examined. The empirical results reveal the effect of vulnerability is greater than the readiness components in both tourism and overall economy in Malaysia. Health factors on vulnerability to climate change are significantly jeopardizing both tourism and overall economy in Malaysia. Besides that, greenhouse gas emissions and SARS epidemic disease also contributes to the losses of tourism industry in Malaysia.

Highlights of MMU Publications in 2020

Tumor Budding Detection System in Whole Slide Pathology Images.

Fauzi M.F.A., Chen W., Knight D., Hampel H., Frankel W.L., Gurcan M.N.

DOI: 10.1007/s10916-019-1515-y

Tumor budding is defined as the presence of single tumor cells or small tumor clusters (less than five cells) that 'bud' from the invasive front of the main tumor. Tumor budding (TB) has recently emerged as an important adverse prognostic factor for many different cancer types. In colorectal carcinoma (CRC), tumor budding has been independently associated with lymph node metastasis and poor outcome. Pathologic assessment of tumor budding by light microscopy requires close evaluation of tumor invasive front on intermediate to high power magnification, entailing locating the 'hotspot' of tumor budding, counting all TB in one high power field, and generating a tumor budding score. By automating these time-consuming tasks, computer-assisted image analysis tools can be helpful for daily pathology practice, since tumor budding reporting is now recommended on select cases. In this paper, we report our work on the development of a tumor budding detection system in CRC from whole-slide Cytokeratin AE1/3 images, based on de novo computer algorithm that automates morphometric analysis of tumor budding.

Joint Cell Activation and User Association for Backhaul Load Balancing in Green HetNets.

Lee Y.L., Tan W.L., Lau S.B.Y., Chuah T.C., El-Saleh A.A., Qin D.

DOI: 10.1109/LWC.2020.2994643

This letter proposes a joint cell activation and user association scheme to address the power consumption and backhaul load balancing issues in green dense heterogeneous networks (HetNets). In this scheme, an optimization problem is formulated for jointly minimizing power consumption and optimizing backhaul load balance of dense HetNets, subject to diverse quality of service (QoS) requirements and heterogeneous backhaul capacities. To solve this problem, a Q-learning-based algorithm is developed. Results show that the proposed scheme achieves substantial performance improvements over several baseline schemes in terms of fairness, QoS and energy efficiency.

Highlights of MMU Publications in 2020

Automated pterygium detection using deep neural network.

Zamani N.S.M., Zaki W.M.D.W., Huddin A.B., Hussain A., Mutalib H.A., Ali A.

DOI:10.1109/ACCESS.2020.3030787

Ocular imaging has developed rapidly and plays a critical role in clinical care and ocular disease management. Development of image processing technologies pertinent to ocular diseases has paved the way for automated diagnostic systems including detection techniques using deep learning (DL) approaches. The prevalence of an abnormal tissue layer in the conjunctiva, known as pterygium eye disease, is increasing due to lack of awareness. Despite the non-cancerous/benign nature of pterygium, a clinical diagnosis from an ophthalmologist is still required to prevent the pterygium tissues from extending into the pupil, which would result in blurred vision. However, current diagnostic methods are mostly dependent on human expertise. Automated detection can potentially serve as an assistive method to reduce diagnosis time by applying a DL approach. Considering the lack of comprehensive research work on pterygium detection using DL, we propose a new architecture consisting of an improved CNN-based trained network named VggNet16- wbn that is derived from VggNet16, a pre-trained CNN algorithm.

This paper presents an overview of the DL as a core approach to the transfer learning (TL) concept, as well as current efforts towards automated ocular detection approaches. A new architecture of a CNN-based trained network was proposed based on a network assessment from six CNN pre-trained networks to detect pterygium. This work consists of two main modules, namely, data acquisition and DCNN classification. The proposed trained network, VggNet16-wbn, shows the best performance with 99.22% accuracy, 98.45% sensitivity, and a perfect score on specificity and area under the curve metrics. This work has high potential for creating a pterygium screening system that can be used as a baseline for fully automated detection using a DL approach.

Highlights of MMU Publications in 2020

Lane Departure Warning Estimation Using Yaw Acceleration.

Poh Ping E., Hossen J., Eng Kiong W.

DOI: 10.1515/eng-2021-0008

Lane departure collisions have contributed to the traffic accidents that cause millions of injuries and tens of thousands of casualties per year worldwide. Due to vision-based lane departure warning limitation from environmental conditions that affecting system performance, a model-based vehicle dynamics framework is proposed for estimating the lane departure event by using vehicle dynamics responses. The model-based vehicle dynamics framework mainly consists of a mathematical representation of 9-degree of freedom system, which permitted to pitch, roll, and yaw as well as to move in lateral and longitudinal directions with each tire allowed to rotate on its axle axis.

The proposed model-based vehicle dynamics framework is created with a ride model, Calspan tire model, handling model, slip angle, and longitudinal slip subsystems. The vehicle speed and steering wheel angle datasets are used as the input in vehicle dynamics simulation for predicting lane departure event. Among the simulated vehicle dynamic responses, the yaw acceleration response is observed to provide earlier insight in predicting the future lane departure event compared to other vehicle dynamics responses. The proposed model-based vehicle dynamics framework had shown the effectiveness in estimating lane departure using steering wheel angle and vehicle speed inputs.

Highlights of MMU Publications in 2020

Diagnosis of acute lymphoblastic leukaemia from microscopic image of peripheral blood smear using image processing technique.

Narjim S., Al Mamun A., Kundu D.

DOI: 10.1007/978-3-030-52856-0_41

At present, cancer is a second leading cause of death which rises the global burden. Among them acute lymphoblastic leukemia is a subtype of blood cancer which is most common in child as well as adults. It occurs when the number of lymphoblast is more producing from stem cells. Over time the accumulation of this abnormal cells in bone marrow prevents to produce other healthy blood cells in our body which is very dangerous. So, early detection is one of the most important which can increase patient's survivability and treatment options. For cancer diagnosis, Ultrasound, Mammogram, MRI and microscopic images are some common methods used in medical science. Some basic detection processes of leukemia are CBC, PBS test and bone marrow test based on microscopic images.

For blood cancer diagnosis, microscopic images are used manually which is time consuming and less accurate and can produce non standardized reports. So, it needs to detect leukemia automatically. Recently some computer aided methods are generated to diagnosis leukemia which are more reliable, more accurate, more precise and faster than manual diagnosis methods. In this paper a new automatic system has been proposed to detect all based on several image processing techniques from microscopic image of blood smear such as, segmentation, preprocessing, enhancement for getting better performance. To, classify blast cells and healthy cells ensemble classifier has been used with several types of feature such as, texture features, geometric features, statistic features. In this paper 99.1% accuracy, 98% Sensitivity have been achieved.

Highlights of MMU Publications in 2020

Ulcer detection in wireless capsule endoscopy using locally computed features.

Hossain M.S., Al Mamun A., Ghosh T., Hasan M.G., Hossain M.M., Tahabilder A.

DOI: 10.1007/978-3-030-52856-0_39

WCE (Wireless Capsule Endoscopy) has become one of the most significant inventions for detecting different types of digestive tract diseases of humans. Distinct types of abnormalities like polyps, ulcer, tumor and intestine cancer are diagnosed by the clinicians with the implement of WCE in a convenient way. In order to deduce the incubus of the physicians an automated and efficient recognition system is required. In this paper, an advanced method for automatically detecting ulcers in the images of the WCE video record is proposed using the HSV color model. Region of interest (ROI) was identified applying a threshold on images that were extracted from the video of WCE. Local features have been extracted only from the ROI which is usually a small part of an image that offers a low computational cost. Linear discriminant analysis has been used for the separation of ulcer and non-ulcer images. The proposed algorithm was tested on a publicly available database. The performance has obtained accuracy 87.55%, sensitivity 94.70%, specificity 83.30%, precision 75.00% and F1 score 83.70%. Hence, the proposed method outperforms an efficient method that will create a great impact in this research arena.

Energy sustainability through generation scheduling.

Wen T.W., Palanichamy C., Ramasamy G.

DOI: 10.32479/ijeep.8228

In a modest electrical energy sector, an economical unit cost of electricity generation is inevitable. For tropical countries like Malaysia, apart from attractive energy cost, the environmental issues due to electricity sector also play a significant role because of its tropical nature. The energy cost and its related environmental concerns are of the momentous issues of the Malaysian Government. So as to resolve the concerned issues, this research presents a direct generation scheduling strategy to match demand against power generation, to augment opportunity for energy sustainability, and to offer an attractive unit electric energy cost. Besides, the same strategy aims at minimizing emissions due to thermal power plants through generation scheduling and incorporation of renewable energy systems.

Highlights of MMU Publications in 2020

Mindfulness and well-being in a digital society: A conceptual framework.

Ming L.M., Mary P.

DOI: 10.31838/jcr.07.16.80

The principle of oneness of life and its environment signifies an inseparable relationship between them. Life is contained within the minds and hearts of the people. The search for joy and happiness is inherent within the human life. This paper presents the key attributes of mindfulness, cultivation of mindfulness practises as well as the significance to be mindful to oneself in a modern and yet busy society. A conceptual framework proposes the cultivation of formal and informal mindful practices that can promote well-being. The framework further suggests a future reform in the education system in view of the rise in mental health problems and stress from the youth to the elderly by incorporating of mindfulness based programme in the education system. This framework comprises transformation of the inner life that enable people to age and live with a healthy lifestyles. One becomes empowered to solve problems and create positive outcomes and happiness by tapping into our own potential and wisdom in life. One needs to stop attributing happiness and unhappiness on others and external circumstances. Mindfulness help people especially middle aged and older adults to manage a wide range of physical conditions to promote general well-being.

Exploring destination image, familiarity, information search behaviour, involvement and travel motivation as influencers of ecotourists' destination loyalty.

Yu J., Kasim A., Sreenivasan J., Dzakiria H., Magray A.U.H.

DOI: 10.18778/0867-5856.30.2.26

This work aims at exploring the influence of selected factors that have received little attention in the past on ecotourism destination loyalty within the context of a developing country. The factors are destination image, familiarity, information search behaviour, involvement and travel motivation. The research was conducted on ecotourists visiting Malaysia who were approached on site and assisted to complete the survey instrument. The sample size was 813, representing a response rate of 47%. Hypotheses were tested using Structural Equation Model. It was found that while there are no linear relationships between the tested variables and destination loyalty, there are findings from the study that offer some managerial implications towards the industry.

Highlights of MMU Publications in 2020

Epitope-Based Peptide Vaccine against Glycoprotein G of Nipah Henipavirus Using Immunoinformatics Approaches.

