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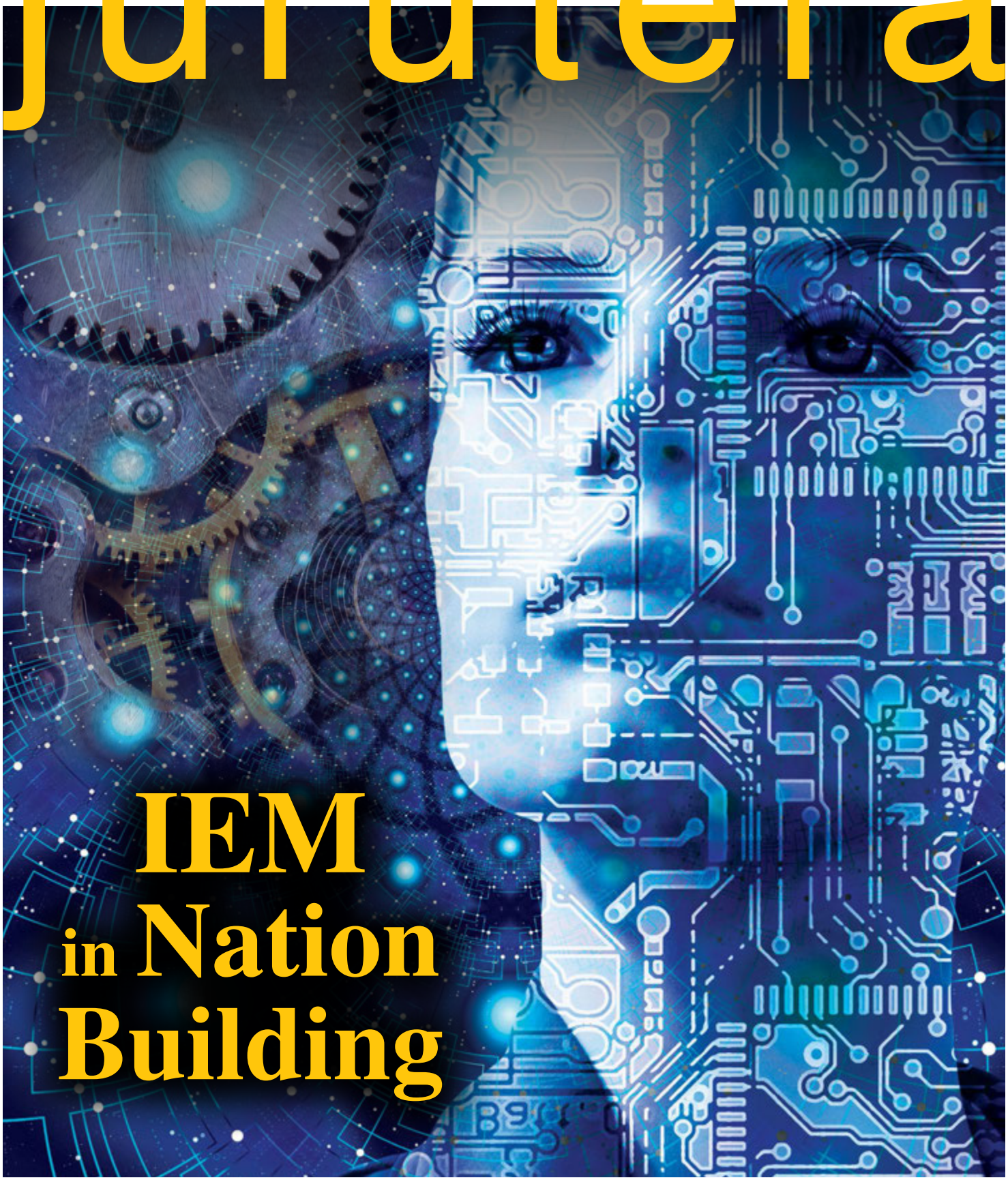

IEM in Nation Building

MAY 2020 THE MONTHLY BULLETIN OF THE INSTITUTION OF ENGINEERS, MALAYSIA

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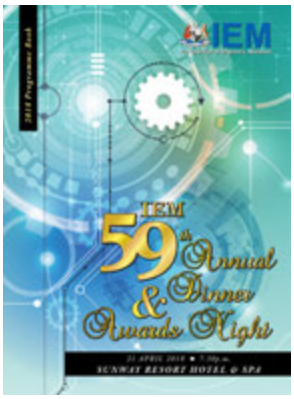

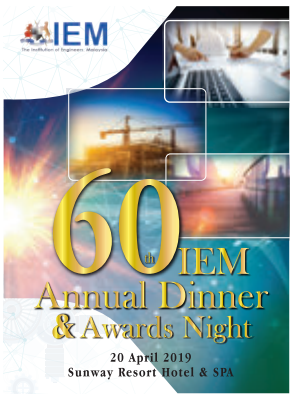

IEM *61st* Annual Dinner and Awards Night 2020 Programme Book

We are pleased to inform that IEM will be holding the 61st Annual Dinner and Awards Night 2020 on **26 September, 2020**. Dimension Publishing has been appointed to put together the Annual Dinner Programme Book which will be circulated to all **1,200 guests** on that night at **KL Convention Centre**.

It is an annual event organised by IEM to present awards to winners of projects and to announce the new committee for year 2020/2021. Special guests of honour will be invited to officiate at the event.

We are now calling for interested advertisers to book their preferred advertising position in this programme book. Below please find the advertising rates for your immediate action and reply. We hope to hear from you soon before the closing date on **28 August 2020**.

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EDITOR'S NOTE

by Ir. Dr Bhuvendhraa Rudrusamy
Bulletin Editor

ACHIEVEMENTS, CHALLENGES AND OPPORTUNITIES

The Covid-19 pandemic and the Movement Control Order have challenged us to work from home and I hope we are now better organised than we were at the beginning of the MCO.

We engineers should embrace these challenges, tapping on technology and scientific discoveries for applications and innovations that contribute to the betterment of our lives. Indeed, I am proud to be an engineer.

This month, *JURUTERA* reflects on IEM's achievements, looking back at our footprint in nation-building and allowing us to ponder over strategies that we can make in the future. To date, 34 eminent engineers have led IEM, which has more than 50,000 members representing all engineering sectors and upholding professionalism and practices.

The IEM strategic plan envisioned some key objectives to sustain its relevance and to enhance services to members. Adoption and use of modern technologies have quicken services such as self-financing, e-books, video-conferencing, new membership and/or transferring process which can now be done with ease, while online-based activities such as e-seminars etc. have yet to take place.

Continuous overarching and a detailed review of the IEM Constitution also keeps the institution relevant through changing times. Apart from annual subscription collections, activities such as conferences and annual dinners also provide additional income for IEM. Business activities and operations can be further looked into.

As IEM membership comprises largely of student and graduate members, YES participation will add new ideas to the institution, while addressing the needs for future nation builders.

IEM continues to effectively implement sustainable development strategies in realising key objectives and to go on to greater heights as a learned society in the country.

JURUTERA also shares some insights on IEM achievements in STEM as well as Women Engineers. I would like to thank the Standing Committee, Secretariat, authors and everyone for putting together this month's bulletin despite the many changes and challenges.

In this current situation where most of us are having to work in unfamiliar territory in addition to our busy schedules and family responsibilities, the continued support of all for the progress of our nation is much needed and appreciated.

I would like to take this opportunity too to wish all Muslim members Selamat Hari Raya Aidilfitri, a month of blessings, forgiveness and guidance. ■


VICE
PRESIDENT

IEM STRATEGIC PLAN: AN INSTITUTION IN A CHANGING ENVIRONMENT

Strategic planning. Institutions. Changing environment. These form the foundation for the sustainability of professional organisations such as The Institution of Engineers, Malaysia (IEM).

STRATEGIC PLAN: Why do we need a strategic plan? According to a 20th century management guru, Peter Drucker (*Management Tasks and Responsibilities,* 1973), "...having a strategic plan is not to eliminate risk but to take the right risks. It is an act of discovery, in which we must embrace the uncertainty of the environment, exploring it for opportunities".

We will see later that IEM's Strategic Plan 2012 is a road map that charts ways for meandering future uncertainties.

INSTITUTIONS: A co-recipient of the Nobel Memorial Prize in Economic Sciences (1993), Douglass North is an authority on institutions and their roles in shaping society. In Institutions (1991), he wrote that "institutions devised constraints that structure political, economic and social interactions". He added that constraints were formal rules and informal constraints.

Throughout history, institutions have been devised to create order and reduce uncertainty in exchange. In our case, IEM is an institution created with a purpose, where members are expected to conduct themselves in prescribed manner in order to achieve the institutional goals.

CHANGING ENVIRONMENT: Globalisation and rapid industrialisation allow greater connectivity between people in transactions. The real challenge is in staying afloat. Dorie Clark of Duke University (July 9, 2013, Forbs) argued that one needs to be careful about these four dimensions:

1. Understand your true business
2. Embrace technology
3. Understand macro trends and
4. Make emotional connections.

Later in this article, we will see that IEM's leadership has taken several steps to ensure its survival, sustainability and relevance in a changing operating environment.

IEM: THE INSTITUTION

IEM has grown by leaps and bounds, from a membership of only 60 more than six decades ago (it was formed in 1959), to over 50,000 today. This is a growth rate of about 10% per annum, making it one of the largest professional organisations in Malaysia.

Representing engineers in all sectors of the engineering industry, as well as serving the industry-relevant needs of engineering graduates

> "Scientists investigate that which already is; **Engineers** create that which has never been."
>
> Albert Einstein

and students, IEM has, over the years, been promoting professionalism among its members, which include those from the private, public and academic sectors.

IEM helps its members keep track of scientific and technological advancements in the engineering field by sharing and disseminating information as well as holding activities such as training programmes, talks, symposiums and conferences as well as publishing industry materials, papers and Terms of References. In addition, IEM continues to help members achieve professional qualifications and certifications.

Through the years, the 61-year-old institution had served well the needs and interests of its members in upholding the professionalism of the engineering profession by promoting sound practices that supported the socio-economic development objectives of the Government of Malaysia, while at the same time contributing towards nation-building and the well-being of the people.

Engineers have contributed substantially to the development of the country with their involvement in numerous infrastructural and building projects and ensuring that these conform to specifications that protect public safety while at the same time provide conveniences and comfort for society. The work of engineers cuts across all sectors of the country's economy and society.

Our engineers are capable of undertaking not only local projects of various complexities but also international jobs that have boosted the export of Malaysia's engineering services worldwide.

MOVERS & SHAKERS OF IEM

From the first President, the late Ir. Tan Sri Yusoff Haji Ibrahim, to current President Ir. David Lai Kong Phooi (2019/2020), a total of 34 eminent engineers have led the institution, steering it from strength to strength, with the support of dedicated volunteers who have mobilised the various Technical Divisions and Special Interest Groups (totalling 21) which represent the different engineering disciplines. These include Civil & Structural Engineering, Geotechnical Engineering, Electrical Engineering, Mechanical Engineering, Chemical Engineering, Building Services, Oil, Gas & Mining Engineering, Tunnelling & Underground Space Engineering, Project Management and others.

The Special Interest Groups include Public Sector Engineers, Urban Engineering Development and Seniors Special Interest Group. There are also the Women Engineers Section and Graduates & Students Section (also known as Young Engineers Section). The latter two are crucial for the continuity of the long-term management of IEM.

