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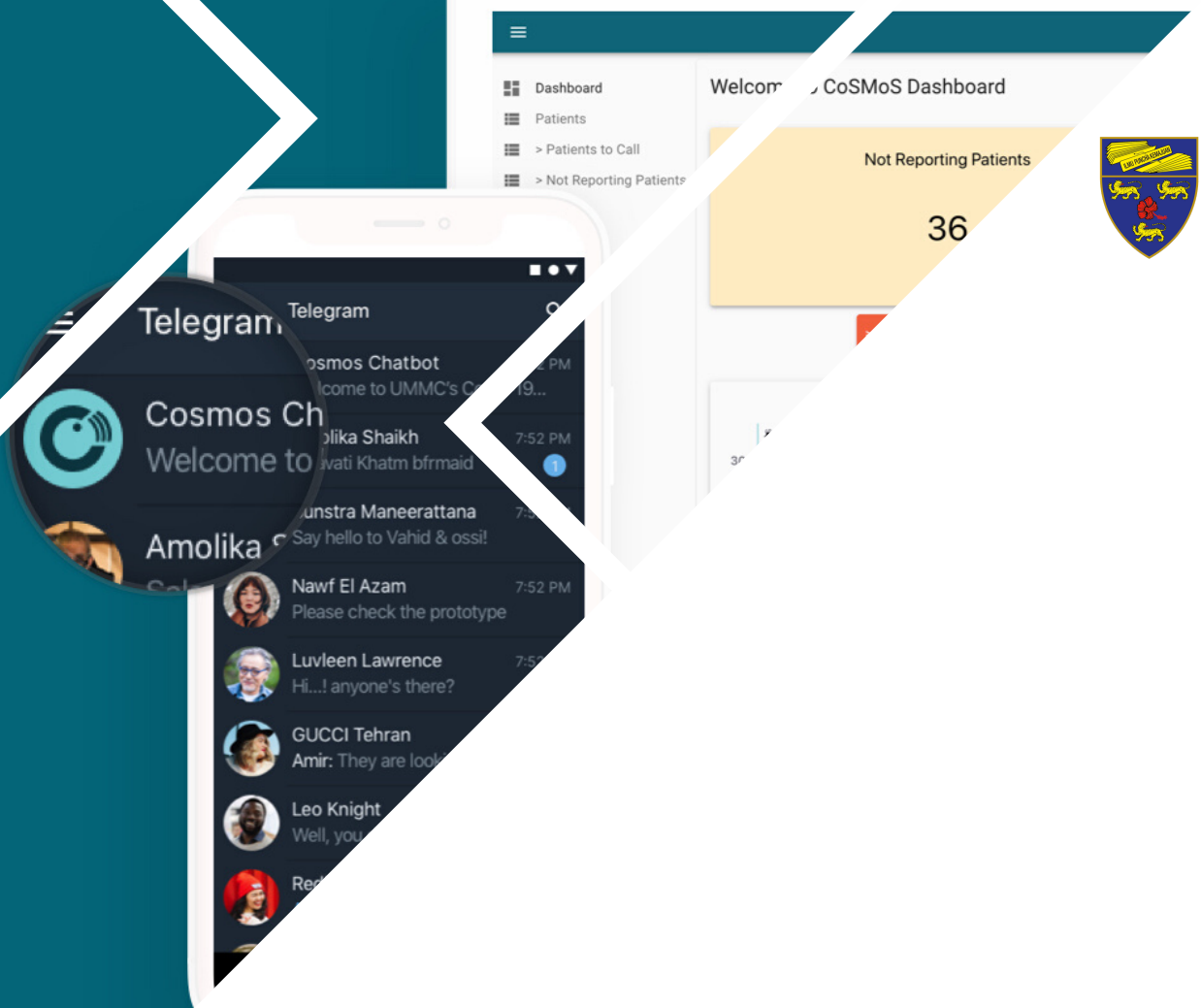

UNIVERSITY OF MALAYA

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UM RESEARCH BULLETIN

Vol.20 No.1
2020

2020

Congratulations

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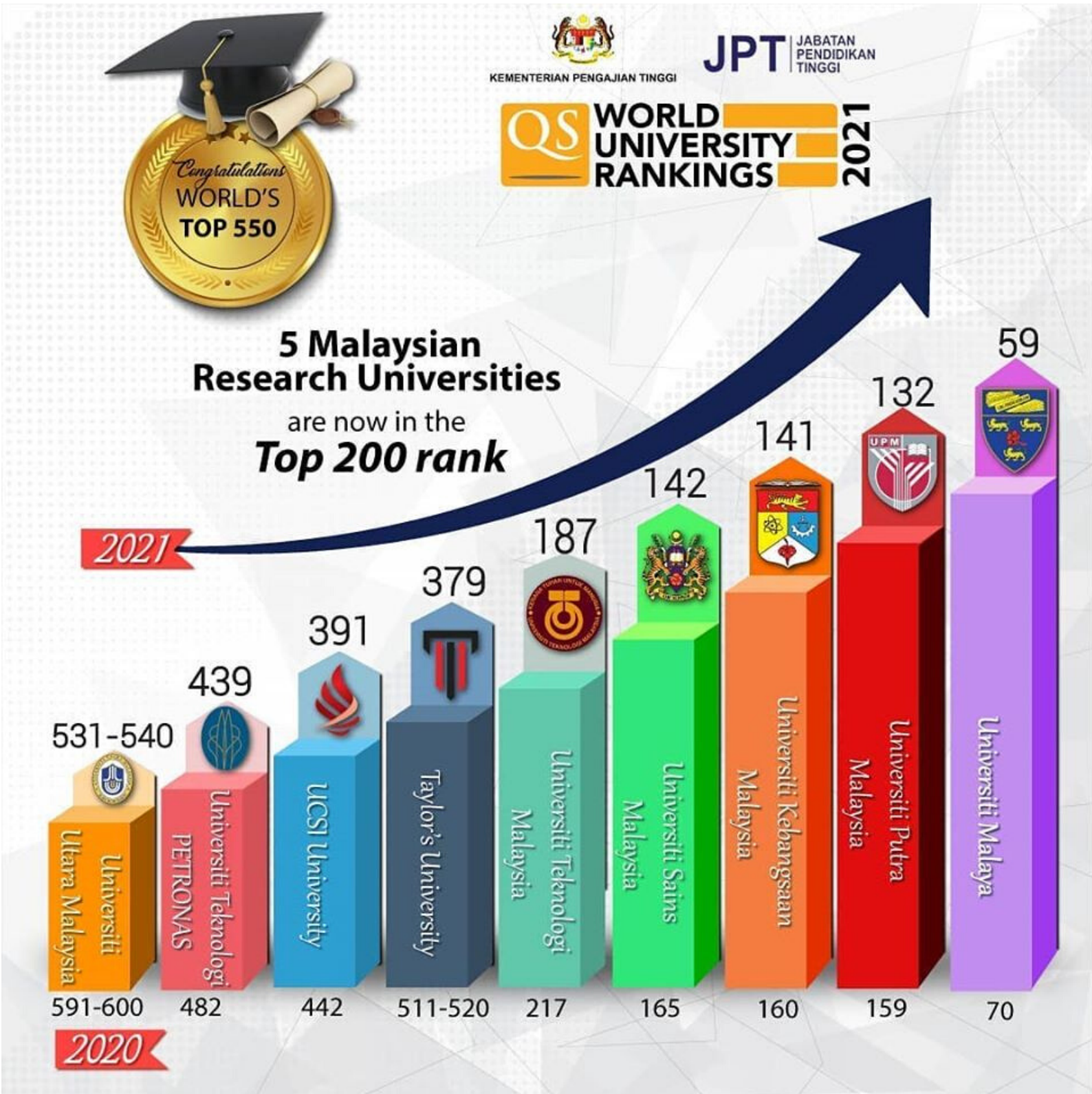
WE CONTINUE TO RISE EVEN HIGHER



PREFACE

The recent Quacquarelli Symonds World Rankings (QS-WUR) 2021 put UM at the 59th position amongst the Top 100 Universities. This is our highest achievement since the rankings began in 2004. Thank you to everyone involved, directly and indirectly to enable UM to reach this stage.

Being at number 59 is a recognition for UM as a high-calibre research and educational institution. UM's community has always strived for excellence and by bench-marking with the outstanding universities worldwide, UM hopes to lift the quality of Malaysian higher education to be amongst the world's best education providers.

This, again, certainly is not an easy task, considering the economic/funding constraints and the global challenges we face over the time. In particular, the CoVID-19 pandemic has resulted in crippling many economies worldwide. Being amongst the top universities in the world and the best in Malaysia, UM has the responsibility to contribute and help rebuild the nation to where we were, if not to a better place. This is by no means a small feat and I am sure our researchers are ever willing to contribute in many ways, pushing their research output to impact the societies in Malaysia, in particular and the world, in general.

