

Industrial revolution 4.0: Universiti Malaysia Sabah perspective

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Abstract. Industrial Revolution 4.0 or IR 4.0 is getting the attention of Higher Learning Institutions throughout the world. In the case of Universiti Malaysia Sabah (UMS), “transformation towards University/Industry 4.0” has been identified as one of the nine key result areas (KRAs) in the Strategic Plan 2018-2020. The transformation framework focusses on three areas namely Teaching and Learning 4.0, Smart Eco-UMS 4.0 and Research 4.0. Various initiatives have been planned for each area, some of which are currently being implemented. Previously, under the Strategic Plan 2013-2017, UMS gave great attention on developing and promoting UMS as an eco-campus in line with UMS aspiration to be the reference of eco-campus or green campus in the region. This will be further enhanced under Smart Eco-UMS 4.0 in line with the United Nation sustainable development goals. One of the related initiatives is Smart Energy. Through the initiatives under the UMS Ecocampus Plan 2013-2017, a total reduction of 44.50 % in energy consumption was recorded between 2014-2017 compared to 2013 and with 29 % reduction in carbon footprint from 2014-2017. The commitment towards an ecocampus has significant impacts on lowering energy usage and reducing carbon footprint. We believe that the smart energy initiative will further contribute to another level of energy saving and carbon footprint reduction towards reducing the impacts of climate change.

1 Introduction

Universiti Malaysia Sabah (UMS), established in 1994, currently has a total enrolment of about 18,500 students involving 10 faculties in three campuses. Some 12.3 % of students are postgraduates while 4.2 % are international students from 28 countries. The number of fulltime academic staff is 1078, of which 10.8 % are international. The total number of UMS alumni, so far, is about 66,500.

During the past five years, the progress of UMS was guided by the UMS Strategic Plan 2013-2017 [1]. One of the focus areas (key result areas) is Committing Towards Environmental Sustainability and one of the key initiatives that have been successfully implemented was the establishment of Ecocampus Management Centre under the EcoCampus Blueprint 2013-2017 [2]. Consequently, UMS has been aggressively promoting the university as an EcoCampus and has achieved significant inroads both nationally and internationally. For example, UMS is ranked at no.37 in the world according to UI GreenMetric World University Ranking 2017. Comparatively, UMS was ranked at no. 224 in 2014.

2 UMS and industry 4.0

The term “Industry 4.0” or the Fourth Industrial Revolution started to become a global buzzword only

recently despite the concept of Industry 4.0 was initially proposed in 2011 [3]. Many definitions, ideas and scenarios on Industry 4.0 have been presented, some of which are difficult for the layman to understand. Nevertheless, due to continuous publicity given on Industry 4.0 lately, industries, government agencies and the general public are progressively becoming more aware of it.

In general, everyone and every industry will be impacted by Industry 4.0 but the good news is that all can benefit from it. Application or incorporation of digital technologies have wide ranging benefits such as increased productivity, increased competitiveness, increased flexibility, increased quality, increased innovation and lower staff cost. Increase in automation, however, will give rise to disappearance of some jobs while some tasks would change significantly [3].

2.1 Transformation towards university/industry 4.0

Universiti Malaysia Sabah (UMS), likes other universities, needs to embrace Industry 4.0 to maintain relevance to prospective students and other stakeholders. UMS need to deliver future generations with the right set of skills and knowledge (future proof graduates) while at the same time needs to change and adapt for the digital transformation. For this, UMS has formulated a transformation framework known as Transformation Towards University/Industry 4.0. This covers several

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phases, the first phase being for the period 2017-2020. This transformation has been included as one of the nine focus areas of the UMS Strategic Plan 2018-2020 [4].

This Transformation Towards University/Industry 4.0 covers three principal areas, namely Learning and Teaching 4.0, Smart Eco-UMS 4.0 and Research 4.0. Learning and Teaching 4.0 focusses on the undergraduate curriculum, learning and teaching process and lifelong learning. To enable systematic and effective implementation of Learning & Teaching 4.0, two new centres have been created, namely Centre for Teaching Excellence and Academic Quality and Centre for E-Learning. To further enhance the teaching skills of the academic staff, a specific training programme on teaching excellence have been formulated and implemented. Additionally, an existing centre which is the coordinator of lifelong learning programmes, have been rebranded as Centre for Flexible Education. Among others, this centre offers Industry 4.0 relevant courses or training to UMS staff as well as to the external community (industries, government agencies and general public).

2.2 Smart eco-UMS 4.0

Smart Eco-UMS 4.0 focusses on digitalization of UMS. This agenda is very much in line with the expectation of the Ministry of Higher Education of Malaysia that public universities in Malaysia need to transform into smart campuses. In fact, the ministry targets all public universities to start implementing Smart Campus by June, 2018 [5]. The UMS Strategic Plan 2018-2020 retains “Committing Towards Environmental Sustainability” as one of the nine focus areas. Therefore, UMS will continue this EcoCampus agenda while at the same time pursue the digitalization agenda. Hence, UMS has branded this digital transformation as Smart Eco-UMS 4.0.

Smart Campus has a wide range of definitions. In general, a smart campus harnesses digital technology and tech-enabled solutions to enhance the performance (productivity, efficiency, etc.) of the university as well as for better learning and teaching, as well as research. Smart Eco-UMS 4.0 adheres closely to this definition whereby the emphasis is the digitalization of UMS. Smart Eco-UMS 4.0 has a number of initiatives, including digital ID, digital payment, integrated information system, smart administration, smart classroom, smart e-Learning, smart energy, smart security, smart facility and asset management, and smart hospital. The main enablers of all these initiatives are connected campus, financial resources, and governance, leadership and management.

