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Digital Learning in Technical and Vocational Education and Training (TVET) In Public University, Malaysia

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Abstract: Digital learning can finally help students in the teaching and learning process. It became necessity due to the global crisis of the pandemic COVID-19. Lecturers have no choice but to provide excellent education online, including technical and vocational education and training (TVET). TVET face-to-face teaching is more practical than online teaching. A preliminary study was conducted to look at the need for a framework in digital learning on TVET in Public University, Malaysia. The instrument used in this study was an online questionnaire (Google Form) that was emailed to lecturers. The data was analysed using the Statistical Package for Social Science (SPSS) version 26.0. Descriptive statistical analysis was performed in the form of mean and percentage scores. A total of 51 lecturers answered this questionnaire. The questionnaire consists of the demographic respondent, lecturers' knowledge of online teaching and learning, lecturers' knowledge of digital learning, faculty readiness, and infrastructure needs in educational institutions. The finding is that lecturers' knowledge of online teaching and learning is moderate, lecturers' knowledge of digital learning is high, faculty readiness is high, and infrastructure needs are high. The findings could be used by the higher education stakeholders for developing a framework in TVET digital learning in nurturing the creation of high quality and effective online teaching and learning content.

Keywords: Digital learning, online learning, technical and vocational education, faculty readiness

1. Introduction

The development of digital technology today has opened space for the world of education to use digital technology in the teaching and learning process. Digital learning is no longer foreign but its use in education is increasing and widespread (Amin & Sundari, 2020; Islam Sarker et al., 2019) especially at the tertiary level (Bond et al., 2018; Ødegaard et al., 2021). This shows how crucial digital learning is in helping the teaching and learning process. UNESCO has recommended that the quality of learning can improve over time in line with current technological developments. There are a variety of digital learning terms such as internet-based training, web-based training, online learning, network learning and distance learning (Cojocariu et al., 2014; Lin & Chen, 2017). According to Abdul Bujang et al. (2020), digital learning is any educational activity using technology to improve students' understanding. Kumar Basak et al. (2018) refers to digital learning as using knowledge and communication technology through open and distance learning. Digitalisation should not be considered e-learning because online teaching and learning are just digital changes in higher education (Adedoyin & Soykan, 2020). In general, digital learning is a teaching and learning process that uses technological mediums such as video, e-learning, web-based, augmented reality, and virtual reality. It helps increase students' understanding and is more affordable, exciting and according to their needs and learning styles. Digital learning

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is a platform for the teaching and learning process according to the suitability of time and place while improving student learning quality (Cojocariu et al., 2014; Kumar & Sharma, 2021; Zwart et al., 2017). In addition to the impact of technological developments, digital learning has helped teachers in schools and lecturers in universities to deliver learning more effectively. Digital learning is essential in education, including technical and vocational education and training (TVET).

Advances in science and technology have changed the global economic landscape, where rapid industrial development needs to be trained human resources to meet the job market (Aldossari, 2020). TVET has made a significant contribution to a country's skilled human resources needs (Idris & Mbudai, 2017). However, the production of highly skilled and knowledgeable human resources needs to be enhanced through the proper routes and measures (Md Nasir, 2016). Therefore, the route of skilled human resources through TVET is considered essential and relevant nowadays. According to UNESCO-UNEVOC (2021), TVET encompasses education and training and skills development in various fields of employment and is lifelong learning which is available at the secondary, post-secondary and higher education levels. In Malaysia, TVET is an education system that provides specialised training where the direction of employment is parallel to industry practices (Kementerian Pendidikan Malaysia, 2012). Therefore, TVET can produce a competent workforce based on recognized employment standards, emphasizing practical components, psychomotor skills, and exposure to training in the industry. However, there are challenges which need to be addressed by lecturers, especially in the context of TVET. Among them is thrown by Adarkwah (2021), Blundell et al. (2016), and Aina and Ogegbo (2022) where they echoed that there are only few research to form a proper conceptual framework in online learning for researchers and instructors. On top of that, the percentage of TVET students who fail to complete their studies is higher if they study online compared to face-to-face learning (Griffin & Mihelic, 2019). In addition, not all universities can afford to provide sufficient infrastructure which is able to meet the needs of digital learning (Aina & Ogegbo, 2022; Mbanga & Mtembu, 2020). This has brought impact towards the education sector, especially higher education such as universities, where drastic measures to ensure that teaching and learning runs well are deeply desired (Rieley, 2020).

