

Evolution in the educational system: Are we ready?

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ABSTRACT

The fourth industrial revolution, IR4.0, reflects a new wave of technology in all aspects of business and industry. The IR 4.0 affects the business, governance and the people, with no exception to the education sector which creates the buzzword of Education 5.0. For the IR4.0 to be embedded into the education system, the participation and contribution of various parties including the university management and the academicians are vital. The involvement of these parties in educating students to become ready for the 21st-century job demands within the IR4.0 digital age is crucial to the employability of graduates. This concept paper aims to discuss the adoption of technology in the education system, beginning from Education 1.0 to the latest of Education 5.0. The understanding of the evolution in the education system will better alert the concerned parties towards their contributions that need to be realized in line with the technology advancement and its impact on the education system. Ultimately, the review on readiness and challenges of Education 5.0 to be implemented in the digital age would also be discussed.

Keywords: IR4.0, Education 5.0, Evolution, Technology, Digitalized

INTRODUCTION

Over 200 years, the industrial revolution (IR) has caused major changes in the economy and advancement in technology. Four phases of the Industrial Revolution starting from IR1.0 to IR4.0 evidenced the revolution of technology from water and steam production, electricity, electronic usage and information technology to cyber-physical systems (Sharma, 2019), as illustrated in Table 1.

Table 1: Phases of Industrial Revolution

Phases of IR	Year	Description
Industry 1.0	1784	Built on machinery for water and steam production
Industry 2.0	1870	Built on mass production possible by dividing labour and using electricity
Industry 3.0	1969	Built on electronic usage and information technology to make more automated
Industry 4.0	Today	Using a cyber-physical system

(Source: Sharma, 2019: 3558)

The changes in IR4.0 also affect all aspects of human life including how people work and do business. Digitalization, the Internet of Things, Big Data are common tools in the era of IR4.0, which have been applied in all sectors including the educational system.

The implication of IR4.0 on the education system can be seen in many ways. For example, Buttler (2018) outlines the implication is twofold. Firstly, researchers in all disciplines should face the challenges of making artificial intelligence more sophisticated and useful in all fields to serve industrial and societal needs. Secondly, universities' curricula, teaching and learning methods must be equipped with all necessary skills to ensure students understand numeracy, literacy of how the world operates in the IR4.0 era. The advancement of technologies keeps evolving, which later transforms the method of teaching and the setting of the learning process (Dunwill, 2016). The shift in teaching and learning process due to technology has been embedded into the evolution in the education system from Education 1.0 to Education 5.0. The latest, Education 5.0 signifies the shift of major learning responsibilities from the instructors to the learners in the world of learning (Fisk, 2017). Furthermore, as the 21st-century learners belong to Generation-Z (Gen Z) who are so much into the digital tools, they need to be prepared to thrive in the IR4.0.

The changes in the economy and advancement in technology that led to the evolution in the education system affect many parties and should be evaluated to enhance understanding and promote efficient implementation within the educational system. Thus, this concept paper aims to discuss the adaptation adoption of technology in the education system, beginning from Education 1.0 to the latest of Education 5.0. The understanding of technology evolution in the education system will better prepare the concerned parties towards their contributions that need to be realized in line with the advancement in technology and its impact on the education system.

The remainder of the paper is structured as follows. The next section describes the methodology used for this concept paper. The subsequent section discusses the findings of the literature review in relation to the adoption of Education technology, evolution in the Education system, and challenges in the implementation of Education 5.0. The final section describes the conclusion and suggestions for future research.

METHODOLOGY

This is a concept paper discussing the evolution of the education system from education 1.0 to Education 5.0. The selection of articles is taken from the platform of Google Scholar ranking from the year 2015 to 2020. The latest six (6) years article is reviewed to get the latest information on the changes in the current education system. The use of Google Scholar is appropriate since it is currently the most comprehensive academic search engine with 389 million records of Information on the size of academic search engines and bibliographic databases (ASEBDs) (Gusenbauer, 2019).

LITERATURE REVIEW

Adoption of Education technology

The term education technology is associated with information and communication technology (ICT) tools and devices that aim to improve the education system (Escueta et al, 2017). At the current digital age, the teaching and learning process is largely influenced by the enormous technological breakthrough including nanotechnology technology, biotechnology, energy storage, quantum computing, artificial intelligence, robotics, the internet of things, big data automatic vehicles, 3D printing, etc. (Schwab, 2016).

The innovation of technology has been accepted as a compulsory part of the education evolution process. ICT is widely used as educational tools and devices. Revolutionary advances in ICT associated with various gadgets, computers, mobile phones, and the Internet is the main cause of a renaissance in education technology (Escueta et al, 2017).

