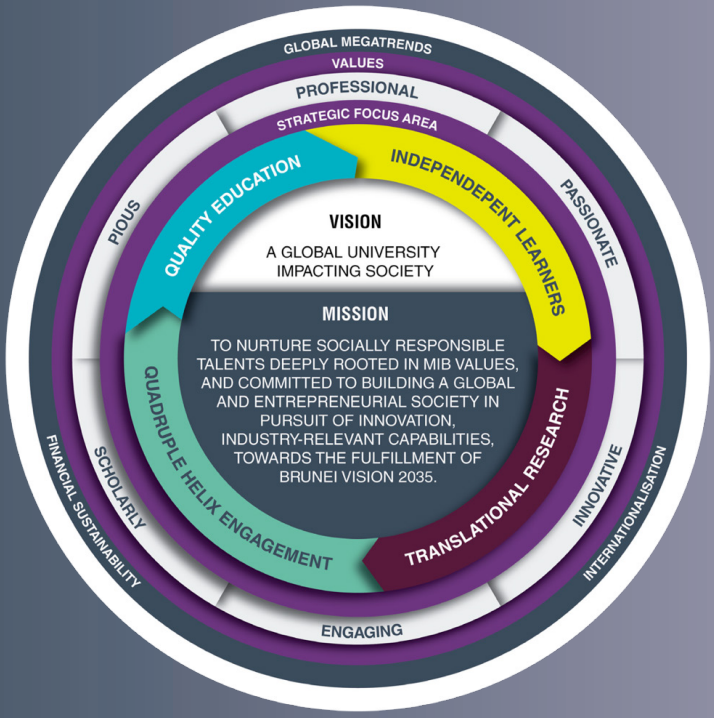
UNIVERSITI TEKNOLOGI BRUNEI

Research Centres and Research Thrusts

RESEARCH AT UNIVERSITI TEKNOLOGI BRUNEI

Established in 1986, Institut Teknologi Brunei (ITB) was upgraded to a university in 2008 and subsequently renamed as Universiti Teknologi Brunei (UTB) in March, 2016. UTB specialises in areas of Engineering, Business, Computing, Applied Sciences & Mathematics and Design. The University's vision to be "A Global University Impacting Society" is at the heart of our research.



At UTB, research is clustered into six Research Thrusts based on a multidisciplinary research philosophy and in line with Wawasan Brunei 2035 (Brunei Vision 2035). The Research Thrusts are:

- Agri-Food Research Thrust (AFRT),
- Digital and Creativity Research Thrust (DCRT),
- Energy Research Thrust (ERT),
- Society and Enterprise Research Thrust (SERT),
- Sustainable Built Environment Research Thrust (SBERT), and
- Wellness Research Thrust (WRT).

At present, UTB also has three Research Centres which focus on niche areas of research and address major engineering and scientific challenges of national importance. The Research Centres are:

- Centre for Transport Research (CfTR),
- Centre for Innovative Engineering (CIE), and
- Centre for Research on Agri-Food Science and Technology (CrAFT).

Owing to their inter-disciplinary nature, the Research Centres and Research Thrusts draw members from UTB's academic units comprising of Faculty of Engineering, School of Applied Sciences and Mathematics, School of Computing and Informatics, School of Design, UTB School of Business and Centre for Communication, Teaching and Learning. Information on individual Research Centres and Research Thrusts is given in subsequent sections of this brochure.

Our researchers work to enhance sustainability covering the three components viz., society, economy and environment. We pursue our research following five strategies (RC4) i.e. Research, Collaboration, Consultancy, Commercialisation and Community Outreach.

UTB emphasises on Translational Research. The objectives are:

- To strengthen impact of applied research,
- To transform research in to tangible products, and
- To enhance technopreneurship culture and enterprise

We are currently working with a number of prestigious academic and industrial partners, both local and international, on different projects. We have partnered in research, education and training programmes. Our collaborations include the exchange staff and students, industrial internships, joint research, conferences, consultancies, seminars and others.