Mohammed A.A., Shantier S.W., Mustafa M.I., Osman H.K., Elmansi H.E., Osman I.-A.A., Mohammed R.A., Abdelrhman F.A., Elnnewery M.E., Yousif E.M., Mustafa M.M., Elfadol N.M., Abdalla A.I., Mahmoud E., Yagaub A.A., Ahmed Y.A., Hassan M.A.

DOI: 10.1155/2020/2567957

Background. Nipah belongs to the genus Henipavirus and the Paramyxoviridae family. It is an endemic most commonly found at South Asia and has first emerged in Malaysia in 1998. Bats are found to be the main reservoir for this virus, causing disease in both humans and animals. The last outbreak has occurred in May 2018 in Kerala. It is characterized by high pathogenicity and fatality rates which varies from 40% to 70% depending on the severity of the disease and on the availability of adequate healthcare facilities. Currently, there are no antiviral drugs available for NiV disease and the treatment is just supportive. Clinical presentations for this virus range from asymptomatic infection to fatal encephalitis. Objective. This study is aimed at predicting an effective epitope-based vaccine against glycoprotein G of Nipah henipavirus, using immunoinformatics approaches. Methods and Materials. Glycoprotein G of the Nipah virus sequence was retrieved from NCBI. Different prediction tools were used to analyze the epitopes, namely, BepiPred-2.0: Sequential B Cell Epitope Predictor for B cell and T cell MHC classes II and I. Then, the proposed peptides were docked using Autodock 4.0 software program. Results and Conclusions. The two peptides TVYHCSAVY and FLIDRINWI have showed a very strong binding affinity to MHC class I and MHC class II alleles. Furthermore, considering the conservancy, the affinity, and the population coverage, the peptide FLIDRINWIT is highly suitable to be utilized to formulate a new vaccine against glycoprotein G of Nipah henipavirus. An in vivo study for the proposed peptides is also highly recommended.

Highlights of MMU Publications in 2020

The impact of alternative assessments in assessing the seventh component of the Washington accord's knowledge profile.

Kiew P.L., Liew C.P., Puteh M., Tan K.G

DOI: 10.1007/978-3-030-40274-7_67

Engineering is an essential activity in meeting the needs of the people, enhancing the economic development as well as providing services to the society. Engineering practices safeguard people's health, safety, the environment and manage risks throughout the entire lifecycle of a system. Such knowledge is categorised as the seventh curriculum component of the Washington Accord (WA)'s Knowledge Profile. In Malaysia, this component of knowledge profile is commonly assessed via traditional assessments such as written assignments or end-of-semester examination. Such assessments, however, do not promote the holistic outcomes as well as the students' learning process. This paper presents the application of alternative assessments in assessing the mentioned curriculum component among the engineering students in Tunku Abdul Rahman University College, Malaysia. The effectiveness and acceptance of alternative assessments by focusing on authentic and flipped assessment methods were investigated.

The qualitative analysis conducted on 208 engineering students revealed positive experience towards the implementation of alternative assessments, acknowledging that these assessment approaches promote cooperative learning and reinforce their understanding of the course materials in an active manner. Similarly, the quantitative analysis supported the effectiveness of alternative assessments with improvement of 6.6 to 7.8% in all course outcomes.

Highlights of MMU Publications in 2020

Violence and sexual offences against children in Malaysia: Searching for the right approach.

Cooray M., Jamaluddin S.Z., Tahir Z.

LINK:
https://www.scopus.com/inward/record.uri?eid=2-s2.0-85079659790&partnerID=40&md5=9fb8bb1f17dc42b8d959ee85cace2b7c

Child pornography on the Internet was first identified in the United States mainly, as a serious problem in the 1970s. In Malaysia, the issue has gained attention only in recent times especially with the case of Richard Hiuckle highlighted by the local media. More recently, with the enactment of the Sexual Offences against the Children Act 2017 provides for specific provisions relating to child pornographic offences. In the Pre-Internet era, the focus of sexual based offences against children was on the physical sexual abuse of children. Physical sexual abuse of children is covered by the sexual offences provisions in the Penal Code such as rape, incest and inciting a child to an act of gross indecency. In sentencing the offender, the court normally opt for a deterrence, incapacitation as well as retribution as the basis for choosing any of the punishment prescribed in the legislation. The objective of this paper therefore is to look into the viability of harsher and strict sentencing policies to be implemented in Malaysia to sexual offences to reduce the harm caused to children from exposure to illegal and harmful material online due to the technical difficulties to regulate the material on the Internet.

A comparative survey on indoor object location tracking techniques and technologies.

Asaduzzaman M., Geok T.K., Sayeed S., Bari M.A., Hossain F., Peng T.C.

DOI: 10.1109/ICSET51301.2020.9265396

Indoor object location tracking has newly vouched an increment in Eagerness, owing to the probable extensive length of services it can deliver by universal connectedness and Internet of Things (IoT). In outdoor location, GPS technology is mostly used that can be found in Geographical Map. But GPS technology a dicey technique for fixing positions of objects in indoor location owing to lack of line of sight (LoS).We discuss different approaches, technique and technologies which are used in indoor positioning system such as Radio Frequency Identification Device (RFID), Ultra-Wideband (UWB), Received Signal Strength (RSS); based on like WiFi technology, Angle of Arrival (AoA), Time of Flight (ToF), Return Time of Flight (RTOF) and also highlight their energy efficiency, cost, reception range, availability, latency, tracking exactness and efficiency.

Highlights of MMU Publications in 2020

Tigecycline resistance may be associated with dysregulated response to stress in Mycobacterium abscessus.

Ng H.F., Ngeow Y.F., Yap S.F., Zin T., Tan J.L.

DOI: 10.1016/j.ijmm.2019.151380

Previously, we characterized 7C, a laboratory-derived tigecycline-resistant mutant of Mycobacterium abscessus ATCC 19977, and found that the resistance was conferred by a mutation in MAB_3542c, which encodes an RshA-like protein. In M. tuberculosis, RshA is an anti-sigma factor that negatively regulates the SigH-dependent heat/oxidative stress response. We hypothesized that this mutation in 7C might dysregulate the stress response which has been generally linked to antibiotic resistance. In this study, we tested this hypothesis by subjecting 7C to transcriptomic dissection using RNA sequencing. We found an over-expression of genes encoding the SigH ortholog, chaperones and oxidoreductases. In line with these findings, 7C demonstrated better survival against heat shock when compared to the wild-type ATCC 19977. Another interesting observation from the RNA-Seq analysis was the down-regulation of ribosomal protein-encoding genes. This highlights the possibility of ribosomal conformation changes which could negatively affect the binding of tigecycline to its target, leading to phenotypic resistance. We also demonstrated that transient resistance to tigecycline could be induced in the ATCC 19977 by elevated temperature. Taken together, these findings suggest that dysregulated stress response may be associated with tigecycline resistance in M. abscessus.

Highlights of MMU Publications in 2020

Renewable energy and environmental quality: A second-generation panel evidence from the Sub Saharan Africa (SSA) countries.

Salahuddin M., Habib M.A., Al-Mulali U., Ozturk I., Marshall M., Ali M.I.

DOI: 10.1016/j.envres.2020.110094

This study employs dynamic panel data for 34 Sub Saharan Africa (SSA) countries for the period 1984–2016 to estimate the effects of renewable energy on environmental quality measured by three indicators, namely, per capita CO2 emissions, energy intensity (EI) and Aggregate National Savings (ANS). The study leveraged a battery of second-generation econometric tests and estimation and causality methods to obtain the coefficients between the regressed and the regressors. Results reveal that use of renewable energy reduces CO2 emissions and energy intensity while it enhances ANS. Economic growth still seems to be expensive for the region as it stimulates CO2 emissions. However, it has a positive effect on ANS. As expected, fossil fuels exacerbate CO2 emissions and energy intensity. FDI is found to be detrimental for the environment of SSA region with its positive significant coefficient on CO2 emissions. Financial development is reported to reduce CO2 emissions. Some causal links between variables are also noted.

Trade-Off Performances in Multiuser MIMO Networks with Quantized CSI Feedback.

Ku I., Hung L.V., El-Saleh A.A., Le T.A., Alias M.Y.

DOI: 10.1109/ISTT50966.2020.9279368

Multiuser multiple-input multiple-output transmission is identified as one of the promising techniques to vastly increase the transmission rate especially in densely deployed networks where inter-user interference is a major issue. To achieve this, channel state information (CSI) is needed to ensure accurate precoder design at the transmitter in order to effectively mitigate inter-user interference. However, the CSI is usually estimated at the receiver and, after quantization, is sent back to the transmitter. The feedback of quantized CSI incurs additional overhead which then leads to trade-off performances between transmission rate and energy efficiency. We will analyze this trade-off and propose the economy efficiency metric as a potential tool to determine the best operating point when the network is jointly optimized using transmission rate and energy efficiency.

Highlights of MMU Publications in 2020

Load Analysis and Energy Management for Residential System Using Smart Meter.

Venugopal C., Govender T., Thangavel B.

DOI: 10.1109/ICECIE50279.2020.9309554

In this paper, the design of load analysis and residential energy management system using a smart meter is is discussed. The AC and DC voltage and current sensors, light and heat sensors, room occupancy counter design is discussed. The sensors are connected to Arduino Mega board. A 3.2-inch TFT display is integrated with Arduino board to display the results. The Arduino Mega board is programmed to save and display the voltage, current, power factor and energy measurement for each load, automatically control the room light based on number of occupants, automatically or manually turn off the high energy consuming loads during peak power demand time, display the sensor information and energy saving tips for saving energy. The novelty of this design is its user friendly display controls with submenu options to set the maximum usage levels, review the previous usage levels and access to energy saving tips. To test the design, two DC and two AC loads were used. The measured load voltages and current are displayed and discussed. The further development of this design can be done by adding low cost energy saving IoT and communication device to monitor, turn on and turn off the loads remotely.

Influence of soft skills during challenging situations.

Chin S.T.S.

DOI: 10.5373/JARDCS/V12SP7/20202165

In late 2019, a deadly virus was found in Wuhan, China. By the first quarter of 2020, the virus, code named Covid-19 has travelled to many parts of the world. Many countries issued a lockdown order, which restricts movements around the country. Businesses regardless of whether it is a large company or even a small enterprise were badly affected. This study selected a successful manufacturing company and examined the soft skills of their executives during this challenging situation. Questionnaires were emailed to the executives via the Human Resource Manager. A total of 50 executives participated in the survey. Questionnaires adapted from Palmer & Stough (to examine the level of Emotional Intelligence) and Podsakoff et al (to examine the level of Organisational Citizenship Behaviour) were used in the study. The study found executives with higher level of soft skills were able to face the challenges of the situation in a better way as compared to those with lower level of soft skills.