2. Literature Review

The rapid development of technology has led to the change of the industrial revolution from the agricultural revolution in the history of human civilization. The industrial revolution started with the 1.0 industrial revolution until 4IR of the present day. The 1.0 industrial revolution began in the late 18th century with the use of steam from coal which has boosted the textile industry on a large scale. At the end of the 19th century, there was an industrial revolution 2.0 with the massive use of electric power, the birth of the steel industry, telegraph systems, and railways. The 3.0 industrial revolution has already shifted to the use of information technology systems and automation, which it is the beginning phase of the digital era (Hwang, 2016). According to Schwab (2017), the founder of the World Economic Forum, in his book entitled The Fourth Industrial Revolution, the Industrial Revolution 4.0 (4IR) will change one's lifestyle with the existence of diverse technologies such as artificial intelligence, automation, robotics technology, cloud processing technology or big data, internet of things (IoT), bio and nanotechnology and 3D printing. This is also supported by Aquilani et al. (2020), who say 4IR can improve product quality and improve the way we work, even the whole of life itself. In conjunction with 4IR, Education 4.0 requires lecturers and students to use new communication and information technology (ICT) approaches. This aligns with the cybergogy learning approach founded by Wang and Kang (2006), where the cybergogy learning approach promotes online learning. Among the features of this cybergogy learning approach is the involvement of students in learning using digital technology. According to Hussin (2018), online teaching and learning using digital technology are very suitable for generation Z (Gen Z), where Gen Z are those born between 1997 to 2013. This opinion is supported by the study of Yu (2020), where the results of the study on Gen Z found that Gen Z was more inclined to a more flexible and accessible schedule to manage learning on their own and preferred to communicate with classmates online through "board discussion".

On top of that, the outbreak of a virus called COVID-19 in late 2019 that began in Wuhan, China, has led to worldwide infections. On March 11, 2020, the World Health Organization (WHO) declared COVID-19 infection a pandemic (Ducharmie, 2020). According to statistics, 48, 786, 440 people were infected, 1, 234, 839 deaths and 291 countries were affected (WHO, 2020). Among the countries severely affected by the spread of this virus are Europe and North America, with a case count of nearly two million people (Alfano & Ercolano, 2020). This number is expected to increase until a vaccine is discovered (Faour-Klingbeil et al., 2021). Therefore, every country has taken immediate and precautionary measures to curb the spread of COVID-19 (Mali et al., 2021). Most European, Asian, American, and Australian countries have implemented curfews to curb the spread of COVID-19. Similarly, the former Prime Minister of Malaysia, Tan Sri Muhyiddin Yassin, has declared a Movement Control Order (MCO) under the Prevention and Control of Infectious Diseases Act 1988 and the Police Act 1967 in his special message on the current situation of COVID-19 infection on March 16, 2020 (Awani, 2020). The Movement Control Order (MCO) has also led to the closure of all types of educational centres, whether government or private schools, day or hostels starting from kindergartens, primary schools, secondary schools, international schools, and other institutions, including institutions of higher education and skills training institutes. Every effort to curb the spread of COVID-19, such as MCO, has changed how live, such as working from home, not attending any gatherings, rapid digital economic development, and virtual learning.

Nevertheless, the practice of these new norms has significantly impacted on the rest of the world in terms of health, economy, environment, society (Mofijur et al., 2021), and education (Jima'Ain et al., 2020).