Each division and section has its own plans, strategies and a host of implementation activities carried out each year that collectively represent the achievements of IEM as a whole.

The backbone of IEM management is its 8 Standing Committees that attend to its various administrative functions. The IEM Main Office in Bangunan Ingenieur in Petaling Jaya, houses the Secretariat, with staff members who oversee different functions including finance, membership and corporate affairs.

As membership continued to grow, IEM bought another building in 2007 to cater to the increase in activities such as training, talks and seminars. With a built-up area of approximately 3,530 sq m (38,000 sq ft), Wisma IEM houses two auditoriums that can accommodate more than 100 people each.

There are also 12 branches throughout the country which carry out activities aligned to meet the overall objectives of IEM. While achieving holistic integration of the workings at Branch level and the Headquarters is not an

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BUILDING TRUST

easy feat, it has been managed through dialogues and collaborations to pave the way for effective implementation of activities for the benefit of our members.

Expansion plans included the establishment of two wholly-owned subsidiaries: IEM Training Centre Sdn. Bhd. and IEM Academy Sdn. Bhd. The former is the training and business arm of IEM, while the latter serves as a supporting organisation to prepare local engineers for global benchmarking. IEM's focus on continuous learning, upgrading of skills and keeping members informed about industry trends, developments and current requirements, contributes to making the Institution stay relevant to members.

STRATEGIC PLANS

In moving forward, IEM had consistently referred to its first Strategic Plans, drafted and introduced in 1996. It was aimed at providing a clear, focused and integrated approach to strengthen IEM and achieve its mission of being the premier professional organisation.

The Strategic Plans contained these five key points:

1. To advance and disseminate knowledge.
2. To achieve and maintain high professional competence.
3. To communicate and contribute on matters pertaining to engineering practice and environment.
4. To enhance awareness and encourage member participation.
5. To manage efficiently and effectively the physical, financial and human resources of IEM.

In 2012, the IEM Council reviewed and revised the Strategic Plans to be more current. There was also a need to relook at IEM's achievements in relation to what was envisaged for the future, bearing in mind the need to sustain the Institution and further enhance services to members. Thus the IEM Strategic Plans 2012 became the reference point over the years for implementing various strategies and achieving some key objectives. IEM has continuously reviewed the strategies and introduced more initiatives to meet current needs. Many of the initiatives have been implemented successfully while some are still works in progress.

The key initiatives include:

- **Membership Retention & Service to Members:** The retention of members and the need to provide service to them remain one of IEM's main priorities. With a large base of 50,000 members, it is a mammoth task to keep updated with changes in data as well as to ensure memberships remain valid with prompt payment of membership fees and renewals. Collection of membership fees is crucial to our efforts to continue with the various activities.

  In processing applications for new memberships or changing/transferring of the different grades of memberships, efforts are on-going to expedite the processes and reduce red tape, from application to approval and the issuance of membership cards. Improving communication flow and notification to members on the status of their applications are also being reviewed for enhancing efficiency. To retain members, IEM has introduced a Loyalty Programme which encompasses all activities organised for the benefit of its members.

  Membership recruitment efforts are also on-going. Among the measures taken are expanding collaborations and partnerships with universities and government bodies. MoUs have been signed with nearly 20 universities, allowing en bloc registration of engineering students. Membership drive among companies in the industry also continues every year.

- **Members Database:** The database of IEM members was improved after including a list of specialists to facilitate the handling of external enquiries about members through the IEM website. A field was added for members to key in their areas of specialisation and this enabled users of the IEM directory to search for members' data online by name, region, discipline, area of specialisation and the university they graduated from. Updating of data, however, remains a mammoth and daunting task, with many members who have yet to update their data.

- **Adoption & Use of Modern Technology:** While trying to increase income, IEM is also looking at ways to control expenses without impairing its services to members. We plan to adopt and use more modern technology, such as paperless meetings, e-newsletters and digital

communication to disseminate information to members. In relation to this, IEM is currently working with a service provider to introduce a mobile application specifically for the purpose of disseminating information to members. It is scheduled to be launched before the end of the year.

Another initiative is to improve the IEM web portal by making it more innovative and self-financing. The plan includes engaging a full-time webmaster, creating social media to be linked to the IEM website, setting up more interactive features such as e-books and e-seminars in the IEM portal and ensuring efficient content management by allowing real-time responses and updates. Progress has been made with video conferencing tested and in the process of implementation. Starting with the Penang Branch, it has been extended to the Perak Branch and the Southern Branch. Though e-books have been implemented, e-seminars have not yet taken off. However, video recordings of talks conducted by IEM have been posted on the portal.

Another enhancement to the portal will be the inclusion of a feature to disseminate information from Government agencies. Such information will specifically cover the topics of incentives/benefits for members to undertake entrepreneur projects by forming Lobbying Groups to identify and get Government offers on tax incentives or services needed. Notifications from Government agencies, including the Ministry of International Trade & Industry (MITI), Malaysia External Trade Development Corporation (MATRADE), Construction Industry Development Board (CIDB) and BOMBA are already posted on the website.

- **Business Matching:** This service is aimed primarily at assisting younger members of IEM to improve their income generation and career advancement and thereby retaining their membership with the Institution. The IEM Business Club has been revived to help with business networking and matching initiatives, such as networking meetings/functions and CEO Talk Series.

- **Ensuring IEM's Voice is Heard:** IEM has begun to identify active IEM members who are employed in the various Government departments to help provide communication linkages, set up the mechanism for IEM to gain representation and nominate representatives including for preparation of Terms of Reference for matters raised. IEM has already publicised this to members, requesting those interested to come forward to represent IEM in various issues.

  MoUs have been signed with various City Councils which, in turn, have invited IEM to send representatives to serve in their committees or working groups. In addition, IEM has provided links to Government agencies through its website and sent the IEM bulletin and other publications to these agencies as a means of providing information.

- **Earning More Non-Membership Income:** IEM has embarked on a key strategy to get branches to purchase premises in their respective regions. This will not only provide a permanent base for IEM members to converge for meetings and activities, but will also be an additional income source for IEM. Such premises will be additional physical assets which can earn rental income, thereby reducing our dependency on annual membership subscription collection. Till today, approximately 70% of IEM's income still comes from subscriptions collection.

  Branch committees have been formed to lead the initiatives at branch level; some have already embarked on profit-making events such as conferences and annual dinners with sales of tables.

- **Creating Other Business Opportunities at Regional Level:** IEM has looked at expanding regionally by collaborating with government bodies such as MIDA and CIDB. An area of emphasis is marketing IEM's services to the Government through these bodies to reach regional markets. The services identified and offered are those which complement rather than be in conflict with those already offered by IEM members. A meeting has been held with MIDA on the setting up of a One-Stop Resource Centre For Engineering & Related Industries within the ASEAN region. The proposal is still a work in progress.

  Initiatives have also been put in place over the years to generate additional income through the IEM Training Centre Sdn. Bhd. and IEM Academy Sdn. Bhd. These have been mobilised to help organise activities such as big scale conferences, and specialised workshops/seminars for engineering professionals. The IEM Training Centre has been turned into a Blue Collar Education Centre to provide career path guidance and technopreneur skills development while IEM Academy is embarking on the development of a structured training module for its engineering students.

  Other initiatives to be implemented this year with the aim of further diversifying income sources include co-organising an annual engineering exhibition that will cover all disciplines in the industry and the selling of advertising space at Wisma IEM in Petaling Jaya.

KEY ISSUES & CHALLENGES

A key issue that IEM faces is improving the efficiency of its governance. Over the years, the prime movers of the Institution are volunteers from the engineering industry, as well as academics and retired engineers. It has augured well for IEM, with volunteers working together to overcome challenges and turn proposals into reality within specified timeframes. Although this has worked well, a proposal has been made to engage highly qualified staff, including a

CEO to manage and improve the operations of IEM.

A proposal has also been mooted to expand the role of the internal auditors to include auditing the effectiveness of the management and operations as well as to identify the risks involved in all IEM's operational and business activities.

These proposals have yet to be implemented due to various views that need to be consolidated for successful implementation.

REVIEWING THE IEM CONSTITUTION

There is a need for an overall review of the IEM Constitution and Bylaws to suit current trends and environment, including technological advancements. Among the amendments considered is adding Societal Engagement into the Constitution, with the aim to enhance the image of IEM and its members and to rebrand the Standing Committee on Welfare & Service Matters to include societal engagement.

At the 58th Annual General Meeting in 2017, the Constitution and Bylaws were amended to allow for 5 Companion/Graduate Members and one representative of the Women Engineers Section to serve on the IEM Council.

While it is recognised as necessary, the Constitution review is a mammoth task that requires time and the involvement of experts to provide detailed input to prepare the amendment and to submit it for approval.

IMAGE BRANDING

It is a challenge to enhance the image of IEM and its members and to make it stand out even more. There is a need to create awareness on the difference between IEM, Board of Engineers Malaysia (BEM) and the Association of Consulting Engineers Malaysia (ACEM) as well as the Board of Technologists (MBOT).

Image-building continues to be carried out through the IEM web portal with links to other bodies relevant to the engineering fraternity. Various other proposals have also been made, including organising image branding road shows and publicity campaigns. However, most of these have not yet taken off.

MOVING FORWARD WITH GREATER EMPOWERMENT

The activities of the Young Engineers Section (YES) continue to be emphasised on. Strategies include getting YES representation of IEM in outside organisations, creating greater exposure for YES members by getting its members to accompany Corporate Members to relevant meetings and allowing YES financial independence with authority and accountability, similar to that accorded to branches.

In moving forward, IEM recognises that YES members, the majority of whom are below 40 years old, can play greater roles. The immediate past and current IEM leaders have called on YES Members to volunteer and help shape the Institution and the profession further. The current President, Ir. David Lai Kong Phooi, said that the participation of YES members in the main committees of IEM will result in new ideas which will help IEM attract and cater to the younger generation of engineers.

In the same vein, he also invited veteran engineers to share their wealth of experience with younger members, including at branch levels. Though some may have retired from active service, senior members continue to make significant contributions to the engineering profession and society. They are also a valuable source of volunteers that IEM can tap into when needed.

He said the future also lies in IEM being a strategic partner for local and foreign organisations. With the liberalisation of engineering services and engineering mobility, it is possible for IEM to be a part of international bodies such as the Asia-Pacific Economic Cooperation (APEC), International Professional Engineer (IPEA) Register, World Federation of Engineering Organizations (WFEO) and Federation of Engineering Institutions of Islamic Countries (FEIIC).

IEM can take advantage of this and be the platform for engineers to market themselves abroad. One good example is IEM's success in securing the position of permanent secretariat of the ASEAN Federation of Engineering Institutions (AFEO) and the ASEAN Engineering Register (AER). These have opened up opportunities for IEM members to embark on joint ventures with ASEAN engineering firms and so expand their network overseas. As a constituent member of several regional organisations, IEM can also facilitate cross-border mobility of engineering services of Malaysian engineers globally.

According to Ir. David Lai, IEM has also embarked on bilateral relations with various overseas engineering institutions. To-date, IEM has signed 25 MoUs with engineering institutions with a view to promote, facilitate and extend professional and social links between the foreign engineering institutions and IEM.

To continue Engineering The Nation, he called on engineers to work hand-in-hand with Government agencies to develop new or to enhance existing guidelines and regulations pertaining to engineering matters. IEM must also constantly work and collaborate with experienced engineers, industry players, various government departments, institutions and universities. It is pertinent that they get involved in forums initiated by the Government and relevant institutions when called upon for negotiations and exchange of ideas and strengthening capacity building in sustainable construction and development.

