



Evaluation of Success Factors in Adopting Artificial Intelligence in E-Learning Environment

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Abstract: This paper focuses on assessing the critical success factors [CSF] in the adoption of artificial intelligence (AI) technology in E-learning. It is a quantitative assessment study based on the students and teachers' perceptions of United Arab Emirates the Joint Command and Staff College (JCSC). Data was collected using questionnaire survey where the questionnaire was distributed to a total of 240 JCSC students and teachers of the college however only 207 completed forms were received. The questionnaire contained 20 CSF in seven group to investigate the level of importance of each CSF in adopting AI and E-learning using 5-points Likert scale. The data was analysed descriptively using SPSS software package. The results of the analysis found that eighteen of twenty CSFs considered in the investigation are reported as high level of importance. The most important CSF is that "*AI systems able to compute big data for improving teaching*" with having the highest mean score of 4.04 in adopting AI technology in E-learning for the UAE military colleges. In term of factors' group, the most important group is "*making education more interesting*" with having mean score of 3.98. however, further analysis found that respondents having higher degree picked *personalization* group while respondent having a lot of teaching experience respondents picked *performance monitoring* group of factors as the most critical success factors groups. The findings from this study are very helpful in formulating strategies for the promotion of AI advanced technology in the education system and getting its maximum benefits.

Keywords: Artificial intelligence, e-learning, UAE military colleges

1. Introduction

Humans are now immersed in a society that is increasingly involved in an inclusive technological process. Many of the world's population habits have changed as a result of technological advancements. People have changed how they interact, read, communicate, write, and learn using new technologies. As a result, in this Fourth Industrial Revolutionary Era, it is critical to upgrade education methods with advanced technology such as Information and Communications Technology (ICT) and Artificial Intelligence (AI) technology in the classrooms (Hinojo-Lucena et al., 2019). The advancements in the digital world are positively reflected in modern educational methods (Kose et al., 2015).

Furthermore, e-learning is widely used to achieve desired outcomes in various educational settings (Regmi & Jones, 2020). The revolution of today is based on new knowledge and innovation. It includes the AI era, which provides information on improving and filling gaps in learning and teaching and allows teachers to practice the educational process more effectively than ever before (Almohammadi et al., 2017).

Military education focuses on preparing students for specialized engagement skills that will be required in future combat. Goals, motivations, and target applications are the primary distinctions between civilian and military

education. The knowledge gathered from the lecture program is used to assess achievement in traditional civic education. On the contrary, military education aims to equip soldiers with special skills and responsibilities. It used evaluation with established principles and standards. Military education seeks to develop cadet officers from junior officers to military specialists (Tung et al., 2009). Military education includes a diversity of training programs. Military officers should acquire several specialized short-term trainings infantry, armour, and artillery starting from the school level (Seow et al., 2005). Officers in military institutions seldom get opportunity to leave their trainings for pursuing education on a traditional campus. Distance learning and e-learning technologies are proved beneficial for such professionals (TRADOC, 2001). Integration of e-learning with computer-based applications are very helpful for improving academic skill (Roffe, 2002; Sentz, 2006; USGA, 2004).

The United Arab Emirates places a high value on military education and training. Mainly to meet the urgent needs of military colleges and institutes by enhancing learning through new technology (Revolvy, 2018). In the United Arab Emirates, major higher education institutions have begun to integrate electronic knowledge with an integrated artificial intelligence approach. As a result, various e-learning tools have become an integral part of the learning process. Artificial intelligence systems are among the software tools that can be used to improve learning management systems (Salloum et al., 2019). Several factors contribute to the success of an effective e-learning system. According to Salloum et al. (2019), after initial experiences with e-learning and AI in education in UAE colleges and universities, most learners do not continue with their e-learning courses and prefer traditional learning. As a result, understanding the factors involved is critical so that the learner does not have a "negative experience that leads to superficial learning" (Alkandari, 2015).