Professor Dr. Noorsaadah Abd Rahman
Deputy Vice-Chancellor (Research & Innovation)

UM Research Bulletin Vol. 20 No. 1 Issue of 2020 showcases selected projects that have potential to be translated from academic research into practical solutions to benefit industry, government, and society. One of the articles as featured in the current issue is on research that makes a difference to COVID-19 Monitoring: The CoSMoS Project. CoSMoS (Covid Symptom Monitoring System) is an automated COVID-19 symptom monitoring system developed by a team of UM researchers to help healthcare providers to monitor patients with suspected COVID-19 infection at home. This is an excellent example of applied research with direct societal impact where a technical solution is developed and implemented successfully in the real-world clinical practice to benefit a wider population.

Congratulations and thank you to the whole UM community for our latest best achievement on being ranked No. 59 in the 2021 QS World University Rankings. We wish everyone continued productivity in the new normal and we look forward to greater achievements in the future. On managing research output and outcome, we are focusing more on measuring research impact and establishing a platform for research data repository to align with the global movement on open science. You will be hearing more from us as we advance further in these areas.

Best wishes for the remaining half of 2020, keep well and stay safe!

Professor Dr. Shaliza Ibrahim CEng FIChemE
Associate Vice-Chancellor (Research and Innovation)

EDITORIAL MESSAGE

Dear readers,

It is our pleasure to present the latest publication of UMR Bulletin (Volume 20, No. 1). Our goals are to create a platform for information exchange on all aspects related to research, covering the science and non-science research projects, as well as to encourage the dissemination of these knowledge to a broader audience. To achieve these, we strive to keep you updated on the current and continuous breakthroughs/contributions made by UM researchers, by giving you inside stories on their development and directions, plus introducing and highlighting our researchers and experts in each article.

Thus, we welcome you to submit original research write-ups with related images/photos of studies run by UM researchers. We hope that UMR Bulletin develops into a respected publication that is able to link external partners with our experts for any kinds of service or collaboration, that will ultimately enable us to transform our research into public consumption.

Our success entirely depends on your response. Thank you for providing us your continuous feedback and support.

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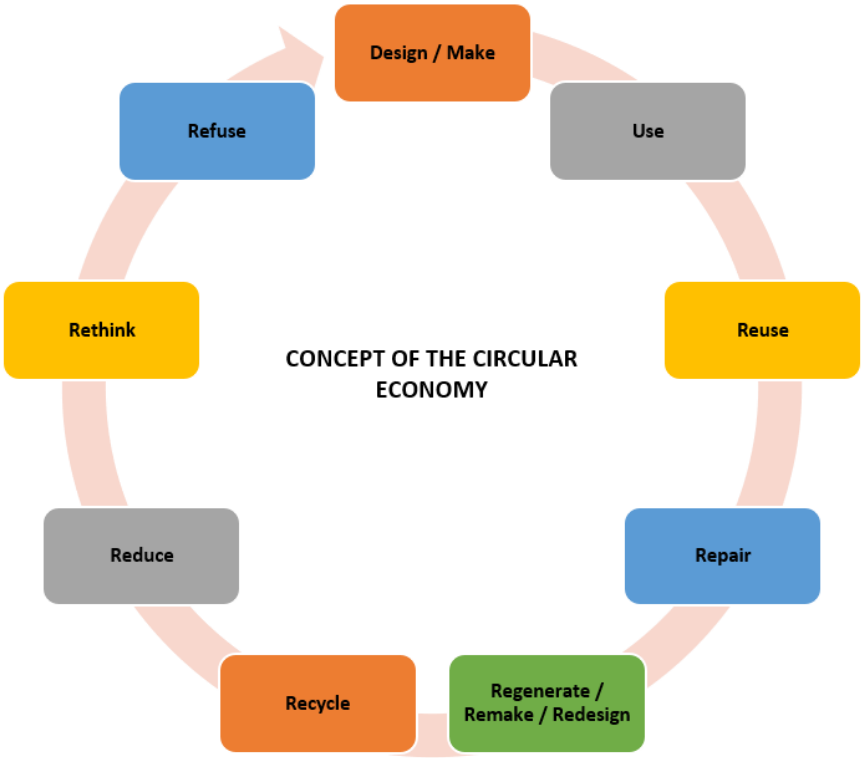
CIRCULAR ECONOMY IN FISHING COMMUNITY: A MISSED OPPORTUNITY!



The circular economy is an emerging economic strategy and is seen as the novel pathway to sustainable development. It is an alternative to the traditional economy, which is more sustainable. In a circular economy, all processes of any production revolve in a circle. Waste from one process is an input to another process. In a simple definition, a circular economy promotes zero waste. The practice of the circular economy is generally seen in the application of 3R principles: Reduce, Reuse and Recycle.

The concept of the circular economy was initially proposed by scholars in China in 1998 as a strategy to address the shortage of raw materials and energy. It is later seen as a potential strategy to overcome existing environmental problems. The circular economy focuses on positive society-wide benefits. It revolves on three main principles: designs out waste and pollution; keeps products and materials in use; and, regenerates natural systems. Thus, the application of the circular economy principles has gone beyond the environmental issues to include society and the economy; the three main pillars of sustainable development.

Awareness of Circular economy application

Awareness of the circular economy application is quite poor. Its use is unknown to many. Furthermore, education on circular economy is not widely known and practised. Only the 3R principles were known to the many. However, in the circular economy concept, the practice towards sustainable developments goes beyond the 3R principles. It includes Refuse, Rethink, Refurbish, Regenerate and Repair. Therefore, the concept of circular economy application should be widely known to everyone. This knowledge will then encourage people to think wisely before making decisions in their daily activities.

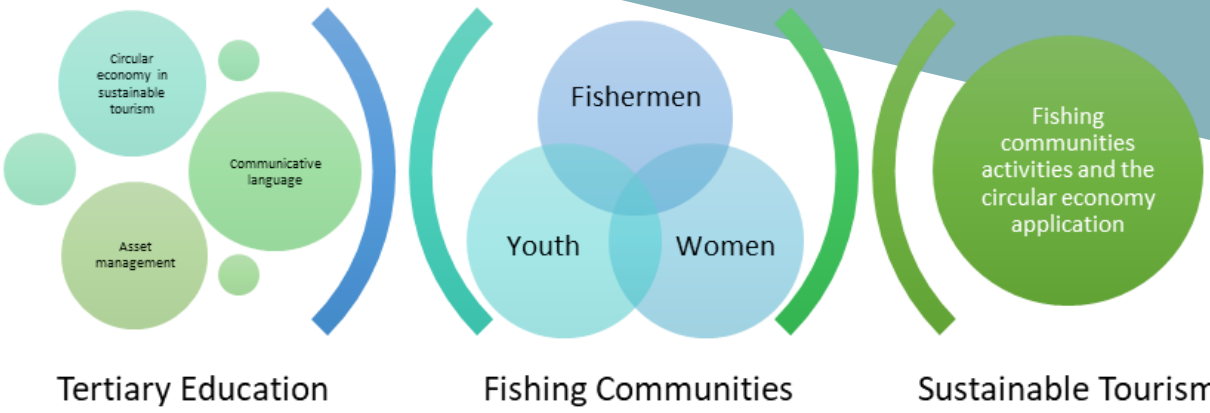


Fig. 1: Project framework

Circular Economy Application in the Fishing Community

The fishing community is highly associated with poverty in Malaysia and globally. Failure of government initiatives in addressing this issue is worrying since these communities need to sustain their activities to ensure food security to the whole nation. Empowering these communities is not an easy task. However, it is believed that education of tertiary skills can empower them. Thus, a team of researchers in the IIRG program (IIRG007/19-SAH) aims to provide education to the fishing communities on the circular economy, communicative language, and asset management in collaboration with the Persatuan Nelayan Kawasan Kota Bharu. These skills will allow them to offer their knowledge on fishing and local cultural heritage in sustainable tourism (Figure 1).

This project is currently ongoing and will end in May 2022. The site chosen for this project is Kampung Pulau Gajah, Kota Bharu, Kelantan. The outcome of this project will be revealed once the project ends. The fishing communities look forward to the project to be implemented.

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DRIVING CHANGE IN PUBLIC HEALTH – INSIGHT FROM THE PEACE UM PROJECT

Malaysia is greying, no doubt. As life span prolongs and fertility drops, our elders are rapidly increasing – a great achievement of public health. But there is one problem: we are not loving them enough. The PEACE UM project, acronym for Prevent Elder Abuse and negleCt initiativE, aims to address the phenomenon of abuse in late life. Our findings showed that the overall lifetime prevalence of EAN (abuse episodes ever experienced from the age 60) was 8.1% with 4.8%, 3.4%, 1.2%, 0.3% and 1.1% for financial abuse, psychological abuse, physical abuse, sexual abuse, and neglect, respectively. Our findings also revealed that various adverse health impacts such as poor sleep quality, depressive symptoms, and premature mortality are higher among those who have had experience of EAN.