Prospective local and international partners are welcome to collaborate with UTB in areas of common interests. Please contact:

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CENTRE FOR TRANSPORT RESEARCH (CfTR)

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INTRODUCTION

The Centre for Transport Research (CfTR) was the first research centre established at Universiti Teknologi Brunei (UTB), with an emphasis on multidisciplinary and collaborative research in the field of transport. CfTR remains the only research centre in the country focusing its research in the field of transport. The centre is committed to improve the transport system by:

- •Conducting interdisciplinary research to develop, support and complement the relevant national transport plans and strategic directions
- Collaborating with fellow national and international researchers for knowledge sharing and advancement
- Acting as a transport and road safety resource and training centre

Since its establishment, CfTR has maintained an active role in the Brunei Darussalam National Road Safety Council chaired by the Honourable Minister of Transport and Infocommunications. Several research projects have been successfully completed and their outcomes disseminated in Scopus-indexed publications and meetings with relevant stakeholders. Moreover, new research projects and initiatives, which are expected to have a strong impact on improving national road safety and transport system, have been started to strengthen and support the growth of research activities at the university.

RESEARCH INTEREST

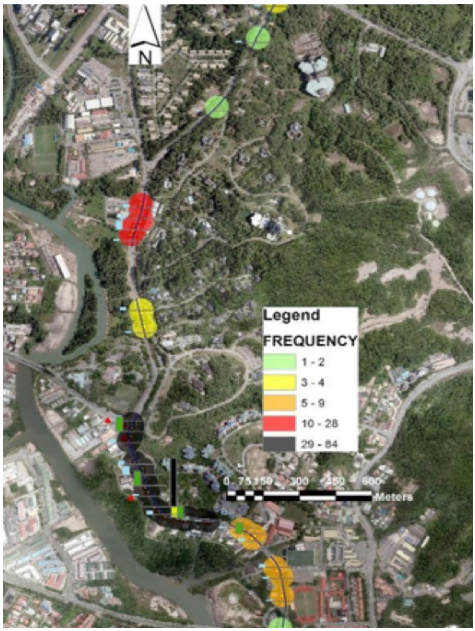
The main research themes of CfTR are road safety engineering, highway and geotechnical engineering, and traffic engineering. These include the application of Geographical Information System for road accident hotspot analysis, database development, laboratory and numerical analysis of road pavement, road safety improvement, intelligent transport system, transport modelling and slope stability analysis.

INDICATIVE PROJECTS

- Road Accident Data Enhancement and Development (RADED) funded by Ministry of Transport and Infocommunications.
- Laboratory investigation of polymer stabilised aggregate layer and dry-mixed rubberised asphalt for road pavement, funded by university research grant.
- Safety impact of alternate road lights in Brunei Darussalam, sponsored by Insurans Islam TAIB General Takaful Sdn. Bhd.
- An investigation into the safety performance of Jalan Tutong, funded by university research grant.

- Review of design guidelines for rainfall-induced slope failures in Brunei Darussalam, funded by university research grant.

- Road Safety Infrastructure Study, funded by Science and Technology Research Fund (10th National Development Plan) Brunei Research Council.



STAFF STRENGTH

In 2018-2019, a total of 10 researchers and 3 research associates were appointed at CfTR. Several academic staff have been seconded to the centre from across the disciplines of Civil Engineering, Electrical and Electronic Engineering, Petroleum and Chemical Engineering and Computer Information System. Moreover, research associates have also been appointed from the government and sector and partner university to provide valuable advice and additional expertise to the centre. The centre also regularly hosts research assistants, research interns, research students and final year project students to work on various contemporary research problems related to transport.

CENTRE FOR INNOVATIVE ENGINEERING (CIE)

Director: Dr. Somnuk Phon-Amnuaisuk
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INTRODUCTION

His Majesty Sultan Haji Hassanal Bolkiah Mu'izzaddin Waddaulah, the Sultan and Yang Di-Pertuan of Brunei Darussalam and Chancellor of Universiti Teknologi Brunei (UTB) officially launched the Centre for Innovative Engineering (CIE) at the UTB convocation on the 23rd October, 2014. His Majesty the Sultan and Yang Di-Pertuan of Brunei Darussalam approved the formation of CIE as a platform for quality innovative engineering and research.

CIE's vision is to become a centre of excellence and to serve as a reference for collaborations between local and foreign agencies. Our missions for July 2018 to June 2022 are:

- To strengthen research capability in key and niche research areas through partnership and technology transfer;
- To promote and sustain research & development capability; and
- To develop new products/services in key research areas.

CORE VALUES

Our core values focus on the following qualities: Integrity, Accountability & Moral courage; Lifelong learning; Creativity & Innovation; and Engineering excellence.