Highlights of MMU Publications in 2020

The prominence of renewable and non-renewable electricity generation on the environmental Kuznets curve: A case study of Ethiopia.

Usama A.-M., Solarin S.A., Salahuddin M.

DOI: 10.1016/j.energy.2020.118665

Ethiopia is one of the fastest growing economies in Africa. During the last three decades, it has been thriving with stupendous efforts for a transition from non-renewable energy use to a renewable energy-dominant economy. It is against this background that this study attempts to highlight the role of renewable energy and non-renewable energy in affecting CO2 emissions under an augmented EKC framework. To achieve this goal, the study exploits data for the period 1981–2015. The Autoregressive Distributed Lag (ARDL) model is employed and the results surprisingly revealed that both renewable and non-renewable energy use reduce Ethiopia's CO2 emissions. The unexpected inhibiting effect of non-renewable energy on CO2 emissions might be attributed to the fact that share of non-renewable energy in the overall energy mix of Ethiopia has become insignificant after experiencing decline consistently during the last three decades. The outcome supports the existence of the EKC hypothesis as well as a N-shaped pattern of association between real GDP per capita and CO2 emissions per capita, particularly in the long run. There is evidence for long run causality, especially from the explanatory variables to CO2 emissions per capita. Policy implications are discussed.

Tourism-induced income distribution in Malaysia: a practical experience of a truly Asian economy.

Shahbaz M., Solarin S.A., Azam M., Tiwari A.K.

DOI: 10.1080/13683500.2019.1697648

This paper investigates the impact of tourism on income distribution by applying income inequality function for the Malaysian economy. The study period is 1991q1 to 2017q4. The Zivot and Andrews unit root test accommodating single unknown structural break in the series is applied to test the unit root properties of the variables. The cointegration between the variables is examined by using the Bayer–Hanck combined approach, and bounds testing approach to cointegration is applied to test the robustness of cointegration results. We find that the variables are cointegrated for a long-run relationship. Tourism (tourist arrivals, tourist receipts) improves income distribution by lowering income inequality. Economic growth is positively linked with income inequality. Trade openness declines income inequality. The causality results indicate the unidirectional causality running from tourism to income distribution.

Highlights of MMU Publications in 2020

A new method for reducing the performance evaluation cost of the photovoltaic module cooling techniques using the photovoltaic efficiency difference factor.

Sultan S.M., Tso C.P., Ervina Efzan M.N.

DOI: 10.1016/j.csite.2020.100682

In an earlier work, a temperature-dependent photovoltaic efficiency difference factor, FTDED, was introduced for the purpose of evaluating the performance of the photovoltaic module (PV) cooling technique. The evaluation is achieved by indicating if the PV cooler performance is contributing to the photovoltaic efficiency gain or loss. The existing method (FTDED) is costly because of the use of a fixed solar radiation of 1000 W/m2, that is the solar radiation at PV's standard test conditions, and the involvement of one unit of a PV without a cooling technique that has the same number of solar cells as a PV with a cooler which are required to accomplish the performance evaluation.

To solve the performance evaluation cost issue, a new method is proposed. This method can execute the performance evaluation of the PV coolers as the existing method but under various solar radiation values. It also depends on the output power of a PV with a single solar cell only (without a cooler) when conducting the performance evaluation for a PV with a cooler that has a known number of solar cells. The applicability conditions of the proposed method are illustrated. It is shown that the performance evaluation cost of PV cooling techniques can be greatly reduced. It can be concluded that the new method is a cost-efficient as compared with the existing method. PV cooling techniques designers and manufacturers are the potential users of the proposed method.

Highlights of MMU Publications in 2020

Cooperative Relay and Jammer Node Selection Strategies Based on Feed-Forward Neural Network.

Salem M.A., Bin Abd Aziz A., Al-Selwi H.F., Yusoff Bin Alias M.

DOI: 10.1109/ICCIT-144147971.2020.9213731

Cooperative non-orthogonal multi-access networking is a promising model for future wireless networks, due to its benefits in terms of energy efficiency, broader coverage and reducing interference. In this paper, under the presence of an eavesdropper node, we are researching the secrecy efficiency of a downlink cooperative non-orthogonal multi access (NOMA) communication system. This paper proposes a cooperative node based on deep learning feed forward neural network. The selected cooperative relay node is employed to enhance the channel capacity of the legal users, where the selected cooperative jammer is employed to degrade the capacity of the wiretapped channel. Simulations of the secrecy performance metric namely the secrecy capacity (Cs) are presented and compared with the conventional technique based on fuzzy logic node selection technique. Based on our simulations and discussions the proposed technique outperforms the existing technique in terms of the secrecy performance.

Energy innovations and environmental sustainability in the U.S.: The roles of immigration and economic expansion using a maximum likelihood method.

Solarin S.A., Bello M.O.

DOI: 10.1016/j.scitotenv.2019.135594

Environmental degradation remains a huge obstacle to sustainable development. Research on the factors that promote or degrade the environment has been extensively conducted. However, one important variable that has conspicuously received very limited attention is energy innovations. To address this gap in the literature, this study investigated the effects of energy innovations on environmental quality in the U.S. for the period 1974 to 2016. We have incorporated GDP and immigration as additional regressors. Three indices comprising of CO2 emissions, ecological footprint and carbon footprint were used to proxy environmental degradation. The cointegration tests established long-run relationships between the variables. Using a maximum likelihood approach with a break, the results showed evidence that energy innovations significantly improve environmental quality while GDP degrades the quality of the environment, and immigration has no significant effect on the environment. Policy implications of the results are discussed in the body of the manuscript.

Highlights of MMU Publications in 2020

Modeling natural gas consumption, capital formation, globalization, CO2 emissions and economic growth nexus in Malaysia: Fresh evidence from combined cointegration and causality analysis.

Etokakpan M.U., Solarin S.A., Yorucu V., Bekun F.V., Sarkodie S.A.

DOI: 10.1016/j.esr.2020.100526

The discovery of natural gas in the 20th century has increased aggregate energy consumption while spurring economic development. However, very little attention has been given in the energy economics literature, especially in Malaysia. As such, this paper primarily revisited the natural gas — economic growth nexus hypothesis in the case of Malaysia. The study was conducted with data from 1980 to 2014 in a multivariate framework with the inclusion of capital formation, globalization, and CO2 emissions to avoid omitted variable bias. We investigated the stationarity properties with a method that accommodates a single structural break. Subsequently, the novel combined co-integration test in conjunction with several techniques were used to assess the magnitude of the long-run equilibrium relationship. The empirical findings trace the long-run equilibrium relationship among the variables over the sampled period. The Granger causality test analysis confirmed the growth-energy driven hypothesis in Malaysia. The findings call for the adoption of cleaner and environmentally friendly energy sources in the Malaysian energy mix. We highlight the need for pragmatic strides from both private and public energy sector stakeholders to prioritize clean and accessible energy in line with the Sustainable Development Goals.

Military Spending, Corruption, and the Welfare Consequences.

Ali H.E., Solarin S.A.

DOI: 10.1080/10242694.2019.1567181

In pursuit of good governance and better allocation of resources, corruption is of interest to policymakers and citizens alike. Using panel data from 1996 to 2016 for 59 countries, the aim of this paper is to examine the relation between military spending and corruption. Taking the advantage of GMM method, we have shown across different measures of military spending, countries with higher levels of corruption tend to exhibit higher levels of military expenditures.

Highlights of MMU Publications in 2020

The impact of shale gas development on the U.S economy: Evidence from a quantile autoregressive distributed lag model.

Solarin S.A., Bello M.O.

DOI: 10.1016/j.energy.2020.118004

The advent of shale gas in economically and commercially viable scale has changed the dynamics of the U.S energy profile making it a net exporter of natural gas. However, despite the growing importance of shale gas, its impact on the economy of US has not been substantially investigated. This creates gaps in the empirical literature of energy economics with limited policy guides for the policy makers and other relevant stakeholders. This paper therefore contributes to the extant literature by examining the impacts of shale gas on economic expansion in the U.S in an augmented framework that includes capital stock and labour as additional variables. With quarterly dataset that covers the period, 2002Q1 to 2019Q1, we employed Cho et al. (2015) [1]'s Quantile Autoregressive Distributed Lag (QARDL) modelling technique to probe the long run relationships between the variables. The results confirm a long-run significant impact of shale gas and capital stock on economic growth of U.S while labour force is found to be a positive but not significant factor in economic growth of the U.S. Investment in capital infrastructure that can enhance the technology of natural gas extraction and fracking is recommended for full optimization of the shale gas consumption. Concerted efforts should also be made, through research and development, to improve the efficiency of labour force.

Highlights of MMU Publications in 2020

Optimizing Industrial Process Flow for Energy Cost Reduction through Demand-Side Management.

Lok J.-J., Tan W.-N., Yip S.-C., Gan M.-T.

DOI: 10.1109/EEEIC/ICPSEurope49358.2020.9160785

Energy demand has grown rapidly over the past decades and will continue to grow in the future. The rise in energy demand is primarily due to industrialization and the evolution from a conventional to a smart-grid paradigm. Therefore, the future energy grids have to be redesigned in order to adapt to the ever-growing global energy demand and achieve environmental goals. Demand-side management (DSM) is a promising solution to these challenges and can significantly improve the financial performances and reliability of electrical power systems. This paper presents a new DSM solution for industrial users in a smart grid. The goal of the load scheduling model is to minimize the operational cost of the industrial users while helping the utility providers to reshape the peak load profile. The proposed linear programming model allows the users to preset the target demand of end-product throughout the time horizon while monitoring the rescheduling of workforce so that the operation cost can be reduced. Besides, users have the flexibility to set constraints to avoid the maximum demand penalty imposed by the utility company. Simulation results show that DSM is able to reduce the peak to-average ratio of the total power demand, as well as industrial user's electricity charges. The proposed model is feasible and realistic to be applied in the industry sectors since many practical constraints are included.

Highlights of MMU Publications in 2020

D2D communication for spectral efficiency improvement and interference reduction: A survey.

Alquhali A.H., Roslee M., Alias M.Y., Mohamed K.S.

DOI: 10.11591/eei.v9i3.2171

Device-to-device (D2D) communication system plays an extremely important role in fulfilling the demands of fourth generation (4G) and fifth generation (5G) technologies. 4G technology cannot meet high data demands. The D2D communication system is believed to provide major improvements in resource usage, energy efficiency, and overall throughput, which are the main demands for the 5G network. Some of the main issues in the D2D communication system involve spectrum efficiency and interference. Although many studies have been conducted on spectrum efficiency improvement and interference reduction, the issues still remain. A study should be conducted to obtain a better understanding of the D2D communication system and to develop a D2D scheme with efficient spectrum utilization and interference reduction. Many survey papers have been published on these issues, but the fundamental concepts behind the D2D communication system require investigation. In this study, we investigated and analyzed the fundamental concepts behind the D2D communication system to develop an efficient D2D resource allocation scheme with reduced interference.

Decision Tree with Sensitive Pruning in Network-based Intrusion Detection System.

Chew Y.J., Ooi S.Y., Wong K.-S., Pang Y.H.

DOI: 10.1007/978-981-15-0058-9_1

Machine learning techniques have been extensively adopted in the domain of Network-based Intrusion Detection System (NIDS) especially in the task of network traffics classification. A decision tree model with its kinship terminology is very suitable in this application. The merit of its straightforward and simple “if-else” rules makes the interpretation of network traffics easier. Despite its powerful classification and interpretation capacities, the visibility of its tree rules is introducing a new privacy risk to NIDS where it reveals the network posture of the owner. In this paper, we propose a sensitive pruning-based decision tree to tackle the privacy issues in this domain. The proposed pruning algorithm is modified based on C4.8 decision tree (better known as J48 in Weka package). The proposed model is tested with the 6 percent GureKDDCup NIDS dataset.

Highlights of MMU Publications in 2020

A new approach for photovoltaic module cooling technique evaluation and comparison using the temperature dependent photovoltaic power ratio.

Sultan S.M., Tso C.P., Efzan M.N.E.

DOI: 10.1016/j.seta.2020.100705

Many photovoltaic module cooling techniques are available to reduce the solar cell temperature, resulting in enhanced efficiency. Although the power of the photovoltaic module is usually reported as a measure for the performance of the cooling technique, the performance assessment and comparison among different coolers become difficult if different photovoltaic module's reference power is being utilized. The existing method requires calculations to be done repeatedly to obtain the photovoltaic module's power, for any given value of the reference power. In order to compare the performance of the coolers, the use of the same reference power is needed, resulting in a lengthy process. Hence, a new assessment method is proposed, based on the temperature dependent photovoltaic module's power ratio that is defined and derived.

The new method identifies the relevant parameters that are essential for measuring the performance of the cooler such as the power of a photovoltaic module with a cooler and the reference power at photovoltaic module's standard test conditions. The outcome is that the calculation of the unknown power for different reference power can be instantly obtained and the performance comparison among different coolers become simple without going through the lengthy process as it is in the case of the existing method. It is shown that the proposed method has the same results as the existing method which is experimentally validated. This is evidence to support the new method which may have potential to be applied by photovoltaic module cooling techniques designers.

Highlights of MMU Publications in 2020

Effects of oxygen variation on the improved structural stability, electronic and optical properties of ZnTeO compounds.

Chang Y.H.R., Yoon T.L., Lim T.L., Koh P.W., Goh E.S.

DOI: 10.1088/1361-648X/ab7032

Crystalline ZnTeO thin films are promising materials for next generation photovoltaics. However, their structural stability and optical nonlinearity potential in bulk form have not been reported. Here, structural, electronic and optical properties of ZnTeO composites have been thoroughly studied using genetic algorithm and density functional theory (DFT). Energetically, mechanically and dynamically stable O-rich phases, namely Zn2Te2O6 and ZnTeO4, were obtained. Ground-state properties such as lattice constants and simulated XRD were analyzed and compared to the experimental literature wherever possible. With a G 0 W 0 corrected band gap, these semiconducting phases display several desirable features, namely, Jahn-Teller distorted cations, hardness and shear anisotropy-induced optical nonlinearity that increase monotonically as O concentration elevates. Such trends appear to be consistent with that seen in the experimental study of ZnTeO thin film. It is observed that Zn-d, Te-p and O-p states have immense influence towards the electronic properties of these structures.

Both phases exhibit steep elevation of absorption throughout the ultraviolet (UV) range, hitting peak value of ~5.0 105 cm-1. Of particular interest, the non-centrosymmetric ZnTeO4 has second harmonic generation coefficients (9.84 pm V-1 and 2.33 pm V-1 at static limit) greater than borates crystal and large birefringence that exceeds 0.08 in deep UV region, thus highlighting its potential pedigree as new optical materials in UV range.

Highlights of MMU Publications in 2020

Routing based multi-agent system for network reliability in the smart microgrid.

Singh N., Elamvazuthi I., Nallagownden P., Ramasamy G., Jangra A.

DOI: 10.3390/s20102992

Microgrids help to achieve power balance and energy allocation optimality for the defined load networks. One of the major challenges associated with microgrids is the design and implementation of a suitable communication-control architecture that can coordinate actions with system operating conditions. In this paper, the focus is to enhance the intelligence of microgrid networks using a multi-agent system while validation is carried out using network performance metrics i.e., delay, throughput, jitter, and queuing. Network performance is analyzed for the small, medium and large scale microgrid using Institute of Electrical and Electronics Engineers (IEEE) test systems. In this paper, multi-agent-based Bellman routing (MABR) is proposed where the Bellman– Ford algorithm serves the system operating conditions to command the actions of multiple agents installed over the overlay microgrid network.

The proposed agent-based routing focuses on calculating the shortest path to a given destination to improve network quality and communication reliability. The algorithm is defined for the distributed nature of the microgrid for an ideal communication network and for two cases of fault injected to the network. From this model, up to 35%–43.3% improvement was achieved in the network delay performance based on the Constant Bit Rate (CBR) traffic model for microgrids.

Highlights of MMU Publications in 2020

Interfuel substitution, hydroelectricity consumption and CO2 emissions mitigation in Malaysia: evidence from a transcendental logarithm (trans-log) cost function framework.

Bello M.O., Solarin S.A., Yen Y.Y.

DOI: 10.1007/s11356-020-08251-z

The main objective of this paper is to estimate the interfuel substitution elasticities between hydropower and the fossil fuels of coal and natural gas used in the generation of electricity for Malaysia. Due to the violation of the assumption behind the ordinary least squares (OLS) method on account of the correlated error terms in the system of equations, the econometrics techniques of seemingly unrelated regression (SUR) was adopted to obtain the parameter estimates using dataset that covers the period 1988 to 2016.

The main finding is that there exists substantial substitution possibility between hydropower and fossil fuels in the generation of electricity for Malaysia. CO2 emissions mitigation scenarios were also conducted to explore the possible effects of substituting fossil fuels for hydropower to generate electricity. The results show that switching from high carbon-emitting fuels to renewable energy such as hydropower will substantially reduce CO2 emission and assist the country towards achieving the carbon emissions reduction targets. Policy recommendations are offered in the body of the manuscript.

Factors Affecting Malaysia's SMEs in Using Public Electronic Procurement.

Soong K.-K., Ahmed E.M., Tan K.-S.

DOI: 10.1142/S0219649220500082

This study illustrates the perception to use public electronic procurement (e-Procurement) system by Malaysia's Small and Medium Enterprises (SMEs) and examines the six predictors for the SMEs employees' perception to use e-procurement system in their daily activities. The study modified the Unified Theory of Acceptance and Usage Technology (UTAUT) by including two new variables that have been ignored by previous studies. As a result, 421 questionnaires were collected and analysed. The security construct has the strongest relationship among the rest. For moderation, it confirms that security has no moderation effect with the moderators. This study contributes to the available literature by filling the gap of past studies using UTAUT framework through adding two variables (system security and usage decision) in the revised framework and enhances transparency in the public sector acquisition.

Highlights of MMU Publications in 2020

Peak power shaving in hybrid power supplied 5G base station.

Woon L.J., Ramasamy G., Thiagarajah S.P.

DOI: 10.11591/eei.v10i1.2705

The Information and Communication Technology sector consumes approximately 3% of the world's electrical energy due to the exploding demand for internet service. The most energy-intensive part of cellular communications is the base station, which there are about four million of them deployed globally. As Fifth Generation (5G) wireless networks are introduced, the number of base stations will be growing in parallel with the data traffic which in turn will increase the energy consumption of the base station to cater for the growing capacity.

The high-power consumption and dynamic traffic demand overburden the base station and consequently reduce energy efficiency. In this paper, an energy-efficient hybrid power supply system for a 5G macro base station is proposed. It is analysed that with the solar energy working in conjunction with the conventional supply from the grid, the reduction of poor power quality is observed as the fluctuation of the demand is greatly decreased. The proposed model showed a reduction in the average grid power by 14.9%. Furthermore, the power supply showed peak power shaving of 5kW; thus, reducing the reliance on the grid as well as increased the energy-efficient of this hybrid power supply system.

Highlights of MMU Publications in 2020

Adaptive multimode precoding for ultra-broadband vectored DSL systems.

Ng Y.H., Chuah T.C., Abidin A.N.Z., Hashim N., Asrokin A.

DOI: 10.1016/j.phycom.2019.100959

In the downstream of a digital subscriber line (DSL) system transmitting over a large bandwidth, the row-wise diagonally dominant (RWDD) characteristic of the copper channel matrix, which holds at low frequencies, may not be valid at high frequencies because of the presence of strong crosstalk. Consequently, linear precoders result in sub-optimal bit-rate performance whilst the optimal non-linear precoders incur high computational complexity. In this work, we investigate a quad-mode precoder (QMP) which selectively operates on one of four modes on each frequency tone. A block-based adaptation strategy is introduced for complexity reduction whereby mode selection is invoked adaptively over blocks of tones.

The computational complexity associated with the proposed precoder is analyzed and quantified against existing precoders. Results demonstrate that by suitably adapting the operating mode and block length of the proposed QMP according to the channel conditions, moderate computational saving could be attained without compromising the bit-rate performance. More importantly, the QMP facilitates green DSL as energy savings are feasible when some tones are de-activated to conserve energy.

Highlights of MMU Publications in 2020

A spectrum sharing model that counters eavesdropping.

Foo Y.-L.

DOI: 10.1007/s11235-019-00605-4

Cybersecurity has become a major concern in the modern world. A serious threat to wireless networks is eavesdropping. On the other hand, usable spectrum is diminishing due to the presence of various wireless services. To address the problem, highly spectral efficient methods have been introduced e.g. spectrum sharing. Cognitive radio networks could sense unused spectrum and make use of it. In this paper, the cognitive radio is to perform a second task, i.e. jamming the eavesdropper. This paper is significant in revealing the cognitive radio's energy efficiency in this setting, where a cognitive transmitter (CT) can transmit its own data when it senses the absence of primary transmitter (PT). If PT is present, CT is to jam an eavesdropper (EA) by transmitting artificial noise. Our main contribution is finding the CT's optimal energy efficiency.

Through the proposed formulas, we have determined the fractions of time and power required by CT to achieve the optimal energy efficiency, subject to constraints like minimum required secrecy rate Rs, etc. Our major findings are: (1) only a small portion of a time frame (66 μs in our setting) is required for sensing. CT can utilize the remaining time for sending its data or jamming EA. (2) To achieve a target energy efficiency of 0.5 bps/Hz/J, PT should not be actively transmitting more than 35% of the time, and Rs should not be larger than 1.2 bps/Hz.

Highlights of MMU Publications in 2020

A comprehensive survey on mobility management in 5G heterogeneous networks: Architectures, challenges and solutions.

Gures E., Shayea I., Alhammadi A., Ergen M., Mohamad H.

DOI: 10.1109/ACCESS.2020.3030762

With the rapid increase in the number of mobile users, wireless access technologies are evolving to provide mobile users with high data rates and support new applications that include both human and machine-type communications. Heterogeneous networks (HetNets), created by the joint installation of macro cells and a large number of densely deployed small cells, are considered an important solution to deal with the increasing network capacity demands and provide high coverage to wireless users in future 5th generation (5G) wireless networks. Due to the increasing complexity of network topology in 5G HetNets with the integration of many different base station types, in 5G architecture mobility management has many challenges. Intense deployment of small cells, along with many advantages it provides, brings important mobility management problems such as frequent handover (HO), HO failure, HO delays, ping-pong HO and high energy consumption which will result in lower user experience and heavy signal loads.

In this paper, we provide a comprehensive study on the mobility management in 5G HetNet in terms of radio resource control, the initial access and registration procedure of the user equipment (UE) to the network, the paging procedure that provides the location of the UE within the network, connected mode mobility management schemes, beam level mobility and beam management. Besides, this paper addresses the challenges and suggest possible solutions for the 5G mobility management.

Highlights of MMU Publications in 2020

AI-assisted framework for green-routing and load balancing in hybrid software-defined networking: Proposal, challenges and future perspective.

Etengu R., Tan S.C., Kwang L.C., Abbou F.M., Chuah T.C.

DOI: 10.1109/ACCESS.2020.3022291

The explosive growth of IP networks, the advent of cloud computing, and the rapid progress in wireless communications witnessed today reflect significant progress towards meeting the explosive data traffic demands. Consequently, communications service providers should deploy efficient and intelligent network solutions to accommodate the huge traffic demands and to ease the capacity pressure on their network infrastructure. Besides, vendors should develop novel energy-efficient networks to reduce network utility costs and carbon footprint. Software-defined networking (SDN) provides a suitable solution, however, complete SDN deployment is currently unachievable in the short-term. An alternative is the hybrid SDN/ open shortest path forwarding (OSPF) network, which allows the deployment of SDN in legacy networks. Nevertheless, hybrid SDN/OSPF also faces several technical, economic and organizational challenges. Although many energy-efficiency routing solutions exist in hybrid SDN/OSPF networks, they are generic and reactive by design. Moreover, these solutions are characterized by manual control plane forwarding configurations, leading to sub-optimal performance. The recent promising combination of SDN and artificial intelligence (AI) techniques such as machine learning (ML) and deep learning (DL) in traffic management and control provides tremendous opportunities. In this paper, we first provide a review of the most recent optimization approaches for global energy-efficient routing and load balancing.

Next, we investigate a scalable and intelligent integrated architectural framework that leverages deep reinforcement learning (DRL) techniques to realize predictive and rate adaptive energy-efficient routing with guaranteed quality of service (QoS), in transitional hybrid SDN/OSPF networks. Based on the need to minimize global network energy consumption and improve link performance, this paper provides key research insights into the current progress in hybrid SDN/OSPF, ML and AI in the hope of stimulating more research.

Highlights of MMU Publications in 2020

Isomorphic drivers of institutional pressure and importance of environmental management system implementation towards the adoption propensity of green ICT.

Islam K.S., Muthaiyah S., Fie D.Y.G.

DOI: 10.32479/ijeep.10618

The rapid development of the Internet has amplified the use of information and communication technology (ICT). This has raised concerns regarding environmental sustainability in the ICT industry in relation to carbon emission, high electrical energy consumption, and vulnerable e-waste management practices. Therefore, this study investigates the relationship between the isomorphic drivers of institutional pressure such as coercive, normative, and mimetic pressures, and the importance of implementing the Environmental Management System (EMS) towards the adoption propensity of green ICT in Malaysia. 127 ICT-based organizations under the Multimedia Digital Economy Corporation (MDEC) in Malaysia are utilized to gather data using a survey based on a 5 and 7-point Likert scale questionnaire. A proportionate stratified random probability sampling procedure is used for this purpose. The results from this exploratory study prove that both normative pressure and the importance of EMS implementation have a positive and significant relationship with the adoption propensity of Green ICT.

This finding will be beneficial in assisting policy makers, academicians, and future researchers in determining the significant factors in the adoption propensity of Green ICT along with the materialization of Malaysia's National Green Technology Policy.

Highlights of MMU Publications in 2020

The impact of age structure on carbon emission in the Middle East: the panel autoregressive distributed lag approach.

Tarazkar M.H., Dehbidi N.K., Ozturk I., Al-mulali U.

DOI: 10.1007/s11356-020-08880-4

Rapid evolution in the population age structure of the Middle East countries has major economic, social, and environmental outcomes. Therefore, to fill the gap in the previous literatures, in this study, the effect of age structure on environmental degradation was investigated in the Middle East region. To achieve this goal, a panel data of 10 Middle East countries were examined over the period of 1990 to 2014. Moreover, the carbon dioxide emission per capita was used as an environmental pollution index in this study. According to the stationary property of the variables, small sample size data, and the assumptions of the model, the panel autoregressive distributed lag method of mean group, pooled mean group, and dynamic fixed effect estimators were investigated in this study. The empirical results implied that the pooled mean group model emerged as the most efficient among the three estimators. Also, results revealed that the age structure have a significant relationship with environmental pollution. Children and working age population have a positive elasticity, whereas elderly people have negative elasticity. Furthermore, the results showed that the working age population has the greatest explanatory power on the carbon emissions. Also, the relationship between per capita energy consumption and gross domestic product per capita with air pollution was positive.

Overall, the empirical results showed that any attempt to decrease carbon dioxide emissions in the Middle East region should consider the population age structure.

Highlights of MMU Publications in 2020

Fast and Energy-Efficient Block Ciphers Implementations in ARM Processors and Mali GPU.

Lee W.K., Phan R.C.-W., Goi B.M.

DOI: 10.1080/03772063.2020.1725656

With the proliferation of the internet of things (IoT) and device-to-device (D2D) communications enabled by the boom of mobile computing technology, secure high-speed communication has now become indispensable in our daily life. This is especially true when potentially private data are being continually sensed by and communicated among mobile devices as they exist in a world of interconnected inanimate objects, which is also one of the main themes of the upcoming 5G revolution. As the amount of data to be secured for high-speed communications is vast, there is a need to ensure that the block ciphers used for encryption are deployed without incurring significant computational cost. In this paper, we present fast implementations of recent industry standard block ciphers in typical embedded platforms, consisting of multi-core CPU (ARM A15 and A7) and GPU (Mali T628). We implemented the conventional block cipher (AES) and lightweight block ciphers (CLEFIA, SIMON, SPECK and PRESENT) optimized for fast computation. We also analyze the energy efficiency of these block ciphers computation in CPU and GPU, as low power consumption is crucial for the embedded system.

Our experimental results show that the embedded GPU is not only able to compute block ciphers faster than conventional CPU but also consumes significantly less power.

Highlights of MMU Publications in 2020

Energy-Efficient Joint Power Allocation and Energy Cooperation for Hybrid-Powered Comp-Enabled HetNet.

Euttamarajah S., Ng Y.H., Tan C.K.

DOI: 10.1109/ACCESS.2020.2972910

Base station (BS) coordination with respect to data and energy cooperation has recently emerged as a potential solution for enhancing the energy efficiency (EE) of multi-cell multi-tier cellular network architecture. This work studies the EE maximization problem in a hybrid-powered (grid and renewable energy source) heterogeneous network (HetNet) where the data and energy are jointly coordinated among the BSs. We propose a combinatorial optimization algorithm to maximize the system EE with the aim to reduce grid power consumption (GPC). Due to the complexity of the formulation, Lagrange dual decomposition and metaheuristic method are incorporated to solve the problem. Furthermore, the non-fractional programming EE problem is solved using the Dinkelbach's method which converges faster with a lower complexity. Simulation results show that cooperation among the BSs to share the channel information and energy reduces the GPC by nearly 20% and increases EE around 10% during harvested energy scarcity among the BSs.

The effects of shale oil production, capital and labour on economic growth in the United States: A maximum likelihood analysis of the resource curse hypothesis.

Solarin S.A.

DOI: 10.1016/j.resourpol.2020.101799

We examine the role of shale oil production in national economic growth in the United States for the period 2002Q1 to 2019Q4. Within a Cobb-Douglas production framework, we estimate the impact of increasing shale oil production on GDP and total employment. Adopting a maximum likelihood approach with a breakpoint, we observe the positive impact of shale oil production on economic growth is bigger in the post-recession period than in the pre-recession and during recession period. The results further show that shale oil production has a positive impact on the employment level but the impact of shale oil production on gross domestic product (GDP) is greater than the impact of shale oil production on employment level. The implication of the results is that shale oil development is yet to indicate tendency of resource curse in the United States.

Highlights of MMU Publications in 2020

A new production cost effectiveness factor for assessing photovoltaic module cooling techniques.

Sultan S.M., Tso C.P., Ervina E.M.N.