Furthermore, these factors may influence learners' acceptance, willingness, and decision-making regarding long-term e-learning adoption. As a result, when a new e-learning environment or artificial intelligence tool is introduced into the learning process, institutions and teachers must demonstrate their willingness to use these systems to encourage students to accept and fully utilize them. Therefore, the degree of learner acceptance and system implementation will ultimately determine the success of e-learning and AI systems (Kanwal & Rehman, 2017; Van Raaij & Schepers, 2008). Hence, it is essential to investigate these factors and group them according to their importance. Therefore, the main objective of this study is to examine the success factors and relative attributes to adopt e-learning and AI in the military educational environment in the United Arab Emirates.

2. Literature Review

In 2017, the UAE government unveiled the UAE Artificial Intelligence (AI) Strategy, encouraging the education sector to embrace artificial intelligence and digital transformation (UAE Government, 2018). Stimulating digital transformation through the use of artificial intelligence helps in addressing many challenges. It accelerates the creation of job opportunities required by the knowledge economy, which differs from well-known professions in nature, emphasizing the importance of investing in the educational system to keep up with the Fourth Industrial Revolution (Salloum et al., 2019). It is critical to promote an innovative culture to reach the advanced level of education. Therefore, educational institutions should change their policies and rely on hybrid curricula different from traditional education. It focuses on skill development and student motivation innovation (Al-Hamad, 2020). In recent years, the use of artificial intelligence and e-learning in the UAE has grown dramatically. The UAE's civil and military education sectors have seen positive growth due to E-learning and artificial intelligence. Salloum et al. (2019) and Al Hamad (2020) highlighted the widespread use of modern learning technologies in the UAE, owing to an increasing culture of distance learning. E-learning in the educational sector and its support with artificial intelligence are distinguished by providing a flexible and adaptable educational content structure using hyperlink technology, reducing education costs, enhancing desire for e-learning, and the efficiency it is manufactured. Digital technologies also facilitate communication by allowing students to present their points of view to various audiences and expose students to the perspectives of others (Arghode et al., 2017). As a result, military colleges are focusing on capturing opportunities to learn through e-curricula.

Furthermore, in this age of information and technology, soldiers must be trained in a technologically supported medium to be prepared for the challenges they will face once they enter the workforce (Halaweh, 2018). Due to their remarkable effectiveness in education and reducing risks to students, military colleges in the UAE seek to adopt e-learning technology based on AI, particularly AR and VR, in training and educating army personnel. Military personnel use head-mounted displays (HMDs) and data gloves to interact with objects in a virtual environment.

2.1 Critical Success Factors for E-learning using AI Technology

This study uncovered 20 critical success factors CSF and are classified into seven groups. These factors were used in the questionnaire form and distributed amongst the selected respondents. Several essential factors of success' groups, as listed below, can help to increase the acceptance of e-learning using artificial intelligence techniques.

i. Personalization (PERS)

Learning can be customized. AI can assist in a variety of ways with the personalization of learning. It can aid in the development of a more professional environment for teachers working with struggling students. Teachers spend a large portion of their time performing regular and administrative tasks such as assigning homework and responding to frequently asked questions. A teacher incorporates a virtual teacher and engages a teaching assistant to assist in routine tasks, saving teachers' time to focus on student orientation and one-on-one communication (Mustafa, 2020). Hence, educators have started collaborating with AI assistants to improve students' possible outcomes using Computer-assisted learning (CAL) alternatives.

ii. Course Quality (QUAL)

The Information System Model asserts that course quality is a critical success factor in quality education. It has been established that users' behaviour plays a vital role in accepting and adopting new technological inventions (Faqih, 2016). Additionally, research indicates that the poor quality of e-learning systems contributes significantly to loss and high dropout rates (Faqih, 2016; Wu & Zhang, 2014).

iii. Providing Helpful Feedback To Students (FEED)

One of the important benefits of e-learning over traditional learning is that the user can receive immediate or post-performance feedback. As a result, students will feel more at ease inquiring about and receiving information. However, some students are hesitant to raise concerns or clarify any confusion or difficulties in front of their peers, particularly during a public conference (Donkin et al., 2019). AI systems allow managing and monitoring discussion forums through the use of AI technologies such as machine learning. These keep teachers updated regarding discussions of the students and promote student engagement and learning (Afify, 2018).

