FACTORS INFLUENCING UAE SECONDARY SCHOOL TEACHERS INTENTION TO USE EDUCATION 4.0

AMNA ABDALLA MOHAMED

A thesis submitted in
fulfillment of the requirement for the award of the
Degree of Master of Technology Management

Faculty of Technology Management and Business
Universiti Tun Hussein Onn Malaysia

SEPTEMBER 2023

To Almighty Allah, who gave me strength and wisdom to complete this work,

ACKNOWLEDGEMENT

I humbly extend my gratitude to my supervisor Associate Professor Dr. Abd Rahman Ahmad, whose helpfulness and commitment to my advancement and success facilitated to make the journey somewhat manageable. My thanks and gratitude extend to my committee members for their guidance through the research process. I also thank my examiners committee members whose support and guidance I genuinely appreciate. I would like to also thank my entire family for their support throughout the years and understanding while allowing me the time and space needed to complete this academic journey. I would like also to acknowledge with much appreciation the crucial role of staff of Universiti Tun Hussein Onn Malaysia (UTHM) and Faculty of Technology Management & Business for their support, and providing access all required and necessary information to complete this research work throughout my journey. I would not have completed this journey had it not been for your encouragement and support over the years.

ABSTRACT

In today's world, the fast and successful development of information technology in terms of education 4.0 has become an important aspect for secondary school education. With the emergence of the covid-19 outbreak, many secondary education institutions have shifted their teaching and assessment online. However, literature about education reform efforts in the UAE revealed remarkably limited research on the subject. Thus, to fill in this gap, this current research focuses on investigating the intention to use education 4.0 among secondary school teachers in the UAE. This study employs a quantitative research approach by using a questionnaire of 5-point Likert scale to collect the data. The sample of the study is composed of 15 secondary schools from K-12 grade in Al Ain, UAE. The sample of 437 secondary school teachers were analyzed using the Statistical Packages for Social Science (SPSS) Statistics. For the first objective, the finding showed that the level of the intention to use education 4.0 among UAE secondary school teachers was significantly high. Similarly, the overall mean score for the respondent's level of performance expectancy, effort expectancy, social influence, and facilitating conditions towards education 4.0 is equally significant which explain the willingness of teachers to use education 4.0. On the other hand, the regression results to answer the rest of the objectives revealed a significant positive relationship between performance expectancy, effort expectancy, social influence, facilitating condition and the intention to use education 4.0. The study contributed to the theory and practice of technology adoption in secondary education institutions in a developing country context. In addition, the outcomes of this research can be used to improve teaching experiences for educational managers, educators, and school administrators to effectively plan and implement appropriate learning environment that adequately integrates intention to use education 4.0 systems for teachers to benefit from. Furthermore, the implications of the findings are that the researcher established that most research on technology acceptance using the UTUAT model has been based in western and developed nations. This study has thus provided empirical grounds for comparing this study's findings with those reported from the western context about middle east countries.

ABSTRAK

Dalam konteks pembangunan teknologi maklumat yang pantas pada masa kini, Pendidikan 4.0 telah menjadi satu perkara yang amat penting dalam pendidikan di sekolah menengah. Pendamik Covid-19, telah mengubah kaedah pengajaran dan pembelajaran di sekolah kepada pengajaran dan penilaian atas talian. Walau bagaimanapun, kajian lepas tentang usaha pembaharuan pendidikan di UAE mendedahkan penyelidikan yang sangat terhad. Dalam usaha untuk melengkapi jurang maklumat, penyelidikan ini telah memberi fokus untuk mengkaji hasrat penggunaan Pendidikan 4.0 di kalangan guru sekolah menengah di UAE. Kajian ini menggunakan pendekatan kaedah kuantitatif dengan menggunakan soal selidik berskala Likert 5 mata untuk mengumpul data. Sampel kajian adalah terdiri daripada guru-guru di 15 sekolah menengah dari Gred K-12 di Al Ain, UAE. Sebanyak 437 guru sekolah menengah telah terlibat dalam kajian ini dan data kajian telah dianalisis menggunakan Statistik Pakej Statistik untuk Sains Sosial (SPSS). Dapatan kajian mendapati tahap hasrat menggunakan Pendidikan 4.0 dalam kalangan guru sekolah menengah di UAE adalah tinggi secara signifikan. Begitu juga bagi skor min keseluruhan untuk tahap jangkaan prestasi responden, jangkaan usaha, pengaruh sosial, dan keadaan memudahkan ke arah pendidikan 4.0 adalah sama signifikan yang menjelaskan kesanggupan guru menggunakan Pendidikan 4.0. Sebaliknya, dapatan daripada statisik regresi bagi menjawab objektif kajian yang lain menunjukkan hubungan positif yang signifikan antara jangkaan prestasi, jangkaan usaha, pengaruh sosial, keadaan memudahkan dan niat untuk menggunakan Pendidikan 4.0. Sehubungan itu, dapatan kajian ini menyumbang kepada teori dan amalan penggunaan teknologi di institusi pendidikan menengah dalam konteks negara membangun. Di samping itu, hasil penyelidikan ini boleh digunakan untuk menambah baik pengalaman pengajaran bagi pengurus pendidikan, pendidik, dan pentadbir sekolah untuk merancang dan melaksanakan persekitaran pembelajaran yang kondusif secara berkesan yang mampu mengintegrasikan hasrat untuk menggunakan sistem Pendidikan 4.0 secara secukupnya untuk memberi manfaat kepada guru. Tambahan pula, implikasi daripada dapatan kajian mendapati bahawa kebanyakan penyelidikan mengenai penerimaan teknologi menggunakan model UTUAT tertumpu di negara maju. Kajian ini telah menyediakan asas empirikal untuk membandingkan penemuan kajian ini dalam konteks negara barat dan timur tengah.

CONTENTS

	DECLARATION	**ii**
	DEDICATION	**iii**
	ACKNOWLEDGEMENT	**iv**
	ABSTRACT	**v**
	ABSTRAK	**vi**
	CONTENTS	**vii**
	LIST OF TABLES	**xii**
	LIST OF FIGURES	**xiv**
	LIST OF ABBREVIATIONS	**xv**
	LIST OF APPENDICES	**xvi**
CHAPTER 1	**INTRODUCTION**	**1**
	1.1 Introduction	1
	1.2 Research background	2
	1.3 Problem Statement	8
	1.4 Research gap	10
	1.5 Research Questions	11
	1.6 Research Objectives	12
	1.7 Research hypotheses of the study	12
	1.8 Significance of the Study	13
	1.9 Scope of the Study	14
	1.10 Operational Definition of Key Terms	15
	1.10.1 Education 4.0	15
	1.10.2 Performance Expectancy	16
	1.10.3 Effort Expectancy	16
	1.10.4 Social Influence	16
	1.10.5 Facilitating Conditions	17
	1.10.6 Structure of the Thesis	17