DOI: 10.1002/er.4889

Numerous cooling techniques are available to reduce photovoltaic module (PV) temperature and thus improve PV efficiency. Sometimes, the manufacturing cost of some PV cooling techniques is higher as compared with their power productivity, and thus the cost parameter is needed to be taken into consideration to justify producing certain PV cooling techniques. This paper is intended to link the manufacturing cost of the PV cooler with its output power by providing an economic analysis as there is a research gap in previous studies related to the economic aspect of these products. It proposes a new method by defining and deriving a new parameter called the PV cooling technique production cost effectiveness factor whose value is affected by the PV efficiency gained of a PV with and without a cooler, the manufacturing cost of the PV cooling technique, and the cost of one watt of PV power. Based on the value of this new factor, three possible classifications are suggested. They are production/not production cost effective or neutral.

To determine the optimum PV cooler, the minimum value of the PV cooling technique production cost effectiveness factor is defined. The applicability conditions and limitations of the proposed method are illustrated. It is shown that the PV cooling technique production cost effectiveness factor and its minimum value are helpful in classifying the PV cooling techniques based on their power productivity and manufacturing cost. This parameter may have a potential to be used by PV cooling technique designers and manufacturers on making their design decisions.

Highlights of MMU Publications in 2020

Arsenate Removal Performance of Magnetite Nanoparticles.

Devaraj N.K., Mukter-Uz-Zaman A.S.M., Hin Yong W.

DOI: 10.1109/R10-HTC49770.2020.9356978

The drive towards Industry 4.0, while beneficial for efficient production and economic growth, may also bring about detrimental effects on the environment. Amongst the most likely effect is increased discharge of wastes containing toxic heavy metal ions into water sources. As such, the adsorption technique which is characterised by the adherence of the metal ions onto the surface of an adsorbent material could help to remediate polluted water. Nano-sized magnetic adsorbents with narrow size distribution have been touted to have better adsorption capacities. In this study, bare magnetite and ceria-coated magnetite particles were synthesised using co-precipitation under different stirring rates and times to obtain particles of different sizes and size distributions. Size measurements confirmed the variation of size and polydispersity index with the variation in synthesis parameters. The electron microscope images depicted large clusters formation due to agglomeration of the particle samples.

Based on the results of the arsenate adsorption testing, most of the samples displayed better removal performance at temperatures of 50°C or 70°C compared to at room temperature. The removal performance was also shown to be not dependent only the average size but also the polydispersity index values.

Highlights of MMU Publications in 2020

A Survey on the Characteristics and Requirements of Electricity Distribution Safety Technology.

Nishanth J., Palanichamy N., Lim S.C.

DOI: 10.1109/ICICCS48265.2020.9120986

Electrical energy is the basic requirement for the economic development of any country. In today's culture, electricity is a vital part of functioning as a society, we use it almost every minute. There are many causes of Blackout due to damage to electrical transmission lines. In places where environmental and public safety is at risk, power failure is particularly critical. In this 21st Century, we are using a radical and interconnected distribution network. Firstly, it briefs distribution used today which has more advantages. Secondly, the safe overhead power transmission techniques for low voltage AC distribution; special challenges to operational safety, power quality, reliability, especially focus on the open circuit fault identification techniques and reason for power outages were discussed. Further, the major impact as a result of the overhead power distribution line gets terminated, and earthing of live wire may electrocute the living things and affects public safety were discussed. Finally, the characteristics and requirements that are to be considered for these fault identification techniques are discussed for line termination in LT (230v/415v) power distribution.

Relationship between financial development and inbound tourism: A revisit.

Al-Mulali U., Solarin S.A., Gholipour H.F.

DOI: 10.1002/pa.2233

In this study, we use a more accurate and comprehensive indicator of financial development to examine the link between financial development and tourist arrivals and expenditures in the top 20 tourist destination countries over the period of 1995–2017. By applying the panel augmented mean group method and controlling for other determinants of tourist arrivals, the overall results revealed that financial development positively influences tourism development. On the contrary, economic growth and countries price levels have no significant effects on tourism development. At the country level results; financial development has positive effects on tourism development in most countries. However, gross domestic product growth and consumer price index have a significant in few countries only. Therefore, the outcome of this study reveals that that visitors do not consider the development and the price level of the country but rather the facilities available including the facilities in the financial structures.

Highlights of MMU Publications in 2020

Organisational context and behavioural complexity affecting ambidextrous behaviours among SMEs.

Poon W.C., Mohamad O.

DOI: 10.1108/IJOTB-03-2019-0037

The purpose of this paper is to examine the antecedents of exploitative and explorative behaviours and to give valuable insight into the role of ambidextrous behaviours in developing creativity and innovativeness among owner-managers in SMEs. Design/methodology/approach: A review of existing literature was carried out and drawing upon owner-managers, a survey using structured questionnaires was carried out with a total of 183 useful responses received. The proposed model was analysed using SmartPLS v2.3.7. Findings: The empirical result suggests that behavioural complexity and organisational flexibility encourages exploitative and explorative behaviours, while ambidextrous behaviours encourage creativity and innovativeness. Rigidity, on the other hand, hinders the cultivation of ambidextrous behaviours.

Originality/value: The paper entails useful implication by demonstrating that flexibility enables owner-managers to reconcile competing demands and consequently, cultivate innovative outcomes. In this regard, business owner-managers must learn implicitly how to juggle these contradictory demands, suggesting an internal balancing mechanism independent of the organisational context and individual behavioural complexity. This paper suggests that cultivation of exploitative and explorative behaviours among owner-managers is useful in encouraging ambidextrous behaviours among SMEs.

Highlights of MMU Publications in 2020

Creditworthiness and access to finance of SMEs in Malaysia: do linkages with large firms matter?

Wasiuzzaman S., Nurdin N., Abdullah A.H., Vinayan G.

DOI: 10.1108/JSBED-03-2019-0075

This study investigates the influence of inter-firm linkages between small and medium enterprises (SMEs) and large firms on the relationship between an SME's creditworthiness and its access to finance. Design/methodology/approach: Survey questionnaire was distributed to 456 SMEs in the manufacturing sector in the Selangor and Federal Territory of Kuala Lumpur regions and a total of 145 useable responses were gathered. Investigation into the possible differences in the effect of creditworthiness – and its dimensions – on access to finance for SMEs with and without linkages are examined using Partial Least Squares-Multi Group Analysis (PLS-MGA). Findings: It is found that the relationship between creditworthiness and access to finance is significant for both SMEs with and without links to large firms. However, no significant difference is found in the effect of creditworthiness on access to finance for both types of SME. Further analysis on the five different dimensions of creditworthiness shows statistically significant differences between SMEs with links and those without for the dimensions of collateral and condition. This implies that alliances formed between SMEs and large firms do not have much of an influence on the overall creditworthiness but do influence the collateral and condition of the SME.

Originality/value: This study contributes to the understanding of the effects of interfirm linkages on SME creditworthiness and access to finance. To the authors' knowledge no such study has been conducted on links between SMEs and large firms, especially in a developing country such as Malaysia.

Highlights of MMU Publications in 2020

Developing an integrative customer satisfaction model: An application of customer experience in Malaysian E-banking services.

Bashir M.A., Ali M.H., Akther N., Wai L.M., Paiz N.A.M., Islam A.

LINK:
https://www.scopus.com/inward/record.uri?eid=2-s2.0-85083303606&partnerID=40&md5=7cf92c21f4b0a8eef6db7568116a6914

Electronic Banking (e-banking) is referred to e-finance services, provided by the banks in the form of goods or services through electronic delivery systems. The emergence of e-banking since its inception has played a major role in the country's economic development and boosting customer satisfaction. It has now become one of the pre-requisite guiding the decision of customers in making the decision of choosing a bank to relate with. This is happening because of the general global transformation into the e-world and the consumer awareness of their e-banking requirement and conveniences from a particulars bank as compared to the initial conventional banking system. Taking from the existing literature of customer behavior, on e-banking services, research from different scholars has revealed the effects of demographic characteristics of the customers, such as age, gender, income and level of education etc. on e-banking provision of goods and services. It is on this ground that this study proposes an extension to the study by proposing an Integrative Model of Customer Experience in Malaysia E-Banking Service Delivery. However, from the theoretical discussion of the above review, it was observed that the original model suffers some limitations. As such, this paper deemed it necessary to examine an additional driver influences, perception, and attitude toward E-banking adoption in Malaysia.

Highlights of MMU Publications in 2020

Factors influencing Malaysian small and medium enterprises adoption of electronic government procurement.

Soong K.-K., Ahmed E.M., Tan K.S.

DOI: 10.1108/JOPP-09-2019-0066

This study aims to examine Malaysian small and medium-sized enterprises (SMEs) Adoption of electronic government procurement (EGP) in the post-introduction phase as the portal was introduced in the early year 2000. Design/methodology/approach: This study integrated electronic public services into two acceptance theories (the technology acceptance model [TAM] and unified theory of acceptance and use of technology [UTAUT] framework) and having a direct measurement of the criterion. Both TAM and UTAUT models measure the behaviour intention to use and indirectly measure the criterion of actual usage along with behavioural intention. Besides, this study conducted a systematic sampling survey in SMEs located in Klang Valley (the business hub in Malaysia).

Findings: The results confirm that effort expectancy, performance expectancy and social influences had a direct effect on the adoption of EGP in the private sector. Rather than the original UTAUT setup, the behavioural intention would influence user behaviour. Social implications: The implications and policy recommendations of these findings will be used by both SMEs and the government to improve the EGP delivery. Originality/value: The gap with this study is at the time the Malaysian Government introduced e-procurement. The SMEs were quite new and had limited knowledge in the e-procurement during the introduction phase. Both SMEs and the government will use the implications and policy recommendations of these findings to improve the EGP delivery in the current post introduction phase.

Highlights of MMU Publications in 2020

Talent management practices impact on Malaysian SMIs managers job performance.

Krishnan R.C., Abu Said A.M., Razak M.R.A., Ahmed E.M.

DOI: 10.1504/IJLIC.2020.105338

This study illustrates the influence of utilisation of human capital management practices via talent management practices (TMP) that influences managers' job performance in the Malaysia's manufacturing small and medium enterprises (SMEs) that is called small and medium industries (SMIs). This study modifies the Mitchel's job performance motivation model by including new variables that had been ignored by previous studies. 300 questionnaires had been collected, and the study employed partial least squares (PLS) for primary data analysis to test the model. The study limits itself in the scope of making out most of the managers' TMP within the perimeter of manufacturing SMEs in Malaysia. This was due to the fact that the specific needs of manufacturing are different than other sectors such as mining, quarrying, construction, services and primary agriculture.

This study contributes significantly to the effect of moderating role of TMP that could influence Malaysia's manufacturing SMEs managers' job performance.

The effect of national culture on fourth industrial revolution and organizational sustainability.

Jayashree S., Malarvizhi C.A., Reza M.N.H.

DOI: 10.1166/jctn.2020.8826

The Fourth Industrial Revolution (IR 4.0) represents an important transformation of the total industrial manufacturing through the alliance of smart technologies and the Internet. It tends to enhance communication among employees, technological equipment and resources, in order to convert centralized manufacturing control processes to a decentralized and independent model. This study aims to aid the organizations by providing wide-ranging direction and explore the dimensions of national culture. The source of the samples is Malaysian SMEs and the survey will be conducted by Questionnaire Method.

The study implies that there an important relationship between the dimensions of national culture and IR 4.0 that can help Malaysia to build a green sustainable manufacturing process.

Highlights of MMU Publications in 2020

Design of a hybrid free space optical and visible light communication system for indoor wireless data broadcasting.

Lee I.E., Chung G.C., Pang W.L., Anas S.S., Cheong M.Y.

DOI: 10.1088/1742-6596/1432/1/012065

The continuous development of online social services and the ever-increasing number of devices demanding high-speed and ubiquitous broadband wireless access have resulted in severe bandwidth congestion, such that the radio frequency (RF) spectrum will no longer be able to support the exponential growth in demand. Along with being faster, cheaper, greener, cleaner, and safer than current technology, visible light communication (VLC) can overcome the bottleneck issues with last-mile connectivity by offering 10, 000 times broader bandwidth. In this paper, we propose a system with portable, low-cost hybrid RF/VLC and free-space optics (FSO) transceivers with a simple graphical user interface and the capability of indoor wireless communication and multimedia broadcasting, thus presenting an economical and cable-free solution to various multimedia applications, such as file transmission and real-time audio and video streaming.

The proposed system deploys VLC as a hotspot for data broadcasting within an enclosed room, FSO as the backbone for data transmission between multiple rooms, and Wi-Fi for lights-off mode. Preliminary results show a transmission rate of 1kbps at a maximum distance of 4 cm.

Highlights of MMU Publications in 2020

Towards sustainable development in developing countries: Aggregate and disaggregate analysis of energy intensity and the role of fossil fuel subsidies.

Solarin S.A.

DOI: 10.1016/j.spc.2020.07.011

The aim of this study is to examine the factors affecting energy intensity and its components such as electricity intensity, oil intensity, gas intensity and coal intensity. We pay special attention to the roles of the fossil fuel subsidies, which include total fossil fuel, fossil-fuelled electricity, oil, gas and coal subsidies in developing countries. Using a generalized method of moments approach, it is shown that increase in fossil fuel, electricity, oil, gas and coal subsidies promote energy intensity or its component elements. The results further suggest that urbanization, industrialization and foreign direct investment also promote energy intensity. Conversely, it is also noted that real gross domestic product per capita and human capital development have negative impact on energy intensity and its components. Moreover, the countries are clustered according to their income level and the relationship in the variables are re-examined in each of the clusters. The results are not substantially different to those obtained for the total sample. The implications of these empirical findings are analysed in the paper.

LoRa driven medical adherence system.

Sherif S., Tan W.H., Ooi C.P., Sherif A., Mansor S.

DOI: 10.11591/eei.v9i6.2195

Recent discovered technologies have exposed many new theories and possibilities to improve our standard of living. Medical assistance has been a major research topic in the past, many efforts were put in to simplify the process of following treatment prescriptions. This paper summarizes the work done in developing LoRa driven medical adherence system in order to improve medicine adherence for elderlies. The designed system is composed of two sections; embedded hardware device for the use of patients at home and Web application to manage all patients along with their medicines and keep track of their medicine intake history. LoRa wireless communication technology is used for connecting all embedded devices with a central gateway that manages the network. Hardware and software tests have been conducted and showed great performance in terms of LoRa network range and latency. In short, the proposed system shows promising method of improving medicine adherence.

Highlights of MMU Publications in 2020

Clan/geographical association heritage as a place-based approach for nurturing the sense of place for locals at a World Heritage Site.

Tan S.-K., Tan S.-H.

DOI: 10.1016/j.jhtm.2020.10.017

Sense of place is important in sustaining the socio-cultural heritage of a place. It can be nurtured through a systematic place-based approach. However, the lack of a critical perspective and often under-theorized place-based education has been criticized as this results in limitations to achieve its original intention. This research aims to comprehend the concepts of place-based learning by identifying the socio-cultural elements, particularly from a clan/geographical heritage perspective, and how it might cultivate a sense of place for locals. Interviews and observations were conducted in Melaka and George Town, the World Heritage Sites of Malaysia. A total of twenty documents, including primary and secondary data, were analysed.

The findings reveal five themes to be developed as a place-based approach for nurturing the sense of place of locals. Theoretically, it extends the literature of place-based learning, and the ontological appreciations of place. Practically, related stakeholders might use this as a reference to preserve their clan/geographical association heritage.

Highlights of MMU Publications in 2020

Tourist experience on traditional pastries in UNESCO heritage city.

Tan C.L., Yeo S.F.

DOI:10.1108/BFJ-09-2018-0635

In recent years, the traditional pastries industry has gained popularity among tourists due to the advantage of the pastries location at UNESCO Heritage city, Penang. However, the little research focused on this particular industry, and there is lack of evidence of the tourists' experience with the traditional pastries and how these attributes affect their revisit decision. Design/methodology/approach: The study utilizes a qualitative research design to gain in-depth understanding on tourists' thought and their repurchase decision. Secondary data were collected via TripAdvisor with 68 tourists who visited the most popular three pastries shops namely, Him Heang, Ghee Hiang and Min Xiang Tai, which are later analysed using qualitative content analysis. Findings: The findings revealed that tourists generally concerned about the service quality, value, brand image and atmospherics that could affect their repurchasing decision. Particularly, the staff service quality has been viewed as the upmost important attribute to influence the tourists' decision. Therefore, the pastries shops shall ensure that the staff who serve the tourists shall be well trained to satisfy the tourists' enquiry.

Research limitations/implications: The limitation concerning the interpretation of the secondary data based on the feedbacks and comments of the tourists may derive the bias possibility. Future research might consider the large-scale primary data to extend the findings. Originality/value: Limited research exists on the tourists' experience which affects the repurchasing decision in pastries industry. This study provides valuable information for pastries shops and researchers interested in this area.

Highlights of MMU Publications in 2020

Crime, urban flight and societal wellbeing: A case of Malaysia.

Hew W.W.-L., Low B.-Y., Goh G.G.-G., Lau S.-H.

LINK:
https://www.scopus.com/inward/record.uri?eid=2-s2.0-85079588458&partnerID=40&md5=1fcdabc3319513d95252623bc6ba65c4

Today, the exploding population, rising costs of living, and limited living spaces have led to various social problems for urban residents. World governments have been gradually moving towards promotion of urban wellbeing where urban centres must be ecosystems that promote societal health and wellbeing as well as conducive for improving its resident s' quality of life (21). Malaysia is of no exception; despite the various initiatives by the Government, recent years have seen an increase in residential crime a and this has adverse impacts on urban wellbeing. This paper discusses how crime affects urban wellbeing and how the problem may be contained. Semi-structured interviews conducted with residents in crime-prone areas in Malaysia have found that growing criminal activity might lead to urban flight or depopulation of residential estates. This runs counter to urban wellbeing as it increases the stress levels of families by destabilising them. The interview also revealed that these problems may be curbed by increasing the safety through various spatial management practices as well as knowledge sharing and participation by residents in community events.

This study provides recommendations to federal and local authorities in spatial policies as well as for housing developers in designing future housing projects.

Highlights of MMU Publications in 2020

CSR and tax aggressiveness of Malaysian listed companies: evidence from an emerging economy.

Mohanadas N.D., Abdullah Salim A.S., Pheng L.K.

DOI: 10.1108/SRJ-01-2019-0021

This study aims to examine how corporate social responsibility (CSR) performance and corporate tax aggressiveness relate in Malaysia, an emerging economy in Southeast Asia. It also seeks to analyse how CSR performance in community, environment, marketplace and workplace themes relate to the tax aggressiveness of listed companies in this country. Design/methodology/approach: This study analyses 182 companies listed in the Main Market of Bursa Malaysia from 2010 to 2012 using fixed-effects panel regression and ordinary least square regression. It uses current effective tax rate as a proxy for corporate tax aggressiveness and measures CSR performance using specially developed CSR performance disclosure index. Findings: This study finds no statistical support that CSR performance is related to corporate tax aggressiveness in Malaysia. Similarly, there are no statistically significant relationships between environment-related and marketplace-related CSR performance and corporate tax aggressiveness. Nevertheless, community-related CSR performance has significant negative relationship with corporate tax aggressiveness. Workplace-related CSR performance meanwhile has significant positive relationship with corporate tax aggressiveness.

Originality/value: This study expands the current literature's focus on developed economies by examining the relationship between CSR and corporate tax aggressiveness in the setting of an emerging Asian economy, i.e. Malaysia. It is also the first empirical study focussing on this relationship among Malaysian listed companies.

Highlights of MMU Publications in 2020

An environmental impact assessment of fossil fuel subsidies in emerging and developing economies.

Solarin S.A.

DOI: 10.1016/j.eiar.2020.106443

The impact of fossil fuel subsidies on environmental degradation has not been adequately examined in the existing literature. However, environmental degradation is often suggested as one of the causes of climate change. This paper examines the factors driving environmental degradation, emphasising the role of fossil fuels, in 35 emerging and developing countries. The ecological footprint is used as a proxy for environmental degradation. Using Generalized Method of Moments (GMM), the results show that an increase in fossil fuel subsidies leads to an increase in ecological footprint. Specifically, a 10% increase in fossil fuel subsidies will increase the ecological footprint by between 0.3% and 1.5%.

The results further suggest that variables such as population size, real GDP per capita, urbanisation and the non-dependent population also boost environmental degradation. It is also shown that primary energy supply per capita, industry share, resource rent and globalisation have a positive effect on environmental degradation. However, the global oil price and human capital development do not have a significant impact on environmental degradation. The implications of these empirical findings are analysed in the paper.

Highlights of MMU Publications in 2020

Convergence in Sulphur Dioxide (SO2) Emissions Since 1850 in OECD Countries: Evidence from a New Panel Unit Root Test.

Solarin S.A., Tiwari A.

