ECONOMICS & Sociology

Pauceanu, A.M., Rabie, N., & Moustafa, A. (2020). Employability in the fourth industrial revolution. *Economics and Sociology*, *13*(3), 269-283. doi:10.14254/2071-789X.2020/13-3/17

EMPLOYABILITY UNDER THE FOURTH INDUSTRIAL REVOLUTION

Alexandrina Maria Pauceanu
Higher Colleges of Technology, Sharjah, UAE
E-mail: apauceanu@hct.ac.ae
ORCID 0000-0001-7412-4813

Nada Rabie
Zayed University, Abu Dhabi, UAE
E-mail: nada.rabie@zu.ac.ae
ORCID 0000-0003-1226-1251

Ayman Moustafa
British University in Dubai, Dubai, UAE
E-mail: amoustafa@hct.ac.ae
ORCID 0000-0002-2938-5843

Received: December, 2019
1st Revision: June, 2020
Accepted: September, 2020

DOI: 10.14254/2071-789X.2020/13-3/17

ABSTRACT. It is expected that the fourth industrial revolution will have a massive impact on individual career future experience by changing the basis of work, employment, and business in the upcoming future. Moreover, one-third of today's jobs will disappear by 2025 due to technology's intelligence development. Thus, students' employability skills are considered an effective tool to sustain employment at the future labour market. However, there are discrepancies in employability skills vision between higher education students' perspectives and those of employers. This study aims to recognize higher education students' perspectives about employability skills and to compare them with the labour market employability skills as requested by employers. A questionnaire was designed to test graduate students' perspectives on employability using the WEF 2020 employability skills. The results show that students are not fully aware of the fourth industrial revolution employability skills, thus, there is a gap between future labour market demand and students' perspectives about future employability skills. This study is testing employability in its two aspects. Firstly, the UAE graduate students' perspective of the employability skills as required by employers. Secondly, testing students' evaluation of the university educational programs' readiness in preparing them for the job market.

JEL Classification: J62, J23

Keywords: employability, the fourth industrial revolution, higher education, UAE.

Introduction

According to several economic reports (World Economic Forum, McKinsey, etc.), advanced digitization and automation of work, known as the "fourth industrial revolution", are expected to have a massive impact on individual future career experiences by changing the very basis of work, employment, and doing business in the upcoming future. It is also predicted that these changes will eliminate thousands of jobs (Hirschi, 2018). Additionally, top technologists, business and industry experts such as Stephen Hawking and Bill Gates have

warned about increased unemployment rates in the future due to the increased reliance on smart technologies. Moreover, it is also forecasted that due to significant development in artificial intelligence, one third of today's jobs will disappear by 2025 (Brougham & Haar, 2017). At the same time, the Cognizant Centre for the Future of Work has predicted that around 21 mln new jobs would be generated in the coming years, thus increasing the demand for new future skills in order to fulfil the future job requirements. Both the World Economic Forum and the British Council in the UAE specified in their reports a set of job-related skills known as employability skills that university graduates need to possess by the year 2030. Basing on such reports, student's employability skills are often seen as effective tools to sustain employment at the future labor markets.

Moreover, employers are concerned with the shortage of employability skills, already demonstrated by the entry-level job applicants as this is considered a global issue (Teng et al., 2019). Despite employability importance, there are discrepancies in the visions on employability skills between higher education students and employers (Kőnig et al., 2016; Ahmad & Pesch, 2017; Singh et al., 2017). The main aim of this study is to analyze higher education students' perspective on employability skills, so we can compare it with the labour market skills demand in order and thus to evaluate the students' knowledge about future job skills as requested by employers. The following section highlights the literature about employability within the fourth industrial revolution.

1. Literature review

1.1. Employability

The concept of "Employability" has attracted a lot of interest in the literature for over a century now. In a study conducted during the twentieth century by Gazier (2001), the researcher claimed seven employability versions. The first version mainly got fame in the early 1900s. Using the term' dichotomic employability', Gazier distinguished between individuals who can work and others who cannot work and need of relief, like the elderly and disabled individuals (Small et al., 2017).

Moreover, Scholars such as (Hillage & Pollard, 1998; Brown et al., 2003; Fugate et al., 2004; Sanders & Grip, 2004; Heijde & Van der Heijden, 2006; Pool & Sewell, 2007; Fugate & Kinicki, 2008; Bridgstock, 2009) defined "employability" in their research. In the Table 1 the most ubiquitous employability definitions are summarized according to the historical order.

It's clear that the concept of employability has evolved across the years, from focusing on the ability to get initial employment to focus on the skills and capabilities that enable employees to manage their careers throughout their careers. Moreover, most of the definitions highlighted the importance of acquiring the job market skills and acknowledge to be competitive in the job market. At the same time, personal attributes are also important, which are aligned to personality theory (Tymon, 2013) or, in other words, the personality traits of employees.

Employability factors remain mainly theoretical or rely on inadequate empirical studies (Wickramasinghe & Perera, 2010). For instance, conceptual models largely considered employability, which focused on the individual's skills or employment outcomes. For example, Lowden et al. (2011) define employability generally as the group of skills, qualities, and characteristics that employers anticipate from employees (Lowden et al., 2011).

Table 1. Employability definitions

No.	Source	Definition
1	Hillage and Pollard, (1998)	"Ability to get initial employment, maintain employment and obtain new employment if required"
2	Brown et al. (2003)	"The relative chances of acquiring and maintaining different kinds of employment"
3	Fugate et al., (2004)	"A psychological construct that embodies individual characteristics that foster adaptive cognition, behaviour and affect, and enhance the individual work interface".
4	Sanders and Grip (2004)	"The willingness to be and remain attractive in the labour market".
5	Heijde and Van der Heijden (2006)	"The continuous fulfilling, creating or acquiring of work through the optimal use of competencies".
6	Pool and Sewell (2007)	"Employability is having a set of skills, knowledge, understanding and personal attributes that make a person more likely to choose and secure occupations in which they can be successful"
7	Fugate and Kinicki (2008)	"A constellation of individual differences that predispose employees to (pro)actively adapt to their work and career environments".
8	Bridgstock (2009)	"Adequate preparation for moving into jobs and maintaining employability once there, involves not only general and discipline specific skills but also a range of skills to manage oneself and his career".

Source: Authors' compilation

On the contrary, De Vos et al. (2011) and Hillage & Pollard (1998) view employability relative to employment outcomes. While De Vos et al., (2011) conceptualize employability as "the continuous fulfilling, acquiring or creating of work through the optimal use of competencies" (p. 438), Hillage & Pollard (1998) define employability as the capacity to find and retain employment. Similarly, Gault et al. (2000) also tried to define employability in terms of employment outcomes by applying research on Business graduates (Chhinzer & Russo, 2018).

To summarize, there is an inconsistency in the employability definitions in terms of the various factors that lead to perceive individuals more or less employable than others. Alternatively, Knight & Yorke (2002) developed a framework of employability, claiming that understanding, skills, efficacy beliefs are connected to employability, while Dacre Pool and Sewell's conceptual model of employability recommended that career development learning, practice, degree of know-how, general skills, and emotional intelligence act together to improve student insights of self-efficacy, self-confidence, and self-esteem, which jointly develop students' views of their employability (Dacre Pool & Sewell, 2007). Based on the previous discussion, the lack of agreement and harmony on the definition of employability became complicated due to the absence of empirical studies recognizing or validating employability factors (Chhinzer & Russo, 2018).

1.2. Fourth industrial revolution definition

The fourth industrial revolution is a combination of technologies that shape the link between physical, electronic, and biological scopes. The world economic forum highlighted that the fourth industrial revolution's progress started since the 21st century, and it is radically changing its shape by different aspects, such as mobile internet, stronger sensors, artificial intelligence, and engine learning (Schwab, 2016). Accordingly, the fourth industrial revolution is known for its radical change based on technological drivers. The fourth industrial revolution is the outcome of the progress of three previous industrial revolutions.

The first industrial revolution focused on coal as an energy source and manufacturing and engines. While the second industrial revolution focused on two other energy sources, which are oil and electricity. Then the third Industrial Revolution mainly focused on the shift from fossil fuel to renewable energy, which moves to marginal cost caused by the technological revolution, such as the internet of things, 3-D printers, automation, artificial intelligence, and cyber-physical systems (Jazdi, 2014). Lastly comes the fourth industrial revolution, which started from 2000 until nowadays.

Nevertheless, there is no agreed definition about the fourth industrial revolution so far because the Fourth industrial revolution contains many aspects such as smart factories, advanced technological systems, programs in procurement and distribution, and new systems in products and services development which support meeting human needs, customizations and corporate social responsibility CSR (Lasi et al. 2014). Based on that, the fourth industrial revolution is the fundamental change that happens when technology impacts different industries (Lee et al. 2018).

1.3. Impact of the fourth industrial revolution

No doubts that the fourth industrial revolution has an impact on different aspects of life as well as the future job market and employment skills. For instance, Jack Ma argues that technology brings excellent jobs and new careers but also brings new problems. As "scientific knowledge is creating opportunities and solutions, while at the same time fuelling disruptive waves of change in every sector. Unprecedented innovation in science and technology is raising fundamental questions about what it is to be human" (OECD, 2018).

To conclude, the fourth industrial revolution produced a massive impact on various directions affecting the standards of livings, income increments, lifestyle, way of working, and communication. Thus, people need to rethink their current competencies and mindset to overcome and manage these changes to develop the required skills that are considered the main driver of employability (Boaden, 1997) and future job needs. At the same time, current preconditions to innovative skills development and use increase steadily via steep ICT development and their pervasion in core spheres of business activity (Bilan et al., 2019).

1.4. