



Semarak International Journal of STEM Education

Journal homepage:
<https://www.semarakilmu.my/index.php/sijste/index>
ISSN: 3030-5152



Awareness and Readiness of Malaysian Generation Z Students towards the Fourth Industrial Revolution (IR4.0)

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ARTICLE INFO

Article history:

Received 30 January 2024

Received in revised form 20 March 2023

Accepted 24 March 2024

Available online 16 April 2024

Keywords:

Generation Z; The Fourth Industrial Revolution (IR4.0); digital literacies and technologies; Artificial Intelligence (AI); Internet of Things (IoT)

ABSTRACT

The Fourth Industrial Revolution (IR4.0) is marked by the integration of digital literacies and technologies, artificial intelligence (AI), and the Internet of Things (IoT), resulting in substantial transformative changes across global industries, economies, and societies. Hence, it is crucial to assess current awareness levels of the Malaysian Generation Z students, who are set to enter the workforce as employees, leaders and entrepreneurs in a time period subjugated by the IR4.0 and to evaluate the readiness of these students in navigating possible challenges and opportunities offered by the IR4.0. This investigation was conducted to determine whether the independent variables, namely Performance Expectancy, Effort Expectancy, Social Influence, Perceived Risks, Trust, are related to the dependent variable, which is Behavioural Intention to use IR4.0 Technologies, among Generation Z students. The sample size consisted of 920 Generation Z students born between 1997 and 2012, currently aged between 16 and 26 years old actively studying in public schools in Putrajaya, Public Higher Education Institutions and Private Higher Education Institutions across Malaysia. The decisive findings from the study reveals that the level of awareness and readiness of Generation Z students in Fourth Industrial Revolution (IR4.0) technologies such as automation, artificial intelligence, data analytics, and the Internet of Things in Malaysia is still low and hence is a definite cause for concern. The findings also underscore the pressing need for immediate action to be taken by educational institutions and industries together, to promote awareness about IR4.0 among Generation Z students, increase the acceptance and use of this technology in their everyday lives and integrate adequate educational infrastructure and resources to support IR4.0 teaching and learning in schools and in higher learning educational institutions.

1. Introduction

The Fourth Industrial Revolution (IR4.0) refers to the rapid ongoing transformation of traditional industries namely manufacturing, healthcare, education, transportation, finance, retail, education

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and even agriculture through the integration of digital technologies, automation, and data analytics by fundamentally changing the manner in which they operate and deliver value [3]. It is characterized by the convergence of technologies such as Automation and Robotics, Internet of Things (IoT), Artificial Intelligence (AI), Big Data Analytics, and Additive Manufacturing (3D Printing) [6] which enhances productivity, innovation and efficiency [12] by optimizing processes, improving operational efficiencies, conducting real-time monitoring, improving supply chain efficiencies [11], controlling physical operations, enabling mass customizations, predicting future consumer trends, improving consumer experiences, increasing sales of products and services, promoting business sustainability, driving the adoption of financial technology solutions such as mobile banking, digital payments and blockchains while reducing human errors waste and energy consumption and lowering production costs [5]. The Fourth Industrial Revolution (IR4.0) and its associated advanced technologies and digital solutions are undeniably creating newer opportunities [10] across the globe for economic and societal growth as it enhances efficiency, productivity, and innovation through automation, data-driven decision-making, improved production efficiency, and enhanced customer experiences [17].

As a developing nation, Malaysia is also actively working to embrace [22] the Fourth Industrial Revolution (IR4.0) and its associated technologies to enhance its economic growth [8], create new high value industries, improve on national and global competitiveness, initiate innovations, create job opportunities in emerging industries [2] particularly in high technology sectors, provide entrepreneurship support, and effectively address societal national challenges in individual income generation, education, healthcare, social protection, infrastructure development, and environmental sustainability [15]. In 2021, the government first released the Malaysia Digital Economy Blueprint (MDEB) [7] which intends to support all initiatives by the Malaysian Government to transform Malaysia to a regional leader in digital economy, followed by the National Fourth Industrial Revolution (IR4.0) Policy [9] which emphasizes on the need for adoption of emerging technologies to bridge digital gaps. The Malaysian government also launched several national initiatives and various funding schemes namely National Policy on Industry 4.0, Industry4WRD Readiness Assessment, Smart Automation Grant (SAG), High Impact Fund (HIF), Digital Transformation Acceleration Programme (DTAP), and IR4.0 Talent Development Programme to support the implementation and transition towards the use of IR4.0 technologies across industry sectors. More recently, in 2023, Malaysia Center for 4th Industrial Revolution reported through a study titled "The Economy Impact of Generative AI: The Future of Work in Malaysia" that the Generative AI technology alone has the potential to unlock a productive capacity worth US\$ 113.4 billion in the Malaysian economy if fully adopted across all industries and hence, Malaysia should immediately accelerate its adoption of IR4.0 [3]

However, despite conclusive findings from studies conducted over the recent years which affirms that IR4.0 technologies do indeed positively benefits the Malaysian economy growth as it improves on productivity and global competitiveness [20] and the government's is rightful in its role in driving the IR4.0 adoption in Malaysia, through government initiatives and schemes [4] and there is indeed a positive correlation between IR4.0 skills and employability among Malaysian graduates [1] but a report released by Malaysia Digital Economy Corporation (MDEC) in 2022 identified that there is a significant and profound gap between the skills required by the industry and the current skills possessed by the Malaysian workforce economy [1] and Malaysian students lack awareness and necessary skills for Industry Revolution 4.0 [21], suggesting a gap in readiness and skills in adapting to IR4.0 technologies[3]. These gaps could possibly lead to a higher unemployment and underemployment rate due to the mismatch in labour market, restrict economic growth and development, increase income inequality, strain efforts of attracting foreign investments, and reduce competitive and innovative practices [16]. These gaps may also cause industries to struggle to

implement and utilize IR4.0 technologies effectively [18] which will lead to decreased productivity, as manual processes are continued to be used instead of efficient automated ones, resulting in Malaysian industries falling far behind global competitors in terms of product development, process improvement, and general innovation [3].

Therefore, it became important to conduct a study on the awareness and readiness of the workforce in Malaysia to gain an insight into the current state of preparedness of Malaysians [13], for the Fourth Industrial Revolution (IR4.0). Hence, the present study centres on the awareness and readiness of the Malaysian Generation Z students, born between 1997 and 2012 who are currently aged between 16 and 26 years old, set to enter the workforce as employees, leaders and entrepreneurs in a time period subjugated by the IR4.0. The findings of the study will assist in identifying gaps in awareness and readiness of individuals for IR4.0 by highlighting areas where additional education, training, or resources are needed, informing policymakers on the level of awareness and readiness for IR4.0 to help develop policies and training programs to support the adoption of advanced technologies, promote possible collaboration between the government, industries, training providers and educational institutions to address the challenges and opportunities presented by IR4.0, and improve on individual skill development programs to ensure that the workforce is prepared for the future economy.

2. Methodology

This study employed the quantitative research design involving generation Z students in Malaysia, born between 1997 and 2012 and currently aged between 16 and 26 years old studying in upper secondary schools and in higher education institutions.

Data was collected through an organised survey instrument which was adapted from the conceptual framework proposed by Sarfaraz [19] obtained through the research report of [14], with the following five independent variables; Performance Expectancy which refers to the degree to which the student believes that work performance will improve as a result of using the IR4.0 technology, Effort Expectancy which refers to the students' most recent perception IR4.0 technology's usability, Social Influence which refers to students' perception of other peoples' view and attitude towards IR4.0 technologies, Perceived Risks which refers to the possible positive and negative consequences for using IR4.0 technologies, and Trust which refers to students' conduct to use IR4.0 technologies and one dependent variable of Behavioural Intention which refers to students intention to use IR4.0 technologies.

In an attempt to collect conclusive data, the non-probability sampling approach was used. The homogeneous sampling technique was used to access students studying in public schools in Putrajaya as Putrajaya has a dense and large number of secondary schools and it is the federal administrative capital of Malaysia, while the snowball sampling technique was use to increase sample diversity and to reach populations that are otherwise difficult to access.

A Research Instrument Development Committee was also appointed, consisting of subject experts from the Metropolitan University College Kuala Lumpur (KLMUC) The committee assisted in the following:

- i. Instrument design: Determining content domains, item generation, and instrument construction.
- ii. Validation Assessment: Providing expert views on the relevance, representativeness, clarity, and comprehensiveness of the instrument to ensure content validity, construct validity, and face validity.

Once the instrument was finalised, a pilot study was then conducted on fifty (50) students from Kuala Lumpur Metropolitan University College (KLMUC) to measure the scale reliability and coherence of the instrument. The Cronbach's Alpha value obtained for all variables is indicated in Table 1 below:

Table 1
 Coefficient Alpha Value, α

Construct	Cronbach's Alpha	Number Of Items	Strength of Association
Performance Expectancy	0.826	10	Very Good Reliability
Effort Expectancy	0.770	4	Good Reliability
Social Influence	0.901	5	Very Good Reliability
Perceived Risks	0.620	4	Fair Reliability
Trust	0.826	3	Very Good Reliability