DOI: 10.1007/s10666-019-09687-5

The convergence of air pollution is a key assumption in several environmental impact assessment models and one of the major ingredients for multilateral climate agreements and allocation of emission rights. In this paper, the sulphur dioxide (SO2) emissions' convergence among 32 OECD countries is examined using the panel stationarity test of Nazlioglu and Karul [1] that provides for smooth breaks, cross-sectional dependency and heterogeneity across the cross-sectional units. For robustness sake, we have also used a panel stationarity test that accounts for sharp breaks. Overall, the findings reveal that there is convergence of SO2 emissions among the OECD countries. The results imply that adjusting the mean value of the relative SO2 emissions trend path should be a key concern of the OECD nations. Moreover, the findings signify that instead of following independent paths in pollution control, the OECD countries are gravitating towards a similar standard of environmental performance. Moreover, the forecast of future relative SO2 emission figures can be based on its past values.

Data mining technique to analyse and predict crime using crime categories and arrest records.

Khatun R., Ayon S.I., Hossain R., Alam J.

DOI: 10.11591/ijeecs.v22.i2.pp444-452

Generally, crimes influence organisations as it starts occurring frequently in society. Because of having many dimensions of crime data, it is difficult to mine the available information using off the shelf or statistical data analysis tools. Improving this process will aid the police as well as crime protection agencies to solve the crime rate in a faster period. Also, criminals can often be identified based on crime data. Data mining includes strategies for the convergence of machine learning and database frameworks. Using this concept, we can extract previously unknown useful information and their patterns of occurrence from unstructured data. The sole purpose of this paper is to give an idea of how data mining can be utilised by crime investigation agencies to discover relevant precautionary measures from prediction rates. Data sets are analysed by some supervised classification algorithms, namely decision tree, K-nearest neighbours (KNN), and random forest algorithms. Crime forecasting is done for frequently occurring crimes like robbery, assault, and theft. Specifically, the results indicate the superiority of the random forest algorithm in test accuracy.

Highlights of MMU Publications in 2020

Are Malaysian companies ready for environmental practices? An extension of theory of planned behavior.

Chan K.H., Chong L.L., Ng T.H.

DOI: 10.32479/ijeep.8899

Changes of climate and pollution globally have been the most concerning issue in the recent decades. The negative impacts of climate change and pollution towards the environment and human well-being have been significantly concern. Among them, Malaysia has been actively involved in looking for solutions to reduce the environmental degradation issues lately. This study adopted the extended theory of planned behaviour, norm activation model and Maslow's Hierarchy of Needs in examining the comprehensive motivational factors towards their intention to environmental practices. This study is aimed to provide insights related to the environmental practices among Malaysian companies specifically public listed companies. Questionnaires are distributed via email due to the location of the companies. The collected and usable data for this study is 107 companies. The targeted respondents are those who ranked manager and above from investor relations department. The data is being analysed by employing partial least square-structural equation modelling in investigating the relationship between the motivational factors that influence companies' environmental practices intention. The findings showed that corporate norm and actualisation needs are positively associated to the intention among companies to be environmental friendly.

Highlights of MMU Publications in 2020

Malaysian Road Accident Severity: Variables and Predictive Models.

Ting C.-Y., Tan N.Y.-Z., Hashim H.H., Ho C.C., Shabadin A.

DOI: 10.1007/978-981-15-0058-9_67

Road accident refers to an incident where at least one land vehicle with one or more people injured or killed. While there are many variables attributed to road accident, ranging from human to environmental factors, the work presented in this paper focused only on identifying predictors that could potentially lead to fatality. In this study, the raw dataset obtained from the Malaysian Institute of Road Safety Research (MIROS) was firstly preprocessed and subsequently transformed into analytical dataset by removing missing values and outliers. Such transformation, however, resort to large feature space. To overcome such challenge, feature selection algorithms were employed before constructing predictive models. Empirical study revealed that there were 26 important predictors for predicting accident fatality and the top five variables are month, speed limit, collision type, vehicle model and vehicle movement. In this work, six predictive models constructed were Random Forest, XGBoost, CART, Neural Net, Naive Bayes and SVM; with Random Forest outperformed the rest with an accuracy of 95.46%.

Assessment of Security Risk Impact on Mobile Payment Services.

Ganesan T., Ong T.S., Cheah W.P., Connie T.

DOI: 10.1109/IICAIET49801.2020.9257829

In mobile payment, trust and confidence are the essential keys in performing a financial transaction. The users feel insecure and hesitant to participate in a transaction due to fear of security and privacy issues raised in mobile payment. The mobile devices are prone to theft of misplacement. When a subject loses his/her phone or when the phone is stolen, it can lead to payment fraud or personal identity theft. To address the complications and restrictions associated with mobile payment services, a responsive Analytical Hierarchy Process (AHP) Pairwise Comparison framework is developed to elicit expert knowledge for security and privacy risk events and consequences dependencies. Risk events and consequences are first acquired from literature analysis. This is followed by an expert's interview to rank the relative important of the risk events and consequences using AHP. In this paper, a secure mobile payment technological model is presented to prioritize the privacy and security risk events and consequences of mobile payment technology.

Highlights of MMU Publications in 2020

Analysis of American television and its impact on the cultural perception on Malaysian youth.

Mohd. Nasseri E., Neo T.K., Perumal V.

LINK:
https://www.scopus.com/inward/record.uri?eid=2-s2.0-85092624852&partnerID=40&md5=7452969771f34d79a68a22db074ecab5

In recent years there has been an increase in Malaysian youth crime and misdemeanor ranging from bullying to rape and murder. The root cause of this problem had never been explicitly addressed but it had been suggested that it was due to television exposure. The question is, to what extent does the exposure affect youth, and which elements of exposure have the greatest influence. These questions were tackled in this study by analyzing the relationship between youth, media consumption, and cultural identity. Using surveys, in-depth interviews, and audience research theories, it was found that youth used television for the purpose of entertainment, and as means for social surveillance: a tool to keep abreast of current trends and affairs and to imitate celebrity lifestyles and practices. This process of mimicry was found to have an important impact on their emotional and social well-being. The desire to copy what is on screen is inherently connected to the collective guilt of maintaining and preserving cultural identity. The dynamics between youth, cultural identity and media stimuli are therefore seen as paradoxical.

Highlights of MMU Publications in 2020

Using conditional random field in named entity recognition for crime location identification.

Goraseb Q.J., Shah N.

DOI: 10.18178/ijmerr.9.2.252-257

Electronic data or information comes in different forms, some are structured data and others unstructured data. The act of collecting such data is known as data mining. This paper will discuss the mining of crime data from electronic news sources in Malaysia, and how this data is further transformed to extract meaningful information from it. Furthermore, the paper will demonstrate how crime locations can be identified within the various news articles. This is significant because there are cases where a location name is mentioned in the news article but that is not the true crime location. To help achieve this, the system makes use of Named Entity Recognition (NER) algorithms. They are task with identifying locations in various sentences. To bring more accuracy to the work, the system will employ machine learning technique known as Conditional Random Field (CRF) to recognize if a sentence is referring to a crime location.

Limitation factors of whistleblowing practices among public sector internal auditors in Malaysia: In-depth interview study.

Sani N.B.A., Salim A.S.B.A., Jaffar N.B.

DOI: 10.1504/IJBCRM.2020.108511

Like Malaysia, the commitment to eradicate the corruption was established through the enactment of Whistleblowing Protection Act 2010 (WPA). The effectiveness of whistleblowing plays a vital role in detriment corruptions issue. The recent Malaysia worst Corruption Perception Index 2017 encourages the need to explore the answers in relation to whistleblowing practice, particularly among public sector internal auditors in Malaysia. Hence, this study is warranted to explore the limitation factors of whistleblowing practices among public sector internal auditors in Malaysia. Due to the complexity of whistleblowing practice, this study decided to conduct a semi-structured interview among the internal auditors from ministries, statutory bodies and state government offices. The result of this study reveals that there are four limitation factors of whistleblowing practice, that include power distance, failure of WPA implementation, lack of manpower and ineffective internal control. This study also ignites few recommendations for the improvement of whistleblowing legislation in Malaysia.

Highlights of MMU Publications in 2020

Flight intentions among residents in crime-ridden neighborhoods: A pls-sem assessment.

Hew W.W.-L., Goh G.G.-G., Low A.B.-Y., Lau S.-H.

LINK:
https://www.scopus.com/inward/record.uri?eid=2-s2.0-85091660309&partnerID=40&md5=670bd613722d80f91978db9af562d2b9

Building sustainable communities is fast becoming a common principle in urban development, and a sustainable community is one that has a prevailing social order and strong cohesion among its members. Today, rising crime is destabilizing traditional neighborhoods by creating fear, which leads to residential turnover. This study aims to assess whether strengthening social cohesion by communities of practice and knowledge-sharing behavior may prevent residents from harboring intentions to leave. A framework based on environmental psychology principles has been developed; communities of practice and knowledge-sharing behavior are believed to stimulate residential satisfaction, which acts as a counteraction to flight intention.

A survey was conducted among residents in crime-ridden neighborhoods in the southern region in Malaysia to assess whether the factors have contributed to their flight intention. Three hundred nine responses were obtained and analyzed using partial least squares structural modeling. Findings revealed that communities of practice reduce flight intention indirectly through the moderation of residential satisfaction, whereas low knowledge-sharing behavior have reduced flight intention. Findings of the former are expected, but the latter is surprising, suggesting residents' resilience and experience in handling crime, hence not requiring any sharing of safety practices. The findings identify suitable methods to improve social interactions to prevent residential turnover and keep the neighborhoods relevant and safe for future inhabitants.

Highlights of MMU Publications in 2020

Corporate governance and cash holdings in hospitality firms: Do board characteristics matter?

Kwan J.-H., Lau W.-Y.

DOI: 10.18488/journal.aefr.2020.107.816-832

This paper study the relationships between corporate governance mechanisms and cash holdings, and the joint effects on firm performance. We test if these governance attributes are related to cash holdings among firms in the hospitality industry. Our sample consists of public listed hospitality firms in Malaysia and Singapore from the year 2005 to 2013. Different from the past literature which mainly adopted the ordinary least squares regression (OLS) model, this study uses panel regression tests to test the link between the variables and the cash holdings level. We adopt the generalized method of moment (GMM) estimation to control the possible endogenous problem.

The results indicate that board of director characteristics plays a pivotal role in cash holdings. We found that board independence, board duality, board busyness and ownership structure are significantly associated with the cash reserves.

We also found that although the relationship between good governance and corporate liquidity are not significant during crisis in general, the benefits are more pronounced during sudden crisis (Cobra type). The impact of such crisis is found to be significantly alleviated for firms with high cash holdings and good governance. The findings should provide valuable information in developing strategies on cash management. This study provides insight on the importance of the disciplinary and monitoring role of boards of directors.

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