

Analysis of Competencies Among Students in Adopting Education 4.0 at Higher Learning Institution in Johor

Kausalya Tiruchelvan¹, R. Chandrashekar^{1*} & Muhammad Ammar Shafi¹

¹Department of Management and Technology, Faculty of Technology Management and Business,
Universiti Tun Hussein Onn Malaysia 86400 Batu Pahat, Johor. MALAYSIA

*Corresponding Author Designation

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Abstract: The development of technologies such as education 4.0 over time has affected the education sector. This study has been conducted because the implementation of education 4.0 is still at starting point in Malaysia. This study attempts to determine the level of competencies among students in adopting education 4.0, to determine the level of performance in adopting education 4.0 among students and to determine the relationship between competencies in adopting education 4.0 and performance in adopting education 4.0. The study was focusing on students in University Tun Hussein Onn Malaysia (UTHM) and University Teknologi Malaysia (UTM). The study used a quantitative approach, and information has been gathered by giving out questionnaires to participants. Utilizing the Statistical Package for Social Science, the data has been examined (SPSS) and Microsoft Excel. The data from 379 valid respondents were gathered for the study using an online survey form. The results show that the level of competencies influence performance in adopting education 4.0 among students in UTHM and UTM. This research found that when competencies increase, then the performance in adopting education 4.0 also increase.

Keywords: Education 4.0, Higher Learning Institution, Competencies

1. Introduction

Technology began to influence the educational process in the new millennium, and both students and teachers began to use it in significant ways (otherwise known as Education 2.0). Education 3.0 emerged as a result of technological advancements, particularly the widespread adoption of a more user-generated internet. Because of these tools, students were able to use their own knowledge sources, learn online, and communicate with teachers and other students. Education became more networkable, giving

students their own direct link to a variety of diverse knowledge sources, rather than focusing on a back-and-forth between students and teachers.

The fourth industrial revolution is associated with the "Education 4.0" learning approach, which seeks to change education in the future through automation and advanced technology. This technological revolution includes artificial intelligence, robotics, and smart technology. Each of these influences how we live our lives on a daily basis. If universities want to continue producing successful graduates, they must prepare their students for a world in which cyber-physical systems are prevalent throughout all organizations. This includes incorporating technology into the curriculum, fundamentally changing how people study, and using technology to improve the educational experience.

The term "Education 4.0" has received a lot of attention in recent years from a variety of authors who have imagined it in accordance with the well-known four industrial revolutions periods. As a result, it has been examined how the development of technologies over time has affected the education sector. As a result, the conceptualizations consider pedagogy, teaching philosophies, educational models, information sources, learning methodologies, and the roles of students and educators. Nowadays, techniques, practices, and activities may be seen attempting to individualize knowledge creation and information transfer processes to increase their effectiveness, flexibility, and accessibility. As a result, initiatives focusing on educational innovation have evolved to address current educational issues.

To support and encourage educators and researchers to take the lead on initiatives and projects in educational innovation by creating new practices, methodologies, and applied technologies, educational institutions—including education departments, research centers, and universities—support and encourage them. In order to respond to the contemporary societal circumstances, it has been observed that these initiatives and projects must be in line with the needs and specifications of educational institutions, taking technology megatrends into consideration as drivers to achieve innovative solutions. These innovative methods will enhance management and teaching-learning processes while fostering desirable conditions for crucial educational methods.

For new teaching-learning programs in higher education, such as continuing education and lifelong learning programs, these creative ideas have been put into practice on a large scale. Additionally, brand-new online courses have appeared, mostly utilizing connectivity, digitalization, and virtualization tools. But, particularly for engineering programs, there is a lack of knowledge, design methodology, and evaluation mechanisms that enable designers and educators to employ technologies and developing pedagogical procedures to deliver the best innovative solutions. Therefore, reference frameworks must be developed to help designers in the design and implementation processes.

In the advance technology era, Malaysia is not left behind to be one of the developing countries. Based on (National Integrity Plan, 2007), memorandum that expressed by the former prime minister Dato' Seri Abdullah Haji Ahmad Badawi stated that, Malaysia has been successful as a developing country, and it is now on its way on becoming a developed country. Although, the Malaysian Institute of Microelectronics Systems (MIMOS) and the Ministry of Science, Technology and Innovation (MOSTI) jointly released the National Internet of Things (IoT) Strategic Roadmap in 2015 as part of Malaysia's preparation for technological progress, specifically IoT (Nusaibah Yahaya, Nur Haryani Zakaria & Hatim Mohamad Tahir, 2018). However, Malaysia is one of the developing countries but the implementation of IoT in education sector still on the starting point. Based on the study investigate by (Ying-Mei Leong & Chockalingam Letchumanan, 2019), they compared five public universities and five private universities in Malaysia whether they offer IoT in curriculum. But the result is only two private universities that have offerings IoT programs but none of the public universities. This shows that, education in Malaysia still lacks exposure in terms of IoT to students and also the educators. The implementation of IoT among Malaysian is still less. In that, the tech savvy people need to investigate more in order to enhance the IoT technology used in educational institution in Malaysia. According to