iv. Provision of Global Online Classrooms (GLOB)

Another critical factor in e-learning using artificial intelligence is the provision of global classrooms, which enable students to learn, communicate, and interact more effectively with peers in other locations. In addition, it allows students to benefit from AI technology used for communication and interaction with experts and scientists in their field of specialization. This type of learning extends the scope of education and increases their motivation (Ikedinachi et al., 2019).

v. Availability of Skilled Teachers (SKILL)

No technology can deny the importance of a qualified human teacher, even if we use artificial intelligence. AI is used as assisting the teacher in upgrading and refining learning styles to comply with their students' advanced needs. Thus, AI education systems are used to improve educational processes, keeping skilled teachers as the core for students' learning (Alzahrani, 2019).

vi. Making Education More Interesting (INTE)

Artificial intelligence tools play a critical role in making education more appealing than ever. It motivates the students to enhance their knowledge and increase their engagement in education (Kew et al., 2018).

vii. Proficiency in Performance Monitoring (PERF)

Teachers spend huge time grading tests and assessing homework. AI can be used as an assessment tool to determine how they grade and thus save teachers' time. In addition, teachers and administrators can use artificial intelligence to track students' performance throughout the learning process and identify students who perform poorly. Artificial intelligence systems manage schools and colleges' massive amounts of data (Cerezo et al., 2020). AI systems can produce precise and detailed reports and analyze student behaviour and performance (Tawafak et al., 2020).

3. Research Method

This study adopted a quantitative approach where the data was collected through a structured questionnaire survey. The survey involved the students and the teachers of military colleges in UAE regarding the acceptance of artificial intelligence and E-learning. The response of the participants in the data collection was recorded using the measuring scale as strongly disagree, disagree, neutral, agree, and strongly agree. Data was recorded in the statistical software package SPSS and analyzed to compute the success factors' mean value and relative indicators. A total of 240 questionnaire forms were distributed amongst the teachers and students, and 207 completed forms were received at a response rate of 86.25%. The participants are well qualified and engaged in different levels of educational degrees. In addition, these participants have been in the education system for several years. The details of their qualifications and experience are shown in figure 1 (a) and figure 1(b), respectively.

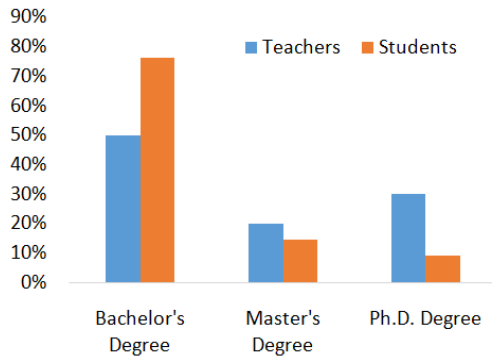


Fig. 1 - (a) Education level of the respondents

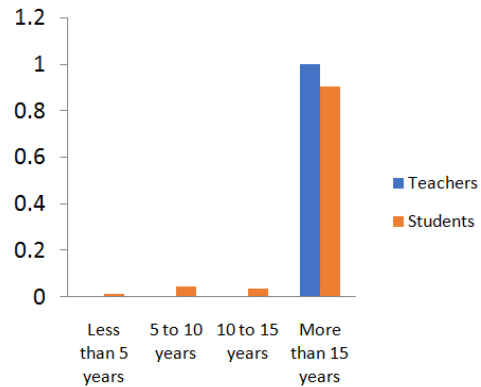


Fig. 1 - (b) Experience of the respondents

Figures 1(a)&(b) show that the students' educational level in the UAE Armed Forces varied between bachelors, masters, and doctorates. Most of them (76.4% of the sample) hold a bachelor's degree, while 14.6% possess a master's degree. In contrast, only 8.9% of the participants have a doctorate, and only 5.7% have a diploma. On the other hand, 50% had a master's degree. In comparison, 30% of the participants possessed a bachelor's degree, and only 20% had a doctorate. Similarly, 90.4% of the students have experience of more than 15 years to be involved in the educational system and all the teachers participating in the survey have experience of more than 15 years. The collected data from these respondents was analyzed to conclude the study.