1.11Chapter summary 18
CHAPTER 2 LITERATURE REVIEW 20
2.1 Introduction 20
2.2 Overview of Secondary Education Institutions in the UAE 20
2.2.1 Secondary Schools in the UAE 22
2.2.1 The K-12 School System in the UAE 22
2.3 The Evolution of Education 4.0 24
2.4 Conceptualization of Intention to Use Education 4.0 26
2.5 Education 4.0 in Developed Countries 27
2.6 Education 4.0 in Developing Countries 28
2.7 Education 4.0 in UAE 29
2.8 Technology Adoption Theories 30
2.8.1 Theory of Reasoned Action (TRA) 31
2.8.2 Theory of Planned Behaviour (TPB) 32
2.8.3 Technology Acceptance Model (TAM) 34
2.8.3.1 Technology Acceptance Model Strengths 36
2.8.3.2 Technology Acceptance Model Limitations 37
2.8.4 The Unified Theory of Acceptance and Use of Technology Model (UTAUT) 37
2.8.4.1 Development of UTAUT Theory 39
2.8.4.2 UTAUT Model Construct for this Study 41
2.8.4.3 Performance Expectancy 41
2.8.4.4 Effort Expectancy 42
2.8.4.5 Social Influence 43
2.8.4.6 Facilitating Conditions 43
2.7.1.1 Strengths of the UTAUT model 44
2.7.1.2 Limitations of the UAUT model 44
2.9 Empirical Evidence 45
2.9.1 The Relationship between Performance expectancy and Intention to use Education 4.0 45
2.9.2 The Relationship between Effort Expectancy and Intention to use Education 4.0 48

2.7.2 The Relationship between Social Influence and Intention to Use Education 4.0 50
2.9.3 The Relationship between Facilitating Conditions and Intention to Use Education 4.0 51
2.10 Research framework of the study 53
2.10.1 Hypotheses development of the study 54
2.10.1.1 Performance Expectancy and Intention to Use Education 4.0 55
2.10.1.2 Effort Expectancy and Intention to Use Education 4.0 56
2.10.1.3 Social Influence and Intention to Use Education 4.0 56
2.10.1.4 Facilitating Conditions and Intention to Use Education 4.0 57
2.11 Chapter Summary 58
CHAPTER 3 RESEARCH METHODOLOGY 59
3.1 Introduction 59
3.2 Research philosophy 59
3.3 Research design 61
3.4 Research population 62
3.4.1 Sample technique 63
3.5 Research Instrument 65
3.5.1 Measurement of the dependent variable of the study 65
3.5.2 Measurement for the performance expectancy 66
3.5.3 Measurement for effort expectancy 67
3.5.4 Measurement for social influence 67
3.5.5 Measurement facilitating conditions 68
3.6 Pre-Testing the Questionnaire 69
3.7 Pilot study 69
3.8 Data Collection 70
3.9 Data Analysis Technique 71
3.9.1 Test of normality 71
3.9.2 Descriptive analysis 72
3.9.3 Factor analysis 72
3.9.4 Correlation analysis 73
3.10 Regression analysis 74

	3.11 Chapter summary	75
CHAPTER 4	**DATA ANALYSIS**	**76**
	4.1 Introduction	76
	4.2 Response rate	76
	4.3 Normality test results	77
	4.4 Reliability test results	79
	4.5 Demographic analysis of the respondents	81
	4.6 Descriptive analysis	85
	4.6.1 Descriptive analysis for Education 4.0	85
	4.6.2 Descriptive analysis for Performance Expectancy	87
	4.6.3 Descriptive analysis for Effort Expectancy	88
	4.6.4 Descriptive analysis for Social Influence	88
	4.6.5 Descriptive analysis for Facilitating Condition	89
	4.7 Factors analysis	90
	4.8 Correlation analysis	91
	4.9 Multiple Regression Analysis	93
	4.10 Summary of the findings	95
	4.11 Chapter summary	96
CHAPTER 5	**CONCLUSIONS AND RECOMMENDATIONS**	**97**
	5.1 Introduction	97
	5.1 Discussion of the research findings	97
	5.1.1 Discussion of the research objective one	98
	5.1.2 Discussion of the research objective two	98
	5.1.3 Research objective three	99
	5.1.4 Research objective four	100
	5.1.5 Research objective five	101
	5.2 Empirical and Theoretical Contributions	102
	5.3 Research implications	103
	5.4 Limitations of the Study	104
	5.5 Recommendations for Further Research	105
	5.6 Conclusion	105
REFERENCES		**107**
APPENDICES		**120**

VITA **146**

LIST OF TABLES

3.1	Determining the Sample Size (Krejcie and Morgan, 1970)	64
3.2	Items for the measurement for Education 4.0	66
3.3	Items for performance expectancy	67
3.4	Item for Effort expectancy	67
3.5	Item for social influence	68
3.6	Item for Facilitating conditions	68
3.7	Pilot Study Result of Reliability	70
3.8	Agreement Level of Mean Measurement (Chua, 2006)	72
4.1	Normality test results	77
4.2	Actual reliability results of the study	80
4.3	Gender classification of the respondents	81
4.4	Age group of the respondents	82
4.5	Education qualification	83
4.6	Teaching Experience	84
4.7	Descriptive result for intention to use Education 4.0	86
4.8	Descriptive result for Performance Expectancy	87
4.9	Descriptive result for Effort Expectancy	88
4.10	Descriptive result for Social Influence	89
4.11	Descriptive result for Facilitating Condition	90
4.12	Factors analysis	90
4.13	Correlation analysis between Performance Expectancy and Education 4.0	91
4.14	Correlation analysis between Effort Expectancy and Education 4.0	92
4.15	Correlation analysis between Social Influence and Education 4.0	92
4.16	Correlation analysis between Facilitating Conditions and Education 4.0	93
4.17	Model Summary	94
4.18	ANOVA Table	94
4.19	Regression Coefficients	94

4.20 Summary of the findings 95

LIST OF FIGURES

2.1	Types of school across the UAE by region	23
2.2	The theory of planned behaviour	33
2.3	Technology Acceptance Model	35
2.4	UTAUT Model	40
2.5	Conceptual framework of the study	54
3.1	Overview of the Research	62
4.1	Gender classification of the respondents	81
4.2	Age group of the respondent diagram	82
4.3	Education qualification diagram	83
4.4	Teaching experience diagram	84

LIST OF ABBREVIATIONS

AI	-	Artificial Intelligence
CCT	-	Collective Cognition Theory
CA	-	Cronbach's alpha
HCT	-	Higher College of Technology
IR	-	Industrial Revolution
ICT	-	information and communication technology
IUMT	-	Intention to Use Mobile Training
KHDA	-	Knowledge Human Development Authority
MoU	-	memorandum of understanding
MoE	-	Ministry of Education
MoIAT	-	Ministry of Industry and Advanced Technology
MTI	-	Mobile Training Infrastructure
OECD	-	nomic Cooperation and Development
PRISMA	-	Preferred reporting items for systematic reviews and meta-analyses
SPSS	-	Statistical Package for Social science
SCMT	-	Support to Change to Mobile Training
TAM	-	Technology Acceptance Model
TRA	-	The theory of reasoned action
TPB	-	Theory of Planned Behaviour
TUP	-	Training Unit Professionalism
UTAUT	-	Unified theory of acceptance and use of technology
UAE	-	United Arab Emirates
UTHM	-	Universiti Tun Hussein Onn Malaysia

LIST OF APPENDICES

APPENDIX	TITLE	PAGE
A	Survey Questionnaire	121
B	Respondent results in bar chart form	126
C	Reliability Scale: All Variables	128
D	Normality additional results	129

CHAPTER 1

INTRODUCTION

1.1 Introduction

At a time when the coronavirus pandemic (covid-19) is revolutionizing the way educational institutions deliver teaching and learning to learners, there is now more focus on education 4.0 as a solution to sustainable education (Maatuk *et al*., 2021; Chakravarti, 2020). In such way, education 4.0 has become a requirement for addressing the challenges highlighted by information technology growth and the desire for increased access to knowledge (Aljarrah *et al*., 2022; Mahmoud, 2022). The impact of information and communication technology (ICT) on learning is being studied extensively (Maatuk et al., 2021). As such, more educational institutions are beginning to nurture the use of electronic learning (i.e. education 4.0) among their students and staff. However, the new norms of learning, especially in the context of the pandemic that has hit countries worldwide have caused online learning to grow faster (Abel *et al*., 2022). This fast growth of online learning is driven by the circulation of Education 4.0, which is the direction of many countries around the world (Chakravarti, 2020).