(Mostafa Al-Emran, Sohail Iqbal Malik & Mohammed N. Al-Kabi, 2020) there was no empirical research that investigated the impact of IoT applications on student learning outcomes. Teaching and learning methodologies have undergone significant changes as a result of Education 4.0, which is characterised by the incorporation of technology and digital resources into traditional educational systems. The effect of Education 4.0 on students' academic performance is still up for discussion and research, though. According to (Alvarez-Cedillo *et al.*, 2019) an essential deficiency is detected in the current education models, and it is detected that educational freedom is nil or scarce, which has led to poor student performance, which cause severe social problems and the economy of the economy.

Therefore, to achieve the research objectives the level of competencies among students in adopting education 4.0 are determined. Moreover, the level of performance in adopting education 4.0 among students also determined. Consequently, the relationship between competencies in adopting education 4.0 and performance in adopting education 4.0 among students is determined.

This research is focused on higher learning institutions in Johor. The respondents of this research are students in the higher learning institution in Johor.

Technology is constantly evolving in tandem with the passage of time. As a result of technological advancements, a country's level of technology can range from developing to developed. Because Malaysia is still in the development stage, the use of education 4.0 is critical. Primary schools can promote the use of education 4.0 before students enter higher education. As a result of this research, Higher Education Malaysia will benefit from it in adopting the use of education 4.0 in Malaysian universities. Following an overview of the education 4.0 applications used by Universiti Tun Hussein Onn Malaysia (UTHM) and Universiti Teknologi Malaysia (UTM), this study will focus on the challenges encountered when implementing education 4.0 at UTHM and UTM. The anticipated data from Universiti Tun Hussein Onn Malaysia (UTHM) and Universiti Teknologi Malaysia (UTM) will be extremely useful for universities and the government in developing new plans and strategies for implementing education 4.0 in Malaysian public universities.

2. Literature Review

A literature review is a type of academic writing that demonstrates familiarity with and understanding of the academic literature on a particular subject. A literature review also contains a critical evaluation of the sources (The University of Edinburgh, 2021). The literature review should go over the research's theories and concepts. It is a discussion of the research field and the principal difficulties it faces (Wolverhampton University, 2018). This chapter's focus is on the analysis of student competencies in adopting education 4.0 at higher education institutions in Johor. This chapter is divided into seven sections. first, describe about education 4.0 Secondly, Competencies and the elements of competencies. In the third segment it is discussed about education 4.0 in Malaysia. Next, describe the higher learning institution. After that, will discuss higher learning institutions in Johor. Besides that, the importance of education 4.0 at higher learning institution. The last discussion is based on the previous study of the analysis of competencies among students in adopting education 4.0.

2.1 Education 4.0

Education 4.0 is an organisation that promotes critical thinking in the classroom. The use of technology-based tools and resources is an important component of Education 4.0's educational promotion. This implies that traditional classroom instruction will not teach students how to use textbooks, pencils, or essay instructors. Instead, Education 4.0 allows remote learners to connect to the Internet and enroll in classes via a variety of free online courses, video chats, or voice calls to acquire more dynamic information about the same learners. (Sharma,2019). Education 4.0 is linked to nine trends. (Fisk, 2017). To begin, learning can be done at any time and from any location. E-learning tools enable online, self-directed learning. The flipped classroom approach also plays an important role because it allows for interactive learning in class while theoretical parts are learned outside of class.

Second, learning will be tailored to the needs of individual students. They will only be introduced to more difficult tasks once they have reached a certain level of mastery. More practice will be provided if the instructors believe it is necessary. Positive reinforcement is used to promote a positive learning experience and increase students' confidence in their academic abilities.

Third, students have the option of selecting how they want to learn. Despite the fact that the institutions in charge of the curriculum have predetermined what students will study in a course, students are still free to choose their preferred learning tools or strategies. Blended learning, the flipped classroom, and the BYOD (Bring Your Own Device) approach are some strategies that lecturers can use to encourage students to be creative in their learning. Fourth, students will have more chances to engage in project-based learning. Students must complete a few quick projects that require them to apply their knowledge and skills. They are developing the organisational, teamwork, and time management skills needed for their future academic careers by participating in the projects.