* < 0.60 Poor Reliability
 0.60 – 0.70 Fair Reliability
 0.70 – 0.80 Good Reliability
 0.80 – 0.95 Very Good Reliability

3. Results

3.1 Demographics of Gen Z Students in Schools and Institutions of Higher Education in Malaysia

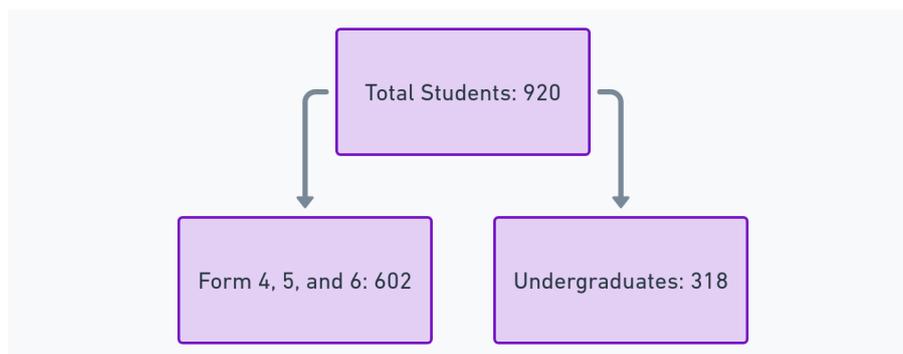


Fig. 1. Distribution of students

The distribution of students in the study is illustrated in Figure 1 above. The study included 920 students, with 602 in Form 4, 5, and 6, and 318 undergraduates from public and private Higher Education institutions in Malaysia. In terms of age, there were 273 16-year-olds, 184 17-year-olds, 157 18-year-olds, and 307 between 19 and 26 years old. Females accounted for 489 students, while males were 432. Regarding race, there were 736 Malays, 91 Chinese, 74 Indians, and 20 others. The study involved several schools in Putrajaya and universities across Peninsular Malaysia. The names of the schools and universities are stated below:

Schools

1. SMK Putrajaya Presint 18(1)
2. SMK Putrajaya Presint 5 (1)
3. SMK Agama Putrajaya (SMAPUTRA)
4. SMK Putrajaya Presint 9(1)
5. SMK Putrajaya Presint 9(2)
6. SMK Putrajaya Presint 11(2)

Universities

1. Kuala Lumpur Metropolitan University College
2. Infrastructure University Kuala Lumpur
3. Xiamen University Malaysia
4. University Malaya
5. University Kebangsaan Malaysia
6. University Sains Malaysia
7. Universiti Malaysia Perlis
8. Universiti Malaysia Terengganu
9. Universiti Putra Malaysia
10. Universiti Malaysia Kelantan
11. Universiti Malaysia Pahang Al-Sultan Abdullah
12. Universiti Teknologi Malaysia
13. Malaysian Institute of Aviation Technology
14. Monash University
15. Universiti Teknologi MARA
16. IIUM Universiti Islam Antarabangsa Malaysia
17. Mahsa University
18. University of Cyberjaya
19. Management and Science University
20. Polytechnic Seberang Perai
21. Albukhary International University
22. Taylor's University
23. Segi University College
24. YPC International College
25. UNITAR International University

The study had a diverse sample of 920 students, including both school students and undergraduates from various public and private Higher Education institutions in Malaysia. The students were from different age groups, with the majority being between 16 and 26 years old. There was also diversity in terms of gender and race, with a mix of Malays, Chinese, Indians, and other races. The study involved multiple schools and universities, indicating a broad representation of students from different educational backgrounds in Malaysia.

3.2 Awareness of IR4.0 Technologies

The awareness levels of various Industry 4.0 technologies among the 920 students are as follows: only 54% are generally able to define IR4.0, 71% have heard or read about Artificial Intelligence (AI), just 48% have heard or read about Cloud Computing, only 24% have heard or read about Additive Manufacturing, just 58% have heard or read about Data Analytics, 75% have heard or read about 3D Printing, 51% have heard or read about the Internet of Things (IoT), and only 40% have heard or read about Smart Manufacturing. The conclusion drawn from the given statistics is that there is a varying level of awareness among students regarding different Industry 4.0 technologies. While some technologies like AI and 3D Printing are relatively well-known, others such as Additive Manufacturing and Smart Manufacturing are less familiar to the students surveyed. This indicates a need for further education and awareness-building efforts to prepare students for the technologies shaping the future of industries.

