Research Frontiers and Way Forward

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Abstract. Researchers and academics do research to address the current and future needs of the nation. They have to be alert and sensitive to demands of their surrounding that can be largely be classed into the community, industry and government to complete the quadruple helix that intertwines the three into the fourth segment i.e. the academia. The current buzzwords that ought to catch the attention of academia are Translational Research, Niche Area, Sustainable Development Growth (SDG), Internet of Things (IoT), 4th Industrial Revolution (IR 4.0), Big Data, Transformasi Nasional 2050 (TN50) and Bottom 40% (B40). UiTM’s niche areas that have been declared to KPT are (a) Sustainable Technology and Economy, and (b) Social Engineering and Creative Media. These are very much in line with 17 Sustainable Development Goals declared by the United Nation in 2012 with the goal of integrating planetary stability with the target of fighting poverty and securing human wellbeing. Internet of Things that swarms the globe brings about the seamless integration of physical objects with information network through internet connectivity. This flourishing development hails the advent of 4th Industrial Revolution (IR 4.0) that is inevitable where industrial automation and data exchange in the manufacturing technology rapidly includes cyber-physical system through IoT, cloud computing and cognitive computing. IR 4.0 should catapult productivity into hyper-drive to meet the needs of global consumers. The tremendous growth of cyber activities that encompass all aspects of life presents the inevitable progression into the dimension of Big Data. It is a new data ecosystem that is very large and complex, rendering the traditional data processing software inadequate and obsolete. A new breed of ICT experts are required to handle the enormousness of the task of capturing, storing, analyzing, searching, sharing, transferring, visualizing, updating and most importantly, information privacy. Closer to home, Malaysia is rapidly approaching the end of Wawasan 2020 and a new set of targets under Transformasi Nasional 2050 (TN50) have been set to guide the nation’s journey into the year 2050. The goal is to be within the top 20 of world’s nation in economic development, social progress and innovation. There are seven thrusts in TN50 that encompass all aspects of a mature and well-endowed nation. The welfare of the bottom 40% of the people of Malaysia is given a special attention by a dedicated effort the B40 agenda in elevating their socio-economic status. UiTM has designed an approach to develop a lush research ecosystem based on a synergic and concerted move of bringing its workforce in the faculties on a transdisciplinary platform of Communities of Research (CoRe). The effect of CoRe is very much apparent in research spotlights of UiTM competency map that shows a definite healthy growth towards multi- and interdisciplinary research activities.
1. Introduction
Research is a systematic activity or inquest carried out to find answers to questions, solutions to problems or simply progress to current situations. Research is essential to the survival and growth of a nation, giving an edge to catalyze its prosperity and boost the tangible and non-tangible wealth and gains. Researchers are often driven by internal and external factors. Their inquisitive and curious nature when combined with natural or cultivated talent for investigation, keen observation and power of deduction could bear fruition to ground breaking innovations and generation of new knowledge. Most often, demand driven research would lead to relatively quicker return of investment than fundamental curiosity driven research, but in terms of knowledge creation, the latter has proven to be more valuable. To remain relevant, it is essential for researchers to always be alert and sensitive to the needs of the community they serve. They must be aware of the challenges, possess far-sightedness and high creativity to come up with and deliver the best answers, solutions and innovations required. Researchers need to be at the forefront and carry out meaningful activities at the frontier of knowledge in their particular field, putting the best interest of their stakeholders on top priority.

2. Frontiers of Research
All research typically deals with the unknown, and any finding has potential to contribute to new knowledge. Along that argument, all research may be classified as frontier. However, to distinguish a genuine frontier research and normal science, a set of criteria may be used as a guide. These characteristics include, but not limited to the following [1]:

- The issues being addressed are shrouded with considerable controversy within the scientific community in the related field.
- The questions are hard to answer, particularly when only applying the normal methodological tactics.
- It requires the application of atypical methodologies and concepts.
- Addressing the issues are commonly initiated through tackling unexpected findings that defy the current dominant paradigm.
- It focuses on resolving issues that would confirm or refute the currently accepted paradigm
- The issues are huge challenges that the likelihood of finding successful answers or solutions has a high degree of uncertainty.