The PEACE UM project has conducted several community engagement programmes involving the healthcare providers - doctors and nurses. While the other two domains of family violence – child abuse and intimate partner violence (IPV) – have received attention by healthcare professionals, EAN is still lagging behind. Healthcare providers are most often the first people who encounter EAN victims. Victims may come to the health facility due to complaints which are direct outcomes of abuse, or those unrelated. At times, they may want to seek attention because of the loneliness and emotional neglect they were suffering from, or they may be brought in by family members in acute health conditions – a result of exacerbating illness – which implies that the individual may have been neglected.

For healthcare providers, we highlight three points that revolve around EAN and its incorporation into clinical practice – detecting EAN, managing EAN and ethical dilemma surrounding EAN. Detecting EANis not an easy task, as most victims are likely to hide their abuse experiences out of fear or shame. While physical abuse victims may present with obvious bodily marks, the more common subtypes of EAN are psychological and financial abuse. Health consequences of EAN therefore can be very subtle – the victim may appear depressed and anxious, fearful and withdrawn, or complain of sleeping disturbances. Understanding the risk factors for EAN is helpful in guiding a healthcare provider to target the right individuals for prevention and intervention of maltreatment. To date, there are no standard guidelines as to how to manage EAN victims in Malaysia. Together with the Malaysian Society of Geriatric Medicine, PEACE UM developed a position statement to inform clinical practice on EAN issues https://sites.google.com/a/ummc.edu.my/msgm/position-statements. On ethical dilemma - owing to its sensitive nature, screening for EAN (by asking a set of questions) has to be conducted carefully. A healthcare provider should consider the following issues while trying to obtain information from a potential victim: privacy (the clinic setting, presence of family members), confidentiality (secrecy of information), and respect for the elder's autonomy and self-determination. Elders (with the exception of cognitively impaired individuals) are considered adults with full rights to make independent decisions. If a victim refuses any forms of intervention, his decision is to be respected. Nevertheless, as a person's safety is of utmost importance, so the healthcare provider can always offer him information on where and how to seek help when necessary. While it is true that resource and financial constraint may not allow us to indefinitely solve EAN, making healthcare practitioners more well-versed in EAN and its

incorporation into healthcare practice are two big steps forward.

As part of our commitment to combating EAN and joining hands with the international community, the PEACE UM team and Violence Intervention Committee (VIC) of University of Malaya and The Star Media Group have organized two Elder Abuse Awareness Week - 2016 and 2018 at the University Malaya Medical Centre (UMMC) Concourse area, with the theme 'Remember Me' (https://spm.um.edu.my/2018/06/30/elder-abuse-awareness-week-2018-at-um-was-held-during-25-29-june/). WEAAD represents a special day in a year when the whole world shows its solidarity in opposing the abuse and suffering inflicted to some of our older generations. This program aimed at raising awareness on EAN among Malaysian society, encouraging community members to value and appreciate older adults, and bridging the gap between the younger and older generations.

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NANOCELLULOSE FOR THE ELECTROCHEMICAL SENSING OF ANALYTES

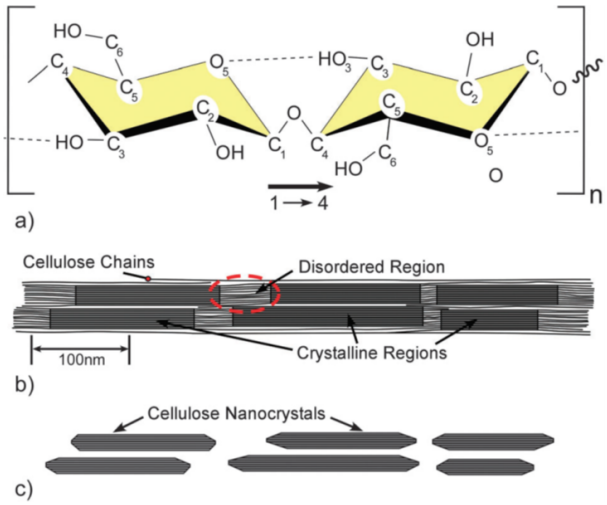

Fig. 1: (a) Cellulose repeating unit, with 1-4 linkage and hydrogen bonding in dotted line, (b) cellulose microfibril with crystalline and amorphous regions, and (c) disordered regions in cellulose nanocrystals dissolved after acid hydrolysis.

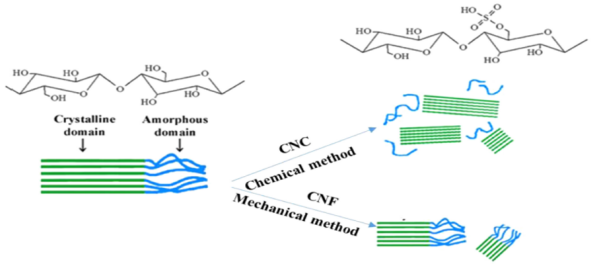

Fig. 2: Cellulose nanocrystals and cellulose nanofibers.

Cellulose is a naturally occurring biopolymer with a general formula $(C_6H_{10}O_5)_n$, is a linear chain polysaccharide with a number of β (1,4) connected with the D-glucose units. The cell walls of plants, several types of oomycetes and algae consists of cellulose. Cellulose can be also produced from a certain species of bacteria which form biofilms. Cellulose is the most abundant natural polymer on earth, where the cellulose component of cotton fiber is 90%, dried hemp is 57% and wood is 40-50%.

There are several type lignocellulose biomass pretreatment techniques that are presently available with the variation in the treatment time, pH, catalysts and temperature. These differences during biomass degradation is affected by the technique of the pretreatment and the composition. The few types of pretreatment techniques are follows: (i) biological; (ii) multiple or combinatorial pretreatments of physical and chemical techniques (steam pretreatment/auto-hydrolysis, hydro-thermolysis, and wet oxidation); (iii) physical (milling and grinding) and (iv.) chemical (alkali, dilute acid, oxidizing agents and organic solvents). Chemical pretreatment is still the most cost-effective and efficient method for biomass precursors with mild conditions.

Cellulose is a semi-crystalline poly-carbohydrate which consists of repeating anhydrous glucose units (AGUs) linked by the β-1, 4-glycosidic bonds. Figure 1 shows two repeating AGUs with a "chair" conformation. Each unit of this kind contains three functional groups of hydroxyls: one primary and two secondary. Due to the equatorial position of the hydroxyls, the AGU could form internal hydrogen bonding between the hydrogen atom of the one-unit C-3 hydroxyl group and the ring oxygen atom of the adjacent units.

When the cellulose forms fibers, rods, particles and whiskers, all of which is at least 100 nm in dimension, they are also known as nanocellulose. Nanocellulose can be isolated by chemical and mechanical purification, as shown in Fig. 2. The mechanical methods such as grinding, milling and chipping for the isolation of nanocellulose from biomass are less effective in separating the crystalline

fraction from the amorphous fraction. The global market value of nanocellulose is expected to reach USD 1.3 billion by the year 2027.

Electrochemical sensing using nanocellulose

Sensors are devices which detect the presence of an analyte, whether qualitative or quantitative. The litmus paper is a semi-quantitative sensor for the detection of hydrogen ions (H+) as it shows the pH range of a solution through the color changes of the litmus paper. On the other hand, a pH meter is a quantitative sensor, as it provides a quantitative detection of hydrogen ions via the pH scale. Thus a qualitative sensor merely detects the presence of an analyte, while a quantitative sensor not only detect the presence but also provides an accurate amount of the analyte in the solution or medium. The human nose and human tongue are actually qualitative sensors, as they could detect the smell and taste of certain analytes in food and beverages. Thus there are few types of sensors which are based on the measurements light intensity (optical sensors) and chemical reaction (gas sensors), while electrochemical sensors are based on the measurements of potential (potentiometric), current (amperometric) and impedance (impedometric). The advantages of electrochemical sensors over other types of quantitative analytical techniques such as atomic emission spectroscopy (AES), Raman spectroscopy, chromatography, is the cost and simplicity of electrochemical methods of measurements which could be miniaturized for the on-site detection of the targeted analyte.

Cellulose and chitosan are naturally occurring biopolymers which are ionic conductors but are not electronic conductors. The ionic conductivity of nanocellulose varies with the degree of crystallinity of the material. The electronic conductivity of nanocellulose could be established by combining the material with other material with high electronic conductivity which binds with nanocellulose to form a composite. Thus certain types of electronic conducting material such as nanocarbons (graphene and carbon nanotubes) and electronically conducting polymers (such as polypyrole and polyaniline) have been combined with nanocellulose to form electronically conducting nanocomposites which could be used in different applications such as solar cells, batteries, supercapacitors, anti-corrosion coatings and electrochemical sensors. Nanocellulose which consists an abundance of hydroxyl (-OH) groups bind well with analytes with carboxyl (-COOH), hydroxyl (-OH) and amine (-NH2) functional groups through hydrogen bonding. With this chemical property, nanocellulose based composites could be used in electrochemical sensing of important biological analytes such as dopamine, ascorbic acid, serotonin, hydrogen peroxide and administered drugs such as paracetamol (acetaminophen) and diclofenac sodium in the human body. Our research group are currently focusing on nano-biopolymers such as nanocellulose for electrochemical applications such as electrochemical sensors. A hybrid nanocomposite of nanocellulose/multi-walled carbon nanotubes (MWCNT) for the electrochemical sensing of diclofenac sodium was reported with good sensitivity and selectivity even in real samples. The nanocellulose facilitates the binding of the analyte to the electrode modified with the nanocellulose/MWCNTs while the MWCNT enhances the electronic conductivity of the nanocomposite. The nanocellulose based sensor showed good selectivity and a low detection limit of 0.02 micro molar, which could detect diclofenac sodium in human urine samples.