4. Results and Discussions

This study assessed the CSF in applying Artificial Intelligence (AI) in E-learning in the UAE Military Education System. The assessment was done based on the students and teachers' perception of CSF in the military education system. The perception of the participants was recorded with the help of a structured questionnaire. There are 20 CSF which are classified in seven groups. The data collected from the questionnaire survey were analysed using SPSS software package to prioritize the Critical Success Factors (CSF) of the adoption of AI technology in UAE military educational colleges. The mean value for each factor was generated, and these values were evaluated based on the 5-points Likert's scale used in the questionnaire. Hence, the threshold range to decide the level of critically, this study formulated the range for determining the levels as follow; for mean values in the range of 1.00 to 1.50, the factor is considered having very low influence. For mean values in the ranges between 1.51 to 2.50, it is considered as low influence, while for the range between 2.51 to 3.50 is considered having moderate influence; for the range between 3.51 to 4.500 is considered high influence and for the range between 4.51 to 5.00 having very high influence (Gamil et.al., 2020; Nasaruddin and Rahman, 2019). The results obtained from the analysis for the success factors are presented in table 1.

Table 1 - Critical success factors in adopting AI in military E-learning

Factors code	Description of factors	Mean score	Level
PERS1	Personalization method of teaching	3.26	Moderate
PERS2	Difficulties in meeting the trainees' individual expectations	3.83	High
PERS3	Quickly able to adapt to individual learning requirements	3.66	High
PERS4	Able to reduce repetitive work for instructors	3.85	High
PERS5	Able to improve personal skills and professional knowledge	3.93	High
QUAL1	Trainees faced difficulties during examination.	3.22	Moderate
QUAL2	Ability to examine the gaps in course content.	3.58	High
QUAL3	It is an adaptive educational system	3.56	High
FEED1	AI technology able to give critical feedback to instructors.	3.82	High
FEED2	Feel more comfortable to ask questions using AI technology	3.70	High
GLOB1	Trainees communicate and interact other trainees globally	3.54	High
GLOB2	Trainees benefit in direct interaction with experts globally	3.62	High
SKILL1	Need skilled instructor to handle the system	3.58	High
SKILL2	Instructor should have AI systems skills for trainees' needs.	3.86	High
SKILL3	AI technology will be the future education tool	3.72	High
INTE1	AI technology helps in making education more attractive.	3.96	High
INTE2	AI technology encourage self-develop knowledge.	3.99	High
PERF1	AI helps to monitor trainees' performance	3.87	High

PERF2	AI systems able to compute big data for improving teaching.	4.04	High
PERF3	AI systems able to profile trainees' progress reports.	3.71	High

From table 2 it is depicted that all the attributes of the success factors are reported as high influential in adopting the E-learning. Only two factors have moderate influence. Among these two factors, one factor is from the success factor Personalization (PERS) group which is the *personalization method of teaching*. Second attribute is related to the success factor quality of the course (QUAL) and the attribute is *trainees faced difficulties during examination*". Furthermore, examining all the attributes within the success factors it is seen that *Able to improve personal skills and professional knowledge*" is reported as the most influential attribute in the success factor "personalization". Among the attributes of the success factors quality of the course (QUAL), "*It is an adaptive educational system*" is found as the attribute having the highest influence in E-learning. In the (FEED) group of factors, the top attributes are reported as "*AI technology able to give critical feedback to instructors*".

Similarly, "*Trainees benefit in direct communication and interaction with experts globally*" is considered as the most influencing attribute in the (GLOB) group. The respondents indicated that to take effect of the availability of skilled teachers (SKILL), instructors need learning style with AI systems when dealing with trainees' needs thoroughly. Similarly, for making education more interesting (INTE), AI technology helps make *education more attractive*. Assessing the influence of proficiency in performance monitoring (PERF) group of factors, the most critical factor is "*AI systems able to compute big data for improving teaching*" as the most influencing attribute for adopting E-learning education system in the UAE military colleges.