In essence, IEM must continue to improve its mechanisms to facilitate effective implementation of sustainable development strategies. The sustainability of a civil society like IEM is very much dependent on the initiatives of its members. Having a sense of belonging and the pride of the profession is also of utmost importance to drive IEM to reach much greater heights as the premier learned society in the country. ■

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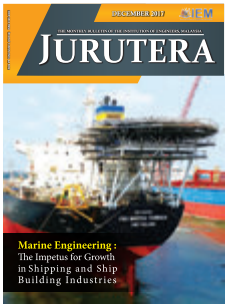

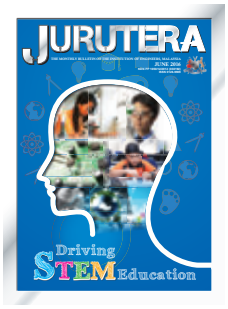

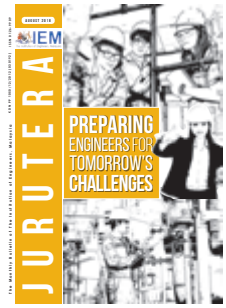

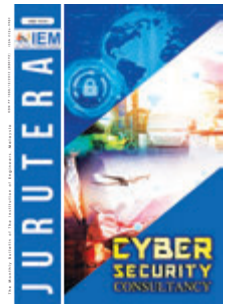

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ROLE OF IEM IN STRATEGIC PROMOTION OF STEM EDUCATION

by Ir. Chua Yaw Long

Ir. Professor Dr Mohamed Thariq bin Haji Hameed Sultan

In 1967, the Malaysian Planning Committee of Higher Education formulated a 60:40 ratio policy for Science and Art streams respectively in secondary schools. This ratio would apply to students in Science, Technology, Engineering & Mathematics (STEM) and students in Art at upper secondary level; it was later extended to tertiary education.

As a developing nation, Malaysia requires a sufficient number of local STEM professionals to sustain the workforce. With the current trend of globalisation, digitalisation and the 4th Industrial Revolution (4IR) replacing many traditional labour-intensive industries, STEM studies have come into the limelight and gained weight.

In Malaysia, the number of STEM students has dwindled over the years. According to statistics released by the Ministry of Education, there were only 44% STEM students in secondary schools for 2018, compared to 48% in 2012. This means approximately 6,000 fewer students per year in STEM.

Figure 1 shows this: Out of 441,883 students who enrolled in Form One in 2012, only 37,627 students completed secondary school in STEM education.

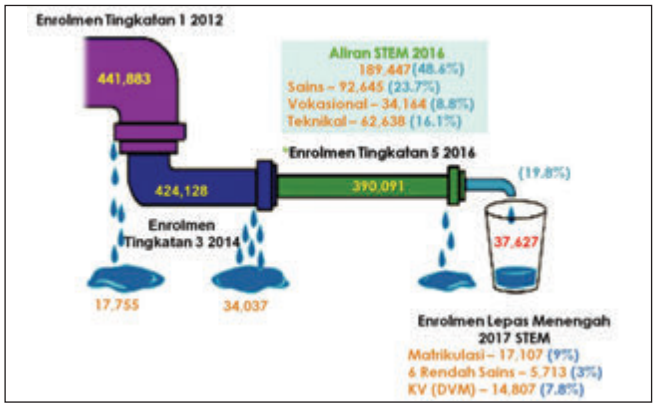


Figure 1: STEM Enrolment
Source: MOE, Malaysia Educational Statistics

In addition to increasing the number of STEM students in schools, we also have to look at the quality of STEM education. As early as 2011, educationists in University of Malaya raised their concerns as Malaysian students scored poorly in Trends in Mathematics & Science Study (TIMSS) in comparison to students from Hong Kong, Singapore, South Korea and Taiwan. See Rasiah (2011, p. 175), Ed. Malaysian Economy, Oxford University Press.

Globally, governments around the world, including that in Malaysia, are investing vast amounts of resources to improve STEM education. On top of efforts by the Malaysian Government, particularly the Ministry of Education (MOE), stakeholders from industry, professional and learned institutions as well as NGOs, are working hand-in-hand to try and increase the dwindling numbers of STEM students by organising STEM-related programmes.

The Ministry of Higher Education has started a new programme called Service-Learning Malaysia – University For Society (SULAM). This is a learning experience that links theory and practical with actual problem-solving in the community. It also benefits local residents, with the provision of various facilities and infrastructure through strategic cooperation with the various agencies.

EFFORTS TO IMPROVE STEM EDUCATION

But are we doing things efficiently enough to increase the number of students in STEM? Is The Institution of Engineers, Malaysia (IEM) putting in enough effort and resources to enhance and improve STEM education in the country? Has IEM addressed current issues correctly to counter the dwindling numbers of STEM students?

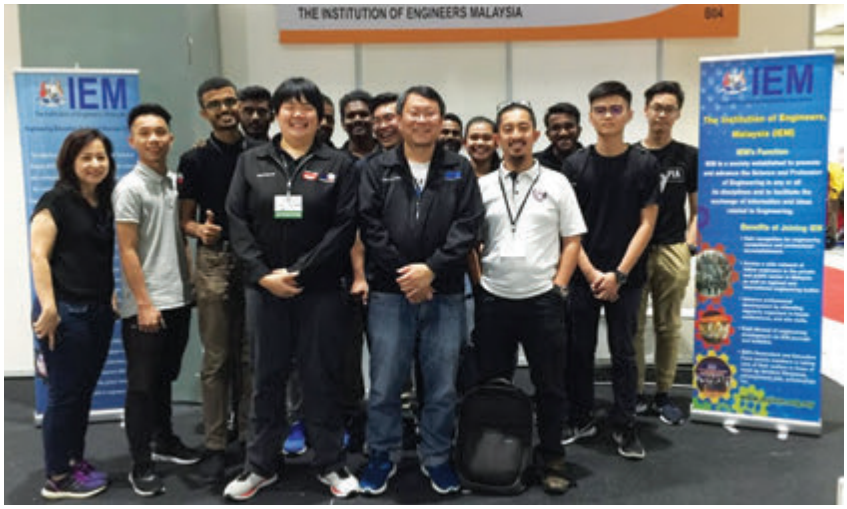
It is only by having an effective system to support STEM education that we will be able to increase awareness among the public on the importance of STEM in producing a local professional STEM workforce.

Through the years, IEM has been instrumental in promoting the engineering profession. The Engineering

Education Technical Division (E2TD) was set up to promote engineering education in the country. The E2TD's STEM Promotion Sub-committee focuses on STEM education efforts, working with IEM Technical Divisions (TDs), Sections and Special Interest Groups (SIGs) to promote STEM education programmes.

IEM has been co-organising the Kuala Lumpur Engineering & Science Fair (KLESF) since it started in 2014. The event aims to enhance interest in STEM at school level and to increase public awareness of the role and importance of STEM in socio-economic well-being and sustainable development. It also aims to enhance awareness and participation of business and industry in promoting learning and career development in areas related to STEM among students and the community.

Each year, IEM spices up KLESF with interactive engineering-related activities and workshops organised by volunteers. So far, the response has been very encouraging. However, IEM should go beyond KLESF and organise more STEM-related programmes such as initiating similar interactive activities in various other states.



Some of the KLESF 2019 volunteer team from IEM

One such example is the STEM Promotion Sub-committee's participation in Pesta Sains Negeri Sembilan (PSN9) which received overwhelming support from not only schools and the state government but also from Institutions of Higher Learning in Nilai, NGOs and industry players in Nilai. IEM should set up STEM Promotion Sub-committees in the various branches to organise such activities.

There are other success stories too, such as Women in Zcience (WIZ) at Penang Tech Dome in 2019, supported by the Women Engineering Section, STEM Promotion Sub-committee and Universiti Sains Malaysia IEM Student Chapter.

With a STEM Promotion Sub-committee in every branch, having interactive STEM activities in schools as well as competitions and design challenges (e.g. ChemE car challenge, Junior ChemE Car Challenge and IEM STEM essay competition) can effectively promote STEM activities in all states. The sub-committees can work with local authorities such as state education departments to design a series of STEM-related activities to help nurture future engineers who can think strategically and critically to solve problems. Teachers, parents and industry players can join in as competition judges, mentors, etc. IEM and industry players can be the catalyst to promote STEM and stimulate young minds through such activities.

Volunteers from IEM attending to VIP visitors at Pesta Sains Negeri Sembilan

Engineers can play an important role to promote STEM education by volunteering their time and expertise through outreach programmes organised by IEM, such as the recent STEM Outreach Programmes at SMK (P) Sri Aman, Pudu Girls School KL and Junior Digital Class at SMK Jalan Kebun in Selangor. Their enthusiasm in sharing their passion for engineering with school students via talks and workshops, has been an inspiration. These volunteers can also share real life work experiences which will inspire and motivate future engineers. Employers should also encourage and support their employees, especially engineers, who are involved in such volunteer activities.

Again, STEM Promotion Sub-committees, whether at IEM HQ or branches, can be a platform to bridge engineers, student, schools and authorities. One suggestion is to encourage industry leaders to adopt nearby school/s and design a comprehensive long-term interactive STEM education plan.

Fellow academia can also play a huge role in promoting STEM education. Programmes such as Professor on Duty, organised by E2TD in collaboration with Universiti Putra Malaysia and Universiti Kebangsaan Malaysia, help to support STEM education. IEM TDs, Sections and SIGs will also join in supporting STEM outreach programmes as a whole.

IEM Student Chapters also play a vital role by engaging school students to take part in these events, closing the age gap between our volunteers and participants as well as making communication more relaxed, fun and engaging. Through stimulating and engaging activities, both formal and informal teaching and learning will cultivate greater interest in STEM education and prepare future engineers.

FUTURE OUTLOOK IN PROMOTING STEM EDUCATION

It is evident that IEM has put in much effort to champion the promotion of STEM education. To realise such efforts, IEM needs constant support from the various stakeholders. For activities in government schools, it is compulsory for IEM to obtain approval from MOE and state or district education offices prior to organising any event. Therefore it is vital that IEM continues to strengthen its relationship with MOE.

In seeking support from MOE, IEM should draft a long-term comprehensive STEM Promotion activity plan together with the various stakeholders, e.g. a 5-year plan with clear goals and objectives. This way, activities with schools can be executed more effectively and efficiently. The outcome of all the various STEM activities should also be reviewed for future improvement.

IEM should also look into the social and financial well-being of its members as well as give due recognition to engineering graduates. However, recognition for IEM is through the efforts and hard work of its members so the institution should step up its pace to meet the many challenges and, apart from its members, it should also be more accessible to the public.

We need to be more vocal in matters that pertain to not only engineering but also to STEM. We should inform the public, through print or social media, that STEM graduates have bright prospects, especially with the dawn of 4IR. Without STEM as the forward driving force, Malaysia will remain stagnant. The challenge is to make greater efforts to increase the number of STEM graduates. Parents and students usually think of fields such as Law, Medicine etc as these have received more recognition than STEM. Therein lies the real challenge and all parties have to do their part to promote STEM.