3. Methodology

Primarily, a preliminary study was conducted to examine the needs for research in developing a framework in digital learning on TVET for public universities in Malaysia. Therefore, this study uses a descriptive technique of quantitative research for data collection to describe the digital learning empirically and systematically on TVET for public universities in Malaysia. The instrument used in this study is an online questionnaire form (Google Form) which was validated through pilot study with Cronbach's Alpha in every construct are Lecturers' Knowledge of Online Teaching and Learning = 0.817, Lecturers' Knowledge of Digital Learning = 0.963, Faculty Readiness = 0.712 and Infrastructure Needs = 0.828. According to Taber (2018), it is a common practice to consider an alpha value of at least 0.70 as a sufficient measure of reliability of an instrument. This questionnaire adopts the one from Ab Halim et al. (2020) which made use the 5-point Likert scale with possible responses of "1 = Strongly disagree", "2 = Disagree", "3 = Neither agree nor disagree", "4 = Agree", "5 = Strongly agree". The Likert scale has the reliability that refers to the consistency of test results, i.e., a level obtained by a person represents their level of use in the test (Konting, 2004). A total of 1,031 questionnaires were emailed to TVET lecturers in six public universities, Malaysia and 51 questionnaires were returned answered completely. This questionnaire has five sections, namely Section A (Respondent Demographic = 4 questions), Section B (Lecturers' Knowledge of Online Teaching and Learning = 9 questions), Section C (Lecturers' Knowledge of Digital Learning = 39 questions), Section D (Faculty Readiness = 7 questions), and Section E (Infrastructure Needs = 5 questions). The total number of questions is 64 questions. Finally, this study was analysed using the Statistical Package for Social Science (SPSS) version 26.0. Descriptive statistical analysis was performed in the form of mean and percentage scores. The interpretation of the mean score is based on scale; 1.00 - 2.33 (low/less agree), 2.34 - 3.66 (moderate/agree) and 3.67 - 5.00 (high/strongly agree) (Ahmad, 2002).

4. Results

This section contains the main findings of the research, including tables in a concise way according to the section in the questionnaire.

4.1 Respondent Information

There are 51 respondents; a total of 29 respondents consisted of male (57%) and 22 females (43%). The teaching category for lecturers, which is two lecturers teaching diploma subjects (3.9%), 43 lecturers teaching undergraduate degrees (84.3%), and 16 lecturers teaching postgraduate degrees (31.4%). Table 1 shows the subjects taught online by the lecturers. There are nine primary areas taught by lecturers online: Agriculture, Chemical, Civil, Electrical and Electronics, Entrepreneurship, Information Technology, Mathematics, Mechanical and Technical and Vocational Education.

Table 1 - Area and subject teach online

Area	Subject
Agriculture	Agricultural Design and Technology
Chemical	Bioreactor System, Chemical Engineering, Material and Energy Balance, Operation Units
Civil	Advanced Steel Design, Building Construction, Building Materials, Building Technology, Civil Engineering Technology, Construction Project Management, Reinforced Concrete, Structural Analysis, Structural Theory, Water, Drainage and Plumbing Systems
Electrical and Electronics	Bioinstrumentation and Principles of Communication Systems, Digital, Digital Integrated Circuit Design, Measurement and Testing, Electrical Systems, Electronic Electrical Technology, Electronics Communication System, Electromagnet, Electrical Circuit 1, Power System Engineering, Power System Analysis, Power Electronics, Transmission Technology, Vibration Analysis and Monitoring
Entrepreneurship	Entrepreneurship Culture, Entrepreneurship Practices
Information Technology	Computer Programming for Technologist, Software
Mathematics	Statistics
Mechanical	Air Conditioner, AutoCAD, Automation Technology, Automation and Robotics, Casting Technology, Component Design, Digital Factory and Simulation. Engineering blueprint, Industrial Engineering, Industrial ergonomics, Theory of Metal Machining, Manufacturing, Metal Fabrication Process, Mechanical Engineering Design, Thermodynamic
Technical and Vocational Education	Curriculum in Technical and Vocational Education, Fundamental in Technical and Vocational Education, Industrial Design, Industry and Vocational Engineering Education, Microteaching, Teaching Method in Technical and Vocational Education