Secondary education institutions have shifted their teaching and assessment online (Maatuk et al., 2021) although even before the global outbreak, some institutions were already aligning with the latest trend in teaching and learning along with the intention to use education 4.0 (Aljarrah *et al*., 2022; Mahmoud, 2022). Technology adoption in terms of intention to use education 4.0 has become a crucial aspect of the integration of educational institutions. The rapid increase in the adoption and intention to use ICT by educational institutions indicated that there is a growing interest in improving the adoption and application of these technologies for teaching and learning (Chakravarti, 2020). Researchers such as Aljarrah *et al*. (2022);

Mahmoud (2022) approved that the traditional teaching approaches such as lecturing, tutorials, and mentoring that are the principal teaching and learning approaches in education institutions are being taken over by the modern use of technology (i.e., education 4.0). This has led more education institutions to invest massively in developing learning technologies such as education 4.0 (Chakravarti, 2020; Abel *et al*., 2022; Aljarrah *et al*., 2022; Mahmoud, 2022). E-learning that become necessary to meet the challenges posed by the development and the intention to use ICT (i.e., education 4.0) along with the propensity for increased access to knowledge (Chakravarti, 2020). Similarly, teachers and students continue to use these tools to communicate, collaborate, and carry out research in a system generally referred to as computer-assisted learning, virtual learning, electronic or e-learning (Abel *et al*., 2022; Aljarrah *et al*., 2022; Mahmoud, 2022).

In addition, the adoption or intention to use and diffusion of such technology by both teachers and students continued to be the main challenge among education institutions, particularly in a developing region such as the Middle East (Chakravarti, 2020). Specifically, according to Aljarrah *et al*. (2022); Abel *et al*. (2022); Mahmoud (2022), the trend of the intention to use education 4.0 has observed a notable increase globally and the UAE lags behind other Middle-Eastern countries despite immense governmental intervention and investment in education 4.0. Similarly, Chakravarti (2020); Abel *et al*. (2022); Aljarrah *et al*. (2022); Mahmoud (2022) highlighted that most of the middle Eastern government countries employ censorship in the use of internet facilities which led many of the countries in this region to be reluctant to adopt education 4.0 due to both moral and ethical reasons. On the other hand, other factors such as performance expectancy, effort expectancy, social influence, and facilitating conditions can contribute to the intention to use education 4.0 (Chakravarti, 2020; Abel *et al*., 2022; Aljarrah *et al*., 2022; Mahmoud, 2022).

1.2 Research background

Education 4.0 is a response to the needs of industrial revolution (IR) 4.0 where human and technology are aligned to enable new possibilities (Hussin, 2018). Similarly, education 4.0 is a new vision of learning that promote learners to learn not only skills and knowledge that are needed but also to identify the source to learn these skills and

knowledge (Hussin, 2018). Industry 4.0 is an umbrella term referring to a new industrial stage that is facilitated by the convergence of manufacturing systems with emergent ICTs (Vilalta-Perdomo *et al.*, 2022). One of the reason for the importance of the use of education 4.0 is that the industrial revolution bases its development on robotics, smart technology, AI, augmented reality, gamification, teacher evaluation and student self-evaluation, Big data, use of digital platforms, as well as facilitating daily lives (Barreiro *et al.*, 2022). In the developed countries, it become more crucial when the modern teachers influence students to be inserted in the education of the 21st century (Tandon & Tandon, 2020). Intellectually, intensive jobs of the 21st century have impacted the education system and especially with the emergence of covid-19, education 4.0 have become a key component among teachers across the globe (Puriwat & Tripopsakul, 2020). In developed countries for example, some education institutions are already developing an education 4.0 experience for the students (Tandon & Tandon, 2020; Puriwat & Tripopsakul, 2020).

In addition, developing countries have similarly found the importance of education 4.0 among teachers and educational institutions during the covid-19 pandemic. Previous studies such as from Costan *et al*. (2021) have discussed the need to develop a public-private collaborations, as well as the promotion of changing mindset, and provide the vital skill set for both teachers and learners to implement education 4.0 in developing countries. Thus, provide the vital skill sets for teachers and learners to implement EDUC4 become crucial (Costan et al., 2021). On the other hand, the covid-19 pandemic has encourage the UAE government to have undertaken the engagement to build education that focus on research, innovation, technology, and science. The shift of the country from a traditional to virtual classrooms have directed UAE to become the most-advanced E-learning country in the Arab world (Samsonova, 2020; Haimi & Adnan, 2021). Currently, the government under the Ministry of Education is also focusing on rearranging leadership, teacher supervision, school leadership training, upgrading facilities and resources, and integrating technologies to promote education 4.0 in the UAE (Haimi & Adnan, 2015).

The impact of the industrial revolution on education, particularly in Education 4.0 requires digital transformations to align with the technological changes. Specifically, the United Arab Emirates (UAE) is a wealthy and relatively new country attempting to achieve top tier global status in education (Matsumoto, 2019) which can

be in line with the adaption during the covid-19 pandemic. Thus, the rapid development of the global virtual education learning systems has necessitated many educational institutions such as in UAE to adopt education 4.0 technologies in teaching and learning, management, and administrative roles. While not much research (e.g. Alblooshi *et al*., 2022; Al-Hamad *et al*., 2021; Al-Emran *et al*., 2016; Chaudhry *et al*., 2021) highlighted teachers' intention to use education 4.0 in secondary education in the UAE, this study intend to investigate this newly current ongoing trend. In the UAE, the use of technology (ICT) is in line the vision of the Ministry of Education (MoE) which focus on pioneering in student preparation in the K-12 education system towards a productive life in a dynamic world to ensure sustainable development for the UAE society (Abdel Ghany & Alzouebi, 2019). The Fourth Industrial Revolution (4.0) is significantly impacting and changing the education sector in the UAE. This is because education in the UAE is always given top national priority by the UAE government. Statistically, it is also shown that according to Chakravarti (2020), the average years of schooling in the UAE has increased to 8.9 years in 2012 from 5.3 years since 1980, and to ensure quality education, 20 percent of government budget is allocated towards developing the education system (Chakravarti, 2020).