The adoption of technology in education is widely accepted. Though some old application and software is still in use, it has been upgraded to represent the new digital age. The use of MS MS excels or PowerPoint for example has added innovation for interactive presentation. The use of the Internet of things, big data, Virtual reality (VR), Augmented Reality (AR) with new revolutionary devices have provided innovative ways for immersion and interaction in teaching and learning (Nurul Nadiah et al, 2019). The use of digital platforms to aid teaching and the learning process is no longer seen as strange things to do among the educators.

Evolution in the Education System: Education 1.0 - Education 5.0

Traditionally, the teaching approach involved whiteboard and chalk. Education 1.0 focused more on a face to face interaction among students and teachers. The classroom should be teacher-oriented where most of the time teachers will decide what is most important for students to learn (Gerstein, 2014). Dissemination of knowledge is transferred from the teacher to the learner, using the concepts and comprehensive study where the teacher's explanation is the main method used (Puncreobutr, 2016). Similar to IR 1.0 which is more on water and steam production, the invention of new technology is hardly seen during this phase.

In line with mass production due to power and electricity in IR2.0, new technology in the printing press has shifted knowledge dissemination solely from a teacher's through printed books in Education 2.0 (Saxena & Bhat, 2017). They further added that the invention of printing technology has had a profound effect on literacy levels in France, England, Germany, Russia and Asia in the 15th and 16th centuries. Later on, the education industry created new challenges for teachers and learners with the introduction of e-learning with the integration of ICT and Web 2.0 applications (Tirziua & Vrabie, 2015)

According to the World Wide Web, Web 2.0 concepts have led to the development and evolution of web-based communities, hosted services, and applications; such as social-networking sites, video-sharing sites, wikis, blogs, and folksonomies (Web 2.0, 2009). Harris and Rhea, (2019) stated that the use of web 2.0 technologies (Facebook, Twitter, blog) as a social platform is making their way into the information system (IS) classroom. Social platforms such as wikis, could be used as collaborative curriculum design and for course content authoring. in project development with peer review, as a group authoring tool, to track a group project, to collect data for a class project, for class and teacher evaluation, and for tracking research groups. The challenge during those times is how to incorporate the technologies to enhance learning and teaching in the education system.

Meanwhile, Education 3.0 is still using dual lecturing method, the online method used e-learning and the offline/traditional method used conventional face-to-face learning. At this phase, the source of content comes from e-books and educational websites (Bongomin et al. 2020). Utomo, Bon and Hendayun (2017) stated that the implementation of Education 3.0 has directed the educational institutions toward better educational experience since it is open access to everybody, wireless assistance and technology providing materials for knowledge production. The use of network media and virtual media has enabled collaboration via online networks.

Education 3.0 also emphasizes synchronized communication among many learners by combining open-source materials from various media. A combination of various media is suitable since learners need to keep pace with the changes in the Education 3.0 era that focuses on communication and collaboration, immersive learning, and social network for immediate

interaction (Mingsiritham & Chanyawudhiwan, 2016). Three underlying principles of Education 3.0 are importance: (1) The freedom of students in making their own choices; (2) The concept of students as producers of reusable learning content; (3) Institutional arrangements permit the accreditation of learning achieved, not just of courses taught (Keats & Schmidt 2007 cited in Putnik, Carvalho & Alves, 2015)

Later, Education 4.0 emerged in response to IR4.0 focussing on innovation and maximizes the use of technology in the teaching and learning process (Aggraeni, 2018). Its strong reliance on internet usage and virtual environment combines the technology used in most aspects of education pedagogy (Meylinda, Faaizah, & Naim, 2018). Information and communication technologies (ICT) including computers, the internet, radio and other electronic devices are the technology tools and resources that are used to communicate, create, disseminate, store and manage information. The Internet of things, big data and gamification are introduced as part of the learning and teaching experiences.

Nine trends of Education 4.0 have been identified as the reasons for the shift of major learning responsibilities from the instructors to the learners in the world of learning – from school children to business executives. These include diverse time and place; personalized learning; free choice; project-based; field experience; data interpretation; exams will change completely; student ownership; and, mentoring will become more important (Fisk, 2017). Although advancement in technology did not change the underlying ethos behind the education system, technology-enabled teaching, learning and assessment to be handled by machine

All four phases of the education system have developed over years. Together with the revolution in the industry, the education system has evolved. Table 2 shows a summary of four phases of education evolution.