Issues that have plagued the STEM field, in particular engineering, are low starting salaries and minimal increments for the next 10 years. One major reason why fresh graduates are paid low salaries is because most have not obtained Professional Engineer (PEng) status. As it is not a requirement by the industry, many graduate engineers feel they don't need to apply for PEng as they can still perform the work of an engineer. IEM can work hand in hand with relevant stakeholders to develop proposals or action plans to come up with incentives for those with PEng status. If a graduate engineer obtains PEng, there will definitely be a salary revision and this can improve his/her financial status.

Another reason why fresh graduates are paid low wages has to do with the quality of education. As some educationists in University of Malaya have pointed out, we need to introduce curriculum reform, hire a high-calibre faculty and enroll the best students. See Rasiah (2011, p. 178).

Another area for consideration is working with school PTAs, informal learning centres and NGOs (such as National STEM Movement, STEM Maker 4 All), Penang Tech Dome, planetariums, science centres, museums and national parks. IEM can also look into the possibility of working with shopping malls as potential venues for technical talks, workshops and science fairs to promote STEM education to bigger crowds and mall visitors.

We can also collaborate with other learned societies such as the Institution of Mechanical Engineers (IMechE),

Engineers Australia Malaysia Chapter (EAMC), The Institution of Engineers & Technology (IET) and the National Association of Corrosion Engineers (NACE) to share common goals and make consolidated and concerted efforts to promote STEM education and the engineering profession at large. Together, we can be the leading driving force to cultivate more interest in STEM education among students.

Working with Parent-Teachers Associations (PIBGs) across the country will enable IEM to reach out to more parents. As they are the children's first educators, parents have an irreplaceable role when it comes to education. Most parents today are not exposed to STEM activities. It has been noted that many parents do not seem interested to join in when there are STEM activities being held. This has resulted in fewer students joining in too. STEM activities are often held on weekends but, instead of joining in, parents are taking the weekends to do something else.

IEM engineers giving STEM talks in schools

To ensure greater coverage in all the states, each IEM branch should have its own STEM Promotion Sub-committee to steer events and activities. Currently, only IEM HQ has a Sub-committee devoted to STEM promotion. With limited resources, it can be challenging for the Sub-committee to support STEM-related activities across the nation but, by establishing Sub-committees in the various branches and working with the YES committee and IEM Student Section, more STEM-based outreach programmes can be achieved. The Sub-committees can also help with other branch activities and provide more avenues for engineers to contribute back to schools and to guide students to acquire and strengthen both technical and soft skills prior to entering the workforce.

Financial support from IEM is crucial for organising STEM-related activities and programmes. These can be considered community social responsibility programmes which ensure the continuity and succession of the engineering profession. At the moment, only KLESF receives a budget; IEM should consider more allocations for IEM HQ and/or Branch to help them carry out more STEM-based activities.

CONCLUSION

IEM is in a position to play an important role in STEM education. It is crucial to have a comprehensive strategy to address the dwindling interest in STEM education among school students. IEM should continue to work with the various stakeholders and join hands to promote STEM education and encourage the young generation to take up engineering as a profession. ■

Authors' Biodata

Ir. Chua Yaw Long is Chairman of IEM STEM Promotion Sub-committee and Committee Member of Engineering Education Technical Division (E2TD)

Ir. Professor Dr Mohamed Thariq bin Haji Hameed Sultan is Chairman of Engineering Education Technical Division (E2TD)

WOMEN ENGINEERS BREAK THE GLASS CEILING

by Women Engineers Section

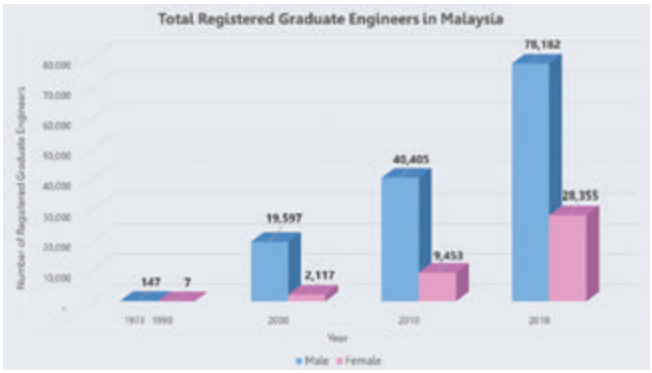
Women. Whether they are mothers, wives, teachers, doctors, nurses, engineers etc., women have contributed much to humanity since the beginning of time. According to the Department of Statistics, Malaysia, out of the country's population of 32.6 million, there are 15.8 million women. This means 48.5% of Malaysians are women and because of this, encouraging the participation of women in the work force is vital to the future of the country as we work towards becoming a developed nation.

Unfortunately, women have always been portrayed as the weaker sex. In her book, Women in Engineering: Pioneers & Trailblazers (2009), Margaret Layne wrote that, in the first half of the last century, "women in engineering were perceived as oddities, defying gender norms". Are women engineers a different breed of women? Is it really so hard to challenge the mindset that the engineering field should be dominated by men?

As engineers, we relate really well to amazing inventions and engineering feats. Those who love great performing engines may have learnt that the first car, the Benz Patent-Motorwagen, was built in the 1880s. As you read this, you may have already thought of Karl Benz as the name related to the car. If you have, you may want to reconsider your answer as it was Karl's wife, Bertha Benz the innovator, who played a significant role in making the Patent-Motorwagen a success.

Let us now look at the number of total registered female graduate engineers and female professional engineers in Malaysia through the years. The total number of registered female graduate engineers has been increasing steadily alongside that of male graduate engineers. In 2018, female graduate engineers made up 27% of the total number of registered graduate engineers. However, looking deeper and further, we will notice that there are significantly more male registered professional engineers than female registered professional engineers; from the diagram, we can see that women constitute only 6.3% of the total number of registered professional engineers. The figures don't seem to add up when 27% of registered graduate engineers are women.

Is this because society does not offer ample support for women who pursue a career in engineering? While it cannot be denied that men have contributed far more to engineering in the country than women, a quick search with the keywords "great women engineers in history" will result in countless stories of women engineers who have made huge contributions to society. Looking at the bigger picture and, in particular IEM and professional engineers, we will see that there have been many very capable women engineers.



Number of total registered female graduate and professional engineers

After over 60 years spent by IEM to promote and advance science and the various professional engineering disciplines and as we work towards our country's vision and development, the IEM Women Engineers (WE) have broken the glass ceiling. IEM WE acknowledges and, most importantly, understands the struggles of women engineers as they try to break the social stigma that "engineering isn't for women" while pursuing their career.

In addition to a full-time career, many women engineers find that they still have to take on another role expected of them as traditionally, it is the woman's responsibility to take care of the family. This is a huge responsibility that cannot be replaced.

At IEM WE, it is our mission to build a network for women engineers and to draw strategic alliances among engineering professional bodies to inspire, support and celebrate women engineers in their career development. Our aim is to empower women engineers so that they will be able to get the recognition they are entitled to and that they will match their male counterparts, thus ensuring their professional development which will enable them to climb the professional ladder.

At the same time, contributing to the nation's vision of having 30% women on board is in line with the 30 Percent Club, a non-profit organisation that advocates having more women in boardrooms, globally. The 30% is the minimum percentage of minorities required within an organisation to have their concerns judged on their own merits and not just as a voice for the minority.

This year, IEM WE celebrates its 20 years of existence within IEM. We take this opportunity to reflect on our many achievements and to reinforce our aim to empower women engineers and to create a platform for their advancement.

We had humble beginnings in 2000 as the IEM Lady Engineers Sub-Committee, with only 13 members. The Sub-Committee was chaired by Ir. (Ms.) Toh Yuan Kait, and organised activities for lady engineers. In June 2013, IEM WE was officially formed and Ir. Raffah Mahfar was appointed Pro-tem Committee Chairman by the Standing Committee on Activities. At the inaugural meeting on 14 November 2013, IEM WE was made a Section and all women engineer members of IEM, with the exception of student members, would be, by default, members of IEM WE.

Through the years, we have relied on dedicated volunteers who organise and run activities that empower not only women engineers but also fellow men engineers and future women engineers. Today, IEM WE has 16 office bearers (2019/2020 session) and 3 observers.

At the IEM WE AGM in 2019

IEM WE representatives and other women delegates at Soroptimist International Convention, 2019

Here are two of the office bearers in the history of IEM WE. Datuk Ir. Dr Siti Hamisah binti Tapsir, IEM WE advisor 2013/2014, is a professional engineer who has contributed to our nation during her career at the Ministry of Higher Education (MoHE) and Ministry of Energy, Science, Technology, Environment & Climate Change (MESTECC). She was deeply involved in the development of the Malaysia Education Blueprint 2015-2025 (Higher Education) and was responsible in leading reformation in the energy sector to transition to rely 20% on renewable energy with the Malaysian Energy Supply Industry (MESI) 2.0.

Ir. Sharifah Azlina, CEO of a well-known engineering consulting firm, has served IEM WE since 2000. She represented IEM WE at the 21st Soroptimist International Convention in 2019 and gave a presentation, Women Leading in Technology & Innovation. She said it was crucial to have women on board as "this was more than a strive for equality; it was a strive to lead". This, she added, was the reason that she had been advocating for women engineers all this while.

There has yet to be a woman President in IEM although the Institution was established more than 60 years ago. Currently, the highest-ranking female on the IEM council is Ir. Prof. Dr Norlida Buniyamin, one of the four vice-presidents. Will we see the first female President in the near future?

At present, there are only 2% female Fellow Members in IEM and of the 67 members in IEM's council and executive committee, only 8 (or 12%) are women.

During an address at the National Technical Profession Day in 2018, the Public Works Department (PWD) indicated that it had targeted for the total number of professional women in engineering and technical fields to escalate to 40% in 4 years' time.

So where does IEM stand when it comes to women in top positions and what have we, women engineers, done to break the glass ceiling?

The 3 main objectives of IEM WE are:

1. To connect women engineers locally and internationally and to establish strong networking.
2. To enable a platform for self-development, continuous learning and contribution to society.
3. To encourage women engineers to participate in engineering activities.

All activities organised and approved by IEM WE, have women engineers in mind. From international-level conferences to simple internal technical talks and workshops, all activities are meant to benefit women

IEM Council Members

engineers. Male engineers who have participated in our activities, have also reaped benefits as IEM WE is passionate about sharing knowledge to benefit the profession as a whole and not just women engineers.

International-level conferences that IEM WE had organised in the past, included Women in Science, Engineering & Technology (WiSET) in 2012 and 2018 as well as Women Engineers ASEAN Federation of Engineering Organisations (WE-AFEO) Summit when Malaysia hosted CAFEO in 2015. These conferences and meetings provided opportunities for engineers to showcase their contributions and innovations in developing solutions in the field of engineering.

IEM WE is also the face of women engineers in Malaysia as it is actively involved in the global network of organisations of women in science, technology, engineering and mathematics (STEM). IEM WE has also had the opportunity to attend the International Network of Women Engineers & Scientists (INWES), Asia and Pacific National Network (APNN) meetings and WE-AFEO meetings. These meetings are a platform for Asian women scientists and engineers to exchange information on policies and current development in the field of STEM in their respective countries. IEM WE has indicated an interest in organising the next INWES APNN AGM, and hopes to secure the bid to make this event a great stage to showcase the capabilities of women engineers in Malaysia.

IEM WE has also organised many technical talks and workshops. Technical talks included Overcoming The Challenge of Gender Imbalance in the Engineering Industry, STEM Mentor-Mentee Programme & The Way Forward, Bringing Engineering Problem into Scaled-Experiment: Challenges in Physical Modelling of Erosion and BIM in Construction: The Challenges & Lessons Learnt. All these were aimed at improving the engineering profession by empowering both male and female engineers.