These twenty success factors in table 1 were further analyzed. The factors were narrowed down into groups, and the influence performance for each group in applying AI and e-learning in the military college is as in table 2

Table 2 - Critical success factors in applying AI and e-learning in military

CSF Code	Critical Success Factors	Mean	Level
PERS	Personalization	3.70	High
QUAL	Quality of the course	3.42	High
FEED	Providing helpful feedback to students	3.76	High
GLOB	Provision of global classrooms (online)	3.58	High
SKILL	Availability of skilled teachers	3.71	High
INTE	Making education more interesting	3.98	High
PERF	Proficiency in performance monitoring	3.87	High

From table 2, it is perceived that the critical success factors considered for investigation in this study have high relevancy with the adoption of the E-learning system in the military colleges of UAE. However, there is a slight difference in the perception of various stakeholders having distinct academic qualifications. Therefore, the comparison of the response based on the academic qualifications of the respondents is presented in figure 2.

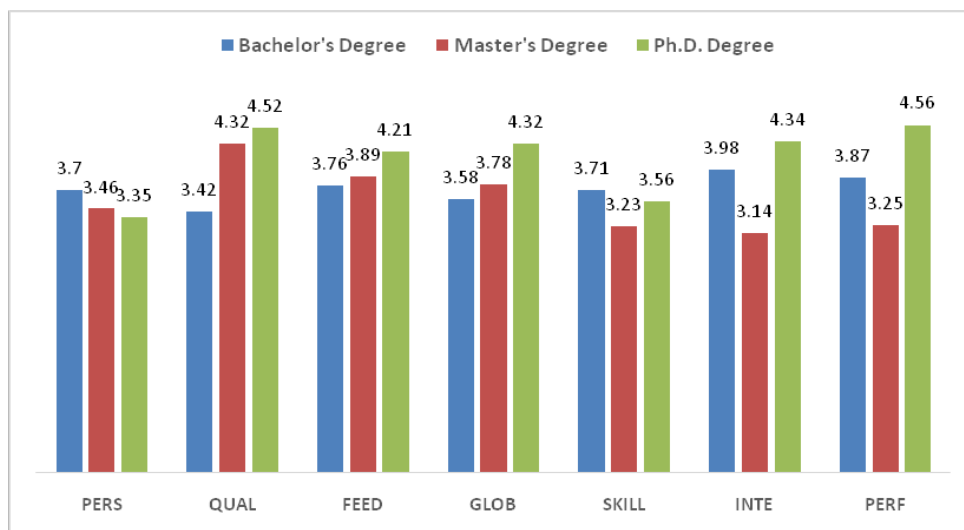


Fig. 2 - Comparison the CSF based on respondents' academic qualification

From figure 2 it is observed that the respondents having bachelor's degrees consider that the success factor Making Education More Interesting (INTE) is more important and influential. It is followed by Proficiency in Performance Monitoring (PERF) and providing helpful feedback to students (FEED). On the contrary, the results depict that the respondents with master-level education consider the quality of the course (QUAL) as the essential factor. Providing helpful feedback to students (FEED) and providing global classrooms (GLOB) are reported as second and third-ranked factors from importance level. Finally, the respondents having PhD degrees consider personalization (PERS) at top level followed by Quality of the course (QUAL) and making education more interesting (INTE) in adopting the E-learning system in military colleges of the UAE. The success factors were also compared based on the respondents' perception with distinct levels of experience, as presented in figure 3.