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GOTTA CATCH 'EM ALL: PREDICTING THE CONTINUANCE INTENTION TO PLAY AUGMENTED REALITY POKÉMON GO

Pokémon Go monsters, Pokéstops and Pokégyms taken KL by storm
(Image credit: https://vulcanpost.com/584632/pokemon-go-hotspots-kl/)

The rapid innovation of mobile technology and app games has given millions of users' new ways to play mobile games. Pokémon Go (PG), an augmented reality game released by Niantic in 2016, became the most downloaded game app. PG's novel use of AR is considered a breakthrough in the gaming world. Despite its success, shortly after its launch in 2016, the growth of PG appeared to lose its momentum in the USA. However, in Malaysia, the popularity has grown again with the introduction of a new feature called Mewtwo, as well as the "Legendary Pokémon". The game remains popular and, according to Apptopia, it made $950m in 2016 with 752m downloads. It also remains the game with the most daily active users as compared with other mobile game apps, including Candy Crush. The interest in AR mobile games is bound to increase with the release of several other games, including Harry Potter and Jurassic World Alive games.

This research investigates the mechanism by which uses and gratification constructs predict the continuance intention to play the augmented reality game Pokémon Go, through multiple serial mediation technique, with enjoyment and flow as mediators. The research model integrates other motivational factors specific to Pokémon Go, namely, network externality and nostalgia; and investigates the process by which they influence continuance intention to play through players' inherent need-to-collect animated monsters and online community involvement, respectively.

This study revealed some of the interactions on the complex pathways or mechanisms through which these relationships occur, and it has meaningful implications for both practitioners and researchers regarding the factors that are most likely to affect the behavioural intention of PG players.

The findings of our study indicated that players seek different types of gratifications in order to enhance their gaming experience. It was found that enjoyment is an important factor in predicting players' motivation to intention to continue playing PG. PG received enormous mass media coverage and public awareness of the game increased tremendously. Besides the news coverage, the energy and excitement of players congregating in various spots around Kuala Lumpur and other big cities in Malaysia was quite infectious.

One of the interesting findings of our study was that online community involvement was vital. In order to be commercially viable, game developers need to ensure that players remain engaged and continue playing the game. A deeper involvement in the online community would result in higher intentions to continue playing. Game developers need to keep this in mind while developing AR games and ensure support for the game community where the members can connect and forge relationships. They can enhance players' enjoyment by ensuring the presence of elements such as achievement, challenge and, more significantly, social interaction, to prolong player usage. The developers should also regularly inject new elements that will elicit players' curiosity and ultimately keep them playing the game.

The nostalgic influence of Pokémon as a childhood game was one of the key reasons that so many people started playing the game immediately after it became available. However, while nostalgic attachments might play an important role at an early stage in attracting players to the game, it might not be enough for them to remain engaged with the game for a long time. Thus, the sentiment of nostalgia needs to be coupled with other gaming factors, such as regular updates that encourage the players to keep playing, that would also enhance player behaviour, and in turn would drive loyalty to the game.

Game providers could also use social media advertising to build a wider user base, create content to engage players and spur word-of-mouth, and receive feedback and suggestions that would help them to further improve their products.

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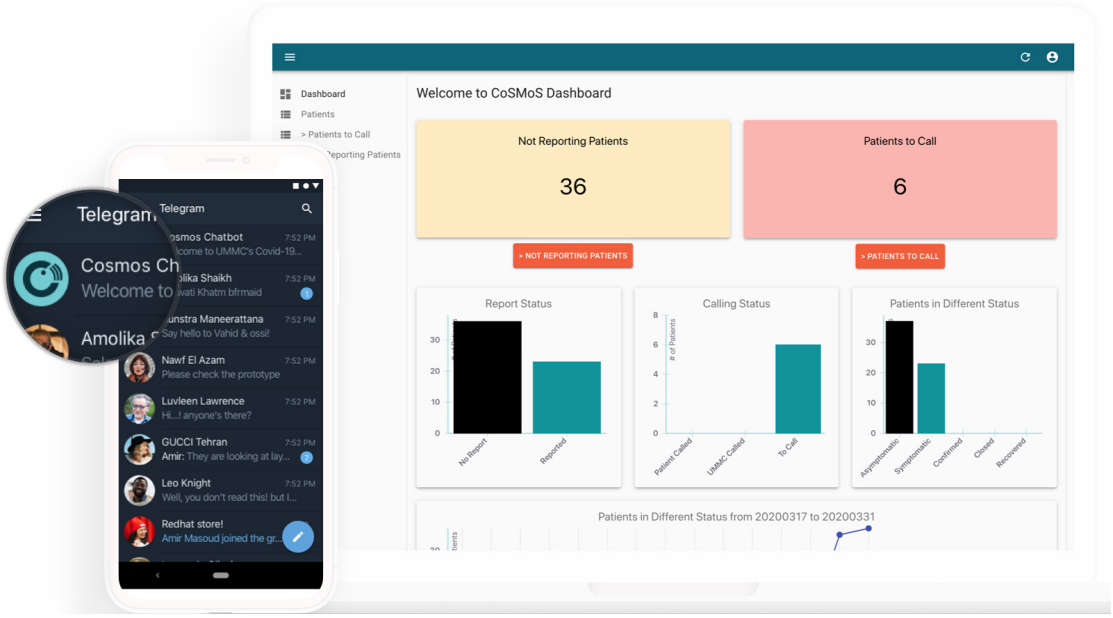
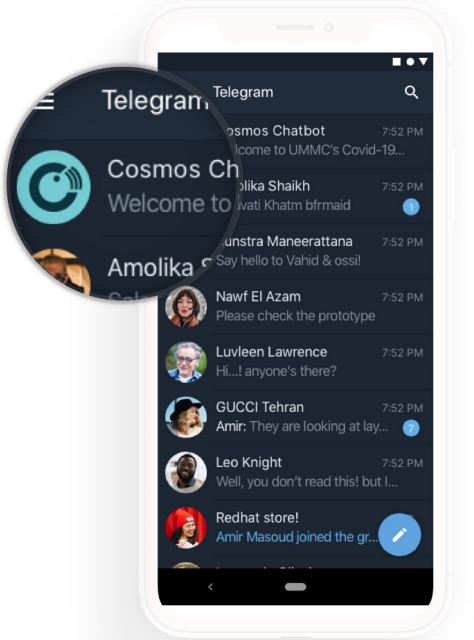
RESEARCH THAT MAKES A DIFFERENCE TO COVID-19 MONITORING: THE COSMOS PROJECT



When Covid-19 virus hit Malaysia, healthcare front liners were overwhelmed and struggled to screen, diagnose and treat Covid-19 positive patients; but this was only the tip of the iceberg. For each patient that was positive with Covid-19 infection, there were many more contacts that needed to be monitored at home. This posed a huge challenge to the healthcare providers who had to call every single patient at home on a daily basis for 14 days to assess their symptoms so that Covid-19 infection can be diagnosed early. This resulted in a crisis – there was a shortage of healthcare providers and the number of patients to be monitored kept increasing. An effective solution was urgently needed to tackle this!