RESEARCH INTEREST

CIE serves as a reference for collaborations between local and foreign agencies. Its activities cover a wide range of multi-disciplinary research areas.

CIE focuses on strengthening research capability in key and niche research areas through partnership and technology transfer under the current **flagship research** titled **'Smart Environment'.**

With this multidisciplinary flagship initiative, research activities of the 'Smart Environment' include physical hardware, communication networks and software application development. Projects in this area can bring researchers from multidisciplinary areas such as Engineering, Science, IT and Business together. There are many potential projects in relevant areas that CIE will spearhead through collaboration among faculties and with international collaborators.

INDICATIVE PROJECTS

- Relay Station Network Based on Low-power Wide-area Network (LPWAN) Technologies for Disaster Management, funded by ASEAN-IVO.
- Event Analysis: Applications of computer vision and AI in smart tourism industry, funded by ASEAN-IVO.
- Cleaning Kampong Air (2019), sponsored by Royal Brunei Technical Services (RBTS).

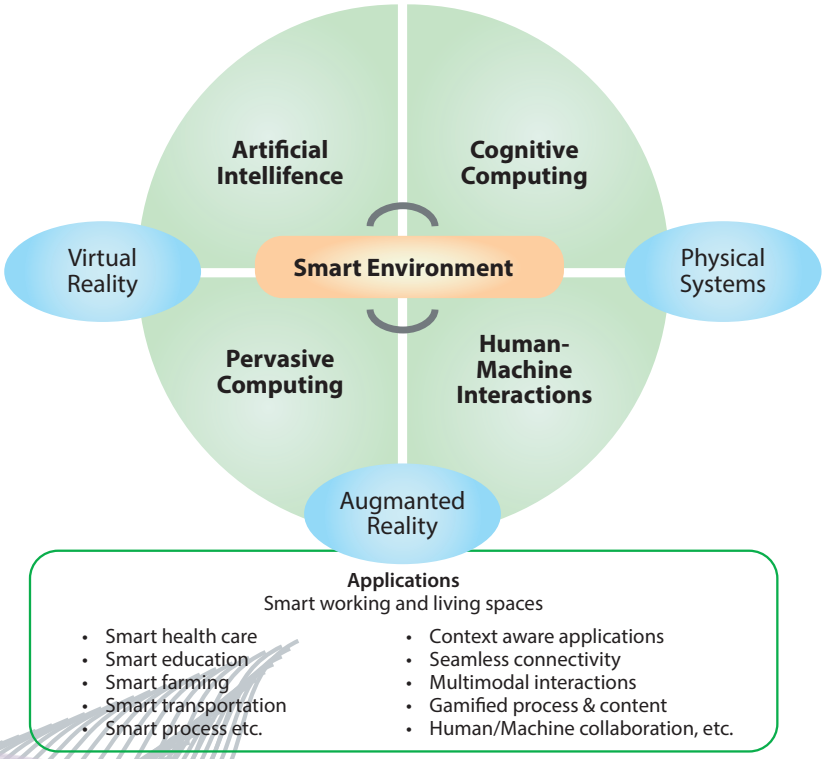
FUTURE PLAN

Exploring into the following areas:

- Energy Saving House
- Capacity Building
- Artificial Intelligence

STAFF STRENGTH

- July 2016- June 2017: 2 staff
- July 2017- June2018: 3 staff and 3 interns
- July 2018- June 2019: 3 staff, 1 PhD student and 2 interns
- July 2019-Hune 2020: 10 staff, 1 PhD student and 3 interns



CENTRE OF AGRI-FOOD SCIENCE AND TECHNOLOGY (CrAFT)
AGRI-FOOD RESEARCH THRUST (AFRT)

Director of CrAFT and Leader of AFRT: Prof. Dr. Beston Nore
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INTRODUCTION

The Centre of Agri-Food Science and Technology (CrAFT) and the Agri-Food Research Thrust (AFRT) were established in 2018 as a university-wide research centre and research thrust, respectively to serve as a agri-food platform for networking of researchers and pooling resources from various organisations, academic institutions and governmental bodies at local and international levels. Their vision is to create new knowledge and sustainable solutions for agri-food problems, while preparing students to become the next generation of researchers and leaders who are able to serve the needs of Bruneian society. CrAFT and AFRT aim to achieve these by maximising (i) transdisciplinary collaborations across various sectors at national and international levels, and (ii) translation of research into products and processes that impact communities. CrAFT and AFRT are:

- Conducting technology-driven research that will impact and benefit the national agri-food economy
- Developing and enhancing collaboration with local and international partners to improve capacity and capability in agri-food and food science research of the centre
- Acting as a hub that propagates scientific and technological agri-food research and development in the university
- Serving as a resource of technical expertise to support development of teaching and learning activities in agri-food and food science as the university and national levels.