Fifth, students will gain more hands-on experience through field experiences such as internships, mentorship projects, and group projects. Technology advancements have made it possible to efficiently learn certain subjects, opening more opportunities to develop abilities that require human understanding and direct engagement. Students in the sixth grade will learn about data interpretation, which requires them to apply their theoretical understanding to numerical data and use their critical thinking skills to draw conclusions based on logic and trends from provided sets of data. The manual component of mathematical literacy will become obsolete as computers perform statistical analysis and forecast future trends.

Seventh, students will be evaluated in new and interesting ways, and traditional methods of assessment may become obsolete or insufficient. When students are working on their field projects, the application of the information can be examined, and the students' factual knowledge can be evaluated. Eighth, with student input, the curriculum will be designed and updated. Their recommendations assist curriculum designers in keeping the material relevant, current, and useful. Finally, as students assume greater responsibility for their own learning, teachers will need to adopt a new role as facilitators who assist students in learning. The nine Education 4.0 trends transfer the primary learning obligations from teachers to students. Instead of viewing the transition as a threat to the traditional teaching profession, instructors should support it.

2.2 Competencies

Competency is a talent required to perform a job. However, in order to enhance students' competencies from an educational perspective, a process of training and development is required. Since the 1990s, competency-based education has had the most impact on higher education globally (Miranda *et al.*, 2021). The challenge of creating educational models that enable students to face situations, challenges, or problems that require the development of knowledge and effective know-how arose from the development of professional competencies in universities, including transversal (soft) and disciplinary (hard) ones. Higher education institutions use this term to respond to knowledge of what is useful to learn at university; By learning and developing the most general competencies, students can apply them in their personal, professional, and social lives.

In this regard, some of the organizations and academic institutions have identified key competencies that should be supported in higher education. As a result, new teaching strategies, exercises, and resources have been produced via the development of these abilities. Since they include the personal, emotional, social, and intellectual talents as well as the accompanying behavior and knowledge that today's students must employ in the workplace, a set of transversal and disciplinary competencies are described as critical competencies in this study. Five key transversal competencies needed to be boosted in higher education which is critical thinking, cooperation, collaboration, communication and creativity and innovation. The disciplinary competencies include three components: training and development of

functional, technical, and technological knowledge, as well as successful workplace performance skills. The ability to research, design, create, and implement new technologies follows. The final one is to propose technology-based solutions using emerging technologies and best practices.

2.3 Elements of Competencies

(a) Transversal competencies

Five essential transversal competencies have been highlighted as core competencies to be cultivated in higher education throughout the period of Education 4.0. First, critical thinking, which encourages students to apply various problem-solving methods while immersing themselves in actual problems. Second, cooperation through activities that encourage group members' individual participation by assigning roles to each participant; as a result, each person is in charge of tackling a particular aspect of a challenging project or problem. Third, collaboration through teamwork exercises; following that, the students must show that they can communicate and cooperate when working on group assignments. Fourth, communication, through exercises that encourage students to communicate their thoughts clearly verbally, visually, orally, even with the assistance of media or other technical resources. As a result, the students' communication abilities can be improved and used in complicated communication situations including pitches, negotiations, and project explanations. Fifth, creativity and innovation encouraging students to invent, develop, and investigate to materialize imaginative and novel problem-solving strategies. Therefore, enhancing these competences encourages the suggestion of solutions to enhance any service, process, system, and practices to maximize resource usage.

(b) Disciplinary competencies

These competences are related to specific technical expertise and task-oriented abilities that can be used in a particular field. In Education 4.0, attaining the creation and implementation of technological systems is increasingly closely tied to training and developing discipline competences. The first of these competencies' three components is the instruction and advancement of practical, technical, and technological knowledge as well as successful workplace performance abilities. The ability to study, plan, develop, and use new technology follows. Additionally, the utilization of best practices and cutting-edge technologies to suggest technological solutions.

2.4 Education 4.0 in Malaysia

According to Dunwill (2016), technological advancements continue to change and transform both the teaching approach and the learning environment. Future changes will be more pronounced. Lecturers posting student grades and assignments online, students using group collaboration software or applications to complete group tasks, students completing their assignments online and uploading them to an online class portal or the educational institution's learning management system, students' high reliance on cloud storage to store their work, and communication between students, parents, and teachers are some of the frequent changes adopted by educational institutions. According to Dunwill, virtual and augmented reality will change the educational landscape, flexible assignments will accommodate different learning styles, and MOOCs and other online learning options will have an impact on secondary education (2016). This represents a significant change in the layout of a typical classroom. Dunwill (2016) focuses on the changes to secondary education's teaching strategy and environment that will take place over the next five to seven years. Malaysia's tertiary education system has previously undergone a similar transition.