IEM WE even took the unprecedented step of holding its 6th IEM WE AGM at the KidZania theme park. This was to ensure that while members were at the meeting, their children were having fun and gaining insights into the different choices of careers as they took part in role play activities. Such events provide women engineers with the opportunity to contribute to the profession while caring for the family.

On top of developing professionalism, an altruistic character is also nurtured among IEM WE members through the various corporate social responsibility (CSR) events organised by our volunteers with various organisations such as the National Autism Society of Malaysia, Pusat Gelandangan Kuala Lumpur, and Tadika Cilik Al- Fateh in Felda Bukit Ramun, Johor.

Dr Habibah @ Norehan Hj. Haron, a long-time passionate volunteer who has been with us since day one, has dedicated much of her time and efforts to CSR events. She strongly believes that IEM WE is a great platform for her to network with a team of like-minded women engineers

CSR activity organised by IEM WE

and, at the same time, to contribute back to the society by organising CSR events. She also believes that by joining IEM WE, one can focus on personal development and enriching general skills set.

Promoting STEM education is also a main agenda for IEM WE as we understand the importance of encouraging the younger generation to pursue STEM. This is crucial to ensure there are enough STEM students to provide a constant supply of STEM-related professionals and so sustain the ever-increasing demand of technology and workforce.

IEM WE have supported many large-scale STEM events, such as the annual Kuala Lumpur Engineering & Science Fair (KLESF), Women in Zcience (WiZ), Pesta Sains Negeri Sembilan, Minggu Sains Negara and, the most recent, World Engineering Day 2020 Celebration at DaMen Mall, Selangor. We aim to inspire and develop a greater interest in STEM fields, in particular for young girls to join the engineering profession. By taking part in STEM events, volunteers can expose students to the world of engineering and show them how "cool" the profession is by sharing our experiences and even by dressing up in our work gear to further showcase to them our daily job.

For young girls who have never thought of having a career in engineering, these events also provide role models for them to look up to and will open up their minds to consider a career that has vast opportunities waiting for them.

IEM WE is also a platform where women engineers can seek guidance and support from fellow women engineers. Dedicated office bearers of IEM WE volunteer their time to engage with and inspire future engineers, demonstrating excellent leadership qualities in the process. Once exposed, some participants in our activities then join as office bearers when they see the overall IEM WE mission and vision.

For instance, Ms. Irene Lock, who represented Malaysia at the APNN International Young Woman Scientist Camp in Seoul, South Korea, in 2019, is now one of our office bearers. The young and outstanding engineer with various international awards is determined to inspire other young girls to become engineers.

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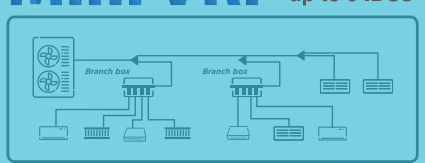

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Members of IEM WE at the World Engineering Day 2020 celebration at DaMen Mall in Selangor

Another example is current session observer, Ms. Choong Pooi Ying, who shared her time with IEM WE at the Women in Zcience (WiZ) STEM Outreach programme in Penang last year. She was so inspired by how supportive IEM WE engineers were that she joined IEM WE so that she could contribute and spread the word to the younger generations. She is now actively involved in other IEM WE activities.

2020 started with a tremendous challenge worldwide, the Covid-19 pandemic. We sincerely hope we will overcome this global threat soon but meantime, we will continue to persevere. IEM WE hopes to empower all women engineers in Malaysia, and to help them overcome this challenging time. To all women engineers out there, IEM WE would like to say a big thank you for all your contributions towards the development and betterment of humanity. ■

POWER PURCHASE AGREEMENT : IMPACT OF COVID-19

by Dato' Nitin Nadkarni[1] *Crystal Wong Wai Chin*[1] *Lim Chee Yong*[2]

As fear surrounding the novel coronavirus (Covid-19) casts its shadow over the whole country, we are faced with the harsh reality of drastic disruptions to livelihoods, communities and business operations worldwide which are likely continue into the foreseeable future. In an unprecedented move to contain Covid-19, the movements of Malaysians were restricted/controlled in a nationwide Movement Control Order (MCO) enforced from 18 March till 12 May 2020 (at Press time) and this brought a lot of uncertainty to the people.

Much of the backbone of the economy, encompassing private business, were ordered to close their premises. Only selected Government machineries, industries and services deemed essential, were allowed to continue operations. With the number of confirmed positive cases on the rise each day, further stringent emergency restrictions to control the pandemic may well be in the pipeline.

During this critical period, energy and construction players may face difficulties in fulfilling their existing contractual obligations, due to disruptions caused by the suspension of business operations and trade restrictions across the country. Important contract terms, such as *force majeure* clauses, which are often (and mistakenly) overlooked as "standard boilerplate" in commercial contracts, are likely to be brought into sharp focus in the weeks and months to come.

Recently, we were engaged in important discussions with clients on the pressing question of whether Covid-19 will excuse them and/or their counterparties from contractual obligations and liabilities.

In this article, we will explore the impact of Covid-19 on the performance of Power Purchase Agreements (PPA).

Unlike civil law jurisdictions, where *force majeure* is governed by the civil code (e.g. French Civil Code, Articles 1218 and 1351; UAE Civil Code, Article 273), the operations of *force majeure* clauses in common law jurisdictions, including that in Malaysia, are dependent on the exact words of the clause.

UNDER POWER PURCHASE AGREEMENT

Malaysian Power Purchase Agreements, from the first to fourth generations and the relatively recent solar PPA, spell out events which constitute a *force majeure*. Some typical circumstances identified in a *force majeure* clause include:

a. Unusually severe weather conditions
b. Strikes and/or other work stoppages
c. Acts of God or act of public enemies/terrorists or act of war
d. Any *force majeure* event affecting the performance of any Person that is a party to the Fuel Supply Contracts, the EPC Contract or other contract between IPP and such Person relating to the construction, operation or maintenance of the Facility
e. Changes in law and
f. Any unavailability or interruption in the supply of fuel.

COVID-19 AND FORCE MAJEURE

However, none of the Malaysian PPAs identifies "disease", "epidemic" or "pandemic" as *force majeure* events. Albeit less explicit, identified events such as work stoppage and *force majeure* events affecting the performance of personnel in relation to the construction, operation or maintenance of the power plant as a result of market conditions or government action, e.g. the Movement Control Order implemented by the Malaysian government, may be relevant.

OPERATION OF FORCE MAJEURE UNDER PPA

PPAs and, indeed, most standard contracts, often require the affected party to timeously provide a notice of *force majeure*. Depending on the contract, such notices may include:

a. Full information about the event
b. Time estimated to resume performance
c. Proposed efforts to remedy its inability to perform and
d. Progress report.

In this regard, the affected party seeking the benefit of a

force majeure clause would need to establish the causal link between Covid-19 and its inability to perform its obligations under the PPA. The fact that Covid-19 has rendered performance more burdensome, both financially and logistically, may not be sufficient. Such limitations or carved outs are often expressly spelled out under Malaysian PPAs.

EFFECT OF FORCE MAJEURE UNDER MALAYSIAN PPAS

Force majeure clauses typically provide that obligations of parties affected will be temporarily suspended until such time that the *force majeure* event has ceased. Some clauses may allow the right to terminate the contract if the impact of the *force majeure* event prevents the party from substantially performing any material obligation and if the force majeure event subsists for a prolonged period, generally 180 days.

Malaysian PPAs make clear that payment obligations shall remain in force, notwithstanding the *force majeure* event. Furthermore, newer generations of PPAs provide a well-delineated payment structure which allocates the risks of *force majeure* events, according to whether the affected party is the off-taker or the power producer.

Industry players should also review other relevant provisions such as Change in Law clauses and Material Adverse Change clauses.

MOVEMENT CONTROL ORDER

Under Malaysian laws, the power industry is considered an essential service and power producers must continue with safe and reliable operations throughout the MCO. However, if a power producer requires supplies (e.g. coal) sourced from areas affected by restrictions and no alternatives are available, the supply of electricity will be interrupted. This may well constitute a *force majeure* event. ■

[1]Partners, Lee Hishammuddin Allen & Gledhill

[2]Associate, Lee Hishammuddin Allen & Gledhill

Authors' Biodata

By **Dato' Nitin Nadkarni[1], Crystal Wong Wai Chin[1]** and **Lim Chee Yong[2]** from Energy, Infrastructures & Projects of Lee Hishammuddin Allen & Gledhill, Kuala Lumpur, Malaysia

UPCOMING ACTIVITIES

WEBINAR - EN 206 Concrete Specification for Engineers

Date	: 2 May 2020 (Saturday)
Time	: 10.00 a.m. – 11.30 a.m.
Venue	: Webinar
Approved CPD	: 0
Speaker	: Mr. Yeo Shih Horng

WEBINAR - How the Data Centre Industry is dealing with the COVID-19 Pandemic, and the Current Best Practices for Data Centres

Date	: 5 May 2020 (Tuesday)
Time	: 9.00 a.m. – 11.00 a.m.
Venue	: Webinar
Approved CPD	: 0
Speaker	: Mr. Patrick Chan

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THE MAGNIFICENT THREE SISTERS OF BLUE MOUNTAINS

Ir. Dr David Chuah Joon Huang

Ir. Dr David Chuah Joon Huang *serves in the IEM as a Council Member, Vice Chairman of Standing Committee on Information & Publications and the Principal Journal Editor. He currently lectures at the Department of Electrical Engineering, University of Malaya and is Head of VIP Research Group.*

The Three Sisters of Blue Mountains National Park is a stunning natural rock structure in New South Wales, Australia. Formed by land erosion on the north escarpment of the Jamison Valley, these fascinating, beautiful rock pillars are fondly referred to by the locals as Meehni (922m), Wimlah (918m) and Gunnedoo (906m).

To fully appreciate the charm of the Three Sisters, one can get up close and personal with this legendary formation. From the Visitor Centre at Echo Point, an old stone archway and a relaxing bushwalking trail direct the way to the Giant Stairway, which starts at the top of the first of the Three Sisters. Offering spectacular views, the Giant Stairway has a total of 998 steps, including stone steps carved into the cliff side and steel staircases that lead to the bottom of the cliffs of the Three Sisters. One should not miss the opportunity to walk across Honeymoon Bridge to stand on the first of the Three Sisters. ■

SUSTAINABLE OPERATIONS MANAGEMENT

by Ir. Chew Weng Yuen

The Engineering Education Technical Division (EETD) co-organised a talk on Sustainable Operations Management with Engineers Australia Malaysia Chapter and The Institution of Mechanical Engineers Malaysia Branch, on 12 February 2020 at Wisma IEM. The talk was delivered by Ir. Dr Ling Chen Hoe. Ir. Dr Ling started by briefing the 29 participants on the complex nature of today's businesses and revisited some corporations which had been plagued by operations or events that could render their respective businesses unsustainable.

He said that at the pinnacle of problems that result in the unsustainable operations of an organisation, is notably, a corporate culture that is toxic and one that prioritises profit above quality assurance. Participants were then shown the Downwards Spiral diagram which depicted the causes of an unsustainable business.