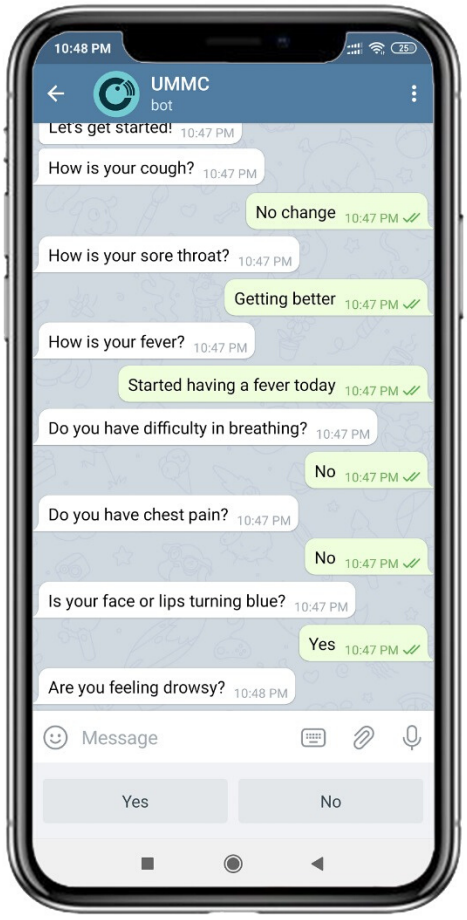
In mid-March, after the second wave of positive cases, a team of researchers from the UM eHealth Initiative (https://ehealth.dicc.um.edu.my), recognizing the potential of using technology to stop this crisis, convened urgently to develop an automated Covid-19 symptom monitoring system to help healthcare providers to monitor patients with suspected Covid-19 infection at home – the system is called the CoSMoS (**Co**vid **S**ymptom **Mo**nitoring **S**ystem: https://cosmos.care). The team, comprising clinicians, computer scientists and legal experts from the Faculties of Medicine, Computer Science and Information Technology, and Law, met via Zoom to brainstorm ideas and subsequently decided to develop the CoSMoS system using an agile 'scrum and sprint' approach. To achieve this, the system required a team of technical experts to develop a user-friendly Telegram chat-bot for patients to report their symptoms and a fit-for-purpose medical dashboard for doctors to monitor patients remotely. A group of undergraduate students and ex-students from the Faculty of Computer Science and Information Technology responded to the call and volunteered to help in developing the

system. They came from Malaysia, Singapore, China and Australia who worked tirelessly with the clinicians, meeting regularly over weekends and staying up late till midnight, to create the first prototype within 8 days.



Funded by the UM Health and Well-Being Research Cluster, the team successfully pushed the CoSMoS into production within the next 2 weeks after multiple rounds of rigorous testing, and obtained ethical approval from the UMMC Medical Research Ethics Committee within a week. Since then, the CoSMoS has been implemented at the Primary Care Clinic and, later, Emergency Department in the University of Malaya Medical Centre. As part of the evaluation, the research team interviewed the patients and doctors to gather feedback on their experience in using CoSMoS. For the patients, despite their unfamiliarity with the Telegram app, they found the chat bot user-friendly and helpful especially in reminding them daily to report their symptoms. For the doctors, CoSMoS allowed them to monitor the patient in real time via the dashboard; this helped them to reduce the monitoring burden and target patients who really needed to be called (for example, those whose symptoms have deteriorated).

Moving forward, the Petaling Health District Office at Ministry of Health, where the patient load is in the thousands, has decided to join the CoSMoS project. The CoSMoS team helped the Health District Office to develop a system that was tailored to their needs. This is an excellent example of how a technical solution developed as a research project has been implemented successfully in the real-world clinical practice to benefit a wider population. The impact is huge; the CoSMoS solution not only improved patient care and safety, it also made healthcare delivery more cost- and time-effective. This is a testimony to how University of Malaya researchers, clinicians and students from different disciplines, across seniority, work together beyond borders towards a common goal of helping the country tackle a health crisis.



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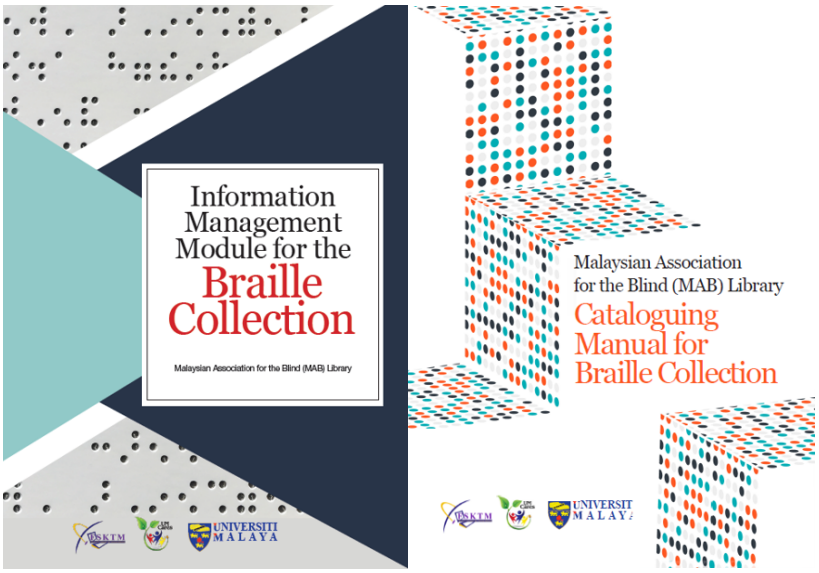
INFORMATION MANAGEMENT FOR BRAILLE COLLECTION: COMMUNITY ENGAGEMENT WITH MALAYSIAN ASSOCIATION OF BLINDS LIBRARY



Malaysian Association of Blinds (MAB), is a non-government organization and provides a special library service dedicated to serve blind and visually-impaired communities in Malaysia. Due to its non-government organization status that runs on a limited budget, the Braille collection was built based on book donation from various organizations of local and abroad, and via in-house Braille production, resulted to house of unwanted and irrelevant collections. Therefore, a proper information management workflow is necessary for the library to help them in managing their Braille collection more systematically and effectively.

The main purpose of this community engagement project is to ensure braille collection in MAB library are well organised based on standard procedure to provide complete and accurate records and access to library staff and users.

The output of the study is an Information Management Module for Braille Collection that serves as guide to library staff and volunteers in cataloguing and classification processes in order to ensure; ii) the quality of the Braille material bibliographic record is controlled in accordance to the standard set; iii) the cataloguing and classification process is following the international standards such as Library of Congress standard; iv) the bibliographic record of the Braille material is complete and accurate; and v) all available materials are accessible to users.

This community engagement project was conducted under UMCARES research grant.

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HALAL RESEARCH IN NANOCAT

Food adulteration is a major concern globally because it is directly involved with consumers' health, lifestyle, religion and economic issues. Protecting the sanctity of halal branded food products has become a global issue because of the rapid expansion of halal food markets in all corners of the world. About 1.9 billion Muslims around the world are consuming Halal food while at the same time people from various races and religions are seeking for clean and pure food. The Halal food market has exploded in the past decade, and is now valued at an estimated $667 billion annually, currently worth 16% of the entire global food industry. The projected growth of Halal product market is expected to increase to over 58.3 billion U.S. dollars by 2022 from 45.3 billion in 2016. The Global market for certified Halal food and products has a huge potential for further expansion as the Halal products are receiving worldwide recognition as a scale for food safety and quality assurance. In order to assure the integrity of Halal food, there is an increasing demand for reliable and sensitive techniques. Nanotechnology & Catalysis Research Centre (NANOCAT), University of Malaya continues to work relentlessly for developing Halal authentication tool to address this issue. In addition to detect pork species in food, we are detecting other non-Halal species as well as commonly consumed Halal species with high sensitivity and reliability. Our developed techniques offer species detection at extremely minute quantity (up to 0.1 ng level).

Until now, NANOCAT Halal research team have successfully developed various PCR based Halal authentication tools which can very effectively detect single and multiples species. Our research is also expanding with a view to developing low cost and portable DNA biosensor-based detection technique for Halal authentication.

Our developed methods include:

1. Single species detection system (Simplex PCR assay): single species can be detected in a single assay.
2. Multiple species detection system (multiplex PCR assay): multiple species can be detected simultaneously in a single assay platform.

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CANCER SURVIVORSHIP MODEL FROM THE LENS OF OCCUPATIONAL SCIENCE - A TRANSLATIONAL THEORETICAL RESEARCH OUTCOME

In the research field of occupational science, 'occupation' is the essential linkage to health, wellness and life after cancer. Enabling occupational participation is the focus of occupational therapists, the rehabilitation specialists with the goal on improving functional independence and quality of life. Post treatment cancer survivors are a rising group of a form of chronic disease –and the posttreatment phase is characterised by a state of "being ***not ill but may not be fully healthy***" either. The essence of an occupational perspective for cancer survivorship is that it is a holistic and pragmatic approach to better care. It considers the subjective experience of individual's previous, current, preferred occupations and its context, their subjective experience of autonomy and self-determination, as well as the complex interrelationships between engaging in these occupations within one's own environment for reassuming healthy living after cancer. 'Occupations' are the individual's activities of daily living undertaken in their environment, while occupational balance is the beneficial target towards health and well-being, with balance defined in terms of the meaningful time spent in self-care, productivity and leisure. For cancer survivors, their readjusted interests, priority and lifestyle habits may exert an influential drive towards self-managing daily live activities to reduce risk. There is a dire need for more occupational research to explore the importance of occupational participation for people living with cancer, as well as gather evidence for a direct, cost-effective, therapy service with a discipline specific framework to guide the proposed care.

Re-connection to life's new norms
A MODEL TO ADDRESS THE GAP

Cancer survivors' meaningful occupational participation needs to be embedded, and carefully defined in the long-term care model. People diagnosed with cancer spend significant time undergoing treatment where there are often major disruptions in their everyday life. Disrupted occupational engagement caused by the loss of bodily part and/or functions, the loss of social roles, lowers a survivor's capacity to engage in basic daily activities.

