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Developing a Skill-Set Model for Industrial Revolution 4.0 (IR4.0) Era: A Conceptual Paper

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Abstract

Most industries are experiencing the Industrial Revolution 4.0 (IR4.0), which requires graduates to learn new skills to be future-proof. Hence, skill preparation for graduates will be crucial. The Malaysia Education Plan 2015-2025 (Higher Education) stated that there is a mismatch in the supply-demand of graduates, with companies claiming that graduates lack the necessary skills and the educational institution not having clear signals of industry's requirement. Previous study indicates the inadequacy in the literature that discussed on the specific IR4.0 skills set needed for business graduates in Malaysia. So, this study aims to (1) explore IR4.0 skills set based on supplies-demand perspective and (2) develop an IR4.0 skills set model for business graduates. Qualitative study will be conducted via Focus Group Discussion (FGD) with service sector and higher education participants. Using NVivo, the model will be developed based on thematic analysis. This study is expected to enhance graduate's employability. Practically, the study assists the educational institution in building and equip the graduate with the right skills for these IR4.0 era. Furthermore, this study is expected to reduce the skills mismatch.

Keywords: IR4.0 Skills Set Model, Supplies-Demand, Service Industry, Business Program, Conceptual Paper

Introduction

For years, Industry Revalution (IR) 4.0 has been transforming the nature of work by replacing manual labor with automated machines and robots. This shift in skills demanded by the job market is not limited to the manufacturing sector, as the service industry is also affected. The National Fourth Industrial Revolution (4IR) policy, published by the Economic Planning Unit (EPU) in 2021, recognizes the potential for 4IR applications in the service industry, including six supporting sectors: construction, real estate, mining and quarrying, arts and entertainment, information and communication services, and administrative and support

services. The policy aims to create a conducive ecosystem to embrace 4IR across all sectors. As automation continues to shape industries, new talents and skills are required to become a future-proof workforce. Graduates must prepare for the new age of automation and acquire the necessary skills to succeed in the job market, as skill preparation becomes a critical factor in the face of Industry 4.0.

In Malaysia, a persistent challenge has been the mismatch between the skills possessed by jobseekers, especially fresh graduates, and the skills required by industries. This skills gap is primarily due to the lack of clear indicators within the education system regarding industry demand (The Star, 2020). The current tertiary education system is not fully equipped to handle IR4.0 concepts, and it is evident that both the current and future workforces in Malaysia are not adequately prepared for IR 4.0 (Sani, 2019). The discrepancy between the skills possessed by graduates and the skills required by employers is a cause for concern, as highlighted in the Malaysia Education Blueprint 2015-2025 (Higher Education) report. Employers report that graduates lack the necessary skills, which creates a mismatch in the supply and demand of graduates. This problem is expected to become even more challenging as technological disruptions continue to transform industries and shift the job market. Addressing this mismatch between industry requirements and the skills of Malaysian graduates is crucial, as emphasized in the report. (Malaysia Education Blueprint 2015-2025 (Higher Education), 2015). Therefore, to reduce the gap between future employees and employers, more research is needed on ways that seek to close the skills gap, evaluate effectiveness, and generate increased resources (Mosier & Kaiser, 2019).

Higher educational institutions play a significant role in preparing the next generation of the workforce. In addressing the skills gap, both higher education and industry must work together as stakeholders in this conversation. The rapid transformation of the industry's working structure in the current digital era, as emphasized by the characteristics and components of IR 4.0, suggests that educational institutions must reconsider their current learning processes to equip graduates with the skills required to meet industry expectations (Singh & Tilak, 2020). Transforming the education system's structure in line with IR 4.0 standards is crucial to enable future graduates to handle their future working roles (Barros, 2019). Despite efforts by higher learning institutions, previous studies suggest that the educational syllabus may not be adequately qualified, skilled, or aligned with industry and workplace demands (Luke & Heyns, 2019; Valiente et al., 2020).

The impact of 4IR on employability is largely determined by graduates' skill sets. If the skills acquired by graduates do not align with those demanded by employers, unemployment may occur. This situation worsens when existing skills are no longer in line with the technological developments in 4IR. Lack of relevant skills among new graduates has partly contributed to graduate unemployment and underemployment in both developed and developing economies (Koys et al., 2019; Mgaiwa, 2021). Based on the New Straits Times (2019), graduates are losing out and unemployed due to skill mismatch. The universities are not producing graduates with the appropriate curriculum that the industries need and this lead to graduate unemployment and the highest unemployed fresh graduate are from social science, business and law programme as highlighted by Department of Statistic Malaysia (DOSM).

