

Proceedings of the
5th International Conference on Accounting Studies (ICAS 2018)
16-17 October 2018, Penang, Malaysia

Awareness and Perception of Accounting Students towards Industrial Revolution 4.0

Siti Aisyah Omar*, Farhana Hasbolah

Universiti Selangor (UNISEL), Malaysia

Abstract

Industrial Revolution (IR) 4.0 is currently at the world's focus of attention. Initially, the IR 4.0 took place in manufacturing industry. As time passed by, the implementation of IR 4.0 was spread widely among various types of industry including education. Thus, it is important for students to acquire knowledge on this matter as they will be heavily affected from this day onwards. The purpose of this paper is to examine the awareness on IR 4.0 among accounting students, and the focus is on undergraduate accounting students at Universiti Selangor (UNISEL). The questionnaire, which are categorised into awareness, perception and behaviour category, was distributed, and the data collected were analysed using Statistical Package for Social Science (SPSS). Findings show that majority of the students are aware and have heard about IR 4.0 but they lack of detail knowledge on the matter. Almost all of them have neutral opinion or unable to form concrete perception regarding various aspects of IR 4.0 and this is evidenced from the result of consistent number of mean for all variables of perception tested in the questionnaire. In terms of behaviour towards IR 4.0, the result shows that most of the students lack of exposure about IR 4.0 but they are keen to know more about it especially during their study period. Finally, recommendations to increase awareness and change the perception about IR 4.0 among students are made.

Keywords: Accounting Students, Awareness, Behaviour, Industrial Revolution, Perception

1. INTRODUCTION

The rapid development of industry or known as industrial revolution has been occurring since long time ago and several phases have passed. The world is now facing the latest industrial revolution called Industrial Revolution (IR) 4.0 which will result huge transformation worldwide. IR 4.0 has been spreading quickly and disrupting almost every industry in all countries in terms of the production, management and governance system.

IR 4.0 in Malaysia is considered new and is in the midst of adaption by certain industries though Malaysia still in its second revolution. The launch of "Transformasi Nasional 2050" or TN50, shows that Malaysia are ready to move their footstep into more advanced technological development focusing wider sectors and industries (Transformasi Nasional, 2017) which the main objective is for Malaysia to become a top 20 nation in economic development, social advancement and innovation. TN50 is very crucial to ensure that Malaysia is prepared for the future beyond 2020. However, a study done by Omar, Hasbolah and Zainuddin (2017) showed about 1% or less than 20 public listed companies in Malaysia have mentioned "artificial intelligence", "big data", and "machine learning" in their annual reports. This signalled that the adoption of IR 4.0 in Malaysia is still at infancy stage, or mainly at awareness level.

Few steps have been taken by the government to instil the awareness and push forward all industries regarding the adoption of IR 4.0 quickly in order to compete and survive globally. Other than various incentives and plans

*Corresponding author.
E-mail: aisyahomar@unisel.edu.my

for manufacturing industry, government has also focused on education industry in order to provide talent and human capital to support the adoption of IR 4.0. Education is the key to face IR 4.0. Malaysia Education Blueprint 2015-2025 was issued in 2015 to transform the education sector to be in line with IR 4.0. Future education or Education 4.0 must be able to produce highly creative graduates with the ability to think critically irrespective of disciplines (Abdul Haseeb, 2018). The main objective of the blueprint is to equip the students to be more competitive and prepared for IR 4.0.

The remainder of the paper is organized in the following manner: the next section is the motivation of study, which is followed by review of the previous literatures relating to IR 4.0 in general. Then, the paper will elaborate on the research methodology applied in this study. The following sections will present the discussion and findings from the analysis. The final section will be the conclusion and recommendation for future researches.