RESEARCH INTEREST

CrAFT and AFRT are leverage on the areas of strength in UTB and connect relevant projects to agri-food industries, governmental bodies and societies as a whole. The main research interest are, but not limited to:

INDICATIVE PROJECTS

- Development of Agri-BKChain platform for "organic sprout farming"
- Development of gluten-free bread using Laila rice and okra flours
- Development of pasta/noodles incorporated with local herbs
- Development of edible food wrap/packaging
- Muskmelon post-harvest methods and technologies
- Disease and pest management in the greenhouse environment

STAFF STRENGTH

There are currently 11 members in CrAFT and AFRT. The membership is drawn from the School of Applied Sciences and Mathematics and the Faculty of Engineering. They also have in their team international researchers across various disciplines as well as collaborative partners. Postgraduates, undergraduates and interns are directly involved in agri-food projects as researchers and consultants under CrAFT and AFRT.

DIGITAL AND CREATIVITY RESEARCH THRUST (DCRT)

Leader: Dr Wida Susanty binti Haji Suhaili
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INTRODUCTION

The Digital and Creativity Research Thrust (DCRT) is one of the six thrusts newly introduced in Universiti Teknologi Brunei (UTB), with an emphasis on multidisciplinary and collaborative research in the field of Computing and Information tools. The DCRT aims at addressing the requirement of the nation to be a focal point to address requests and take initiatives in order to digitize and creatively create or upgrade processes, softwares, policy documents, materials and tools for bringing digital projects to the next level.

RESEARCH INTEREST

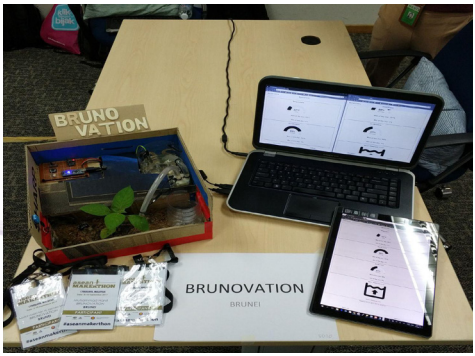
The main research themes of DCRT comprise of creation of applications and tools that aid in the everyday operational processes of organizations. Projects generated from School of Computing and Informatics remain the core of the research interest. These are supported by the team members from various other UTB faculty and schools, in collaboration with local industry stakeholders and international academicians, to create the multidisciplinary and collaborative research that the thrust is aiming for. DCRT caters for various disciplines and areas in the broader context where digital technology, computer information systems, computing algorithms, networks, programming languages, hardware and software play their part in process re-engineering. The examples of advanced ICT and mobile technologies may include the use of animation, smart sensors, internet of things, multimedia technologies and 5G networks as well as on the advanced technical side to include architectures, frameworks, protocols, digital strategies and policies as well as software interfaces for photonics, semiconductor device design and fabrication technologies etc.

STAFF STRENGTH

There is a total of 21 members; majority from the School of Computing and Informatics and others from the School of Applied Sciences and Mathematics (SASM), UTB School of Business (UTBSB) and Faculty of Engineering (FoE). The multidisciplinarity, which is reflected through the diversity of its members' skill sets and research interests, gives the Thrust its necessary potential in providing holistic solutions that it aims for in cultivating technologically advanced insights for various fabrics of Bruneian society and various industries of the Bruneian economy for its dynamic adjustments to the future forces of digital revolution and disruptive technologies for the sake of advancing future generations in the global world.