To ensure that every individual can work in a 4IR setting, they must develop a set of skills that will enable them to satisfy the future job market's needs (Kamaruzaman et al., 2019). As these technologies continue to transform the workforce, an IR4.0 skill models that compromise the critical skills for future workforce is needed. In addition to that, the existing literatures on IR

4.0 skills mainly focused on engineering students (Jelonek et al., 2020; Kamaruzaman, et al., 2019; Ramli et al., 2022; Othman et al., 2017), but business management graduates also need to cope with the changes and need to acquire the IR4.0 skill set in order to be employed in the workforce. As there was high percentage of unemployed business graduates due to mismatch of skills, hence developing IR4.0 skill set model that focusing on business graduates might able to enhance their employability. Hence this study aims to:

1. explore IR4.0 skills set based on supplies-demand perspective; and
2. develop an IR4.0 skills set model for business graduates.

Literature Review

Supply-demand Perspectives

The students, educational institutions, and industries are the primary stakeholders in this situation, and their collaboration is crucial to ensure that academic programs meet the demands and needs of the industry. **Figure 1** is framework adapted from Ibrahim and Nashir (2022) as well as Alagaraja, Kotamraju, and Kim (2014). Their framework is focusing on Technical Vocational Education and Training (TVET), but this study focusing on non-technical educational institution, specifically in business program. As shown in **Figure 1**, it serves as an integrative framework for sustainable human resource development by linking supply and demand stakeholders with the several system components. The interconnections between these stakeholders and the four components address and harmonize human resource development at the organizational, regional, and national levels. Additionally, skill development facilitates meeting stakeholder's supply (educational institution) and demand needs (industry), enhances knowledge acquisition, and promotes continuous innovation.

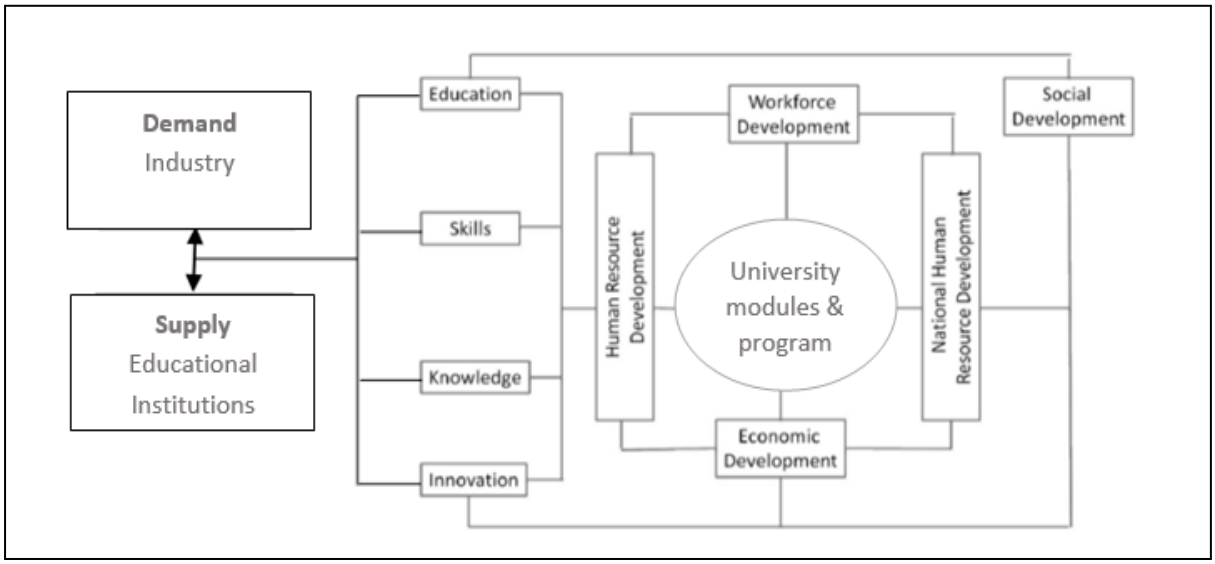

Figure 1. Integrative framework for supply and demands stakeholder linking the non-technical university system components (Source: Ibrahim & Nashir, 2022; Alagaraja et al., 2014)

As stated by Yamada et al (2018), the mismatch issue happens due to limited interaction between the supply and demand stakeholders. Previous literature postulates various causes of supply and demand imbalances (Ibrahim & Nashir, 2022). Valiente et al (2020) explained that higher education institutions can be considered successful if they are able to align their

programmes to the economic skill requirements, making their degrees more valuable and a better investment for youths entering the labour market.