The design of the classroom has gradually evolved from neat rows of chairs to a flexible seating arrangement that allows for both individual and group workspaces. Assignments for students are no longer simply constructed or selected responses. Alternative assessments have been introduced to accommodate multiple learning styles. Portfolios, project papers, skill demonstrations, and rating systems are examples of alternative exams used today. Massive Open Online Courses (MOOCs) and

other online learning platforms, as well as changes in classroom design and assessment methods, are now being used in tertiary education. The majority of MOOCs offered by reputable academic institutions in Malaysia are free. Students may take whatever courses they are interested in.

Many courses are self-paced, allowing students to learn from anywhere and at any time using their own devices. Finally, many tertiary education instructors in Malaysia appear to be unfamiliar with Dunwill's (2016) final forecast on the use of virtual reality (VR) and augmented reality (AR) in teaching and learning. Teachers can now incorporate virtual and augmented reality into their lessons thanks to the development of user-friendly VR and AR apps.

2.5 Higher Learning Institution

A college, university, or other similar institution, such as a technical or business school, is considered a "institution of higher learning" if it offers postsecondary academic instruction leading to an associate's or higher degree and is authorised to do so by the relevant State education authority in accordance with State law. Public and private institutions of higher learning are divided. In contrast to private universities, public universities are those that receive the majority of their funding from the public sector through a national or subnational government. The definition of "public" differs from nation to nation, usually dependent on the particulars of the educational system. Public universities are frequently among the most significant research institutions worldwide and typically have a stronger domestic reputation in some parts of the world. Furthermore, government funding is provided to public universities. The university receives significant funding from the state or federal governments, so it is not dependent on students' tuition fees to sustain it. Additionally, public universities and colleges have large class sizes with hundreds of students. There will be a lot more students enrolling at the university overall. The Penn State University, which has close to 40,000 undergraduate students, is an illustration of a sizable public university.

Institutions of higher learning, private universities and colleges are not operated, owned, or institutionally sponsored by governments. They may receive tax breaks, grants, and public student loans from the government, which they frequently do. Private universities could be governed by the government, depending on their location. Public universities and national universities can be contrasted with private universities. Lots of private universities are charitable institutions. Additionally, private institutions tend to be smaller due to more selective financing sources, which frequently results in fewer students and smaller class numbers. Consequently, there will be fewer instructors, majors, and degrees. Private institutions, on the other hand, frequently attract students from around the county since they do not charge in-state tuition. Due to fewer students vying for the same possibilities, smaller private universities may offer more options for students wishing to participate in sports or the arts.

The term "education 4.0" has become more well-known as a result of the advent of "industry 4.0," which will undoubtedly have an impact on virtually everything, including education (Maria *et al.*, 2018). Technology has revolutionised education in today's institutions of higher learning, moving it away from a passive, knowledge-transfer model and toward an active, collaborative, self-directed one (Bagheri & Movahed, 2016). Motivating students and enhancing their learning outcomes is Education 4.0's primary objective for all higher education institutions. Students are both the ecosystem's most significant stakeholders and its main beneficiaries. In Education 4.0, students are still seen as recipients of benefits. Students at higher education institutions can communicate more efficiently with many other system stakeholders, such as teachers, parents, and administration, thanks to technology. For example, those higher learning institutions students who are staying far from their home can interact with their family members. Student learning outcomes and the extent to which Education 4.0 is implemented are directly related. Education 4.0 also promotes learning because the majority of the tools and techniques it uses will help students at higher education institutions learn faster and more effectively than they would with conventional teaching techniques. Given that learning is frequently customised, students are interested in education 4.0. To put it another way, the curriculum grabs students' interest. Education

4.0 also emphasises more engaging activities that inspire students to learn through tools and platforms, even if they can connect and learn at any time, like images and videos. 4.0 Education makes instructional resources easily accessible and dramatically improves student learning outcomes.