Loh and Jonsson (2016) conceptualised the Occupational Model for Cancer Survivorship (MOPCS) which incorporated the IOM's (2006) four components of survivorship care, are illustrated under their underlying occupational concept of 'health after cancer' (Figure 1). In this model, a vertical theme runs across the

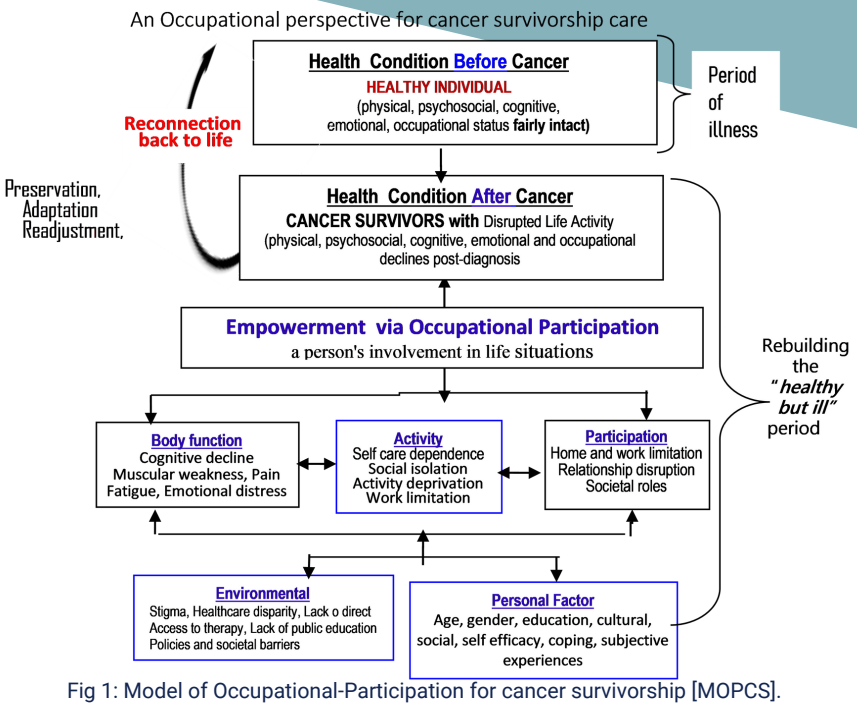

Fig 1: Model of Occupational-Participation for cancer survivorship [MOPCS].

four IOM components, ie the unique 'occupational participation' theme, the essential core element of 'occupation' as the basis to human performance. Loh &Jonsson 's MOPCS Model (2016) addresses the gap in the ICF general framework to emphasise the work that needs to be done through a partnership care approach with cancer survivors. The 'personal' factors (e.g., attributes such as self-efficacy needs intervention to build up) and environmental factors that influence positive adaptation after cancer (needs to be assess and modified where needed), are integrated in their framework to encapsulates the occupational perspective within the ICF basic framework. The resultant model, ie an occupational model of care for cancer survivorship (OMCS, Figure 1), ensure better engagement of occupational participation, and better 'health-after-cancer' status. Clinicians and researchers in the field of occupational science can use this model to inform their direct interdisciplinary interventions with key health providers in occupational survivorship practices. The MOPCS model is a framework to highlight the essential concept of occupational participation, and inform the research conducted by occupational therapists / scientists, providing a direction to therapists, oncology collaborators and health care providers such as the oncologists, primary care physicians, physical therapists, psychologists and counsellors.

Summary

As a chronic disease, the after-effects of many cancer sites can be extensive, and tremendously varied from one person to another. Therapeutic health implications are beyond merely treating the illness, with a need to enable empowerment of patient self-management and self-care. The need to integrate the unique non-medical psychosocial and occupational needs of cancer survivors calls for direct occupational therapy to proactively assess and manage these issues in partnership with an informed patient. An occupational perspective allows therapy professionals to better manage a cancer condition that can lasts for years or decades. Having an occupational model like the MOPCS (Loh & Jonsson, 2018) provides a conceptual guide to direct related occupational research and occupational clinical practices.

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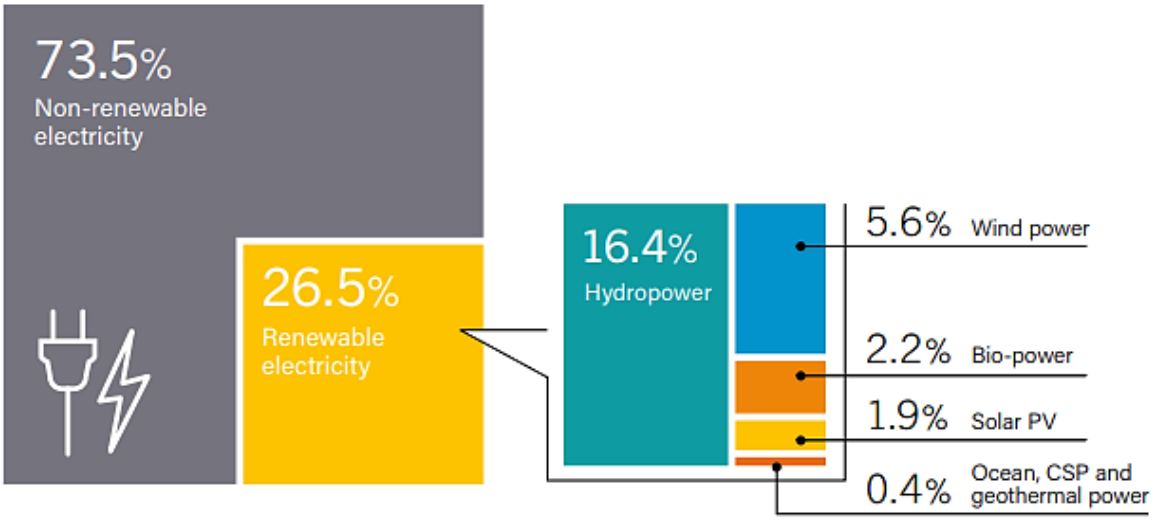
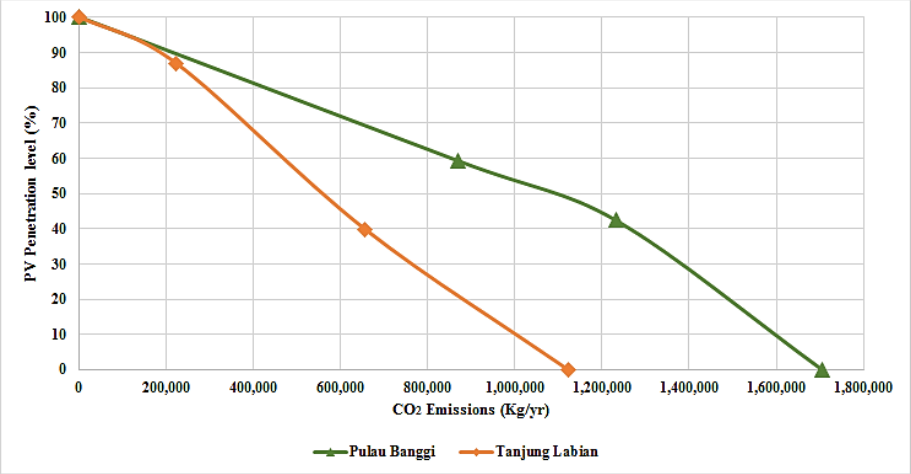
PERFORMANCE EVALUATION OF STAND-ALONE PV-WIND-DIESEL-BATTERY HYBRID SYSTEMS FOR REMOTE AREAS OF MALAYSIA



Global electricity generation mix in the end of 2017 [Source: Renewables 2018 global status report]

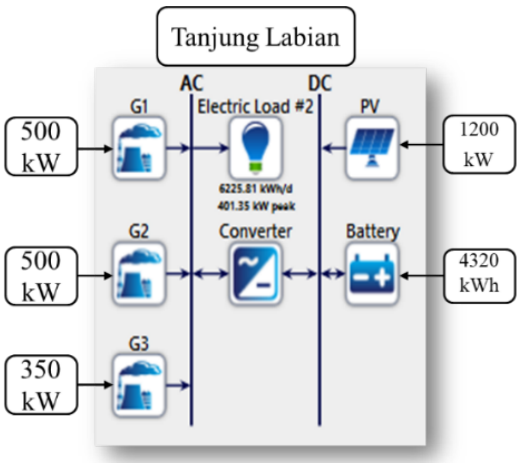
Renewable global status report shows renewable energy sources contribute 26.5% of global electricity, whereas, the remaining 73.5% comes from fossil fuels and nuclear power plant (Renewables Global Status Report, 2018). According to this report, about 1.1 billion of the world population do not have access to the electricity. Besides, Malaysia has lot of remote areas and islands that are located away from the main grid and, surrounded by rugged terrains and dense jungles. Grid extension through these remote locations is not considered feasible or economical at present due to high construction cost of the transmission line. Stand-alone diesel generators are commonly used to provide electricity for these areas. In addition, the tourist sectors in the islands of Malaysia also completely depend on diesel generators for 24 h power supply. But, the volatile market price of diesel fuel, CO2 emission and high operation and maintenance cost of diesel plant makes the system environmentally risky and costly. In addition, the diesel price is almost double in the remote areas and islands than on the mainland.