Respondents have used a total of 15 tools. A total of 29 respondents have used Google Classroom (56.9%) and followed by Google Meet at 19 people (37.3%) and Webex at 15 people (29.4%). Next, seven people (13.7%) used the Zoom application and the WhatsApp application, a total of 6 people (11.8%). Among the tools used by respondents in online teaching and learning is the Microsoft Team of 4 people (5.9%). YouTube, Telegram, and Utem Ulearn each by two people (3.9%), then Jamboard, Moodle, Recorded PowerPoint 360, Skype, Video Record, and YouTube Live by one person (2%). Some respondents use more than one tool in online teaching and learning.

4.2 Lecturers' Knowledge in Online Teaching and Learning

The analysis in this section uses mean and percentage scores to look at the knowledge of lecturers in online teaching and learning. One of the factors which leads to the successful implementation on digital learning is lecturer's knowledge of online teaching and learning (Blonder et al., 2022). Lecturer's knowledge of online teaching and learning includes knowledge using ICT in teaching and learning, experience using online learning and effectiveness during online teaching and learning. Based on Table 2, the results of the analysis of lecturers' knowledge in online teaching and learning are at a moderate level with a mean score of 3.51. There was a low mean score of 2.16 on online teaching and learning effectiveness, and the lecturers felt that face-to-face learning was more effective than online. Three constructs have moderate mean interpretations, namely implementation of online teaching and learning before MCO, satisfaction of lecturer and student interaction during online teaching and learning and whether online teaching and learning will continue after the COVID-19 pandemic. For the knowledge construct of lecturers in ICT, willingness to implement online teaching and learning, delivery of online teaching content, taking more time to prepare and proficiency in using tools in delivering lectures get high mean scores.

Table 2 - Mean, standard deviation and interpretation of mean

Construct	Mean	Standard Deviation	Interpretation of Mean
1. Have sufficient knowledge in the field of computers and ICT to deliver online teaching and learning.	4.08	0.69	High
2. Willing to implement online teaching and learning	4.29	0.54	High
3. Have implemented online teaching and learning before the Movement Control Order (MCO).	2.60	1.40	Moderate
4. Satisfied with the interaction between lecturers and students during online teaching and learning.	2.98	0.93	Moderate
5. Can deliver teaching content online	4.13	0.75	High
6. Feel that online teaching and learning are more effective compared to face-to-face teaching and learning.	2.16	0.90	Low
7. Take more time to prepare materials for teaching and learning online.	4.02	1.09	High
8. Proficient in using online tools when delivering lectures	3.98	0.65	High
9. Will deliver online teaching and learning after the end of the COVID-19 pandemic.	3.35	1.04	Moderate
Overall Mean	**3.51**		**Moderate**

4.3 Lecturers' Knowledge in Digital Learning

The analysis in this section uses mean scores and percentages to look at lecturers' knowledge of digital learning. In this study, digital learning knowledge encompasses the knowledge about digital tool such as video, website, e-learning, augmented reality (AR), virtual reality (VR), and mixed reality (MR). Concurrently, the use of digital tools can provide new learning experience, together with encourage innovation in online learning (Horváth, 2018; Mapundu & Musara, 2019). Based on Table 3, the results of the analysis of lecturers' knowledge in digital learning are high, with a mean score of 3.98. Lecturers have high knowledge of digital tools such as video, websites, e-learning, AR, VR, and MR. For the digital tool, suitability construct in teaching and learning for TVET, the use of video (mean score 3.22), website (mean score 3.53), e-learning (mean score 3.53), and AR (mean score 3.78) had a moderate score. While the use of VR and MR in teaching and learning for TVET got a high mean score of 3.88 and 3.82, respectively. Furthermore, 76.4% of lecturers agreed that digital TVET learning is relevant nowadays, with a high mean score of 3.94.