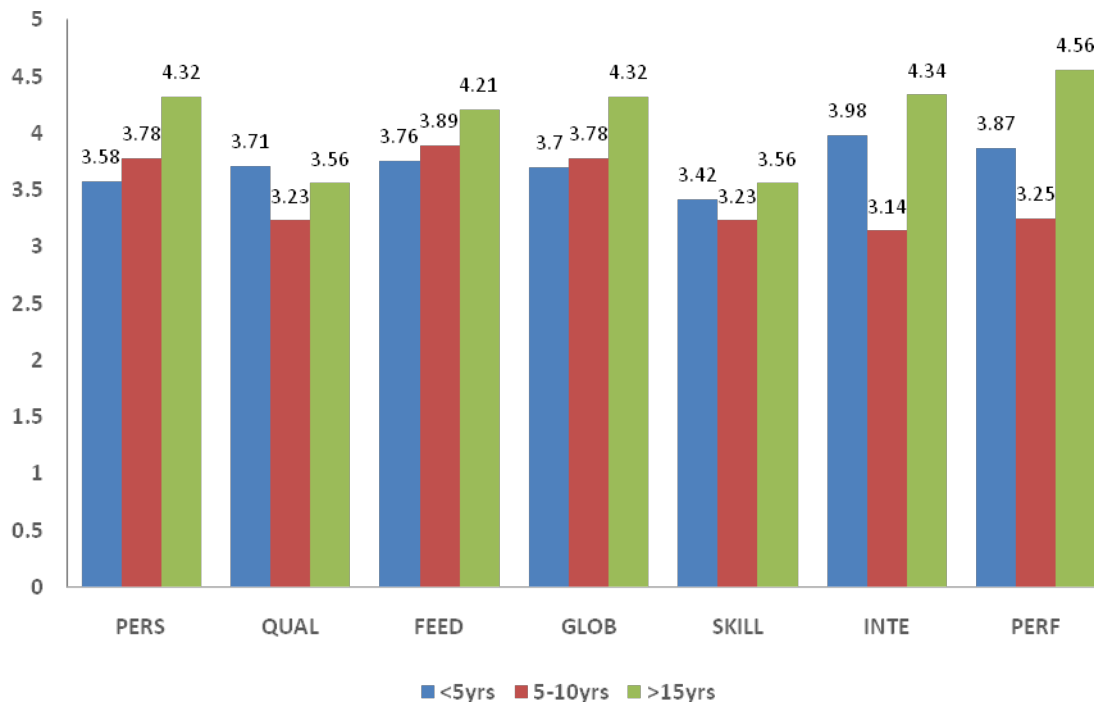


Fig. 3 - Comparison the CSF based on respondents' experience

Figure 3 shows that the respondents having experience of more than 15 years consider that the success factor Proficiency in Performance Monitoring (PERF) is more important and influential. Making Education More Interesting (INTE) is the second ranked factor as perceived by the respondents. The respondents pointed out that providing global classrooms (GLOB) and personalization (PERS) are equally important at third level for adopting AI-based e-learning system in the college level of educator under military control. Similarly, the participants having experience of 5 to 10 years reported that providing helpful feedback to students (FEED) is the most influencing factor while they placed providing global classrooms (GLOB) and personalization (PERS) equally crucial as second leveled factors. The respondents having experience less than five years reported Proficiency in Making Education More Interesting (INTE) as the top success factor followed by Proficiency in Performance Monitoring (PERF) and providing helpful feedback to students (FEED).

5. Conclusion

In this technological era, adopting the new technology is essential to experience the benefits of the technology. Together with other fields, the education sector is also embracing advanced tools to assist the teaching staff in smoothing the process of learning and teaching and assessing the student's performance. This paper studied the critical factors of adopting e-learning using artificial intelligence (AI) technology in the military education process in the United Arab Emirates. By administering questionnaires among the students and the Joint Command and Staff College (JCSC) teachers, the researchers collected 207 completed questionnaire forms. Statistical analysis results of the questionnaire showed that 7 success factors and 20 attributes used for investigation have high level agreement from the respondents in showing the importance of an AI-based e-learning system. The respondents mentioned that the most prominent attribute of AI base e-learning to motivate the teachers and students to adopt this system is that "AI systems can deal effectively with the vast volume of data to improve the teaching system". The findings of this study will be

useful for develop strategies in promoting the advance technology in the education system and get its maximum benefits.

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