Similarly, the K-12 education system is an educational element that includes a few initiatives to support professional development for teachers and leads to licensing of the educational staff in public and private schools. While some teachers prefer to introduce the work verbally with some electronic material, others prefer to collect documentation as a case to be presented on request to assessors. However, some supervisors and administrators encourage teachers to develop their portfolios to allow teachers the opportunity to reflect on their own practices and develop their performance (Abdel Ghany & Alzouebi, 2019) by using education 4.0 for instance. With the help of digital revolution, teachers' commitment, and intention to use education 4.0 in the UAE clearly showed that UAE is leading academic transformation in the Middle East. The country is committed to prepare the teachers and equipping the future generations with the skills needed to be successful for the Fourth Industrial Revolution. For example, a research by Chakravarti (2020) have shown that teachers who intent to use education 4.0 approach into their teaching practice, all then all developments in the fourth industrial revolution will positively impact the growth of

teachers, educational institutions and achieving worldwide education goals in the future (Chakravarti, 2020).

There is a widespread consensus of the need to better integrate ICTs in classrooms. Up to this date, there has been no concerted effort in UAE to identify and assert the relevant determinants of online education services at the tertiary level. Abel *et al*. (2022); Almekhlafi & Almeqdadi (2010); Aljarrah *et al*. (2022); Mahmoud (2022) concluded that teachers and administrative staff felt themselves competent in using ICT available at the school they reported a lack of guidelines that would lead them to successful integration. Thus, the new norms of learning, especially in the context of the epidemic that has hit countries worldwide, have caused online learning to grow faster, driven by the circulation of Education 4.0, which is the direction for many countries in the world. Up to this date, there has been no concerted effort in UAE to identify and assert the relevant determinants of online education services at the tertiary level. Abel *et al*. (2022); Almekhlafi & Almeqdadi (2010); Aljarrah *et al*. (2022); Mahmoud (2022) concluded that teachers and administrative staff felt themselves competent in using ICT available at the school, they reported a lack of guidelines that would lead them to successful integration. Thus, the new norms of learning, especially in the context of the epidemic that has hit countries worldwide, have caused online learning to grow faster, driven by the circulation of Education 4.0, which is the direction for many countries in the world.

According to the Organization for Economic Cooperation and Development (OECD) (2020), research have shown that effective teachers can positively influence students' achievement in the formal education which in turn benefits their long-term outcomes. Additionally, the UAE has made important efforts in recent years to integrate ICTs in schools and has equally recognised the importance to develop global competences and other 21st century skills, as well as to support students' integration in today's digital world. In addition to providing ICT resources to schools, UAE has provided teachers with ICT training and developed digital and online interfaces (The Organization for Economic Cooperation and Development (OECD), 2020).

However, even teachers who might be proficient users of technology in their personal lives can often be intimidated by the prospect of applying it to teaching. As such, the OECD (2020) has further confirmed from a study that applying ICTs is challenging in undertaking since several education systems and teachers have failed to

introduce them effectively despite their best efforts. It can be said that there is absence of facilitating condition. For example, some countries have reduced their student to computer ratio, without significant gains in their students Programme for International Student Assessment (PISA) (OECD's programme for international student assessment) scores. In addition, students who reported using computers in all or nearly all their lessons had slightly worse PISA results than those students who did not report using computers as frequently. This shows and implies that intention to use ICT is less significant in terms of performance expectancy, effort expectancy, social influence, and facilitating conditions as compared to those who used less ICTs. However, there is evidence that ICT (i.e education 4.0) can support learning when adequately used.

For example, OECD study showed that moderate computer use at school was related to slightly better student outcomes. The use of ICTs by teachers is expected to improve further the use of education 4.0 (OECD 2020). On the other hand, other studies (Yeboah *et al*., 2020; Barreiro *et al*., 2022; Alosaimi *et al.*, 2021; Badri *et al*., 2016; Alosaimi *et al.*, 2021) have found that teacher's usage of technology in terms of education 4.0 can lead to benefit students' achievement, progress, and noncognitive outcomes such as the student's motivation to use ICT and the use to the technology. Similarly, as teachers often face challenges to make ICTs work in their classroom, it is then encouraged to consider how ICT (i.e., education 4.0) using industry revolution can allow teacher to intensify and justify their proper needs regardless of their subjective needs in terms of their career opportunities to related with the UTAUT theory (unified theory of acceptance and use of technology).

The UTAUT model focuses on how to explain user's intention to use an information system and subsequent behavioral intention and identifies four key drivers of the adoption of information systems which are performance expectancy, effort expectancy, social influence and facilitating conditions. In addition, OECD (2020) statistical report showed that teachers in the UAE are confident and well-prepared users of ICT (i.e., education 4.0) in the classroom, and the teachers in the UAE have also reported using ICT with students more than nearly every other country and 4, 77% of lower secondary teachers and 80% of upper secondary teachers say they frequently or always let students use ICT for projects or class work. For lower secondary teachers, only Denmark, New Zealand and Australia have higher percentages of teachers who report frequently or always letting students use ICT for class work (OECD, 2020). A

slightly lower percentage of UAE primary school teachers (68%) report frequent usage of ICT with their students, but it is still well above the average of 43% for those countries that surveyed their primary school teachers (The Organization for Economic Cooperation and Development (OECD), 2020).

Teachers intention to use education 4.0 has become an important aspect of successful teaching and it has triggered many researchers to investigate different aspects of such intention (e.g., Almekhlafi & Almeqdadi, 2010; Hussin, 2018; Alosaimi *et al*., 2021; Barreiro *et al*., 2022; Yeboah & Nyagorme, 2022). This is because education 4.0 allows students to learn more in less time and allows schools to focus on global learning environments if used appropriately. In addition, it could be an effective teaching tool when used to engage all students in the learning process. For instance, research from Barreiro *et al*. (2022); Yeboah & Nyagorme (2022); Almekhlafi & Almeqdadi (2010) revealed the existence of increasing number of computers being used at home and an increasing number of technological devices available to schools. Furthermore, other researchers (e.g. Alosaimi *et a*l., 2021) have also studied the use of information technology (IT) in education (i.e., education 4.0) seeking to identify the factors that influence the likelihood of successful implementation of innovative technologies in an educational setting. Consequently, these innovations have improved access to learning resources and enhanced synchronous and asynchronous communication among learners and between learners and teachers (Yeboah *et al*., 2020).

Through education 4.0 (Barreiro et al., 2022), countless number of studies (eg. Yeboah *et al*., 2020; Barreiro *et al*., 2022; Alosaimi *et al*., 2021; Badri *et al*., 2016) have been undertaken to promote teachers' use of technology in which it is suggested that when teachers employ innovative technologies and tactics, they may give efficient education to their pupils. In addition, other research studies such as from Alosaimi *et al*. (2021) suggested the evidence of a relationship between teacher's student-centered beliefs about instruction and the nature of teacher's technology-integrated experiences. Similarly, Badri *et al*. (2016) have investigated the factors related to offering a high school course online for the first time. The study employed a sample of public and private secondary school students in Abu Dhabi using online survey regarding offering free online courses. The results indicated significant interaction between intention to use e-learning (e.g., education 4.0), perception of easiness, perception of usefulness,

and other factors such as user characteristics and support (Badri *et al*., 2016). Alblooshi *et al*. (2022) examined the factors that influence user acceptance of technology and identified performance expectancy, effort expectancy, social norm and facilitating conditions using the UTAUT model (Alblooshi et al., 2022).