Table 2: Evolution phases of education system

Characteristic	Edu 1.0	Edu 2.0	Edu 3.0	Edu 4.0
Students' behavior	Largely passive	Passive to active	Active, enthusiastic, string and confidence	Independent, active, innovative and self-directed learning style
Primary roles teacher/professor	Authoritarian and source of knowledge	Guide and source of knowledge	Facilitator of collaborative knowledge creation	Monitor and observer of learning
Teacher/professor source of content	Traditional books and copyright handouts	Copyright and free educational materials for students	e-books and educational websites	Technology-based dynamic and 3D materials

Institutional arrangement	Campus-based with fixed boundaries institution involving traditional paragraphs, tests assignments and sometimes group classroom	Increasing collaboration between universities but one-to-one between students and universities	Open, collaborative and creative activities with loose international affiliations and relation	Creative, skilful innovative and dynamic activities are performed, universities are boundaryless
Methods	Dictation and direct transfer of information Guru-Shishya method of teaching	Progressivism and openness to internet	Knowledge production and constructivism	Innovation production and classroom replacement
Technology	E-learning through electronic management within an institution	E-learning and collaboration involving other universities	E-learning driven from the point of view of personal independent learning environments Use of computers and internet	E-learning is totally based on new innovative technologies tools, High-speed internet, mobile technology, social media platforms, virtual reality etc.
Location of institution	Specific building; Mortar and brick	Specific building plus online; Brick and click	Everywhere in a creative society	Globally networked human body; anytime, anywhere, any device and any platform

(Source: Bongomin et al. 2020)

The latest emergence in the education evolution phase is Education 5.0. Education 5.0 is defined as “a learning-centric ecosystem that is sustainable, balanced and principled, driven by values, powered by intellect and afforded by new, ubiquitous technologies” (Nor Aziah, 2019) UiTM listed five (5) elements of Education 5.0 which are;

- Embraces the elements of education 4.0 with an emphasis on values and future progressive thinking imbuing adab and amanah
- Technology acts as enablers, scaffolds, support and affordances;
- A human-driven approach is taken rather than a technology-driven approach.

- The crux of education 5.0@uitm is learning, by all parties i.e students, educators, administrators and other university members.
- Learning is connected to the student or the learner, focused on the learner, demonstrated by the learner and driven by the learner

All the elements must be taken into consideration by educators and learners to ensure teaching and learning approaches become more creative and interactive. For example, the use of Virtual Reality (AR) and Augmented Reality (VR) have been revolutionized with new cameras and mobile devices to serve the needs of Education 5.0. In the current digital age, immersive and interactive educational experiences that combine Education 5.0 and IR4.0 are the future of teaching and learning that suit the society (Nurul Nadiah et al., 2019).

Challenges in implementation of Education 5.0

Educational facilities and infrastructures refer to the physical assets and facilities that contribute directly or remotely to the teaching and learning process in the educational system (Mohd Fauzee and Zarita, 2012). The combination of these two may create an institutional appropriate shape and atmosphere that contribute to conducive teaching and learning. The learning approach in this digital age is more student-centered, and therefore it must be equipped with strong learning facilities support systems (Subidjo et al, 2019). In most Higher Learning Institutions (HLI), they have their intranet academic information system (AIS) to help administrative processes in the academic affair but not teaching purposes. The problem comes when e-learning and AIS are implemented in separate applications. Utomo, Bon and Hendayun (2018) opined that HLI must empower ICT resources to support the characteristics of the education system (mainly Education 5.0) by integrating AIS with e-learning and mobile platform support. The integrated AIS hopes to decrease the administrative processes and increase the lecturer's innovativeness in teaching and learning.

Physical infrastructures are also important to the smoothness of education evolution, but of course, it requires a huge fund. The latest study by Muzira and Bondai (2020) revealed that educators perceived Education 5.0 as helpful and beneficial to the education system. However, lack of infrastructure and financial resources distorted the proper implementation. Among the recommendations made is management should source funding for physical infrastructure hubs to support Education 5.0 with their strategic business partners. In Malaysia, inadequate support of technical infrastructure and the burden of cost to the content developer and end-user are the main obstacles that need to be overcome (Nurul Nadiah, 2019). In terms of lecturers' teaching techniques, lecturers are expected to use various teaching techniques in each meeting to encourage students' active participation that fulfill the students' needs and reflect the characteristics of the digital age (Anggraeni, 2018). Clearly, knowledge and skills become great challenges to the academicians in meeting the Education 5.0 demands.

CONCLUSION

The technology in education which is synonymous with IR4.0 requires the alignment of teaching and learning processes through Education 5.0. In catering to the needs of 21st-century learners who are revolutionized by technology and digitalization of knowledge, academicians and learners need to relearn and equip themselves with the digital tools to align with the learning preference. The problems and challenges of an educational revolutionary system should be properly assessed to ensure effective and efficient delivery of teaching and learning that match with the digital era.

In line with IR4.0 which promote the evolution in the education systems, discussion of current literatures is important to enhance understanding and promote efficient

implementation within the educational system. Pandemic COVID 19 has proved that the education system is following the trends where online distance learning has almost fully replaced the old version of teaching and learning. Looking at the current trend, are we ready to implement the latest version of Education 5.0? Further study should be conducted to assess the state of readiness of our society.

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