2.6 Higher Learning Institution in Malaysia

The educational system in Malaysia is divided into two sectors: the public sector and the private sector. Malaysia's higher education system is well-organized. The government of Malaysia, which is represented by the Malaysian Ministry of Education, controls the public sector as the first sector. Public institutions are classified into three groups, according to Education Malaysia Global Services (2021), which include public colleges, polytechnics, and community colleges. There are currently 20 public universities in Malaysia, which are grouped into three categories: research universities, targeted universities, and comprehensive universities. Public colleges, community colleges, and polytechnics all provide certificate and diploma programmes to their students. Second, the sector is the private sector, which comprises 15 private institutions of higher learning, including 47 private universities (StudyMalaysia.com, 2020). Regarding the level of the programmes they provide and the size of their campuses and infrastructure, private colleges and public universities are very similar. While compared to private universities, the private university college has a smaller campus and fewer students. University colleges place a greater emphasis on undergraduate programmes only. Malaysian education also has other institutions like foreign universities, overseas campuses, and language centres in addition to private sector institutions that are not government-run. The university that has foreign branches in Malaysia are based on partnership between Malaysian institution and other overseas universities such as United States, United Kingdom, Australia, and Ireland (Education Malaysia Global Services, 2021).

Malaysia's educational system, as a developing country, is moving toward education 4.0. According to Ministry of Education Malaysia (MoE) (2015), the Malaysian Ministry of Higher Education (MoHE) developed the MEB (HE) programme with the goal of aligning the Malaysian educational system with technological innovation (Maria *et al.*, 2018). This plan was developed to modernise Malaysia's high school curriculum and produce balanced learners who value both knowledge and skills as well as ethics and morality (Maria *et al.*, 2018). The blueprint's two purposes are divided into three key points for each. There are three major areas of focus for ethics and morality: ethics and spirituality, leadership skills, and national identity. While the main point under the second purpose of the blueprint, knowledge and skills, is language proficiency, thinking skills, and knowledge.

Additionally, in order to improve the educational systems in Malaysia, the Ministry of Education Malaysia (MoE) (2015) developed additional programmes including CEO@faculty, 2u2i, and Massive Open Online Courses (MOOC). The CEO@faculty programmes invite CEOs from any local or foreign company to speak to university students, professors, and all other institutions in Malaysia in order to inform them, particularly students, about the employment environment. The time allotted to CEOs is roughly 30 hours each year. This program's major goal is to connect and involve university students with academics and industry based on their shared industry fields. In order for university students to successfully apply the knowledge they learn at the institution to their industrial field, this programme must be implemented. This is since they gained a thorough understanding of the workplace during their session. Next, "2 years of study + 2 years of industrial training" is what the 2u2i curriculum stands for (Maria *et al.*, 2018). The 2u2i programme exposes students to a real-world industrial setting so they can obtain experience in the workplace. The MOOC programme is currently the most and most commonly used at the higher education level in Malaysia. It allows students and lecturers to put together and provide the resources needed for the learning process, hence reducing the need for textbooks.

2.7 The Importance of Education 4.0 in Higher Learning Institution

Education 4.0 seeks to improve upon the shortcomings of traditional teaching and learning methods. The primary responsibility for learning will change from teachers to students under Education 4.0. Over the next few years, classes will become more adaptable to different learning styles. The importance of education 4.0 in higher education institutions supports a student-centric approach that gives students the freedom to select the courses they want to take. Each learner will also have a unique learning experience. Before they can advance to the next level, they will also need to have a specific level of expertise. Additionally, students will be given the choice of which learning resources they choose. Also, the learning process will be more project-based for students to help them develop time-management or interpersonal skills to make them job-ready. Additionally, altering instructional strategies. The inventive ways in which teachers can enhance teaching and learning will be improved through education 4.0. To increase teachers' performance, the report recommends strengthening teacher preparation. A comprehensive approach for improving teacher capacity that integrates training with career development is being designed with input from teachers as well.

As part of education 4.0, the emphasis will be placed on practical and experience learning-based projects or field work that are appropriate for future employment, rather than just relying solely on tests. Education 4.0, according to Hariharasudan & Kot (2018), "actually alters" the conventional exam-taking procedures. Instead, then being evaluated primarily on their ability to memories information, students are evaluated in real-time according to how they do while working on field projects. According to Marshal (2002), the impact of technology on the education sector should be used to change not only how knowledge is delivered to students, but also how students view education.

In comparison to the conventional methods of learning, which include studying textbooks, Education 4.0 also connects a learner to achieve a deeper connectivity. According to research by Diwan (2017), today's learners might easily become bored because they are continuously seeking out exciting visual and audio cues. The use of education 4.0 enables all students to encounter a visual component that successfully strengthens the relationship between concepts learned and knowledge (Halili 2019). This was particularly clear in the 1990s, when augmented reality and virtual reality were being used in everyday life. Because this technology offers an indirect view of a real-world setting with greater sensory inputs and graphic features, the usage of augmented reality and virtual reality has increased student interest in studying.