Alblooshi *et al.* (2022) found strong empirical evidence of the model to support the intention to use the technology. On the other hand, examined the impact of wide range of antecedents on the support to change to mobile training and intention to use mobile training. Performance expectancy (PE), effort expectancy (EE), and social influence (SI), individual beliefs (attitude) (IB), mobile training infrastructure (MTI), and training unit professionalism (TUP), management support (MS), facilities condition (FC), technology habits (TH), legacy system habits (LSH), habits (HA), intention to use mobile training (IUMT), and support to change to mobile training (SCMT) are employed in literature. This provides evidence that supports the use of the UTAUT model as the principle theoretical framework in this study.

1.3 Problem Statement

Educational technology has become a cornerstone for every country's effort to improve students' performance. It has become the focus of educators worldwide (Almulla, 2022). Despite the arrival of education 4.0 which represents an ideal approach, aligning the fourth industrial revolution with education and the intention to use education 4.0 in UAE secondary schools remain a topic of wide range discussion (Almulla, 2022). However, research studies investigating intention to use technology, particularly at the United Arab Emirates secondary schools have become a necessity that not much scholars have investigated in the area (Almekhlafi & Almeqdadi, 2010). Up to this date, there has been no concerted effort in UAE to identify and assert the relevant determinants of online education services at the tertiary level. Abel *et al*. (2022); Almekhlafi & Almeqdadi (2010); Aljarrah *et al*. (2022); Mahmoud (2022) concluded that teachers and administrative staff felt themselves competent in using ICT available at the school they reported a lack of guidelines that would lead them to successful integration. Thus, the new norms of learning, especially in the context of the epidemic that has hit countries worldwide, have caused online learning to grow faster, driven by the circulation of Education 4.0, which is the direction for many

countries in the world. Additionally, Due to the role of technology in the advancement of society in general and educational sector in particular, intention to use effective technology (i.e., education 4.0) into teaching and learning has become the focus of many educators.

Though, Badri *et al*. (2016) and Jain & Jain (2022) argued that the use of education 4.0 using online integrated high school course for the first time may involve a great deal of challenges. This is because of better understanding of the factors that could affect the intention to use education 4.0 could provide support for better implementation of education 4.0 in UAE (Badri *et al*., 2016). Despite, there is a problem regarding these factors and lack of empirical and theoretical evidence that provide the use of UTAUT model towards intention to use education 4.0 among teachers in UAE (especially for the factors such as performance expectancy, effort expectancy, social influence, and facilitating condition. Additionally, another study conducted by Alblooshi *et al*. (2022) focused solely on one of the four key structures of the UTAUT model to examine its influence on the actual use of e-learning among higher college of technology students. The study did not consider education 4.0 intention among secondary school teachers. Which indicates the insufficiency of studies conducted on intention to use education 4.0 among secondary school teachers. In addition, other researchers such as Almekhlafi & Almeqdadi (2010) have conductedempirircal review but did not consider the use of UTAUT model.

Currently, there is limited empirical research on how Education 4.0 is being utilized in UAE institutions, as well as a lack of understanding of the factors that influence its actual use. The specific factors that affect the intention to use Education 4.0, including performance expectancy, effort expectancy, social influence, and facilitating conditions, are still being discussed. The knowledge gap lies in the absence of empirical and theoretical evidence that applies the UTAUT model to determine the intention to use Education 4.0 among teachers in the UAE.

Many high authorities around the world and in the UAE have demonstrated their awareness of the importance of the use of education 4.0 and especially in secondary education. However, literature review regarding education reform efforts in the UAE revealed remarkably limited research on the subject (Matsumoto, 2019) and especially in secondary education. In addition, research showed that teachers in UAE who were highly educated and skilled with technology are usually innovative, and they

REFERENCES

Abdel Ghany, S., & Alzouebi, K. (2019). Exploring Teacher Perceptions of Using E-portfolios in Public Schools in the United Arab Emirates. *International Journal of Education and Literacy Studies*, *7*(4), 180.

Abel, V. R., Tondeur, J., & Sang, G. (2022). Teacher Perceptions about ICT Integration into Classroom Instruction. *Education Sciences*, *12*(9).

Abu-Dalbouh, M. H. (2016). An Integrated Expert User with End User in Technology Acceptance Model for Actual Evaluation. *Computer and Information Science*, *9*(1), 47–53.

Ajibade, P. (2018). Technology Acceptance Model Limitations and Criticisms: Exploring the Practical Applications and Use in Technology-related Studies, Mixed-method, and Qualitative Researches. *University of KwaZulu-Natal*, 1–14.

Ajzen, I., & Fishbein, M. (1975). A Bayesian analysis of attribution processes. *Psychological Bulletin*, *82*(2), 261–277.

Akpa, V. O., Asikhia, O. U., & Nneji, N. E. (2021). Organizational Culture and Organizational Performance: A Review of Literature . *International Journal of Advances in Engineering and Management (IJAEM) , 21*(1), 361–372.

Al-Emran, M., Elsherif, H. M., & Shaalan, K. (2016). Investigating attitudes towards the use of mobile learning in higher education. *Computers in Human Behavior*, *56*, 93–102.

Al-Hamad, M. Q., Mbaidin, O., Qasim, A., Alhamad, M., Alshurideh, M.-H. T., Hikmat, B., Kurdi, A., & Al-Hamad, N. Q. (2021). International Journal of Data and Network Science Investigating students' behavioral intention to use mobile learning in higher education in UAE during Coronavirus-19 pandemic. *Canada.*

International Journal of Data and Network Science, *5*, 321–330.

Al-Maroof, R. S., Alhumaid, K., & Salloum, S. (2021). The continuous intention to use e-learning, from two different perspectives. *Education Sciences*, *11*(1), 1–20.

Alblooshi, S., Binti, A., Hamid, A., Onn Malaysia, H., Pahat, B., & Corresponding, M. (2019). An Empirical Investigation of the Unified Theory of Acceptance and Use of Technology in E-Learning Adoption in Higher Education Institutions in the UAE. *International Journal of Research & Review (Www.Ijrrjournal.Com) Vol*, *6*(November), 11. www.ijrrjournal.com

Alblooshi, S., Binti, N. A., & Hamid, A. (2022). The Effect of Performance Expectancy on Actual Use of E-learning throughout the Mediation Role of Behaviour Intention. *Journal of E-Learning and Higher Education*, *2022*(: 2169-0359), 2169–0359.

Ali, R. A., Rafie, M., & Arshad, M. (2018). Empirical Analysis on Factors Impacting on Intention to Use M-learning in Basic Education in Egypt Empirical Analysis on Factors Impacting on Intention to Use M-learning in Basic Education in Egypt Ali and Arshad. *International Review of Research in Open and Distributed Learning*, *19*(2), 253–270.

Aljarrah, H., Alqudah, H., Alwaely, S. A., & Lahiani, H. (2022). Influences of Technology Integration Education on Professors' and Students' Perceptions in the UAE Universities. *2022 International Arab Conference on Information Technology (ACIT)*, 1–9.