Table 3 - Mean, standard deviation and interpretation of mean on lecturer's knowledge in digital learning

Construct	Mean	Standard Deviation	Interpretation of Mean
1. Video is a digital learning platform for TVET.	4.27	0.63	High
2. The use of video in the teaching and learning process allows visuals to be displayed dynamically and incorporates a variety of media such as audio and graphics.	4.31	0.68	High
3. Using video allows the teaching and learning process to resemble an actual situation due to authentic images.	3.76	0.99	Moderate
4. Students can watch video clips repeatedly to understanding a topic.	4.63	0.53	High
5. The use of video is very effective for students who learn visually.	4.31	0.71	High
6. The video preparation process can save time, energy, and expense costs for an extended time.	3.88	0.91	High
7. The use of video is suitable for the teaching and learning process in TVET.	3.22	1.12	Moderate
8. Website is one of the digital learning platforms for TVET.	3.84	0.92	High
9. Website allows a student to interact with lecturers, other students, and the website environment.	3.98	0.79	High
10. The use of the website enables the preparation of the lecture materials in a planned manner in line with the teaching syllabus.	4.08	0.74	High
11. The latest information on the website is easy to update.	4.12	0.65	High
12. The website's medium of synchronous communication (chat) allows interaction to occur in real-time between students. In contrast, asynchronous communication (email) allows interaction between two or more users at different times and locations.	4.02	0.86	High
13. The website serves as an effective tool to cultivate students' interest and improve achievement in learning.	3.55	0.83	Moderate
14. Students tend to explore websites from one Section to another and from one medium to another through hypermedia.	3.76	0.79	Moderate
15. The use of websites is suitable for the teaching and learning process for TVET.	3.55	1.03	Moderate
16. E-learning is a digital learning platform for TVET.	4.14	0.75	High
17. Through e-learning, students can access all information regardless of time and place.	4.39	0.60	High
18. Learning strategies, material management, and teaching and learning environment are essential elements to improve e-learning effectively.	4.25	0.63	High
19. E-learning is suitable for TVET.	3.53	1.24	Moderate
20. Augmented Reality (AR) is a digital learning platform for TVET.	4.10	0.70	High
21. AR technology combines elements such as processor, screen, sensor, and input device.	4.12	0.71	High
22. AR technology allows virtual objects to be moved from various angles as if holding a real object.	4.02	0.76	High
23. AR can motivate students to learn TVET.	4.04	0.76	High
24. Students can understand a subject in more depth through AR.	3.78	0.74	High

Construct	Mean	Standard Deviation	Interpretation of Mean
25. The use of AR technology is suitable for TVET.	3.78	0.73	High
26. Virtual Reality is one of the digital learning platforms for TVET.	4.06	0.70	High
27. VR uses computer technology to create a simulated environment with a three-dimensional world.	4.22	0.65	High
28. VR allows students to interact with learning materials, even without such components.	4.04	0.67	High
29. VR allows experiments to be performed before they are performed in real-time.	3.92	0.69	High
30. VR allows students to learn skills well without causing damage to learn materials and causing injury to others.	4.06	0.80	High
31. VR can assist students in visualizing complex concepts and theories, stimulate interaction, and make the teaching and learning process more interactive.	4.06	0.65	High
32. VR is well suited for teaching and learning processes for TVET.	3.88	0.61	High
33. Mixed Reality (MR) is one of the digital learning platforms for TVET.	3.96	0.68	High
34. There is a difference between AR, VR and MR.	4.02	0.72	High
35. MR combines both aspects of the virtual world and the real world and allows students to interact with the two worlds	3.98	0.76	High
36. MR gives new experiences of the learning process to students.	4.02	0.73	High
37. MR allows students to touch and manipulate objects to increase their understanding of a subject.	4.00	0.69	High
38. MR is suitable for TVET.	3.82	0.77	High
39. Digital learning for TVET is very relevant nowadays.	3.94	0.83	High
Overall Mean	**3.98**		**High**

4.4 Faculty Readiness

Undeniably, digital learning requires extra effort from the faculty to ensure the learning process to be smooth (Cutri & Mena, 2020; Junus et al., 2021). However, the lack of attention on technology development by faculty renders the lecturer to be unprepared to embrace digital learning (Farazkish & Montazer, 2019). Indeed, measuring faculty readiness is highly required to ensure the success of digital learning. For this, Martin et al. (2019) develops an instrument which includes course design, course communication, time management and technical to compare faculty readiness between US and German educators and found that US faculty rated higher competency than German. Based on Table 4, the results of the faculty readiness analysis are at a high level, with a mean score of 4.32. The mean score for each construct was high, i.e., a person who is technology literate (4.12), skilled in managing online teaching and learning, the importance of technology in education (4.59), and using digital learning technology in teaching and learning (4.47). Furthermore, attending courses and seminars organised by the faculty (4.37), collaborating with other institutions to improve the quality of teaching and learning (4.04), and 88.3 % of the lecturers were motivated by the Dean of the faculty to use digital technology in teaching and learning.

Table 4 - Mean, standard deviation and interpretation of mean on faculty readiness

Construct	Mean	Standard Deviation	Interpretation of Mean
1. I am a person who is technology literate.	4.12	0.63	High
2. I am proficient in using learning management systems, Google classroom, and online classrooms.	4.31	0.55	High
3. I recognise the importance of technology in education in this century and beyond.	4.59	0.54	High
4. I am using digital learning technology in teaching and learning.	4.47	0.50	High

Construct	Mean	Standard Deviation	Interpretation of Mean
5. I am attending courses or seminars organised by the faculty to improve my skills in technology and pedagogy.	4.37	0.82	High
6. I am collaborating with other institutions to improve the quality of teaching and learning.	4.04	0.60	High
7. I get motivation from the Dean of the Faculty to use digital technology in teaching and learning.	4.33	0.74	High
Overall Mean	**4.32**		**High**

4.5 Infrastructure Needs

Another factor which had influence on higher education digital learning is the accessibility towards digital infrastructure (García-Morales et al., 2021). This is explained in Table 5 where among them, the results of the infrastructure need for lecturers to assist online teaching and learning are high, with a mean score of 4.09. The constructs that got high mean scores were lecturers who had good access to laptops and computers (4.49), had good internet access for online teaching and learning (4.24), access to data for research (4.06) and lecturers who had to attend periodic courses so that online teaching and learning can be done more effectively (4.18). As for the construction of computer lab facilities to enable students to interact with other students from different universities, 43% of lecturers are not sure about the facilities.

Table 5 - Mean, standard deviation and interpretation of mean regarding infrastructure needs

Construct	Mean	Standard Deviation	Interpretation of Mean
1. I have good access to the laptop and computers.	4.49	0.58	High
2. I have good internet access for online teaching and learning.	4.24	0.84	High
3. Gain good access in terms of obtaining data for research activities.	4.06	0.88	High
4. Use computer lab facilities that allow students to interact with other students of different universities.	3.47	1.06	Moderate
5. Need to attend courses regularly so that online teaching and learning can be done more effectively.	4.18	0.74	High
Overall Mean	**4.09**		**High**