2.8 Previous Study

The findings are consistent with previous research (Finger & Trinidad, 2002; Jorge *et al.*, 2003; Young, 2003; Jamieson-Procter *et al.*, 2013). Instead of relying solely on textbook material, students, according to the author, get to explore more knowledge and information. According to the author, this was demonstrated when virtual reality and augmented reality were used in practical ways that increased student engagement because technological advancements provide them with a glimpse of the real-world environment. Furthermore, students in a technology-based course are exposed to more hands-on activities that will develop their understanding and knowledge of the subject, while teachers have the opportunity to design their lesson plans in a more effective and engaging manner, which has a significant positive impact on a student's active learning. Technological advancements, from the perspective of the lecturer, allow for the expansion of the teaching process and the development of a student's learning through collaborative learning, as previously described by (Aziz Hussin, 2018).

Teachers that possess these skills can improve student learning results and encourage their creativity and innovation, according to Brown Martin (2018). In a sense, teachers have the privilege of creating skilled professionals who are highly competent in technical skills, social skills, interdisciplinary thinking, as well as problem-solving techniques for a technologically driven, virtualized, and highly globalized workplace, as opposed to simply producing trained and qualified professionals.

"Seeking to graduate a new generation of highly competitive professionals capable of deploying the necessary physical and digital resources to provide innovative solutions to current and future societal challenges" is what Miranda *et al.* define as "Education 4.0," according to Miranda *et al.* Additionally, the idea of "Education 4.0" has been used to develop and put into reality creative educational techniques. In this situation, educational innovation aims to find the "best practises" of active learning and relies heavily on technical tools to put them into effect.

According to Lawrence (2019), students benefit from using technology and devices to further their education. The methods and resources that students want to use to learn this information are their own. A excellent illustration of this are methods like blended learning, BYOD (Bring Your Own Device), and flipped classrooms, which combine campus-based and online learning on a module-by-module basis.

2.9 Summary

The literature review is concerned with prior researchers' studies that will be used as a reference for this investigation. This is important because the researcher will learn the research procedures to use in order to gather relevant data as well as evaluate and value the findings of past studies based on these previous studies. The study covers the analysis of student competencies in adopting education 4.0 in this chapter. Both educators and also students will have a good impact with the development of education 4.0.

3. Research Methodology

Methods and steps that are generally adopted by researchers will be discussed in this chapter. Research methodology consists as the important part throughout the research. The planned methodology will ensure the methods of data collection would achieve the research objectives in the right direction. This chapter needs to discuss the important elements which are research population, sampling method, instrument of data collection and data analysis. The research process will be running systematically when is a complete planning in methodology. In addition, the source of the data is crucial because it determines the research's accuracy. Therefore, methodology helps to make research process effective in collecting and analyzing the data systematically for achieving research objectives.

3.1 Research Design

The researcher should decide on the design of their research before starting it. Designs are classified into three types: quantitative, qualitative, and mixed method (Abutabenjeh & Jaradat, 2018). The research method chosen will provide guidelines for the techniques and steps of the study. The quantitative research method was used to conduct the analysis in this study because we wanted to know the correlation between the objectives. Quantitative research is the process of generating numerical data and converting it into statistical results. According to Rahi (2017), the approach will focus on data collection from large population problems and data analysis while ignoring the person's emotions and environment. Survey formats such as questionnaires, online surveys, and mobile surveys will be used to collect data. As a result, the focus of this study will be on the questionnaires distributed to respondents in order to collect data and meet the research objectives.

3.2 Research Population and Sample

In this research, the target population will be public universities students from Johor, which is Universiti Tun Hussein Onn Malaysia (UTHM) and University Teknologi Malaysia. (UTM) The population of UTHM students is around 16,700 (UTHM, 2016). The population of UTM students is around 15,200 (UTM 2022). The data is obtained from the official websites of the universities. The size of the sample in this research will be determined by referring to the Krejcie and Morgan table.

According to (Krejcie & Morgan, 1970) the sample size of this study is 379 students from UTHM and UTM.

3.3 Data Collection

Data collection is vital to ensuring that the research process works well and that the study goals are met. It is the process of gathering data from appropriate sources, testing hypotheses, and evaluating the results. In this study, there are two categories of data: primary and secondary.

3.4 Pilot Study

The questionnaire used in this study was created by consulting previous studies and conducting a literature review. As a result, a pilot test will be conducted prior to the distribution of the questionnaires in order to assess the validity and reliability of the questionnaires. It is the final and most important step in data collection because it contributes to the reliability of survey questionnaires. For the pilot test, 30 questionnaires were used.