A brief overview of operations management and its importance to an organisation was discussed. The six eras of operations management were also shown to the participants. It was noted that, from the 1960s to 1970s, focus was on cost of operations and efficiency. This focus shifted to improving the quality of products (1970s to 1980s) and to customisation and design as well as delivery time (1980s to 2000s). From mid-1990s to the present, there was a focus on providing better service and value to the customers.

Currently, the focus is on sustainability (i.e. from low-cost focus to environmentally sensitive production, green manufacturing, recycled materials and remanufacturing), with the triple bottom line (i.e. profit, environment and people) serving as the base.

In general, operations management has seen a shift in focus from cost minimisation to sustainability, from mass production to mass customisation, from manufacturing-based technology to information-based technology, from the focus of goods to the focus on value and from local markets to global markets.

The Six Sigma Improvement process of measure, analyse, improve and control (MAIC) was shown and Six Sigma methodologies were mentioned briefly, together with Lean Six Sigma management method and Enterprise Resource Planning, which was an important tool used in operations management. The concept of value chain which viewed an organisation as a system made up of subsystems, each with its own inputs, transformation processes and outputs, was also put forth.

Next, Ir. Dr Ling discussed operations strategy in the context of its alignment with customer value proposition. He showed participants the different levels of strategy normally found in large organisations, prior to explaining the strategic role of operations management. He said strategy is related to operations and that for a business to be sustainable, its operations must support its strategy and vice-versa.

He also stressed on the importance of managing the supply chain in operation management. A diagram of a sustainable supply chain framework was shown and the importance of leadership, innovation, integration, continuous improvement and compliance, discussed. The various measures of sustainability used by different disciplines in an organisation was also highlighted.

Ir. Dr Ling Chen Hoe receiving a memento from the Session Chairman after the talk

The operations of an organisation must not only be able to create value for its customers but it must also be able to create value for its shareholders and to share value with the ecosystem. The Sustainability Formula which comprises a solid financial model, good governance and value proposition, is crucial to all organisations wishing to achieve business sustainability.

Ir. Dr Ling then discussed the principles of sustainability design and sustainable engineering, with emphasis on sustainability approaches in solving engineering problems. The overarching goal in sustainable engineering is to generate a balanced solution to any engineering problem. It was put forth that an organisation must embrace change in its business environment and ecosystem if it was to be sustainable. Companies fail because of the inability to relinquish the past achievements and embrace changes that spell the future. It is imperative that companies adapt to disruptive technologies and innovate their business operations if they wish to survive in an ever-changing and challenging business environment.

In summary, Ir. Dr Ling highlighted that, for any operation to be sustainable, operations managers must be concerned with sustainability, need to manage and adapt to cultural differences, and continually improve or change the company's business model to sync with the environment and ecosystem. It is also imperative for an organisation to give due consideration to environmental sustainability, address human issues and promote sustainable practices. ■

UPCOMING ACTIVITIES

WEBINAR - Thinking Techniques for Engineers in Time of Crisis

Date : 5 May 2020 (Tuesday)
Time : 3.00 p.m. – 5.00 p.m.
Venue : Webinar
Approved CPD : 0
Speaker : Ir. Prof. Dr Mohd Rizal Arshad

WEBINAR - Introduction to HAZOP

Date : 9 May 2020 (Saturday)
Time : 9.00 a.m. – 11.00 a.m.
Venue : Webinar
Approved CPD : 0
Speaker : Ir. Razmahwata Razalli

WEBINAR - Engineering Competency Development - Your Path to becoming a Professional Engineer

Date : 16 May 2020 (Saturday)
Time : 9.00 a.m. – 11.00 a.m.
Venue : Webinar
Approved CPD : 0
Speakers : Ir. Mohd. Azha bin Abu Samah and Ir. Han Seng Kong

TALK ON PROFESSIONAL NEGLIGENCE

by Ir. Leon Weng Seng

On 22 February 2020, the Sub-Committee on Dispute Avoidance & Resolution Practice (DARP) of the Standing Committee on Professional Practice (PPC), IEM organised a morning talk on professional negligence by Ir. Leon Weng Seng.

There were 60 participants who came from various construction industries including consulting engineers, contractors, lawyers, arbitrators and quantity surveyors.

Ir. Leon started the talk with a 2-minute video on **Donoghue vs Stevenson**, with Lord Atkin's pronouncement of his infamous Neighbour Principle. He then delved into the detailed legal aspects of the three essential elements of negligence, as follows:

1. Duty of care
2. Breach
3. Causation and remoteness

It touched on foreseeability, proximity and fairness, based on the later case of **Caparo vs Dickman**. It is important that the duty of care must be established first before moving to other elements. There was a brief mention of negligent misstatement (**Hedley Byrne vs Heller**). The breach of duty hinges on two aspects: What is the standard of care and if the performance has fallen below such a standard, especially for professionals, as determined by **Bolam vs Friern Hospital Management Committee**.

The third element of causation and remoteness covered the "but for" test and again, the reasonable foreseeability situation. The difficulties in applying the "but for" test were demonstrated by several case laws.

The claim for damages and time limit to pursue a negligence claim was elaborated with reference to the Limitation Act 2019. Not all damages would be borne by the tortfeasor as he could seek contributory negligence from the plaintiff claimant or protect himself through Professional Indemnity Insurance, though with limitations.

Three case studies were presented and these generated strong reactions and lively discussions. The first was the Highland Tower Collapse (Kuala Lumpur, 11 February 1993) with 48 deaths, followed by the Granito Tragedy (Penang, 21 October 2017) with 11 casualties and the Pan-Island Expressway (PIE) Collapse (Singapore, 14 July 2017) with one death and 10 injured.

Ir. Leon elaborated on the causes of collapse and the negligence involved and these were actively debated. For the Highland Tower Collapse, he highlighted the Government and local authorities' full immunity to suit as codified in S95(2) Street, Drainage & Building Act 1974 and Federal Court's decision.

The participants' attention was also drawn to the criminal aspects of punishment in Occupational Safety & Health Act (OSHA) 1994 and Singapore's Building Control Act (BCA) 1989. The imprisonment sentences handed down in the PIE case showed clearly that, apart from the monetary fines, professionals were not immune to prison terms.

The last part of the talk focused on submission of plans and drawings to local authorities, the CCC and supervision, particularly on alternative designs. Not only must the alternative design engineer submit the design calculations and drawings to the local authorities but he/she must also supervise and sign Form G. These can be part of the main submission and the Uniform Building By-law (UBBL) does not state that there can be only be one or single submitting person. ■

Participants at the talk

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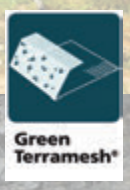

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WORKING ON BIM DURING MCO: CHALLENGES & SOLUTIONS

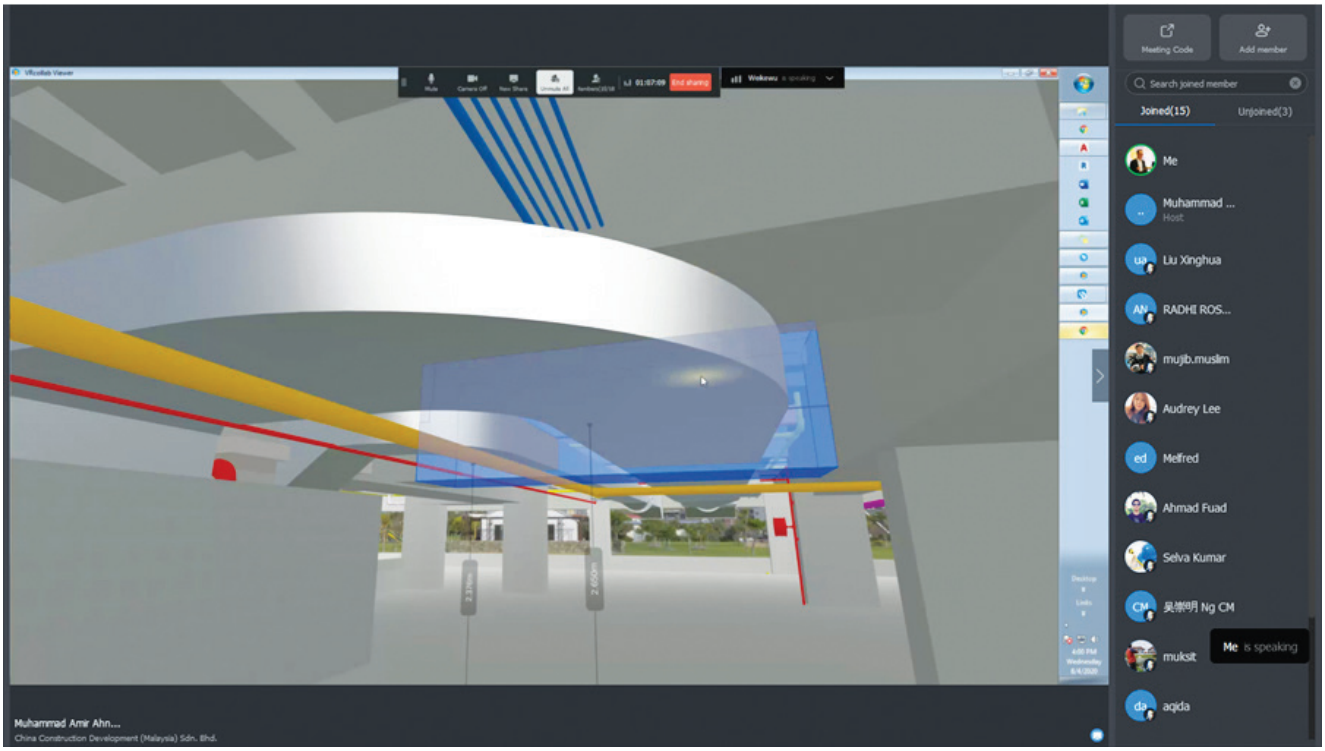
by Mr. Wei Kewu

As part of a nationwide exercise to curb the spread of COVID-19, the Malaysian Government enforced a Movement Control Order (MCO) from 18 March to 12 May 2020 (at Press time). This meant that only essential services were allowed to operate. However, the construction industry was not considered part of essential services, so we stopped work on site. When the said announcement was made on 16 March 2020, we had very little time to respond to and plan for the MCO. Moreover, nobody in the company had had the experience of handling such a situation.

With this situation, a project delay was inevitable. Still, we had the option of working from home and we made full use of this period to continue with our technical coordination by using Building Information Modeling (BIM) with our teams of subcontractors, consultants and clients.

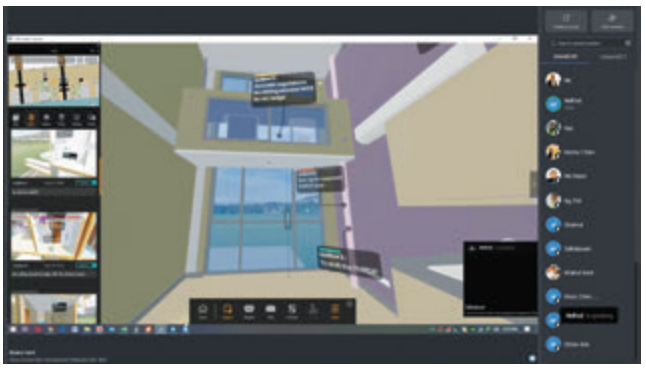
We brainstormed with our teams via video conferencing to hammer out the SOP for Work From Home (WFH) during this trying period. We encouraged them to work for the benefit of company and for themselves. Here are some of our challenges and what we have done to overcome them.