INDICATIVE PROJECTS

- Networked ASEAN Peatland Communities funded by ASEAN IVO
- A mesh-topological, low-power wireless network platform for a smart watering system funded by ASEAN IVO
- Reusable, Shareable, and Transferable Smart Data Platform for Collaborative Development of Data-driven Smart Cities funded by ASEAN IVO
- Determine the current gaps between demands and supply in ICT human resource for certified professionals in information security in ASEAN (ASEAN-TELSOM-ATRC 2020)
- Development of Low-Cost 3D-Printed Robotic Pros-thetic Hand and Tasks-based Control Optimization
- Network Evolution Strategies and Architecture for Next Generation Internet/ Future Internet (e.g. software defined network, network function virtulisation)
- Internal Auditing and Risk Management of ICT Infrastructure and Applications' Project: Use of Machine Learning and Artificial Intelligence Algorithms to ICT Exposures and Threats
- Data security and privacy in IoT
- IoT pipe leakage detector (prototype)
- Dynamic Interactive Campus Map
- Virtual reality 360 film driver behaviour



ENERGY RESEARCH THRUST (ERT)

Leader: Dr Reddy Prasad
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INTRODUCTION

The Energy Research Thrust (ERT) aims to promote and undertake fundamental and applied research related to the efficient use of energy in the domestic and industrial environments. Research undertaken by ERT is expected to boost the national energy sector.

RESEARCH INTEREST

Areas of interest include both renewable and non-renewable sources of energy such as petroleum, solar, biomass, tides and wind.

INDICATIVE PROJECTS

- Prospects and roadmaps for harvesting solar thermal and PV power in tropical Brunei

Brief explanation: Solar energy includes light energy and thermal energy. Solar thermal energy is more suitable for Brunei than light energy. Planning to develop hybrid technology to utilize maximum solar energy. Hence PCE, UTB conducting in-depth research in this area and developing the human resource (local students) to support the nation.

- Implementation of smart farming techniques to save water and energy in Brunei

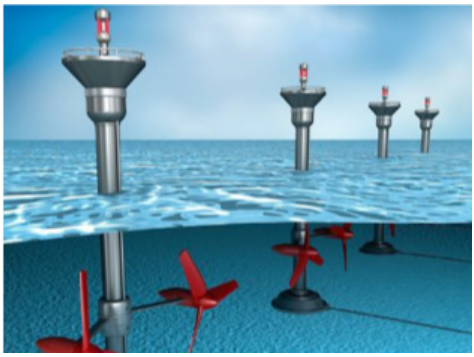
Brief explanation: Smart agriculture helps agribusinesses meet growing demands in Brunei by providing analytics and other tools that help farmers, ranchers, and others involved in agriculture gather and analyse data including weather, soil conditions, fertilization, and other factors used to assess growing conditions. Smart farming technologies also aid in tracking and monitoring the health and location of livestock in feedlots and pastures. It helps to save energy and improve the yield.

- Harvesting energy from biomass (forestry wood waste)

Brief explanation: Biomass is plant material used for energy production (electricity or heat), or in various industrial processes as raw material for a range of products. It can be purposely grown energy crops (e.g. miscanthus, switchgrass), wood or forest residues, waste from food crops (wheat straw, bagasse), horticulture (yard waste), food processing (corn cobs), animal farming (manure, rich in nitrogen and phosphorus).

- Feasibility study on using tidal power to generate electricity in Brunei

Brief explanation: Tidal power or tidal energy is the form of hydropower that converts the energy obtained from tides into useful forms of power, mainly electricity. Although not yet widely used, tidal energy has the potential for future electricity generation. Tides are more predictable than the wind and the sun. It is an upcoming technology for future Brunei.



- Solar thermal system for the drying of agricultural products

Brief explanation: Solar dryers are devices that use solar energy to dry substances, especially food. Open-air, sun drying of agricultural products is the traditional method employed in most of the developing countries. Sun drying is used to denote the exposure of a commodity to direct solar radiation and the convective power of the natural wind. This technology helpful for the agriculture industry in Brunei.

STAFF STRENGTH

At present, there are 11 academic staff members are registered in the Energy Research Thrust. In addition, a number of Masters and PhD students are working in various fields like petroleum engineering, solar energy, tidal power, photovoltaic, solar drying, bio energy and wind energy.

SOCIETY AND ENTERPRISE RESEARCH THRUST (SERT)

Leader: Prof Dr Kamariah Binti Ismail
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INTRODUCTION

With the emergence of the fourth Industrial Revolution (IR4.0) and globalisation, the study of behaviour of society and enterprise is becoming crucial research for Science, Technology, Engineering and Mathematics (STEM).

The Society and Enterprise Research Thrust (SERT) offers studies on businesses and political, cultural, institutional, social, and economic contexts. Specifically, the thrust focuses on individual firms/organisations/ industries comprising of any areas in the broad context including business, entrepreneurship, communications, Institutional studies on the impact of technology on social cohesion, security studies and economics.