3.5 Research Instrument

A tool or medium used in research is known as research instrumentation. Instrumentation is made up of a few tools that are used to accomplish the research's goals. In this study, the questionnaire was the most important tool.

(a) Questionnaire

The questionnaire is a tool that consists of a series of questions designed to gather information from respondents. The questionnaire data were used to conduct an analysis of students' competencies in adopting education 4.0 at a higher learning institution in Johor. Part A, Part B, and Part C are the three sections of the questionnaire. Part A will be the respondent's demographic profile, Part B will be an analysis of student competencies, and Part C will be about implementing education 4.0 at higher learning institutions in Johor.

Table 1: Five-point Likert scale

1	2	3	4	5
Strongly Disagree	Disagree	Moderate	Agree	Strongly Agree

3.6 Data Analysis

In this research, descriptive analysis was used to examine the data obtained from a questionnaire. The technique used to arrange, summarize, and simplify numerical data is known as descriptive analysis. The Statistical Package for Social Sciences (SPSS) and correlation approaches are utilized to analyze the data.

3.7 Summary

In conclusion, the approach might be applied to create a standardised process for acquiring and examining the necessary data. The equipment used to measure data varied depending on the type of study, and there were numerous forms of measurement. This technique covers all aspects of research design, population and survey respondents, survey instruments, data collection, and analysis. This chapter has identified and briefly analysed the main categories of approaches that are available to a researcher within the issue of the subject area. A questionnaire survey was used in the quantitative method. Findings from prior literature reviews will help the study achieve its goal more efficiently. The data analysis will begin after all the required data has been collected and the questionnaires have been

returned. The SPSS programme was used to determine the frequency, percentage, mean, and standard deviation of the data that were obtained from the questionnaires.

4. Results and Discussion

4.1 Descriptive Analysis (Independent variable)

This section is to answer the research questions which is to determine the level of competencies among students in adopting education 4.0. in Universiti Tun Hussein Onn Malaysia (UTHM) and University Teknologi Malaysia (UTM) in Johor which focus on UTHM and UTM students. In this study, consists of 5 Likert scale questions for competencies The output gain from the data have been analysed into descriptive analysis. There is a total of ten components to measure the level of competencies among students in adopting education 4.0. The components are create interactive video contents, critical thinking student, written communication skills, problem-solving skills, adapt with different types of learners, potential to lead a team, communicate well, advancements in technology, flexible to face all the challenges, facilitate problem and project based learning strategies.

Table 2: Descriptive analysis (Competencies)

No	Competencies	Mean	Standard deviation
1	I can create interactive video contents for my assignments and projects	3.96	0.87
2	I am ready to be a critical thinking student in this era in education	3.98	0.86
3	I have some written communication skills in this era in education	3.95	0.83
4	I have some problem-solving skills in this era in education	3.91	0.89
5	I am ready to adapt with different types of learners	4.11	0.83
6	I have some potential to lead a team	3.89	0.90
7	I am ready to communicate well with my group members in any form of learning	4.04	0.93
8	I can easily adapt to the advancements in technology	4.06	0.85
9	I am ready to be flexible enough to face all the challenges brought about this revolution in education 4.0	4.04	0.87
10	I am ready to facilitate problem and project-based learning strategies in my studies	4.04	0.84
Cumulative Average		4.00	0.65

Table 2 showed the descriptive analysis of the competencies. In competencies among students' ability to adapt with different types of learners' item no 5 is having ranking of highest mean value of 4.11. Meanwhile, in competencies among students that have some "potential to lead a team" item no 6 is having ranking of lowest mean value of 3.89. Moreover, item no 8 is nearest to the highest mean value and item no 4 is nearest to the lowest mean value.

4.2 Descriptive Analysis (Dependent variable)

Table 3: Descriptive analysis (Performance)

No	Performance	Mean	Standard deviation
1	I can usually find ways of applying what I'm learning in class to something else in my life.	4.00	0.88
2	I am learning a lot in most of my classes this semester	3.99	0.89
3	I often discuss with my friends what I'm learning in class	4.00	0.90
4	I usually think about how the topics being discussed in class might be connected to things that i have learned in previous class periods.	4.07	0.85

5	When I am learning about a new idea in a class, I think about how I might apply it in practical ways	4.04	0.83
6	Sometimes I get so interested in something I am studying in class so that I spend extra time	4.07	0.84
7	I regularly participate in class discussions in most of my classes	3.91	0.92
8	Sometimes I am afraid to participate in class	3.52	1.26
9	Often, I find my mind wandering during class	3.65	1.08
10	it's hard to pay attention in many of my classes	3.48	1.22
Cumulative Average		3.87	0.65

Table 3 indicated the descriptive analysis for the performance in adopting education 4.0 in UTHM and UTM. The table shows the 10 items in this group with their mean and standard deviation respectively. The highest mean is scored by item no 6” Sometimes I get so interested in something I am studying in class so that I spend extra time” Meanwhile, item no 10” it's hard to pay attention in many of my classes” is having ranking of lowest mean 3.48. Furthermore, item no 5 is nearest to the highest mean value and item no 8 is nearest to the lowest mean value.