The implementation plan for the respective initiatives has been formulated. Nevertheless, implementation will be in stages and according to priority. Some of the initiatives, namely University Integrated Information System, digital ID and digital payment have produced quick wins. In the case of smart energy, the university expects this initiative to significantly improve energy management including reducing electricity bills, in

addition to the commitment in aligning itself to the national and international policies in sustainable development especially the Sustainable Development Goals 7 (ensure access to affordable, reliable, sustainable and modern energy for all) and 13 (take urgent action to combat climate change and its impacts). Meanwhile, Research 4.0 focusses on developing new research dimensions as well as intensifying university-industry collaborations for research and innovation.

2.3 Smart energy: sustainable energy management for sustainable development

UMS is committed to achieving a world-class reputation for sustainable energy management through high efficiency and cost-effective practices with the highest regard for the environment. The University recognises the importance of effective energy management and shall endeavour to continuously provide a conducive environment through the implementation of sustainable learning, teaching, research and human capital development.

By establishing a sustainable energy management system, there is an opportunity for an effective, continuous and extensive implementation of energy conservation, efficient practices and renewable energy throughout the University. To implement the concept of Industry 4.0 as well as for sustainable development, Universiti Malaysia Sabah has identified several energy issues in our buildings and open spaces in which our smart energy strategy will be implemented based on automated metering system and building management system and supported by Building Information Modelling (BIM) to monitor the energy consumption of buildings as well as reduce energy usage without undermining the comfort and safety of the campus community.

The significant challenge in this initiative is getting funding to support the campus wide system as the main campus area is 4.04-million-meter square with 47 buildings. UMS is currently in the process of engaging with a registered energy service company (ESCO) under Malaysia Energy Commission to establish energy performance contracting (EPC in order to support the initiative. Meanwhile, UMS is in the preparation stage of establishing a 20 MW solar project as a source of renewable energy.

3 Our achievement

UMS has identified electricity usage as one of the key areas which have a significant effect on the operation cost. Through preliminary energy audits in 2014 and 2017, it was identified that most of the electricity usage came from the operation of air-conditioning chillers. As an initial initiative of reducing energy usage, UMS has prepared a schedule for the operation and maintenance of the chillers to reduce the daily energy peak demand. Many other initiatives such as awareness program, quarterly utility usage report during the UMS

development meeting chaired by the top management with the attendance of all the heads of department, stringent control of outside office hours usage, usage of energy efficient appliances, usage of solar energy best office practices based on the “Guidelines for Energy Saving Methods in Government Offices and Premises” [6] and the “Guidelines on No-Cost and Low-Cost Measures for Efficient Use of Electricity in Buildings [7] have been implemented.

By implementing these strategies, a significant reduction of electricity usages between the years 2014 to 2017 has been observed (Fig. 1) with a tremendous 35.32 % reduction reported in 2014 (compared to 2013) and further 11.51% reduction in 2017 (compared to 2016). A total reduction of 44.50 % was recorded between 2014-2017, the achievement has been in line with aims of the establishment of UMS Ecocampus Management Centre in 2013 and the EcoCampus Blueprint 2013-2017 [2]. To understand the impact of energy usage reduction, the total carbon emissions are calculated based on the electricity and transportation usage in the campus and presented (Fig. 2). Since the electricity is the major contributor to CO₂ emission in the campus, therefore the reduction of electricity usage has significant effects on CO₂ emission (estimated a total 29% dropped from 2014 to 2017).

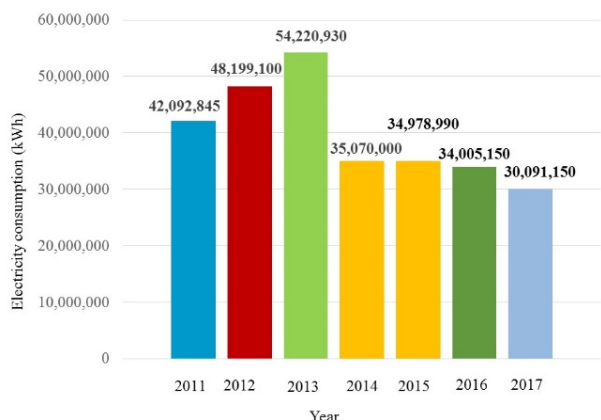


Fig. 1. Electricity consumption (kWh) of UMS main campus in 2011-2017

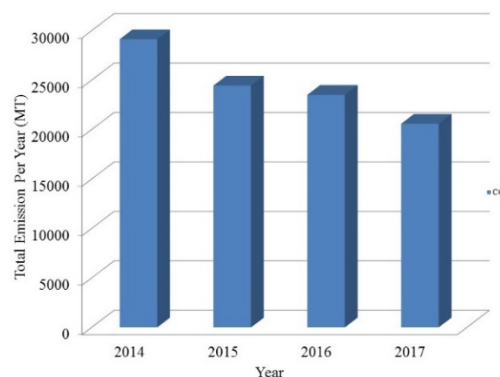


Fig. 2. Total estimated CO₂ from electricity usage and transportation

4 Summary

UMS has been aggressively promoting the university as an EcoCampus and has achieved significant inroads both nationally and internationally. The focus of the industries has changed due to the impact of the fourth industrial revolution that creates significant pressure on teaching and learning in the universities. The university needs to embrace Industry 4.0 to maintain relevance to prospective students and other stakeholders. By establishing a smart energy initiative supporting sustainable energy management system; there is an opportunity for an effective, continuous and extensive implementation of energy conservation, efficient practices and renewable energy throughout the university. UMS will continue to cultivate environmental citizenship among the students and staff through university activities, practices and operation towards the achievement of the sustainability goals as well as the Smart Eco-UMS 4.0.

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