Malaysia has a good potential of solar energy, due to the abundance of solar radiation. Based on this, solar energy has always been considered as a sensible approach to sustainable green energy in Malaysia. Malaysia aims to attain 2000 MW of renewable energy (RE) production by 2020. The Malaysian Government is endorsing RE usage, especially in power generation throughout its comprehensive policies and wide social support. Meanwhile, according to National Energy Balance 2017 report published Energy Commission of Malaysia, oil and natural gas are the most used sources for generating electrical energy with 87.4% from the total production. On the other hand, renewable energy penetrates only 9.4% from the total production, despite the high availability of renewable energy resources in Malaysia. Whereas, hydropower shares 8.7% versus all other renewable energy sources.



PV penetration level VS CO2emissions [Halabi et al., 2017)

Currently, total replacement of conventional diesel generators by RE sources in rural/remote communities is unfeasible due to unstable nature of RE resources. Renewable and conventional hybrid energy systems could be a suitable solution to provide the best in each system. However, in designing hybrid RE system several factors such as social, institutional, and technical need to be consider in order to obtain the desired results otherwise, the system would be unreliable and inefficient. Many studies have been conducted in the field of RE to find the optimal deign, examine the potential or investigate the techno-economic feasibility based on different factors and comparison analysis for typical hybrid systems. Generally, these studies have shown hybrid systems offering higher level of reliability as well as lower leveled cost of energy LCOE compared to single source energy. However, analyzing the operational behavior of hybrid systems once it is built and commissioned has not been taken into consideration in previous studies, despite the high importance associated with such practical evaluation. Therefore, our main of the research is to study and analyze the performance metrics of PV/Diesel/Battery hybrid system in many remote locations of Malaysia; Pulau Banggi Island, Tanjung Labian, and Pulau Tioman.



Existing hybrid system implemented in HOMER for Tanjung Labian

System evaluation is carried out based on technical, economic and environmental factors as well as modeling of all possible scenarios that contain different combinations. The results obtained showed that standalone diesel generator run hour reduced more than 50 % when hybrid PV/diesel/battery systems integrated in Pulau Banggi and Tanjung Labian. Decreasing the running hours of the generators could lead to minimizing the dependence on the larger generators, thereby reducing the wear/tear, and leading to overall efficiency improvement. It is also observed that increasing the energy produced by RE sources would result in reducing the harmful emissions generated by the system. This study is expected to be very useful in decision making in any area with similar conditions.

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APPLYING TEACHING AND LEARNING ACTIVITIES TO SUPPORT LIVING LAB RESEARCH ON THE UM GREEN BELT

Students from Faculty of Built Environment learning about the history of Tasik Varsiti before providing landscape design ideas for UM Green Belt

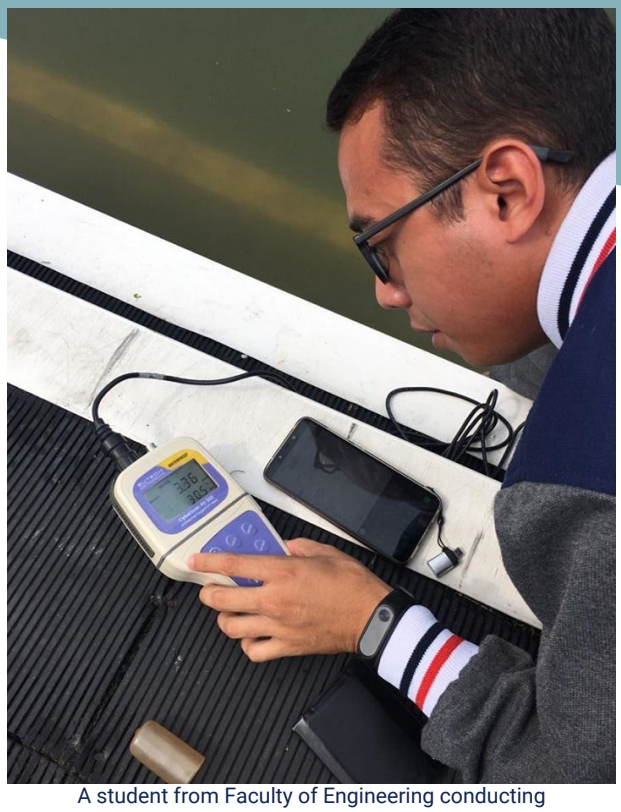
In the year 2015, Water Warriors (WW) embarked on the journey of being transformed from a grassroots movement to a 'campus sustainability living lab' - an action-oriented research entity to provide real-time sustainability solutions to the campus on integrated water management. One of our focused site is Tasik Varsiti, a man-made lake located at the heart of the University of Malaya (UM) campus. In the year 2018, the surrounding areas had undergone a small transformation whereby landscape plans had been made to convert part of the green space facing the UM Main Library to include a wetland pond and stream leading up to the lake. The project was completed in 2019, with the whole area now officially renamed as the UM Green Belt. Throughout the whole project, WW played a critical role as the lead research partner by providing ideas and develop solutions to the UM Department of Development and Estate Maintenance (JPPHB) as the process owner. One of the unique strategy adopted by the team is the creative combination of research with teaching and learning activities by the WW researchers.

Taking the opportunity from the landscape elements of the UM Green Belt project, a WW researcher from the Faculty of Built Environment, Associate Prof. Dr. Hazreena Hussein, has devised a creative design studio project for her courses on Landscape Fundamental (for undergraduates) and Landscape Architecture (for postgraduates). Students were given the task to improve the landscape design of UM Green Belt based on their understanding of not only the aesthetic and design principles, but also engineering knowledge in planning, designing and

A student from Faculty of Science organized a place-based interpretation session at UM Green Belt

management of both natural and built environment. Another WW researcher, Dr. Fathiah Mohamed Zuki who is an expert in Environmental Management from the Faculty of Engineering, had created pragmatic assignments for her students by conducting experiments at UM Green Belt which can provide insights on water quality of the area and ideas for risk assessment. She also conducted outdoor lectures for final year students under her Sustainability in Engineering course on how they can restore and improve UM Green Belt through sustainability engineering design principles. Additionally, Associate Prof. Dr. Zeeda Fatimah Mohamad, WW's principal investigator from the Faculty of Science had included watershed-related citizen science activities and a place-based interpretation master project as a part of her problem-based teaching and learning strategy. Insights gained from analyses and discussions conducted with the students during these activities have been invaluable in refining WW's interdisciplinary ideas in the management of water bodies in UM.

Overall, the WW's 'on-site' teaching and learning activities as described above has provided vital knowledge exchange for both students and researchers alike. This is especially useful due to WW's role as an advisor to JPPHB for UM Green Belt's management, development and maintenance - where fresh ideas from the campus community are essential.



A student from Faculty of Engineering conducting water quality monitoring at Tasik Varsiti

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Institute of Biological Sciences
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iv) Dr. Fathiah Mohamed Zuki
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CAPACITY BUILDING TO ENHANCE INTERDISCIPLINARY RESEARCH IN TUN MUSTAPHA PARK, SABAH

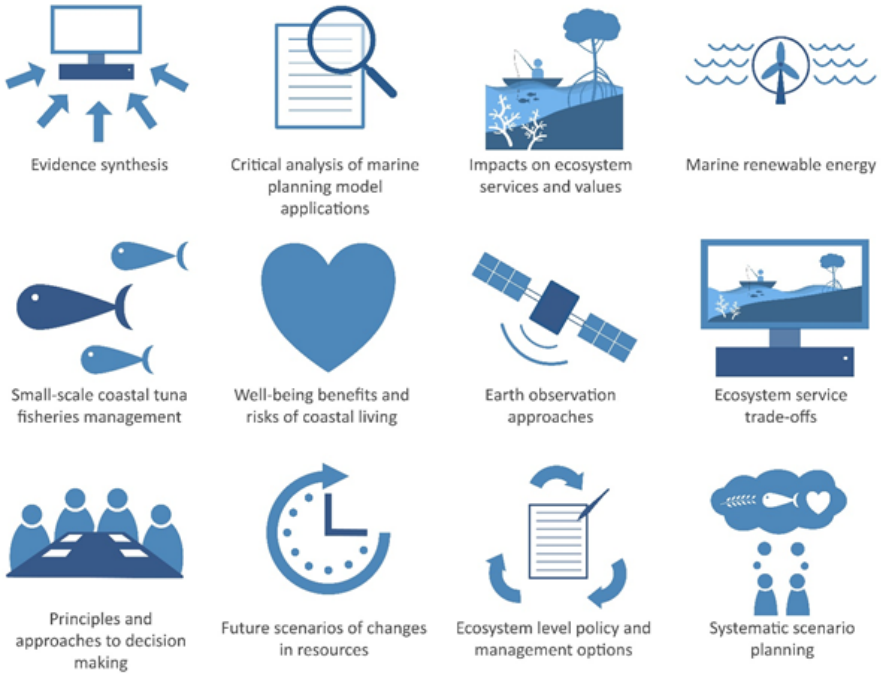

Figure 1: 12 integrated, interdisciplinary research projects aimed at building research capacity

The Blue Communities Programme is a 4-year research program that is awarded by the UKRI GCRF (United Kingdom Research and Innovations Global Challenges Research Fund) in 2017. The program is lead by the Plymouth Marine Laboratory (PML) and brings together highly interdisciplinary international researchers at different career stage from institutions in the UK (University of Exeter, University of Plymouth, Blue Ventures, North Devon Biosphere and International Pole and Line Foundation) and Southeast Asia (University of Malaya [UM], Western Philippines University, Hanoi National University of Education and Universitas Nasional). Specifically, in GCRF Blue Communities Malaysian case study (BC MY), the program is led by Dr Goh Hong Ching and Dr Amy Then Yee Hui and the team is made up of several co-researchers and from different faculties in UM.