From a supply perspective, previous studies have identified various categories of skills. The World Economic Forum (2023) highlighted that problem solving, collaboration, and adaptability as critical skills for each student's personal curriculum. Miranda et al (2021) categorized competencies into transversal competencies (critical thinking, cooperation, collaboration, communication, and creativity) and disciplinary competencies (including functional, technical, technological skill development and successful workplace performance skills). On the other hand, Islam (2022) emphasized that employees should possess business and technical skills, such as critical thinking, cognitive thinking, complex problem solving, programming, data interpretation, data visualization, and virtual collaboration skills. The Malaysia Education Blueprint 2015 - 2025 report stated that graduates also need transferrable skills like critical and creative thinking and problem-solving abilities.

On the demand perspective, the World Economic Forum (2020) identified problem-solving, self-management, technological, and people management skills as the top skills that employers see as increasingly important in the lead up to 2025. Saari et al (2021) highlighted empowering digital skills, proficiency in using high impact technology, entrepreneurial mindset, and a combination of technical and soft skills as the four primary skills sets for IR 4.0. According to Tajuddin et al (2022), communication skills, ICT or digital skills, leadership skills, interpersonal skills, and personal qualities are the skills required by industry players in the IR4.0 environment.

Although both perspectives have identified relevant skills for the IR4.0 environment, the main challenge is to align or to match the supply and demand perspectives. Past studies often focused only on one angle (either the supply or demand side). Therefore, the present study aims to gather perspectives from both industry players' demand and universities' supply side.

Research Methodology

The qualitative research design will be utilized in this study. Focus group discussion (FGD) will be conducted in this study. This study will be focusing on service industry and universities offering business and management programs. It aims to investigate two perspectives: the supply side (universities) and the demand side (service-based companies). To address the supply side, the study will ask questions such as "What specific IR4.0 skills does your university intend to develop in business graduates?" and "Has the university incorporated these skills into the curriculum and extracurricular activities?" Meanwhile, for the demand side, questions such as "What are the most crucial IR4.0 skills that your industry seeks in employees?" will be asked. Thematic analysis will be conducted by using NVivo to derive the categories of IR4.0 skill-sets and to develop IR4.0 skills set model.

Implication and Conclusion

Technological advances, as driven by the Fourth Industrial Revolution (IR4.0), are evolving at an incredibly fast rate, revamping the way we live, work, and function as a society. But currently, the university plays a major role in preparing students for industry 4.0 to stay relevant to current needs (Halili et al., 2021). Given that these technologies are constantly reshaping the workforce, there is a pressing need for an IR4.0 skill set model that encompasses the essential skills required for the future workforce. In fact, Ggaduates' employability in the 4IR era is highly dependent on their skills set. In cases where graduates possess skills that are no longer in demand by employers, unemployment may become

prevalent. This is further worsened when the skills graduates have acquired are no longer aligned with the technological advancements in IR4.0. To ensure that individuals can thrive in the IR4.0 environment, they must develop a set of skills that align with the future job market's needs (Kamaruzaman et al., 2019).

Theoretical Implication

A model of IR4.0 skills can provide a theoretical contribution to the understanding of the skills required for success in the Fourth Industrial Revolution, IR4.0. This finding will provide a new model of IR4.0 skills set to able to enhance graduate's employability that can be referred by both researchers and practitioners. This IR4.0 model can be guideline for the relevance of educational and training curricula, and qualifications and skills certification systems that currently appear to be uneven across industries, companies, and institutions. Hence, this study may have some direct implications towards the IR4.0 movements in Malaysia which able to help the ministry to extend their works on developing IR 4.0 education transformation in line with Malaysia Education Blueprint 2013-2025. Furthermore, this study used different approach by looking into both demand and supply perspective and finding the alignment between these two perspectives.

Practical Implication

Practically, the study will assist the educational institution in building and equip the graduate with the right skills for IR4.0 era. Responsive educational system that develops the right skills to meet the demands of IR4.0 have become imperative for graduate's employability. The employability of graduate greatly enhanced if the graduate's skills are aligned with the industry demand. Furthermore, an IR4.0 skills set model that based on supply demand perspective is expected to reduce the skills mismatch.

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