In the Malaysian context, researchers are urged to apply the quadruple helix approach in setting their research goals and objectives to include and intertwine the 4 important stakeholders of the nation, namely the academia themselves, government, industry and community. There are a few vogue, or in-trend, terms that researchers have to be mindful and be aware of:

- Translational research
- Niche areas
- Sustainable Development Goals (SDG)
- Internet of Things (IoT)
- Fourth Industrial Revolution (IR 4.0)
- Big data
- Transformasi Nasional 2050 (TN50)
- Bottom 40% (B40)

This paper briefly touches on each of the terms to put them in context with research direction and the way forward for researchers to concertedly pool their expertise and effort. This is pertinent to ensure that the interest of the nation, and human sustainability is addressed, at large.
2.1 Translational Research

Translational research is activities carried out by researchers that generates high impact outcomes and solutions that positively affect and directly benefit the government, industry and community. It is one of the ten initiatives in the Malaysian Education Development Plan 2015-2025 (Higher Education) gazette under Shift 7: Innovation Ecosystem. It was introduced during the 2017 New Year Address of the Minister of Higher Education [2] in response to the realization that RM5.58 billion has been invested in Malaysia into research in the period of 2007-2015. The returns of research investment (RORI) in the form of tangible and intangible gains were valued at RM7.17 billion (28.5%), as diverse sources of income from fundamental and commercialized research products.

Wealth and value creation across the quadruple helix is mapped into the 2017 Research Priority Roadmap that includes grand challenges, translating R&D into business values, talent development and global prominence.

2.2 Niche Area of UiTM versus Sustainable Development Goals

Simply put, niche area is the area of strength of a certain group of people. In 2015, the Ministry of Higher Education of Malaysia has requested each public university to declare their niche area, based on their specific expertise make up. Universiti Teknologi MARA (UiTM) has declared the following as its niche areas, as approved by the universities Board of Executives:

- Sustainable Technology & Economy
- Social Engineering & Creative Media

Both niche areas are in line with the philosophy and direction of the United Nation who has introduced Sustainable Development Goals (SDG), mooted during the United Nations Rio+20 Summit in Brazil in 2012. SDGs for the people and planet are concerned about planetary stability that must be integrated with the United Nations targets to fight poverty and secure human well-being. There are seventeen SDGs as illustrated in Figure 1, excerpted from the United Nation Development Program (UNDP) booklet [3]. The United UNDP is the United Nation’s global development network, advocating for change and connecting countries to knowledge, experience and resources to help people build a better life. They exist in 166 countries, working with each nation on their own solutions to global and national development challenges.

![Figure 1](image_url)

Figure 1. Seventeen Sustainable Development Goals (SDG) gazetted by the United Nation in the fight against poverty
2.3 Internet of Things (IoT)

In today’s world where physical objects are seamlessly integrated into the information network, and where the physical objects can become active participants in business processes, services are available to enable interaction between these ‘smart objects’ over the Internet. This creates a situation where internet connectivity between consumers, industries and government generates a virtual network that opens up a whole new mode of communication and interaction. Parties may query and change the state of any information associated with them, taking into account security and privacy issues. Teaching and learning, business transactions, administration, social interaction and all forms of communication do not only occur through the traditional physical means, but also increasingly becoming more virtual, happening through the cloud and via a whole range of internet connected communication tools such as desktop computers, laptops and handheld gadgets. Internet of things is the situation or phenomenon when a huge amount of connected data is being generated and transferred from one entity to another virtually.

2.4 Fourth Industrial Revolution (IR 4.0)

The manufacturing industry has undergone progressive changes or revolution throughout the years. The first revolution is the machination, using water power or steam power. The second industrial revolution occurred on the advent of electricity when assembly lines powered by electricity enabled mass productions. The third industrial revolution was when automation was made possible through the use of computers and programming.

With the ubiquitous internet connectivity, now machines are communicating with one another in the latest trend of automation and data exchange in manufacturing technologies. This is the fourth industrial revolution currently happening that includes cyber-physical systems, the IoT, cloud computing and cognitive computing. For all means and purposes, with each revolution, the dependence of manufacturing industries on manual labour and physical human interactions became less and less important. On the one hand, this trend increased productivity and efficiency, shortened production time and minimized human errors, but on the other hand, it also put many workers at risk of losing their jobs and livelihood.

2.5 Big Data

IoT has an intrinsic characteristic that inherently causes a lot of data to be created at a fast pace on a daily basis. Big data is the term coined to refer to a new data ecosystem with data set so large or complex that traditional data processing application software is rendered inadequate to deal with them. The data is generated and used by the industries, scientists, businessmen, advertising executives, practitioners of medicine, governments, consumers etc. It is increasingly used to spot business trends, prevent diseases, combat crime, social engineering, developing and refining war tactics and so on.