SERT has the following four main objectives based on Brunei WAWASAN 2035:

- To study economic, finance and accounting issues
- To study curriculum development and communication
- To study local business development / technopreneurship / entrepreneurship/ Innovation / information technology management.
- To study human resource management / man power planning

RESEARCH INTEREST

SERT members have varied research interests commensurate with their academic background, expertise and diversity. Following is a list of research areas SERT members are working in:

- Commercialisation of technology from university, technopreneurship / SMEs, innovation management / information systems / e-commerce
- Crowdfunding, corporate finance, financial management, SMEs financing issues
- Application of IoT in smart farming
- Big data analysis on market segmentation and forecasting, IR4.0 and its impact on the growth of SMEs, predictive maintenance and its impact on revenue generation for manufacturing sectors
- Hospitality management, human resource development and management, knowledge management, training
- Emotional intelligence, organisational behaviour, leadership, management Information systems and national culture
- Accounting, financial economics, econometrics, energy economics, international economics and Brunei economics
- Communication, teaching and learning

STAFF STRENGTH

SERT has 27 members representing disciplines such as Economics, Accounting, Finance, Management, Computing & Information Systems, Computer Network Security, Communication and Teaching & Learning. The Thrust members are well connected internationally and are working on a number of projects with overseas collaborators.

INDICATIVE PROJECTS

- An Examination of the Factors Affecting the Adoption of Cryptocurrency Among Investors in Malaysia
- A Preventive Framework for Adolescents in Tobacco Use Initiation: Push-Pull-Intention Model.
- Towards sustainable crowdfunding for entrepreneurs in Malaysia: Examining motivations and deterrents in crowdfunding decision making
- Sustainability of Tourism industry in Geopark Langkawi
- Halal leather industry in Indonesia. Collaboration with State Islamic Universiti of Sultan Syarif Kassim Riau Indonesia
- Startup intention among Bruneian students

SUSTAINABLE BUILT ENVIRONMENT RESEARCH THRUST (SBERT)

Leader: Prof Ir Dr Mohammad Yeakub Ali
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INTRODUCTION

Sustainable Built Environment Research Thrust (SBERT) is one of the biggest six research thrusts at Universiti Teknologi Brunei (UTB), with an emphasis on collaborative research in various fields of engineering for sustainability. The main objective is to encompass ways to make the world better than today for future generations. This is aligned with United Nation sustainable development goals and Wawasan Brunei 2035. SBERT aims to be a regional one stop research centre for industry, government and research organisations for a sustainable built environment in Brunei Darussalam and the region.

SBERT is committed to improve environmental sustainability by:

- Appropriate use of resources especially land, water, energy and human
- Proper infrastructure development
- Green building and construction innovation
- Clean water and sanitation
- Affordable renewable energy
- Local business and supply chain management
- Knowledge dissemination and transfer
- Green manufacturing processes
- Carbon footprint reduction
- Responsible consumption
- Proper waste management
- Human interaction with energy and waste management system
- Adoption of fourth industrial revolution (IR 4.0)
- Sustainable city and transport system
- Conducting interdisciplinary research to develop, support and complement the relevant national strategic plan
- Collaborating with national and international individuals and academic / research organisations for knowledge sharing and advancement

SBERT members have long experience in research, development and publication in the field of sustainability. They have secured research grants from university and government and have published their research outcome in reputed scientific journals. Moreover, new research grants and initiatives have been introduced to support and strengthen research activities among the members to have a strong impact on sustainable built environment.

RESEARCH INTEREST

The main research themes of SBE research thrust at UTB is to improve human life quality within the capacity of ecosystem. Researchers in the group are working in the areas of building technology, green building, environment friendly materials and equipment, green design and manufacture, supply chain management, sustainable energy policy, waste management, air pollution and carbon footprint, network and security systems, telecommunication, internet of things (IoT), smart system, and sustainable technology development.

STAFF STRENGTH

Since its inception in 2019, a total of 31 academic researchers have joined this research thrust. These researchers are from various engineering disciplines such as Civil Engineering, Electrical and Electronic Engineering, Mechanical Engineering, and Petroleum & Chemical Engineering. Undergraduate and postgraduate students leading to their final year project, master's dissertation and PhD thesis are also attached to this research thrust.