5. Discussion

This preliminary study was designed to examine the needs for research in developing a framework in digital learning on TVET for public universities in Malaysia. Based on the results, when the COVID-19 pandemic occurs, almost all teaching and learning should be conducted online as one of the ways to curb this pandemic from spreading through the area of educational institutions (Giovannella, 2021; Irawan et al., 2020; Kedraka & Kaltsidis, 2020). The area of TVET that is most affected in this study is at the undergraduate level, where many university students are comprised of this level. The subjects taught online include mechanical, civil, electrical and electronics, education in TVET, mathematics, agriculture, entrepreneurship, chemistry, and information technology. Through these subjects, there are teaching and learning that require the use of specific tools and machines to be taught to students. For example, in the field of mechanical, there are casting technology subjects that are taught theoretically and are necessary to practice so that students better understand and see the process themselves. To deliver lesson content in a quality manner, many lecturers in this study used Google Classroom as the primary medium for teaching and learning. This opinion is supported by the study of Al-Maroof and Salloum (2021), who stated that most universities in the Middle East use Google Classroom as a teaching and learning medium due to the large capacity of students. Google Classroom is easy to use by lecturers to communicate with students, such as sharing teaching content, making announcements, quizzes, and assessments on students (Laili & Muflihah, 2020; Prastiyo & Purnawan, 2018). However, it is not in line with the opinion of Khoa et al. (2020), who said Moodle is a widely used platform globally especially in Vietnam.

The level of knowledge of the lecturers in online teaching and learning was moderate level. Lecturers have good knowledge of Information and Communication Technology (ICT) and are ready to implement online teaching and learning. However, the lecturers found that face-to-face teaching and learning effectiveness was higher than online. According to Hayashi et al. (2021), the TVET sector is experiencing enormous challenges in teaching and learning where some tools and machines need to be taught face-to-face to students. This is because, through the online method, the learning of tools and machines is quite challenging to assess, especially on the practical mastery of students according to

the set standards. This study also found that lecturers take a long time to complete the teaching content to carry out the presentation well without interruption. Ghazali and Nordin (2018) study on university lecturers' teaching and learning process in Massive Open Online Courses (MOOCS) found that among the constraints faced by lecturers is time constraints because lecturers have a lot of work commitment. Next, the lecturers had a high knowledge of video, websites, e-learning, AR, VR, and MR and agreed that the tools were a platform for TVET digital learning. The lecturers also agreed that TVET digital education is very relevant nowadays. The availability of faculty and infrastructure facilities for a university is essential in sustaining digital learning. This study found that the readiness of faculty and infrastructure facilities is at a high level. Lecturers are highly motivated by the Dean to use digital technology in the teaching and learning process and attend courses organised by the faculty to produce quality teaching. In addition, access to a good internet network and access to data for research also helps the perfection of online teaching and learning. Mbanga and Mtembu (2020) also argue the need for courses or training given to lecturers and students to improve the skills needed to implement digital learning. The reality is that many TVET instructors lack the digital skills to teach online which causes them to struggle in delivering teaching content, and it is an important issue that needs to be addressed (UNEVOC, 2021). Therefore, it can be concluded that high ICT and digital technology knowledge, high faculty readiness, and good infrastructure cannot deliver online teaching and learning efficiently without solid digital skills.

6. Conclusion

To conclude with, the 4IR and the emergence of the COVID-19 pandemic has transformed digital learning to be a necessity which is very relevant nowadays. The higher education sector, namely universities, is no expectances in pursuing online teaching and learning, including TVET. From the result, it is proven that there is a significant need in developing a proper framework in online TVET teaching and learning to ensure the process is effective where subsequently, this can produce a graduate which meets the requirement of industries. Furthermore, by implementing this future framework, it is hope that TVET student can complete their study in a good manner, even via online teaching and learning. Although the finding of this study is relevant, however, this study has few limitations. Firstly, the limitation of effective yet small sample size where to gain better perspective, a mechanism for obliging lecturers for answering the questionnaire needs to be devised. Secondly, the study is conducted in a quantitative manner where personalised opinions by lecturers are not considered. Therefore, it is recommended to implement a qualitative method which can obtain deep explanation on the practical side of TVET. The last recommendation is to establish the practical framework of TVET online teaching and learning where this framework would be able to address several findings of the effectiveness of the corresponding process.

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