3.3 Performance Expectancy- Belief on Importance of use

Among the 920 students surveyed, 25% believe that IR4.0 technologies are crucial for academic success, 32% agree that these technologies are essential for fostering creativity and innovation in their current socio-economic environments, and only 27% agree that they need adequate knowledge and skills in IR4.0 technologies for future workplace purposes. This suggests that while a significant portion of students recognize the importance of IR4.0 technologies for their academic and future professional lives, there is also a substantial percentage that may not fully appreciate their relevance, particularly for future workplace requirements. This highlights a potential gap in understanding or awareness among students regarding the importance and impact of IR4.0 technologies, which could affect their readiness for the future workforce.

3.4 Effort Expectancy- Perception and Current Involvement in IR4.0 Technologies

Among the 920 students surveyed, an alarming percentage of 22% are currently involved in the study or operations involving some forms of general IR4.0 technologies, while just 17% are involved in Artificial Intelligence, 14% in Cloud Computing, 3% in Additive Manufacturing, 12% in Data Analytics, 13% in 3D Printing, 17% in the Internet of Things (IoT), and 6% in Smart Manufacturing. These findings conclude that there is a very low level of involvement in various Industry 4.0 technologies among the surveyed students, and there are obvious gaps in the levels of engagement. This indicates a need for more focused efforts to engage students in a broader range of Industry 4.0 technologies.

3.5 Trust- Motivation to use and Learn IR4.0 Technologies

Specifically, 60% from 920 Generation Z students are motivated to learn more about IR4.0, 41% believe that IR4.0 will increase their current academic performance, 63% believe that IR4.0 knowledge and skills are important to pursue further studies, 61% believe that IR4.0 technologies are important for employment prospects and 55% want to become frequent users of IR4.0 technologies. This shows that a significant percentage of Generation Z students are interested in and recognise the value of Industry 4.0 (IR4.0).

3.6 Social Influence – Other People’s Views on IR4.0 Technologies

Among the 920 students surveyed, 15% have discussed the importance of IR4.0 as promoted by the Malaysian Madani government, while 55% have not had such discussions. Additionally, only 25% agree that they and their friends discuss the importance of IR4.0 technologies for future work purposes. These findings suggest that there is limited discussion among the surveyed students regarding the importance of IR4.0 as advocated by the Malaysian Madani government, indicating a potential lack of awareness or engagement among students regarding the significance of IR4.0 technologies and the government's promotion efforts.

3.7 Perceived Risks-Uncertainties on using and Learning IR4.0 Technologies

80% of 920 students are unsure about where to enrol for IR4.0 courses, while 81% believe that studying IR4.0 technologies is a lengthy and challenging process, and 80% believe that courses related to IR4.0 Technologies are costly. These findings show a significant level of uncertainty and perceived

difficulty and cost associated with pursuing IR4.0 technologies among the surveyed students. The high percentage of students unsure about where to enrol indicates a need for clearer guidance and information on available educational opportunities. Additionally, the belief that studying IR4.0 technologies is challenging and expensive highlights potential barriers to entry for students interested in these fields.

4. Conclusion

In summary, this study provides various insights into the awareness and involvements of Generation Z students in Industry 4.0 (IR4.0) technologies. The study suggests that there is a growing interest and recognition of the importance of IR4.0 among Generation Z students in Malaysia. However, there are still challenges that need to be addressed to fully harness students' potential in this rapidly evolving technological landscape. Generation Z students exhibit concerning levels of familiarity with IR4.0 technologies and low levels of involvement. They also express uncertainties regarding where to enroll for IR4.0 courses, the perceived possible challenges and costs associated with studying these technologies. Nonetheless, there is a positive trend in the students' motivation to learn more about IR4.0, with many recognizing its importance for their academic and future career prospects. These findings underscore the importance of providing clearer guidance and support to help students navigate the complexities of IR4.0 education and opportunities.

Acknowledgement

This is an independent research conducted by Kuala Lumpur Metropolitan University College (KLMUC), Smatrix Consultancy Sdn Bhd, Malaysia Cyber Consumer Association (MCCA) and Yayasan Harapan. This research was not funded by any grant.

The findings of this research were published on the following Malaysian New Portals as well:

Manzor, Z. (2024, February 7). Tahap kesedaran generasi Z tentang IR4.0 membimbangkan. Kosmo. Retrieved from <https://www.kosmo.com.my/2024/02/07/tahap-kesedaran-generasi-z-tentang-ir4-0-membimbangkan/>

Amir Abd Hamid ((2024, February 7). Ramai Gen Z tak tahu mengenai IR 4.0. Retrieved from <https://www.hmetro.com.my/mutakhir/2024/02/1058829/ramai-gen-z-tak-tahu-mengenai-ir-40>

Astro Awani Live (2024, February 7) Generasi Z di Malaysia belum bersedia mengharungi cabaran IR4.0? Retrieved from <https://www.youtube.com/watch?v=nsJYYjMbAG8>

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