INDICATIVE PROJECTS

- Water quality formation mechanism of Brunei River and its numerical modelling
- Impact identification and sustainability of storm water drainage system of Sungai Brunei Catchment under climate change
- Organic waste-amended soil as an alternative landfill cover
- Transboundary air-pollution prediction in ASEAN region using machine learning
- Review of design guidelines for rainfall-induced slope failures in Brunei Darussalam
- Chemical treatment of landfill leachate using persulphate and ferrate

WELLNESS RESEARCH THRUST (WRT)

Leader: Dr Malai Zeiti binti Sheikh Abdul Hamid
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INTRODUCTION

Univeristi Teknologi Brunei (UTB) introduced six Research Thrusts as part of a research initiative in line with Wawasan Brunei 2035 (Brunei Vision 2035). Wawasan Brunei 2035 aims to reduce Brunei's independence on the Oil and Gas sector, diversify its economy and develop public sectors such as Health, Education, Infrastructure, Recreation, Finance and Tourism.

Of the 6 research thrusts, the Wellness Research Thrust (WRT) was to conduct research in Wellness and related areas. WRT encompasses any areas in the context of well-being that includes point care of diagnostics, apps for health monitoring, cosmetics, technologies for rehabilitation, geriatrics, occupational wellness, medical discourse, traffic and road safety, drilling safety, blow out preventer (BOP), air quality and big data analysis for health, health care, environment, mathematical modelling of physiological systems and many more.

To understand the significance of wellness, it is important to understand how it is linked to health. According to the World Health Organization (WHO), health is defined as being "a state of complete physical, mental, and social well-being, and not merely the absence of disease or infirmity". WHO defines wellness as the optimal state of health of individuals and groups. The National Wellness Institute defines wellness as "a conscious, self-directed and evolving process of achieving full potential".

The objectives of the Wellness Research Thrust are as follows:

- To conduct interdisciplinary research to develop, support and complement the relevant wellness plans for national and international community
- To collaborate with national and international researchers for knowledge enhancement, sharing and advancement in wellness
- To develop risk management strategies in terms of safety concerns and plans for wellness

RESEARCH INTEREST

Wellness is multidimensional and the following research dimensions for wellness have been identified and can be pursued by any members within the research thrust.

- Emotional wellness is the ability to control stress and to express emotions appropriately and comfortably.
- Environmental wellness promotes health measures that improve the standard of living and quality of life at home and in the community that safeguard the environment.
- Intellectual wellness involves the ability to learn and use information effectively for personal, family, and career development and mental growth.

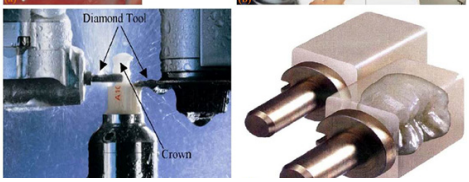
- Occupational wellness achieves a balance between work and leisure in a way that promotes health and a sense of personal satisfaction and worth.
- Physical wellness is the ability to carry out daily tasks, develop cardiorespiratory and muscular fitness, maintain adequate nutrition, free from diseases and ailments, maintain healthy body fat level, and avoid substance abuse.
- Social wellness means having the ability to interact successfully with people and personal environment.
- Spiritual Wellness is related to your values and beliefs that help you find meaning and purpose in your life. Spiritual wellness may come from activities such as volunteering, self-reflection, meditation, prayer, or spending time in nature.
- Financial Wellness is a feeling of satisfaction about your financial situation. Finances are a common stress or for people, so being able to minimize worry about this aspect of your life can enhance your overall wellness.

STAFF STRENGTH

At present, WRT consists of a total of 12 research members. The research members include both academic and administrative staff from UTB. Academic research members come from various disciplines including Computer Information System, Petroleum and Chemical Engineering, Civil Engineering, Applied Sciences and Mathematics, Food Science and Technology, Architecture and Product Design, and Effective Communication and Technical Communication. Our administrative research members are from both the Counselling Unit and Career Guidance Unit.

INDICATIVE PROJECTS

- A case study of depression, anxiety and stress among undergraduate students in Brunei.
- The relationship of happiness through health, wellness and well-being.
- Assistive technology for the visually impaired.
- Commonalities in English language medical case reports.
- The impact of food safety and health issues in Brunei.
- Effects of Sintering Time, Temperature and Indentation Load on the Microstructure and Mechanical Properties of Lithium Disilicate Glass-ceramic for Dental Restoration.



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