2. MOTIVATION OF STUDY

According to World Economic Forum, jobs which are repetitive, based on rules and well defined physicality are most likely to be automated. There are about 95% or higher probability that these jobs will be replaced by system, machines or robots. Among of the jobs are cashiers, bookkeepers, accounting and auditing clerks, billing and posting clerks, and bill and account collectors (US Bureau of Labor Statistics, 2017). This means that the nature of the jobs in the future definitely will change as a result of the IR 4.0. In addition to that, students who are currently enrolling at primary, secondary, and tertiary levels may not be able to get jobs in the fields for which they are studying. This is one of the challenges that come with IR 4.0 when it is fully adopted in Malaysia. Therefore, students are encouraged to be brave and bold in facing the challenges brought by IR 4.0.

The effects of the automation and computerization already can be observed in the financial sector. More than 18,000 employees were retrenched in the banking sector because the banks adopted technology that could replace bank tellers (Malaysian Employer Federation, 2015) and it is expected that more adoption of financial technology (fintech) in the future. Nevertheless, humans can compete against machines in terms of social interactions and physical deterioration. The technology is not able to replace the human knowledge and experience in order to provide more valuable decision making to the business. In the long run, the machine needs to be replaced where things change in the future or where it is no longer coping with the complex circumstances.

In the wake of IR 4.0, irrelevant courses offered in universities might have to be discontinued and new courses may need to be introduced. The government's desire is to produce more digitally skilled graduates in the future. Currently, there are 14 institutions in Malaysia that offer Artificial Intelligence (AI) course, such as Universiti Malaya, Universiti Sains Malaysia, Universiti Putra Malaysia, Universiti Kebangsaan Malaysia, and Universiti Utara Malaysia. This course is designed together with representatives from the industry to ensure the students learn the skills needed by the companies in the future. It is expected that the course will be able to create new jobs such as cyber security specialist, digital marketing expert, 3D printing specialist, urban farmers, data scientist, robotics engineers, and aerospace engineers. Students have a lot of potential to gain benefits from the IR 4.0.

However, one fundamental and crucial issue to be examined is how to prepare the students for the changes brought by IR 4.0 and whether the students are actually aware of this new revolution. For that reason, this paper attempts to address the following research questions:

- RQ1 Do accounting students aware on the IR 4.0?
- RQ2 What are the accounting students' perceptions towards IR 4.0?
- RQ3 How accounting students respond/react towards IR 4.0?

3. LITERATURE REVIEW

According to the Oxford dictionary, Industrial Revolution is defined as the rapid development of industry that occurred in Britain in the late 18th and 19th centuries, and quickly spread throughout the world. It was started by the introduction of machinery and later characterized by the use of steam power to mechanize production (first revolution), the use of electric power to create mass production of manufactured goods (second revolution) and the use of electronics and information technology to automate production (third revolution).

Whilst the Fourth Revolution or better known as Industrial Revolution (IR) 4.0 is unlikely similar to previous revolutions as it is characterized by a fusion of technologies involving physical, digital, and biological scopes (Schwab, 2016). IR 4.0 is a technology advancement which involves the latest trend of automation and data exchange such as cyber-physical systems, the Internet of things, cloud computing and cognitive computing. It is also known as a "smart factory", where physical processes being monitored by technology system and decision-making being decentralized. This will result increase in productivity. IR 4.0 will bring huge impact to the worldwide as it affects the way human live, work, play, socialize and even on how human should behave (Abu

Ahmad, 2016). The journey towards this revolution was ignited by the announcement at the World Economic Forum (WEF) Conference in January 2016.

The existence of IR 4.0 is inevitable as all countries worldwide progress technologically, including Malaysia, thus the move towards it is unavoidable. IR 4.0 has been the centrepiece of conversations among key players in Malaysia such as the government and industry as this might be a potentially massive opportunity, but the majority of organizations are unprepared for how IR 4.0 would transform their business or services. It will certainly affect the entire system of organizations since it involves changes and massive uncertainty in processes, management and governance (Abdul Rahim, 2016) and the changes could either simplify or complicate matter, depending on its application. However, as reported in 2016 GE Global Innovation Barometer, a significant number of Malaysian executives are more positive to face IR 4.0 compared to their peers globally (Abu Ahmad, 2016).

Malaysian must be prepared to face the IR 4.0 and all its challenges to continue to develop the country. Thus, the government has organized various dialogues with its agencies and encouraged views and suggestions on the implementation of IR 4.0. The TN50 en route to the 2050 National Transformation which is the country's vision of being among the top countries in the world in economic development, citizen well-being and innovation has included IR 4.0 as one of the required paths. As Malaysia entering the IR 4.0 phase, the government has provided many incentives and introduced various action plans and roadmaps towards the adoption of IR 4.0 among industry including education. A new educational programme must be tailored to meet certain skills and knowledge required by students to embrace IR 4.0. In order to address the challenges and critical needs of IR 4.0, Education 4.0 has been introduced to revamp and revise the educational structure especially in universities to produce innovative and highly analytical students who can collaborate and working together not only with the human, but robots as well since those skills are required in future employment (Sani, 2018).

IR4.0 is also expected to affect the accounting profession. The revolution will influence accounting practice in various ways and result both benefits and risks to the accountants. According to Sani (2018), the back office jobs such as data entry and book keeping, there will be a forecast of decrease in demand due to the replacement with AI and global outsourcing. Whilst the type of job relating to planning of management and products as well as research and development might have increase in demand. Burit and Christ (2016) argued that in IR 4.0, accountants will involve less in automated operations but need to focus more on big-picture strategies of companies. Thus, in order to remain strongly in demand, they need to equip themselves with awareness and knowledge on current development issue, develop new skills and collaborate more with other professionals.

There are limited literatures available relating to awareness in IR 4.0 especially among students. Most of the previous studies focus on awareness among players in industry such as the top management. In addition, most of the previous studies focus on manufacturing industry. The government may have not done enough to communicate the importance of IR 4.0, hence explaining the lack of awareness among people including students (Abdullah, Abdullah & Mohamad, 2017). One of the most practical ways to spread the knowledge and awareness among students could be through the education system. A new structure of education which involves collaboration with industry is vital as it will enhance the adaptability of students in industry once they have graduated and industry will have good supply of human capital. The example of innovative development which receives more attention by academia and industry is service innovation and industrial big data (Lee, Kao & Yang, 2014).

To the best of authors' knowledge, no study has been conducted relating to perception on IR 4.0. Previous studies on students' perception were mostly deal with their learning experiences. Thus, this paper might attract more study relating to this topic in the future.

4. RESEARCH METHODOLOGY

The study employed a questionnaire, which consists of four sections, to collect data. Section A requires respondents to fill out their demographic details. In order to study the demographic factors such as age, gender and level of education of the respondents, the sub-category were split in respect of age into three age ranges; below 20 years old; 21-25 years old; and 26-30 years old. In respect of gender, the sample was divided into males and females. With respect to the level of education, the sub-category were divided into two groups; Diploma and Bachelor level. Section B seeks information on the respondents' awareness and understanding on IR 4.0. The respondents' awareness and understanding were measured by asking whether they have heard about IR 4.0 and further understanding is indicated by selecting "yes" or "no" questions. Section C contains 14 items assessing the respondent's perceptions towards IR 4.0. These items were in the form of Likert Scale that range from 1 (strongly disagree) to 5 (strongly agree). Lastly, section D assess the respondents' attitude towards IR 4.0. The purpose is to know whether respondents have involved or engaged in any activities that bring more awareness and understandings on IR 4.0

From the population of 605 accounting students in Universiti Selangor (UNISEL), a total of 450 questionnaires were distributed to students who are currently pursuing Diploma in Accountancy and Bachelor of Accounting program in Faculty of Business and Accountancy. In all, 350 accounting students had participated in the study. After screening process, 334 questionnaires were usable for further analysis, giving a usable rate of 95%. The sample size of this study was determined based on the method recommended by Krejcie and Morgan (1970). The data were analysed by using Statistical Package for Social Sciences (SPSS) version 22 (IBM Corporation, New York, NY, USA). Descriptive and frequencies analysis were performed and the results were based on the total number of respondents answering each particular question.

5. FINDINGS AND ANALYSIS

The section presents the results for the questions related to the knowledge and perception of accounting students towards IR 4.0. Firstly, demographic structures of the students are determined. A total of 334 accounting students participated in the study consists of 241 (72.2%) female and 93 (27.8%) male students. About 68.9% of the students is from the age of 21-25, 24% is below 20 years old and only 7.2% represents the age of 26-30. Among students pursuing accounting program, 37.4% is from Diploma in Accountancy which consists of first year (14.4%), second year (45.6%), and third year (40%) while 62.6% is from Bachelor of Accounting which consists of first year (9.09%), second year (23.4%), third year (32.5%), and fourth year (34.9%). This is illustrated in Table 1.

Table 1. Demographic Structure of the Respondents

		Frequency	Percentage (%)
Age	Below 20	80	24
	21-25	230	68.9
	26-30	24	7.2
Gender	Female	241	72.2
	Male	93	27.8
Education level	Diploma	125	37.4
	Bachelor	209	62.6

Table 2 shows the findings with respect to the students' knowledge on the IR 4.0. Majority of the respondents (70.9%) have heard about IR 4.0 and have general knowledge about it. When they were asked about the sources of information about IR 4.0, majority of the students answered that they knew about IR through public talk and seminar. Recently, Accounting Club of UNISEL had organized one accounting seminar where IR 4.0 has been introduced in details. Apart from that, students had read from books or journals, visited websites and listened to radio and television. The students also mentioned that they get the exposures from a few accounting courses like Accounting Theory, Advanced Management Accounting, and Financial Reporting where lecturers had discussed the issue in their classes. Only small percentage (29%) did not aware of the existence of this new revolution.

Table 2. Knowledge and Awareness of the Accounting Students on IR 4.0

Statements	Yes (%)	No (%)
Have heard about IR 4.0	70.9	29.1
IR 4.0 represents the industrial future.	94.3	5.7
IR 4.0 is similar to the previous industrial revolutions.	44.9	55.1
IR 4.0 is based on the use of cyber physical system.	82.9	17.1
IR 4.0 elements involve "smart factory", "big data", and "internet of things".	88.6	11.4
IR 4.0 is about the digital transformation in industry.	90.4	9.6
IR 4.0 is about more than automation and data exchange.	85.9	14.1

About 55.1% of the students did not agree that IR 4.0 is similar to the previous IRs. This is confirmed where the First IR discussed on mechanizing production using water and steam power, the Second IR focused on creating mass production by using electric power and the Third IR used electronics and information technology to automate production, the IR 4.0 mainly discussing the fusion of technologies that are characterized by cyber-physical system, the internet of things, cloud computing, and cognitive computing (Ministry of Industrial Trade and Industry, 2017). Moreover, the students also agree that IR 4.0 is based on the use of cyber physical system (82.9%), smart factory, big data and internet of things (88.6%), digital transformation (90.4%), and automation (85.9%). From the findings, it can be concluded that the accounting students are aware of the new revolution as they are able to distinguish the key features of IR 4.0 and have general idea or knowledge about it.

Table 3 shows the mean for all variables in the questionnaire distributed to the respondents. Since all of the variables have mean between 3.0000 to 4.0000 the results have been divided into two groups which are 3.5000 and below and 3.5001 and above. For the first group (3.5000 and below), most of the respondents have no idea or unable to form concrete opinion regarding the readiness of Malaysia to embrace IR 4.0 and this variable obtained the lowest mean in this study. Respondents were also unable to form strong agreement on the impact of IR 4.0 on employment by replacing human with AI systems and robotics. While for the second group (3.5001 and above),

mean of the variables has only slight difference, which shows that respondents were basically agreed with most of the variables asked but due to limited knowledge, they were unable to provide firm decision (4.0000 and above).