As with any new phenomenon, big data presents its own unique set of challenges that includes data capture, storage, analysis, search, sharing, transfer, visualization, querying, updating and information privacy. A new breed of ICT experts with knowledge and skills to address all the challenges and issues is urgently needed to cater for the rapidly growing needs and demands of the consumers and stakeholders of big data. Researchers must respond to these needs to remain relevant and referred.

2.6 National Transformation 2050 – Transformasi Nasional 2050 (TN50)

‘Transformasi Nasional 2050’ or TN50 is an initiative to plan for the future of Malaysia in the period 2020 to 2050. From the vision of becoming a developed nation, we should strive to be amongst the top countries in the world in economic development, citizen well-being and innovation. From the humble and
uncertain beginning of Malaya, the nation has grown and evolved significantly into a modern economy and society.

Beginning with the era of the New Economic Policy (1971-1990) where the goal was to eradicate absolute poverty irrespective of race and eliminating identification of race by economic function, Malaysia stepped into the Vision 2020 era (1991-2020), to be a developed nation, in our own mould. Now, Malaysia has to be ready to face the next 30 years. In the Transformasi Nasional 2050 era (2021-2050) Malaysia aims to become a top 20 nation in economic development, social advancement and innovation.

There are seven thrusts of the TN50:
- Pure values/attributes – A community with open spirit and inclusiveness
- Governance – A public administration model that is effective and balanced
- Environment – A safe, sustainable and efficient environment that provides for a healthy life
- Education – A relevant and wholesome education ecosystem that has continuous learning environment
- Employment – A competitive and advanced economy driven by highly able workforce
- Lifestyle – An energetic, active and socially friendly lifestyle
- Malaysia on the global platform – A nation that has significant influence in the international arena

The secretariat for TN50 is the Ministry of Youth and Sport with the target groups of youth between the ages of 18 to 40 years old.

2.7 Bottom 40% (B40)
A report entitled Household Income and Basic Amenities Survey 2016 [4] by the Department of Statistics of Malaysia has categorized Malaysians into three different income groups namely (a) Top 20% (T20), (b) Middle 40% (M40), and (c) Bottom 40% (B40). The change in values of the bar for each group’s income level is one of the indicators of economic growth of the country. Based on the 2016 monthly household earning, the latest definitions for T20, M40 and B40 is shown in Figure 2.

Figure 2. Categorization of Malaysian population into T20, M40 and B40 based on 2016 household monthly income
In the Tenth Malaysia Plan (2011-2015) several national major issues and challenges have been identified. These were socio-economic disparity, low education attainment and skills acquisition, low skilled and low value-added jobs, lack of entrepreneurship capabilities, increase in cost of living, high indebtedness, fragmented and silo implementation of social safety net programs, inability to own houses and limited access to quality healthcare services. Therefore, as a way forward, in the Eleventh Malaysia Plan (2016-2020), three issues have been given due attention and importance. These are raising the income and wealth of B40 households, addressing increasing cost of living and enhancing the delivery system in B40 programs.

The B40 programs are created to address pockets of poverty and socio-economic imbalances among the bottom 40% of the society with the aim of elevating the B40 households towards the middle class society.

3. Recommendation
Researchers need to contribute to the community at large to remain relevant. To tackle the issues highlighted above, the most effective approach is transboundary where resourceful researchers with various expertise and experience come together to try to solve the problems or elevate the current achievements in a concerted manner. Disjointed silo efforts would only result in misaligned solutions that by themselves present a set of problems and cause wastage of precious resources.

Groups of academics and researchers need to synergize and crosslink on formal or informal platforms to produce effective and impactful translational outcomes that benefit various stakeholders directly with quick wins, and in the long run would achieve far reaching objectives for the growth of the nation.

4. References
[1] Rey, J. (2011) Frontier Research: Bringing The Future Closer, Issue 05/June 2011, Journal of Lynchnos, Forum Section, Fundación General CSIC. http://www.fgcsic.es/lychnos/en_en/past_issues/lychnos_05/forum (accessed on 23 December 2017)
[2] 2017 New Year Address of the Minister of Higher Education of Malaysia.
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