4.3 Correlation and Regression Analysis (Competencies)

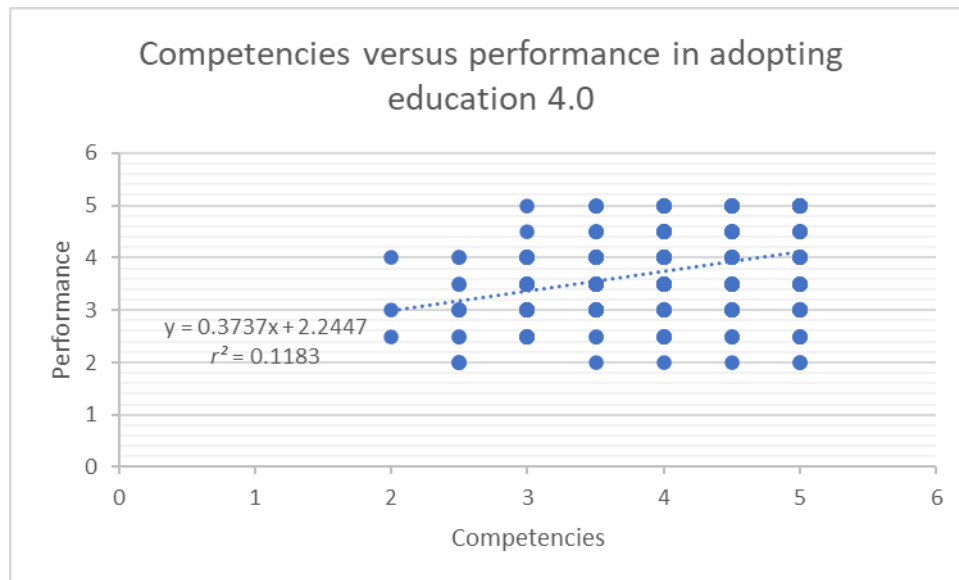


Figure 1: Correlation between competencies versus performance in adopting education 4.0

Based on Figure 1, it shows the correlation between competencies versus performance in adopting education 4.0 among students from UTHM and UTM. The pearsons’s correlation of coefficient, $r = 0.34$ ($-0.4 \leq r < 0.4$). There is very little correlation exist between competencies and performance in adopting education 4.0. The equation of regression line is $y=0.3737x + 2.2447$. As competencies increases, the performance in adopting education 4.0 among students increases. In particularly, the level of competencies increases by 1 unit, the level of performance in adopting education 4.0 increases by 0.3737 units. The correlation of determination, $r^2= 0.1183$. This shows only 11.83% of the total variation is explained or accounted for by the regression line.

5. Conclusion

In conclusion, the aim of this study to determine the level of competencies among students in adopting education 4.0, to determine the level of performance in adopting education 4.0 among students and to determine the relationship between competencies in adopting education 4.0 and performance in

adopting education 4.0 among students. The developed research questions and objectives have been achieved after all the research process went through.

The quantitative research methodology has been applied in this study. The target respondents were 379 students from University Tun Hussein Onn Malaysia (UTHM) and University Teknologi Malaysia (UTM), but only 320 students responded to the questionnaire. Thus, the data are gathered to be used and analyzed in this study. According to the findings, the higher the level of competencies among students in adopting education 4.0, the higher the level of performance in adopting education 4.0. The research highlights how crucial it is to give students education 4.0-related skills. Students need to be able to adapt, develop, and flourish in a technology-driven environment as the digital era continues to alter many businesses and professions. Higher education institutions in Johor can ensure that students are ready for future possibilities and challenges by concentrating on the development of competencies that are aligned with Education 4.0.

Finally, the results gained are being discussed in the further way to ensure the adoption of education 4.0 growing continuously in higher education institutions, the intervention from government and other important parties are crucially needed. Thus, suggestions for future studies have been proposed to enhance the reliability and validity of collected data.

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