Table 3. Perceptions of Accounting Students towards IR 4.0

Statements	Mean
Malaysia is ready for IR 4.0.	3.3922
With the emergence of IR 4.0, robotics will replace accountants in future.	3.3982
The application of AI in IR 4.0 can solve every problem through machine learning approach.	3.4970
IR 4.0 will result in mass unemployment.	3.5000
Accounting tasks, including audit would be fully automated with the use of AI based technologies in IR 4.0.	3.5689
Regulators and standard setters need to build their understanding in IR 4.0.	3.6467
IR 4.0 demands accountants to develop hard skills with technology and data analysis as well as critical thinking and adaptability.	3.7066
Due to IR 4.0, accounting roles are already changing in response to new capabilities in data analytics.	3.7066
Data security issue is the biggest concern in IR 4.0.	3.7186
IR 4.0 will improve efficiency of processes in an organization.	3.7335
IR 4.0 will bring greater benefits to the society.	3.7545
IR 4.0 is the next evolution of automating processes, making them smarter and better.	3.7725
IR 4.0 will give huge impact towards accounting graduates employability.	3.7814
IR 4.0 will involve significant cost to an organization	3.7994

IR 4.0 creates massive uncertainties which change the business model across industries. Thus, it requires a different set of skills and competencies of accountants compared to their traditional roles. Although the respondents unable to give firm opinion on the impact of IR 4.0 towards employment, most of them agreed that IR 4.0 will give huge impact towards accounting graduates employability. The challenge in the future is not because of insufficient supply of employment, but due to unavailability of skills required by employers. In order to successfully implement the IR 4.0, employers must ensure that their organizations will accompany the technological transformations with training and development programs for their workforce, in new tools and technologies that skilled labour uses (Romero, Stahre, Wuest, Noran, Bernus, Fast, & Gorecky, 2016). This indicates that current education system might need to be revamped to cater the demand from industry (Unicefstories, 2017). However, it is still early to conclude that accounting tasks, including audit would be automated with the use of AI based technologies in IR 4.0. Partial of the process can simply be replaced by intelligent system and technology, but the decision making process will still require human value and judgement. This process explains the changing role of accountants, which demand them to develop hard skills with technology and data analysis as well as critical thinking and adaptability to IR 4.0, as agreed by the respondents.

Data security issue is the biggest concern in IR 4.0, as agreed by the respondents. In order to adopt IR 4.0 effectively, the availability of relevant and reliable data is the most important as they will be analyzed to help human in decision making process. Thus, to avoid the stealing and unauthorized use of data, relevant rules and regulations need to be enacted and implemented. The respondents also agreed that regulators and standard setters need to build their understanding in IR 4.0 so the creation of new rules and regulation will be relevant and serve the purpose of protecting data against unauthorized use by third party. The legal part will also need to be revised effectively to be in line with the development of IR 4.0 in industry so it will cater any legal problems arisen along the adoption process.

Most of the respondents agreed that IR 4.0 will bring greater benefits to organization and society. IR 4.0 will be the catalyst and amplifier for the growing number of efforts to ensure that technology benefits society. The adoption of IR 4.0 will lead to high productivity and efficiency in organization's processes as it normally cutting the redundancies and simplify processes. In addition, the next evolution of automating processes, making them smarter and better with less human intervention, will result zero human errors. However, according to Unicefstories (2017), IR 4.0 will not bring much benefit to society if the world continued to be on its current trajectory. Meanwhile, the variable relates to IR 4.0 adoption cost has obtained the highest mean, which shows that the respondents agreed that IR 4.0 will involve significant cost to an organization. IR 4.0 will definitely require huge amount of capital due to the highly complexity in nature and to ensure its smooth adoption and implementation within an organization especially at the initial stage. However, the organizations will be able to absorb the cost in long term by having efficient processes which will reduce costs involved (Global Trade, 2016).

Table 4 shows how students react and their behaviour towards the new revolution. Majority of the students (78.7%) agree that they lack knowledge and information about IR 4.0. This shows that the students did not discuss the issue with their friends (59%), did not learn in class (56.9%) and did not attend any seminar or talks relating to IR 4.0 (57.5%). However, 84.4% of the students agree that this new revolution is giving major impact to them in the future. In addition, the students have the same opinion (81.4%) on the effects of IR 4.0 in the learning methods in accounting class. They are also to be in agreement that university should prepare the students for the

challenges brought by IR 4.0. This view is in line with findings of other researchers who believe that IR 4.0 requires changes in major aspects of education in terms of syllabus, delivery and structure of education (Abdul Haseeb, 2018).

Table 4. Accounting Students' Behaviour towards IR 4.0

Statements	Yes (%)	No (%)
Have you discussed about IR 4.0 with peers?	41.0	59.0
Have you learned about IR 4.0 in class?	43.1	56.9
Have you attended any seminars or talks relating to IR 4.0?	42.5	57.5
Would you agree that the students lack of exposure on the IR 4.0?	78.7	21.3
Do you think learning IR 4.0 is important to students?	84.4	15.6
Do you think IR 4.0 will change the learning method in accounting class?	81.4	18.6
Do you think university should follow industry in implementing IR 4.0?	81.4	18.6
Do you intend to know more about IR 4.0?	79.3	20.7

Universities have to be prepared to adapt and change their curriculum and delivery so that graduates are able to get jobs which are yet to emerge. The challenges of the IR 4.0 were addressed in the Education 4.0 framework, under the Malaysia Education Blueprint for Higher Education 2015-2025. Educators should be more focusing on the outcomes and performance and at the same time to pursue technologies and innovations that meet the students' needs. This will allow greater learning experience during their studies in universities. Apart from that, the training and education of professional accountants such as Malaysian Institute of Accountants (MIA) also needs to adapt to prepare new graduates and current professional accountants to adjust to new technologies and the new practices, procedures, and processes (Hoffman, 2017). New graduates should be prepared with a new skill set comprises of critical thinking, problem solving, communication, collaboration and creativity. In addition to that, the regulators and standard setters also need to build their understanding of the application of IR 4.0.

In order to be prepared for the new revolution, students themselves should be more proactive in seeking information about it. This is confirmed from the study whereby 79.3% of the students intend to know more about IR 4.0. This shows that the students are motivated and encouraged to be part of the revolution. The findings indicate that the students believe that this new IR 4.0 will bring more opportunity to learn many new things and to help them in their studies. The finding is consistent with Abdullah, Abu Ziden, Chi Aman, and Mustafa (2015) where they discussed three common elements of the students' attitude towards technology which are affections, behaviours, and belief. The students' attitudes towards technology are highly correlated with the positive feeling about it, high behaviour to use it and high positive belief about it. Rogers (2003) claimed that people might react differently to a new idea, practice, or object based on differences in their attitudes toward innovation. They might respond positively or negatively to the new innovation.

6. CONCLUSION

Based on the findings, this paper provides academic and practical implications. From an academic perspective, this paper adds a new perspective to the literature with regards to IR 4.0. Findings show that accounting students are generally aware and have knowledge about IR 4.0 though many of them were unable to form concrete opinions. They are able to state the key features of IR 4.0 and able to distinguish it from other IRs. Apart from that, the students also show a positive attitude towards IR 4.0 where they are very much interested to know more about IR 4.0. From a practitioner perspective, the findings show that the university; particularly the educators must also empower themselves to prepare the students for the future. The Ministry of Higher Education plays an important role to assist the educators to achieve this objective.

Even though IR 4.0 is still new in Malaysia, the committed effort between industry, government and society is important to ensure proper implementation and adaptation as it will give rise to huge impact worldwide. Among the best way to increase awareness and spread the knowledge about IR 4.0 in society is by education industry. The introduction of Education 4.0 by the government can be regarded as a wise strategy to prepare the next generation to face with IR 4.0 challenges. Students particularly need to prepare themselves in the new era of employment which demands mainly new different skills and competency compared to previous generations. Accounting professions may no longer require numerical and computation skills as these tasks can simply be replaced by system or robots, instead the analytical and human judgments value in decision making must be at the highest level.

Nevertheless, this paper might overlook some relevant work that were published in other areas. This study's data were only collected from accounting students at UNISEL, hence the findings of this study cannot be generalized to other universities or contexts due to the different environment and situation. Accordingly there is a need for further investigation to be carried out in the future in order to extend these findings in different contexts. Future

researchers could extend this research by determining the undergraduate students' awareness, perception and attitude towards IR 4.0 in all universities in Malaysia or in other organizations. Moreover, the statistical data could be supported by data collected using qualitative approach, for example from the semi-structured interviews, to provide a deeper understanding of students' perception towards IR 4.0 and the relationship with their attitude and behaviour.

REFERENCES

- Abdullah, Z. D., Abu Ziden, A., Chi Aman, R., & Mustafa, K. I. (2015). Students' attitude towards information technology and the relationship with their academic achievement. *Contemporary Educational Technology*, 6(4).
- Abdullah, D., Abdullah, M. Y., & Mohamad, M.A. (2017). A review on the concept of Fourth Industrial Revolution and the government's initiatives to promote it among youths in Malaysia. *Journal of Social Science and Humanities*. December 2017.
- Abdul Haseeb, A. S. M. D (2018, January 10). Higher education in the era of IR 4.0. *New Straits Times*. Retrieved from <https://www.nst.com.my/education/2018/01/323591/higher-education-era-ir-40>.
- Abdul Rahim, Rushdi (2016). Initial Thoughts. *MyForesight Magazine*. 04, 02-03.
- Abu Ahmad, I (2016). Is it the dawn of Industrial Revolution 4.0 in Malaysia? *MyForesight Magazine*. 04, 04-07.
- Bureau of Labor Statistics, Civilian Unemployment Rate, 1948-2017.
- Burritt, R. & Christ, K. (2016). Get ready for the fourth industrial revolution. *Accounting and Business*. November/December 2016.
- Global Trade (2016). The fourth industrial revolution: Benefits and challenges. December 2016. Retrieved from <http://www.globaltrademag.com/global-logistics/fourth-industrial-revolution-benefits-challenges>.
- Hoffman, C. (2017). Accounting and Auditing in the Digital Age. Retrieved from <http://xbrlsite.azurewebsites.net/2017/Library/AccountingAndAuditingInTheDigitalAge.pdf>.
- IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.
- Krejcie, R.V., & Morgan, D.W. (1970). Determining Sample Size for Research Activities. *Educational and Psychological Measurement*, 30, 607-610.
- Lee, J., Kao, H., and Yang, S. (2014). Service innovation and smart analytics for Industry 4.0 and big data environment. *Procedia CIRP*, 16, Page 03 – 08.
- Malaysian Employer Federation, 2015.
- Ministry of Education Malaysia. Malaysia Education Blueprint 2015-2025.
- Ministry of Industrial Trade and Industry, 2017.
- Omar, S. A., Hasbolah, F., & Zainuddin, U. M. (2017). The Diffusion of Artificial Intelligence in Governance of Public Listed Companies in Malaysia. *International Journal of Business, Economics and Law*, 14(2).
- Rogers, E. M. Diffusion of Innovations, Free Press, New York, 2003.
- Romero, D., Stahre, J., Wuest, T., Noran, O., Bernus, P., Fast-Berglund, A., & Gorecky, D. (2016). Towards an operator 4.0 typology: A human-centric perspective on the fourth industrial revolution technologies. CIE46 Proceedings, 29-31 October 2016.
- Sani, R (2018), January 17). Embracing Industry 4.0. *New Straits Times*. Retrieved from <https://www.nst.com.my/education/2018/01/325914/embracing-industry-40>.
- Schwab, K (2016). The Fourth Industrial Revolution: What It Means and How to Respond. World Economic Forum. Retrieved from <https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/>.
- Transformasi Nasional (2017). Retrieved from <https://mytn50.com/>.
- Unicefstories (2017). Are young people prepared for the Fourth Industrial Revolution? Retrieved from <http://unicefstories.org/2017/04/04/are-young-people-prepared-for-the-fourth-industrial-revolution/>. Accessed 31 May 2018.
- US Bureau of Labor Statistics, 2017.