Almeida, F., & Simoes, J. (2019). The Role of Serious Games, Gamification and Industry 4.0 Tools in the Education 4.0 Paradigm. *Contemporary Educational Technology*, *10*(2), 120–136.

Almekhlafi, A. G., & Almeqdadi, F. A. (2010). Teachers' Perceptions of Technology Integration in the United Arab Emirates School Classrooms. *Educational Technology & Society*, *13*(1), 1176–3647.

Almulla, M. A. (2022). Developing a Validated Instrument to Measure Students' Active Learning and Actual Use of Information and Communication

Technologies for Learning in Saudi Arabia's Higher Education. *Frontiers in Psychology*, *13*(June), 1–15.

Almuqrin, A. H. (2022). Social exchange theory and theory of reasoned action affecting knowledge sharing: a case from Saudi Arabia. *Journal of Information Studies & Technology*, *2022*(1), 1–16.

Alosaimi, M. A. S., Umar, I. N., & Rabu, S. N. A. (2021). Factors Affecting Schools Teachers Behavioural Intention to Use Gamified Learning Activities in Learning Management Systems (LMS) in Saudi Arabian Schools. *International Transaction Journal of Engineering*, *12*(12), 1–12.

Alsharafi, A. (2022). *An empirical study into factors that influence e-learning adoption by medical students in UAE*. *September*.

Alzahrani, M. A. (2019). Factors that Influence Secondary School Teachers' Acceptance of E-learning Technologies in Teaching in the Kingdom of Saudi Arabia. *Journal of Research in Curriculum, Instruction and Education Technology*, *5*(2), 175–196.

Anderson, P. J., England, D. E., & Barber, L. D. (2022). *education sciences Preservice Teacher Perceptions of the Online Teaching and Learning Environment during COVID-19 Lockdown in the UAE*.

Badri, M., Al Rashedi, A., Yang, G., Mohaidat, J., & Al Hammadi, A. (2016). Students' intention to take online courses in high school: A structural equation model of causality and determinants. *Education and Information Technologies*, *21*(2), 471–497.

Bai, Y., Jin, X., Wang, X., Wang, X., & Xu, J. (2020). *Dynamic Correlation Analysis Method of Air Pollutants in Spatio-Temporal Analysis*.

Baraka, H. A., Baraka, H. A., & El-Gamily, I. H. (2013). Assessing call centers' success: A validation of the DeLone and Mclean model for information system. *Egyptian Informatics Journal*, *14*(2), 99–108.

Barreiro, S., Vladimir, A., & De Oriente, U. (2022). Education 4.0 and its impact on

the educational system during the pandemic and post pandemic Covid 19 in Ecuador. *Periodicity: Semestral*, *7*(1), 2022.

Batucan, G. B., Gonzales, G. G., Balbuena, M. G., Pasaol, K. R. B., Seno, D. N., & Gonzales, R. R. (2022). An Extended UTAUT Model to Explain Factors Affecting Online Learning System Amidst COVID-19 Pandemic: The Case of a Developing Economy. *Frontiers in Artificial Intelligence*, *5*(April), 1–13.

Bhattacharyya, S. S., Goswami, S., Mehta, R., & Nayak, B. (2022). Examining the factors influencing adoption of over the top (OTT) services among Indian consumers. *Journal of Science and Technology Policy Management*, *13*(3), 652–682.

Bidin, Z., & Shamsudin, F. M. (2013). Using Theory of Reasoned Action to Explain Taxpayer Intention to Comply with Goods and Services Tax (GST) School of Accounting , College of Business , Othman Yeop Abdullah Graduate School of Business ,. *Middle-East Journal of Scientific Research*, *17*(3), 387–394.

Bonfield, C. A., Salter, M., Longmuir, A., Benson, M., & Adachi, C. (2020). Transformation or evolution?: Education 4.0, teaching and learning in the digital age. *Higher Education Pedagogies*, *5*(1), 223–246.

Brookes, E. (2021). *The Theory of Planned Behavior* . Simply Psychology.

Bryman, A., & Bell, E. (2007). *Business research strategies. Business research methods*, *226-238.*

Buraimoh, O. F., Yusuf, M. O., Olusanjo, M. O., Ajijola, E. M., & Aladesusi, G. A. (2020). Examining Performance Expectancy and Effort Expectancy as determinants of Secondary School Teachers' Behavioural Intention to use Mobile Technologies for Instruction in Kaduna. *World Journal of Innovative Research (WJIR)*, *8*(2), 42–47.

Chakravarti, S. (2020). Role of Teachers in Ir 4.0, #Gbl and Beyond in Uae. *International Journal of Management (IJM)*, *11*(9), 1711–1723.

Chen, H. (2012). *The Application of SPSS Factor Analysis in the Evaluation of*

Corporate Social Responsibility. *7*(6), 1258–1264.

Chaudhry, I. S., Paquibut, R., Islam, A. R., & Chabchoub, H. (2021). Testing the success of real-time online delivery channel adopted by higher education institutions in the United Arab Emirates during the Covid-19 pandemic. *International Journal of Educational Technology in Higher Education*, *18*(1), 1–21.

Cheung, R., & Vogel, D. (2013). Predicting user acceptance of collaborative technologies: An extension of the technology acceptance model for e-learning. *Computers & Education*, *63*, 160–175.

Costan, E., Gonzales, G., Gonzales, R., Enriquez, L., Costan, F., Suladay, D., Atibing, N. M., Aro, J. L., Evangelista, S. S., Maturan, F., Selerio, E., & Ocampo, L. (2021). Education 4.0 in developing economies: A systematic literature review of implementation barriers and future research agenda. *Sustainability (Switzerland)*, *13*(22).

Creswell. (2012). *Planning, Conducting, and Evaluating Quantitative and Qualitative Research (4 ed.).* Boston: Pearson Education.

Creswell, J. (2013). *Research design: Qualitative, quantitative, and mixed methods approaches:* Sage publications.

Daouk, L., & Aldalaien, M. (2019). The Usage of E-Learning Instructional Technologies in Higher Education Institutions in the United Arab Emirates (UAE). *The Turkish Online Journal of Educational Technology*, *18*(3), 97–109.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly: Management Information Systems*, *13*(3), 319–339.

De, K. K., Oliveira, S., & Souza, R. A. C. De. (2022). Digital Transformation towards Education 4.0. *Informatics in Education*, *21*(2), 283–309.

Dečman, M. (2015). Modeling the acceptance of e-learning in mandatory environments of higher education: The influence of previous education and

gender. *Computers in Human Behavior*, *49*, 272–281.

Dos Santos, A., Setiawan, M., & Rofiq, A. (2019). *Effect of recruitment, selection and culture of organizations on state personnel performance*.

Faraliza, N., Noor, M., & Ramalingam, L. (2014). The Unified Theory of Acceptance and Use of Technology (UTAUT) and the Goods and Service Tax (GST) Application System. *Research Journal of Applied Sciences, Engineering and Technology*, *8*(17), 1911–1916.

Funmilola, B., Olalere, Y., Oluwole, O., Modupe, A., & Ayodeji, A. (2020). Examining Performance Expectancy And Effort Expectancy As Determinants Of Secondary School Teachers' Behavioural Intention To Use Mobile Technologies For Instruction In Kaduna State, Nigeria. *World Journal of Innovative Research (WJIR)*, *8*(2), 42–47.