1. As the BIM computer is a company asset, it is company policy that and we are not allowed to bring it home. We made an exception this time and sent a BIM computer to each house where a BIM modeller lived. So even before the MCO started, we had already



Coordination of Structure and MEP Services

Coordination of MEP Services



Coordination of Architectural and ID design

crossed our first hurdle by putting BIM computers into the hands of our BIM modellers.

2. On the first day of WFH, the feedback from BIM modellers was that they did not have sufficient data plan. We came to their rescue by subscribing to the required data plan. We recognised that providing a little incentive to our employees would go a long way to motivate them.
3. A third point was the usefulness of the Cloud Server. In the office, we had a server to store documents but how would we retrieve drawings and documents while at home? We immediately initiated the use of BIM360 Cloud Server to store all our BIM models and drawings in addition to one at the site office. It was not easy to change the mindset during the initial stage of using any new technology. It was also an additional job to upload the files into BIM360 but our teams could now access the Cloud Server anywhere and anytime.
4. Next was communication. How did we monitor progress and communicate with each other? On a regular day at the office, BIM modellers will snapshot the crash or discrepancy of the BIM model and send this to different WhatsApp groups. We hold regular technical meetings face-to-face to resolve technical issues. During the MCO, we could not do this physically but thanks to technology, we had various free software such as Zoom and Dingtalk for video conferencing. We continued to hold regular technical meetings with all stakeholders. We used the Dingtalk App for video conferencing since this had many functions with respect to HR management.
5. Lastly, it was about the power of virtual meetings. During normal times, our site teams are busy on site and QSs are so busy with claims that they seldom have time to join us for BIM technical coordination meetings. However, during the MCO, we invited them to join us during video conferencing to learn what the issues were. BIM modellers shared their screens with everyone, walked us through the BIM Model and everybody could detect the crash and detailing or could raise questions based on their experiences to solve structural, architectural and MEP issues before actual work started.

We realised that the video conferencing was quite effective as everybody was at home in a quiet environment and, armed with a computer, could view the model clearly and snapshot any issue during the navigation of the BIM model.

Who led the digital transformation of your company? Was it the CEO, CTO or COVID-19? The answer would be COVID- 19. We need to prepare and adapt to the new environment and change the way we work. Now that we are in the wave of 4IR, we can learn and improve our work during this difficult period. ■

TO OUR UNSUNG HEROES, A BIG THANK YOU!

IEM President Ir. David Lai presenting the surgical face masks to Datuk Ir. (Dr) Abdul Rahim Hj. Hashim. On the right are Professor Dr Tunku Kamarul Zaman bin Tunku Zainol Abidin and Dr Susheela Nair. On the left are Ir. Dr Oh Seong Por, Ir. Prof. Dr Jeffrey Chiang Choong Luin and Encik Yuhanis Abdul Latiff

Fighting a mammoth battle against the spread of the Coronavirus or Covid-19, all medical professionals in the country are working tirelessly with long shifts while at the same time, worrying about bringing the virus home to their loved ones.

At Press time (29 April, 2020), the coronavirus had claimed 100 deaths in Malaysia, with more than 5,800 infected. Without a vaccine in hand, governments around the world are implementing lockdowns and calling on all its citizens to #StayAtHome in a bid to detect and contain Covid-19.

While the general public stays at home as far as possible, there is an army of medical frontliners who risk their lives daily and who are working relentlessly to fight the coronavirus despite not having any effective weapon.

IEM Penang Branch Committee Members presented PPE to the Penang General Hospital

IEM HQ COVID-19 COVID-19 FUND – LIST OF DONORS

1.	Academician Dato' Ir. Lee Yee Cheong
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10.	Mr. Ooi Wai Kham
11.	Mr. Tan Kean Phaw
12.	IEM Negeri Sembilan Branch
13.	JNK Consultant
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IEM HQ and the Branches initiated Covid-19 Fund drives to alleviate the shortage of supplies that our frontliners faced. IEM felt that face masks, Personal Protection Equipment (PPE) and food were at the top of the list of essential items needed.

On 13 April 2020, IEM HQ donated 10,000 surgical face masks to the medical staff of University Malaya Medical Centre. Making the presentation to Y.Bhg. Datuk Ir. Dr Abdul

Rahim Hj. Hashim, Vice Chancellor of University Malaya and Acting Chairman of the UMMC Board of Management was IEM President Ir. David Lai Kong Phooi. Also present were Ir. Prof. Dr Jeffrey Chiang Choong Luin, Chairman of IEM Standing Committee on Corporate Affairs, Ir. Dr Oh Seong Por, Chairman of IEM Negeri Sembilan Branch and Encik Yuhanis Abdul Latiff, representative of C.I.S Network, one of the donors to the COVID-19 Fund.

IEM Branches also did their part. IEM Penang Branch raised RM13,700 from members and well-wishers in a donation drive from 3-8 April 2020. The proceeds were used to purchase PPE supplies of 2,000 pieces of bouffant caps, 2,000 pieces of shoe covers, 500 pieces of KN95 face masks, 100 pieces of isolation gowns and 60 pieces of surgical gowns which were donated to the Penang General Hospital on 13 April.

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10.	Ir. Leo Choe Peng	24.	Mr. Teo Eu Jin
11.	Ir. Loh Eng Chuan	25.	Ir. Tiu Jon Hui
12.	Ir. Dr Mui Kai Yin	26.	Mr. Wong Kok Nian
13.	Mr. Ng Leong Aun	27.	Ir. Yau Ann Nian
14.	Ir. Ooi Choy Hoong	28.	Soil Mechanic Sdn. Bhd.

On 17 April 2020, IEM Melaka Branch donated food and drinks worth RM1,301 to Melaka Tengah District Police Chief YDH ACP Afzanizar bin Ahmad. The presentation was made by IEM Melaka Branch Chairman Ir. Prof. Dr Puvanasvaran Perumal and a few Committee Members. Also present at the event were JKR Melaka Director Datuk Ir. Haji Ismail bin Abd. Rahman.

IEM MELAKA BRANCH COVID-19 CHARITY DRIVE – LIST OF DONORS

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10.	Ir. Pua Chai Eon	20.	Ir. Ronnie Neo Hai Fun

IEM is optimistic that, together as a nation, Malaysia will succeed in its fight against the COVID-19 outbreak.

To medical frontliners, police officers and army personnel which had been deployed to monitor the Movement Control Order since 18 March 2020, IEM wishes to say "We Thank You for Staying At Work For Us". ■

IEM Melaka Chairman Ir. Prof. Dr Punesh Perumal presented donations to Melaka Tengah District Police Chief YDH ACP Afzanizar bin Ahmad

CHINESE NEW YEAR CELEBRATION AT IEMNS

by Ir. Dr Oh Seong Por

IEMNS members wishing everyone Happy Chinese New Year 2020

Gong Xi Fa Cai, Selamat Tahun Baru Cina, Happy Chinese New Year! On 1 February 2020, The Institution of Engineers, Malaysia, Negeri Sembilan Branch (IEMNS) ushered in the Year of The Rat with an open house at the seminar room of the IEMNS office in Oakland Commerce Square, Seremban.

The event started at 10 a.m. and was extended till 4 p.m. to accommodate guests who turned up at various times throughout the day. IEMNS Chairman Ir. Dr Oh Seong Por, who hosted the event, welcomed the early guests, IEMNS Past Honorary Secretary Ir. Hj. Badiuzzaman and Past Vice Chairman Ir. Wong Kin Siak. Then IEM HQ Honorary Secretary Ir. Mohd Khir and council member Ir. Fam Yew Hin also turned up, which helped give the celebration mood a big boost.

Besides IEM members, those who came for the event included university students, lecturers, suppliers, manufacturers and partners. Among them were the Honorary Treasurer of The Institution of Mechanical Engineering Malaysia Ir. Gerald Victor, RHB Bank Manager Ms Hong Yoke Hwee, Tenaga National Manager Ir. Mohd Zaiddy and Samsung SDI Energy Malaysia Manager Mr. Maharam Ismail. While they were enjoying the local cuisine, Mandarin oranges and cookies, the guests were briefed on IEMNS activities from 2018 to 2020, which included technical visits, engineering talks and seminars, PI courses, STEM promotion campaigns at schools, supports for robot competitions and article contributions to the *JURUTERA* bulletin. Indeed, the event had achieved the following 4 major intentions:

1. Strengthened the bonds between IEM members through direct interaction during the auspicious celebration.
2. Promoted IEMNS activities to attendees so as to motivate them to continuously participate in these and to support Negeri Sembilan Branch.
3. Created a greater understanding about IEM and its noble mission, and so encourage potential engineers to join as members.
4. Fostered goodwill with other agencies including industry, government, professional associations and contractors. ■

Guests enjoying both food and fellowship

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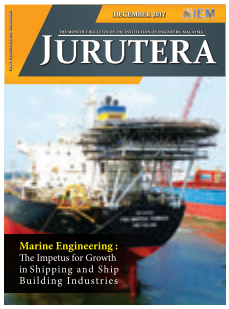

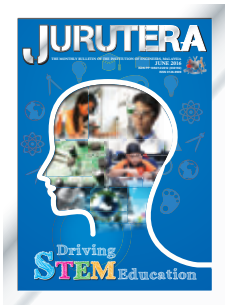

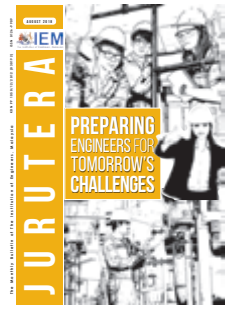

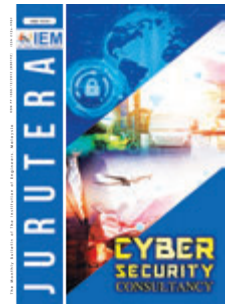

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WORKSHOP ON IMAGE PROCESSING

by Lim Chun Seong

On 17 March 2019, the IEM UniMAP Student Section organised an Image Processing Workshop for 30 students. It was presented by Dr Rafikha Aliana, a senior lecturer at the School of Computer & Communication Engineering UniMAP.

The objective was to expose the students to the basic principles of image processing, including the various image colour space such as RGB (Red Green Blue), grayscale and HSV (Hue Saturation Value).

Dr Rafikha talked about how this can influence the performance of machine learning. To covert an ordinary RGB colour image to HSV colour space, the "rgb2hsv" Scilab command can be used. It can also be done easily by using other scientific software. One of the advantages of HSV over RGB is its ability to separate image intensity from colour information, enabling machine learning algorithm and it is less sensitive to light variations for pattern recognition.

The students were also taught other useful image processing techniques which will further their interest in this highly developing field. ■

The students and Dr Rafikha (middle)

FIDDLER ON THE ROOF

Ir. Chin Mee Poon

***Ir. Chin Mee Poon** is a retired civil engineer who derives a great deal of joy and satisfaction from travelling to different parts of the globe, capturing fascinating insights of the places and people he encounters and sharing his experiences with others through his photographs and writing.*

What appears to be a little misfortune initially, may actually turn out to be a blessing in disguise later on. This I learnt when my wife and I together with a regular travel buddy, decided to take a ride in the Carpathian Forest Steam Train.

I am a diehard train buff and I rarely forgo any opportunity to experience a narrow-gauge scenic train ride when I travel. So when the three of us were backpacking in Bulgaria and Romania in April and May of 2017, we made Vişeu de Sus one of our pit stops for the sole purpose of taking a ride on what was reputedly the last forestry railway in Europe still powered by steam locomotives.