Blue Communities aims to address the issues of coastal communities increasing dependency on the marine environment that is leading to the rapid depletion and deterioration of the marine resources. Such impact on the marine resources would undoubtedly affect the coastal communities' livelihood, health and wellbeing in the long run. As there are millions of people being dependent on the marine environment as a source of livelihood, sustainable use of marine resources and effective marine planning are needed to overcome these issues. Thus, Blue Communities is established in with the aim to develop interdisciplinary research capability and long-lasting international collaborations between academics and local stakeholders in order to facilitate the development, implementation and management of the marine environment in UNESCO Man and Biosphere Reserves and marine parks in South

East Asia. Blue Communities responds to the United Nations Sustainable Development Goals (SDGs) of no poverty, zero hunger and good health and wellbeing.

Within the Blue Communities programme, cross-cutting activities will be delivered through 12 integrated research projects in which BC MY is focusing on 10 of the projects (except marine renewable energy and small-scale coastal tuna fisheries management). The Malaysian case study site is Tun Mustapha Park, Sabah (TMP). As one of the largest and first marine parks to adopt a collaborative management concept in Malaysia, significant challenges are present such as the issues of poverty and different levels of coastal communities' dependency on the marine ecosystem. The Board of Trustees of the Sabah Parks (Sabah Parks in short) as the park authority of TMP has been engaged since the proposal planning stage of the program in 2016. The collaboration between Sabah Parks and UM had started back in 2005 and until this day. In February 2018, a Memorandum of Understanding (MoU) was signed between UM and Sabah Parks making UM the first local university that embarked onto such collaboration with Sabah Parks.

Capacity building and research activities have been carried out extensively within the Blue Communities programme and at the case study site. Blue Communities believe that constant engagement with stakeholders plays a key role in designing and implementing the planned activities. Training workshops occur both internally among the researchers and externally among stakeholders at the case study site. The training workshops involving case study partners and local stakeholders cover topics from marine governance to public health and wellbeing as well as sharing of tools and experiences with one another. BC MY had conducted programs with school students in TMP as well as local youths through community festivals and citizen science workshop. Multiple talk series sessions took place in UM with invited speakers sharing their expertise and experience. Research in TMP involved stakeholders at both community level and decision-making level. Stakeholder mappings, ecosystem mappings and household health surveys were among the research activities carried out in TMP across the districts of Kudat, Kota Marudu and Pitas. Blue Communities has entered its third year into the program and while the research is still on-going at all four case study sites, the teams are revising and adapting their capacity building and research activities to cope with the outbreak of COVID-19 throughout the world.

Blue Communities Website: https://www.blue-communities.org/Home
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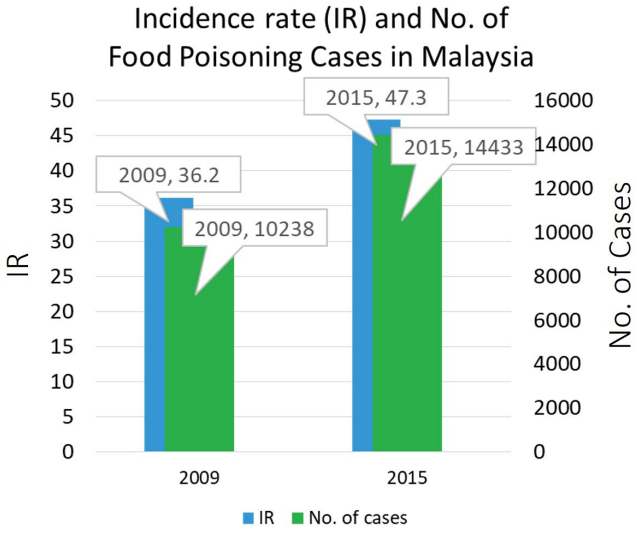
RAPID, POINT OF CARE SALMONELLA DETECTION DEVICE



Introduction

Although it's quite uncomfortable, food poisoning isn't unusual. According to the Department of Statistics Malaysia, the incidence rate of food poisoning in 2016 is 17,480 cases or 55.2 per 100,000 populations. Foodborne diseases like cholera, typhoid fever, hepatitis A, dysentery and food poisoning occur as the results of ingestion of foodstuffs contaminated with harmful microorganisms or chemicals. Salmonella Typhimurium, Salmonella Paratyphi and Salmonella Enteritidis are examples of harmful bacteria found in food.

To ensure food safety is maintained by food stalls, sampling and testing are carried out by municipal councils during routine inspections. Under the Food Act 1983 and Food Hygiene Regulations 2009, the local authorities are responsible to perform an inspection of food premises cleanliness and to monitor food safety. This also includes mobile infrastructure such as stalls, night market, Ramadhan Bazaar and hawker centres.

However, traditional methods to identify the presence of Salmonella bacteria (e.g. LAMP, Multiplex PCR, Quantitative PCR, NASBA, Immunological assays) are time-consuming and take as long as 10 days to provide the results. If the food was contaminated, many clients would have already consumed the contaminated food before the authorities can take action on the premises. Early, on-site point-of-care (POC) detection devices are critical in food safety insurance processes such as diagnosis and monitoring. Previous POC device development focused on medical diagnosis, but not food safety. However, the advancement of POC device research has facilitated growing interest in application towards foodborne pathogen detection.

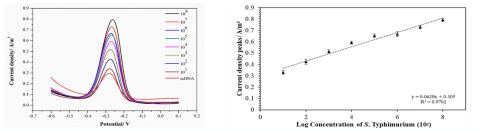


Figure 1. The Rapid Point-of-Care Foodborne Salmonella *Detection Device shows detection limit of 10 CFU ml^{-1} and 97% linearity in detecting* Salmonella *from 10^{1} to 10^{8} CFU mL^{-1} concentration*

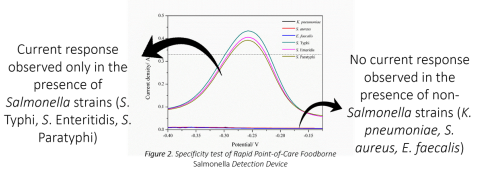


Figure 2. Specificity test of Rapid Point-of-Care Foodborne Salmonella Detection Device

Food sample

Measure 10g food sample

Blend food sample

Homogenate + peptone buffer solution

Mini centrifuge

Load sample onto carbon sensor strip

Current point-of-care device setup

The Innovation

Based on the research carried out at CIME, a point of care device to rapidly detect Salmonella bacteria in food samples has been developed with a limit of detection of 10 CFU mL-1. The sensor can detect Salmonella *Typhimurium, Salmonella Paratyphi* and *Salmonella Enteritidis*.

The device consists of an electrochemical sensor and an electronic readout. Electrochemical sensors detect changes in electrical signal due to electrochemical changes when the target analyte binds to the surface of the sensor. Conventionally, DNA and antibodies are used as the biorecognition element in electrochemical sensors. Although the electrochemical test is rapid, however, the process of DNA isolation and extraction takes 2-3 days.

Hence, the developed device overcomes the time barrier by using aptamers as the biorecognition element. Aptamers are synthetic DNA chains, not found in the natural environment. The DNA chains were designed and chosen based on the SELEX method. The aptamer binds to a surface protein specific to Salmonella, thereby eliminating the need for isolation and extraction processes. The proposed rapid test technology will only take approximately 20 minutes.

Impact

With rapid population growth and demographic shift toward ageing population, changing eating habits such as consumption of raw or lightly cooked food, long storage of such foods, lack of education on basic rules of hygienic food preparation and food trading without appropriate microbiological safety procedure become contributing factors for food-borne diseases.

A rapid, POC detection device will be able to deliver quick results to food providers and food safety authorities, ultimately ensuring the well-being of the consumer.

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