George, S. R., Nebebe, F., & Tan, W. (2007). Viability of the "Technology Acceptance Model" in Multimedia Learning Environments: A Comparative Study. *Interdisciplinary Journal of E-Skills and Lifelong Learning*, *3*, 175–184.

Granić, A., & Marangunić, N. (2019). Technology acceptance model in educational context: A systematic literature review. *British Journal of Educational Technology*, *50*(5), 2572–2593.

Greener, S. (2008). Qualitative Research Methods: Collecting and Analyzing Qualitative Data. In *Business Research Methods*.

Grenčíková, A., Kordoš, M., & Navickas, V. (2021). The impact of industry 4.0 on education contents. *Business: Theory and Practice*, *22*(1), 29–38.

Haimi, A., & Adnan, M. (2015). Teaching Arabic in Malaysia Using Higher Education 4.0 Technologies. *E-Proceedings of International Conference on Language, Education, Humanities &Social Sciences (i-LEdHS2021)*, 345–357.

Harryanto, Muchran, M., & Ahmar, A. S. (2018). Application of TAM model to the use of information technology. *International Journal of Engineering and Technology(UAE)*, *7*(2.9 Special Issue 9), 37–40.

Hebert, M., & Benbasat, I. (1994). Adopting information technology in hospitals: The relationship between attitudes/expectations and behavior. *Hospital & Health Services Administration; Chicago, 39*(3), 369–369.

Himmetoglu, B. (2020). Education 4.0: Defining The Teacher, The Student, And The School Manager Aspects Of The Revolution. *Turkish Online Journal of Distance Education-TOJDE*, 12–28.

Huk, T. (2021). From Education 1.0 to Education 4.0 – Challenges for the Contemporary School. *New Educational Review*, *66*, 36–46.

Hussin, A. A. (2018). Education 4.0 Made Simple: Ideas For Teaching. *International Journal of Education & Literacy Studies*, *6*(3), 93–98.

Ibrahim, A., & Aljneibi, F. (2022). Heliyon The in fl uence of personal and work-related factors on teachers ' commitment during educational change : A study on UAE public schools. *Heliyon*, *8*(October), e11333.

Jain, V., & Jain, P. (2022). From Industry 4.0 to Education 4.0: acceptance and use of videoconferencing applications in higher education of Oman. *Journal of Applied Research in Higher Education*, *14*(3), 1079–1098.

Jalil, H. A., Rajakumar, M., & Zaremohzzabieh, Z. (2022). Teachers' Acceptance of Technologies for 4IR Adoption: Implementation of the UTAUT Model. *International Journal of Learning, Teaching and Educational Research*, *21*(1), 18–32.

Keith, T. Z. (2015). *Multiple regression and beyond: An introduction to multiple regression and structural equation modeling (2nd edition),* Taylor and Francis, New York.

Kim, H. S., Kim, Y. H., Woo, J. S., & Hyun, S. J. (2015). An analysis of organizational performance based on hospital specialization level and strategy type. *PLoS ONE*, *10*(7), 1–14.

Kumari, K., & Yadav, S. (2018). *Linear Regression Analysis Study*. https://doi.org/10.4103/jpcs.jpcs

Krauss, S. E. (2005). Research Paradigms and Meaning Making: A Primer. *The Qualitative Report*, *10*(4), 758–770.

Lakhal, S., Khechine, H., & Mukamurera, J. (2021). Explaining persistence in online courses in higher education: a difference-in-differences analysis. *International Journal of Educational Technology in Higher Education*, *18*(1), 1–32.

Liao, Y. K., Wu, W. Y., Le, T. Q., & Phung, T. T. T. (2022). The Integration of the Technology Acceptance Model and Value-Based Adoption Model to Study the Adoption of E-Learning: The Moderating Role of e-WOM. *Sustainability (Switzerland)*, *14*(2).

Maatuk, A. M., Elberkawi, E. K., Aljawarneh, S., Rashaideh, H., & Alharbi, H. (2021). The COVID-19 pandemic and E-learning: challenges and opportunities from the perspective of students and instructors. *Journal of Computing in Higher Education*, *0123456789*.

Madden, T. J., Ellen, P. S., & Ajzen, I. (1992). A Comparison of the Theory of Planned Behavior and the Theory of Reasoned Action. *Personality and Social Psychology Bulletin*, *18*(1), 3–9.

Mahmoud, K. (2022). *Realising The Vision of Technology Integration: A Case Study Of K-12 Private Schools in The United Arab Emirates*. University of Southern Queensland.

Makowski, D., Ben-shachar, M. S., Patil, I., & Lüdecke, D. (2020). *Methods and Algorithms for Correlation Analysis in R*. *5*, 3–6.

Malatji, W. R., Eck, R. Van, & Zuva, T. (2020). Understanding the usage, Modifications, Limitations and Criticisms of Technology Acceptance Model (TAM). *Advances in Science, Technology and Engineering Systems Journal*, *5*(6), 113–117.

Malejka, S., Vadillo, M. A., Dienes, Z., & Shanks, D. R. (2021). Correlation analysis to investigate unconscious mental processes: A critical appraisal and mini-tutorial. *Cognition*, *212*, 104667.

Marandu, E. E., Makudza, F., & Ngwenya, S. (2019). Predicting Students ' Intention and Actual Use of E-Learning Using the Technology Acceptance Model : A Case from Zimbabwe. *International Journal of Learning, Teaching and Educational Research*, *18*(6), 110–127.

Maskey, R., Fei, J., & Nguyen, H. (2018). The Asian Journal of Shipping and Logistics Use of Exploratory Factor Analysis in Maritime Research. *The Asian Journal of Shipping and Logistics*, *34*(2), 91–111.

Masmali, A., & Alghamdi, F. (2021). Factors Influencing Teachers' Continuation of Online Learning in Elementary Schools. *International Education Studies*, *14*(12), 31–39.

Matsumoto, A. (2019). Literature Review on Education Reform in the UAE. *International Journal of Educational Reform*, *28*(1), 4–23.

McNeish, D., & Wolf, M. G. (2021). Dynamic fit index cutoffs for confirmatory factor analysis models. *Psychological Methods*, *28*(1), 61.

Melián-Alzola, L., Fernández-Monroy, M., & Hidalgo-Peñate, M. (2019). Information technology capability and organisational agility: A study in the Canary Islands hotel industry. *Tourism Management Perspectives*, *33*, 100606.

Murat, Y., & Abdurrahim, G. (2022). Factor analysis of the COVID-19 Perceived Risk Scale : A preliminary study. *Death Studies*, *46*(5), 1065–1072.

Nyoro, M., Kamau, J., … G. W.-I. J. of, & 2015, undefined. (2007). Review of Technology Acceptance Model usage in predicting e-commerce adoption. *Academia.Edu*.

Omar, M., & Ali, A. (2022). *Extended Model of Acceptance and Support to Use Mobile Training Based on the UTAUT3 Model – Empirical Analysis in the UAE*. *2*(43).

Pittalis, M. (2021). Extending the technology acceptance model to evaluate teachers' intention to use dynamic geometry software in geometry teaching. *International Journal of Mathematical Education in Science and Technology*, *52*(9), 1385–1404.

Puriwat, W., & Tripopsakul, S. (2020). Preparing for Industry 4.0-Will youths have enough essential skills?: An Evidence from Thailand. *International Journal of Instruction*, *13*(3), 89–104.

Ramírez-Montoya, M. S., Castillo-Martínez, I. M., Sanabria-Z, J., & Miranda, J. (2022). Complex Thinking in the Framework of Education 4.0 and Open Innovation—A Systematic Literature Review. *Journal of Open Innovation: Technology, Market, and Complexity*, *8*(1), 1–15.

Ridge, N., & Erfurth, M. (2020). The Impact of COVID-19 on Education in the UAE. In *Al Qasimi Foundation*. Knowledge E. https://doi.org/10.18502/AQF.0143

Scotland, J. (2012). Exploring the philosophical underpinnings of research: Relating ontology and epistemology to the methodology and methods of the scientific, interpretive, and critical research paradigms. *English Language Teaching*, *5*(9), 9–16.

Senthilnathan, S. (2019). Usefulness of correlation analysis. *Available at SSRN 3416918*.

Seva, U. L. (2022). A method for splitting a sample into equivalent subsamples in factor analysis. *Behavior Research Methods*, 2665–2677.

Sharma, P. (2019). Digital Revolution of Education 4.0. *International Journal of Engineering and Advanced Technology (IJEAT)*, *9*, 2249–8958.

Sheikh Saud Bin Saqr Al Qasimi Foundation for Policy Research. (2020). Fact Sheet: Education in the United Arab Emirates and Ras Al Khaimah. In *Al Qasimi Foundation* (Issue September).

Shrestha, N. (2020). Detecting multicollinearity in regression analysis. *American Journal of Applied Mathematics and Statistics*, *8*(2), 39-42.

Singh, A. S., & Masuku, M. B. (2014). Sampling Techniques & Determination of Sample Size In Applied Statistics Research: An Overview. *International Journal of Economics, Commerce and Management*, *2*(11), 1–22.

Srivani, V., Id, A. H., Id, N. N., & Ratajczak, S. (2022). *Impact of Education 4 . 0*

among engineering students for learning English language. 1–12.

Tandon, R., & Tandon, S. (2020). Education 4.0: A New Paradigm in Transforming the Future of Education in India. *IJISET-International Journal of Innovative Science, Engineering & Technology*, *7*(2), 32–54.

Thang, L. Van, & Dung, N. X. (2018). Building the Higher Education 4.0 in the Armed Forces Associated With the Industry 4.0: Potential and Challenges. *Ad Alta-Journal of Interdisciplinary Research*, *8*(1, 4), 171–175.

The Organization for Economic Cooperation and Development (OECD). (2020). *Teaching in the UAE: 10 Lessons from TALIS*.

Tinmaz, H., & Lee, J. H. (2019). A preliminary analysis on Korean University students' readiness level for industry 4.0 revolution. *Participatory Educational Research*, *6*(1), 70–83.

Tuli, F. (2011). The Basis of Distinction Between Qualitative and Quantitative Research in Social Science: Reflection on Ontological, Epistemological and Methodological Perspectives. *Ethiopian Journal of Education and Sciences*, *6*(1).

Valentine Sergon. (2022). *Secondary schools in the UAE: a guide for expat parents | Expatica*. Expatica.Com.

Vatcheva, K.P., Lee, M., McCormick, J.B., and Rahbar, M. H. (2016). *Multicollinearity in regression analysis conducted in epidemiologic studies," Epidemiology (Sunnyvale, Calif.), 6 (2). 227.*

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly: Management Information Systems*, *27*(3), 425–478.

Vilalta-Perdomo, E., Michel-Villarreal, R., & Thierry-Aguilera, R. (2022). Integrating Industry 4.0 in Higher Education Using Challenge-Based Learning: An Intervention in Operations Management. *Education Sciences*, *12*(10).

Weilage, C., & Stumpfegger, E. (2022). Technology acceptance by university lecturers: a reflection on the future of online and hybrid teaching. *On the Horizon*,

30(2), 112–121.

Weaver, B., & Maxwell, H. (2014). *Exploratory factor analysis and reliability analysis with missing data : A simple method for SPSS users*. 143–152.

Wut, T. M., Lee, S. W., & Xu, J. (2022). How do Facilitating Conditions Influence Student-to-Student Interaction within an Online Learning Platform? A New Typology of the Serial Mediation Model. *Education Sciences*, *12*(5).

Yahaya, T. A. B., Idris, K., Suandi, T., & Ismail, I. A. (2018). Adapting instruments and modifying statements: The confirmation method for the inventory and model for information sharing behavior using social media. *Management Science Letters*, *8*(5), 271–282.

Yang, F., Ren, L., & Gu, C. (2022). A study of college students' intention to use metaverse technology for basketball learning based on UTAUT2. *Heliyon*, *8*(9), e10562.

Yong, A. G., & Pearce, S. (2013). *A Beginner ' s Guide to Factor Analysis : Focusing on Exploratory Factor Analysis*. *9*(2), 79–94.

Yeboah, D., & Nyagorme, P. (2022). Students' acceptance of WhatsApp as teaching andStudents' acceptance of WhatsApp as teaching and learning tool in distance higher education in sub-Saharan. *Cogent Education*, *9*(1).

Yong, A. G., & Pearce, S. (2013). *A Beginner ' s Guide to Factor Analysis : Focusing on Exploratory Factor Analysis*. *9*(2), 79–94.

Young, A., & Temple, B. (2015). Populations and Sampling. In *Approaches to Social Research* (pp. 79–102).

Yüceol, N. (2021). The Steps to be Taken in Higher Education for Successful Adaptation to Industry 4.0. *Journal of Higher Education (Turkey)*, *11*(3), 563–577.

Zaineldeen, S., Li, H., Koffi, A. L., Mohammed, B., & Hassan, A. (2020). Technology Acceptance Model' Concepts, Contribution, Limitation, and Adoption in Education. *Universal Journal of Educational Research*, *8*(11), 5061–5071.

Žukauskas, P., Vveinhardt, J., & Andriukaitienė, R. (2018). Philosophy and Paradigm of Scientific Research. In *Management Culture and Corporate Social Responsibility*. InTech.

VITA

Amna Abdulla Mohamed Abdulla is an ambitious Emirati with a deep passion for art education and a commitment to continuous growth. Graduating with a Bachelor's degree in Art Education from Ajman University, Amna's journey has been fueled by a strong desire to share her creativity and communication skills with the world. As a skilled educator, Amna has honed her expertise in teaching Arabic and Islamic subjects during her tenure at ALDana School in Abu Dhabi. Her vibrant personality and dedication have made her a respected figure among her students and colleagues alike. Moreover, Amna's leadership qualities and sense of responsibility have allowed her to take charge and excel in various team-based projects. Beyond her academic achievements, Amna has actively participated in workshops and courses, earning certificates in Excellence, Creativity, and Innovation, as well as mastering the ICDL and enhancing her English language proficiency. Adaptable and dynamic, Amna possesses a keen eye for detail, consistently completing tasks efficiently and often ahead of schedule. She is proficient in Microsoft Office and possesses excellent typing skills, making her well-suited to tackle any challenge.