Vişeu de Sus is a village in the county of Maramureş in northern Romania, close to the Ukraine border. Founded as early as the 14th century, it was, for a long time, an important logging centre and the forestry railway was constructed in 1930-33 to transport timber logs from the Carpathian Mountains. It was partially destroyed during WWII but in 2004, it was rehabilitated as a tourist attraction. With a gauge of 760mm, the 4-coach train chugs along at the respectable speed of about 10kph towards its destination 21.6km away, giving its 180 passengers ample time to enjoy the magnificent views along the Vaser Valley.

That morning I got to the railway station early and when the ticket office opened at 8, I was the first in line. Yet I only managed to buy tickets for the third departure of the day as the two earlier departures, at 9 a.m. and 9.30 a.m., were sold out due to heavy online bookings by individuals and tour groups. I was rather disappointed as I had wanted to complete the train ride as early as possible so that we would have more time to move on to our next pit stop.

Later, as we were boarding the 10 a.m. train, we were pleasantly surprised to see a group of conspicuously dressed musicians joining us for the journey. The train snaked its way alongside Vaser River, up the refreshingly lush and charming valley. Small clusters of rustic farmhouses were seen with a narrow catenary footbridge or two straddling the river. Piles of timber logs and the occasional horse-drawn goods carriage reminded us of the historical past of the area.

One hour into the journey, the train made a 25-minute stop and all passengers alighted to stretch their legs and enjoy the views. The musicians, led by a pretty female singer, started to perform, much to the pleasure of the passengers. However, they were not there to entertain us but rather to do location shooting. A videographer and a photographer were busy at work and we passengers just happened to be convenient supporting and background "actors".

We reached the final destination, Paltin, after another hour or so but just before that, the train paused to allow the fiddler of the music group to climb on to the roof of one of the coaches to perform while the train eased slowly into Paltin, much to the excitement and appreciation of the passengers.

Paltin was a large picnic ground beside the river, with rows and rows of picnic tables and benches, a few sheds and a food vendor. There was even a tiny museum on the Carpathian Forest Steam Train. A few trekking trails penetrate deep into the mountains. We were given 1½ hours to have our lunch, visit the museum, do a little trekking or to just laze around.

Again, the musicians provided us with some much appreciated entertainment. The 9 o'clock train pulled away for its return journey soon after we arrived, followed by the 9.30 train half an hour later. Our return journey was delayed by almost half an hour because one member of a French tour group failed to come back after trekking into the forest. ■

CONTINUATION OF APRIL ISSUE 2020

PEMINDAHAN AHLI KEPADA AHLI KORPORAT

No. Ahli	Nama	Kelayakan
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69692	ISHAK BIN ABDUL AZID	BSC HONS (CLARKSON) (MECHANICAL, 1993) MSc (WALES) (COMPUTATIONAL MODELLING & FINITE ELEMENTS IN ENGINEERING MECHANICS, 1995)
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30327	MOHAMAD SAIFUL BIN ABDUL RANI	BE HONS (UiTM) (MECHANICAL, 2008)
54613	MOHD ARIF ANUAR BIN MOHD SALLEH	BE HONS (UTHM) (MECHANICAL, 2006) ME (UTHM) (MECHANICAL, 2008) PhD (QUEENSLAND) (2016)
49388	MOHD AZWAN BIN BAKAR	BE HONS (UTM) (MECHANICAL, 2008)
79349	MOHD FIRDAUS BIN ADAM	BE HONS (UPM) (MECHANICAL, 2007)
41211	MOHD HAZIZI BIN MOHD HANAPIAH	BE HONS (UTM) (MECHANICAL, 2000)
89527	MOHD SAFARIZAM BIN ABDULLAH	BE HONS (UTM) (MECHANICAL, 2004) ME (UTM) (MECHANICAL - ADV. MANUFACTURING TECHNOLOGY, 2015)
41216	MOHD SAFARUL IZMI BIN SAIDIN	BE HONS (UTHM) (MECHANICAL, 2006)
41988	MOHD ZIRWANDY BIN ZAINUDDIN	BE HONS (UTM) (MECHANICAL-AERONAUTICS, 2003)
30566	MOORTHY A/L PAKISAMY	BE HONS (UTM) (MECHANICAL, 2005)
95900	MUHAMMAD TARIQ ZIAD BIN TARMIZI	BE HONS (UTHM) (MECHANICAL, 2014)
66385	ROZMAN BIN GHAZULI	BE HONS (USM) (MECHANICAL, 2005)
96885	SURESHRAJ VASUDEVAN	BSc (WICHITA STATE) (MECHANICAL, 2008)
36911	TAN BEE KIAN	BSc HONS (SOUTH ALABAMA) (MECHANICAL, 2001) MSc (KANSAS STATE) (MECHANICAL, 2003)
65204	TAN POH SHEN	ME HONS (IMPERIAL COLLEGE LONDON) (MECHANICAL, 2011)
89677	TAN SYH WEI	BE HONS (MALAYA) (MECHANICAL, 2011)
30582	TUEN WAI KEONG	BE HONS (MISSOURI, COLUMBIA) (MECHANICAL, 2000)
44812	VIJAYAPRAGAS A/L MUNIANDY	BE HONS (UTM) (MECHANICAL-AUTOMOTIVE, 2012)
66436	WONG CHEE KONG	BE HONS (UNITEN) (MECHANICAL, 2013)
KEJURUTERAAN PEMBUATAN		
88291	MOHD IZHAM BIN ABDUL LATIFF	BE HONS (IIUM) (MANUFACTURING, 2004)
KEJURUTERAAN SUMBER AIR		
34033	AZWIN ZAILTI BINTI ABDUL RAZAD	ME HONS (MANCHESTER) (CIVIL, 2006) ME (UPM) (WATER, 2012)
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WAN HUSAIMAH BINTI WAN HUSSAIN	BE HONS (UKM) (ELECTRICAL & ELECTRONIC, 2005)
WAN NORSYAFIZAN BINTI W. MUHAMAD	BE HONS (MALAYA) (ELECTRICAL, 2002)
WAN ROSMARIA BINTI WAN AHMAD	BE HONS (UKM) (MICROELECTRONIC, 2005) MSc (UKM) (MICROENGINEERING & NANOELECTRONIC, 2008)
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INTAN FADHLINA BINTI MOHAMED	BE HONS (USM) (MECHANICAL, 2000) ME (UKM) (MECHANICAL, 2010)
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MOHD FAIZ FIKRI BIN YUSSOFF	BE HONS (UiTM) (MECHANICAL, 2008)
MOHD RAFAL BIN SAHUDIN	BE HONS (UiTM) (MECHANICAL, 2007)
MOHD SYAHRIL BIN MOHD SAIT	BE HONS (UTM) (MECHANICAL, 2007)
MUHAMMAD AFIF BIN HALIM	BE HONS (USM) (MECHANICAL, 2006)
NUR AZURA BINTI ZEOL	BE HONS (USM) (MECHANICAL, 2007)
ROSLIANA BINTI RUSLI	BE HONS (UNIMAS) (MECHANICAL & MANUFACTURING SYSTEM, 2005)
SHAMSUL BIN SARIP	BE HONS (UTM) (MECHANICAL, 1999)
SUHANA BINTI CHE SEMAN	BE HONS (UTHM) (MECHANICAL, 2006)
SYED TAUFIQULRAHMAN BIN SAID ABU HASSAN	BE HONS (MALAYA) (MECHANICAL, 2011)

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Nama	Kelayakan
KEJURUTERAAN AWAM	
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LAU HIN HUAT	BE HONS (NOTTINGHAM TRENT) (CIVIL & STRUCTURAL, 2003)
KEJURUTERAAN ELEKTRIKAL	
MOHD NASSURUDDEN BIN KADER BAWA	BE HONS (UTM) (ELECTRICAL, 2007)

PEMINDAHAN KEPADA AHLI 'COMPANION'

No. Ahli	Nama	Kelayakan
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24992	LEE JIN MING	B.E.HONS.(UTM)(CIVIL, 2007)
KEJURUTERAAN ELEKTRIKAL		
18513	CHIN WOON YU, DENIS	B.E.HONS.(UNI. OF SUNDERLAND) (ELECTRICAL & ELECTRONIC, 1994) DIPL.(INST. TEKNOLOGI PERTAMA)(ELECTRICAL/ ELECTRONIC, 1992)
KEJURUTERAAN MEKATRONIK		
103093	CHENG YU SENG	B.E.HONS.(USM) (MECHATRONICS, 2008)

PERMOHONAN MENJADI AHLI 'COMPANION'

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105640	MOHAMMED IZRAI BIN ABD RAZAK	B.E.HONS.(UKM) (CIVIL, 2003) M.Sc.(UiTM)(CIVIL-CONSTRUCTION, 2015)
104603	MOHD SAMAN BIN AHMAD	B.E.HONS.(UTM)(CIVIL, 2009)
104612	ROZAIDI BIN MOHD DAUD	B.E.HONS.(UTM)(CIVIL, 2006)
105513	SAIFUL BAHRI BIN HAMZAH	B.E.HONS.(UNI. OF MALAYA)(CIVIL, 1998)
104240	SHAHAROM BIN RAMLAN	B.Sc.(NEW MEXICO STATE UNI.)(CIVIL, 1987)
104604	SYED MOHAMAD AZANI BIN SYED MOHAMAD	B.E.HONS.(UiTM)(CIVIL, 2006)
105504	TOH BIN TEE	B.E.HONS.(USM) (CIVIL, 2006) M.Sc.(NTU)(CIVIL, 2018)
KEJURUTERAAN ELEKTRIKAL		
105501	AIRULL AZIZI AWANG LAH	B.E.HONS.(MMU) (ELECTRICAL, 2002)
104613	CHAI JEE HUEI	B.E.HONS.(THE UNI. OF ADELAIDE)(ELECTRICAL & ELECTRONIC, 2002)
104275	HO MING CHUNG, WILLIAM	B.E.HONS.(LIVERPOOL JOHN MOORES UNI.) (ELECTRICAL & ELECTRONIC, 2001) DIPL.(INTI COLLEGE) (ELECTRONIC & ELECTRICAL, 1999)
105503	MOHD AL-AMIN BIN MUALIF	B.E.HONS.(UTM) (ELECTRICAL-TELECOMMUNICATIONS, 2008)
105510	NUROOL ASYIKIN GHAZALI	B.E.HONS.(UNITEN) (ELECTRICAL POWER, 2002)
KEJURUTERAAN ELEKTRONIK		
104300	AZAH AHMAD	B.Sc.(THE OHIO STATE UNI.)(ELECTRICAL & COMPUTER, 1998) M.Sc.(UKM)(ENERGY TECHNOLOGY, 2004)
105508	HAMID BIN SALIM	B.E.HONS.(UTHM) (ELECTRICAL, 2003) M.Sc.(UiTM) (TELECOMMUNICATION & INFORMATION, 2013)
105639	JUSTIN JOHN PAPU	B.E.HONS.(UNITEN) (ELECTRICAL & ELECTRONICS, 2006)
105505	SUFIAN BIN MOHAMAD	B.E.HONS.(UiTM) (ELECTRICAL, 2008) M.E.(UKM)(COMPUTER & COMMUNICATION, 2011)
KEJURUTERAAN KIMIA		
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105512	PRAVINA A/P N. ASHOK KUMAR	B.E.HONS.(UMP) (CHEMICAL, 2009)
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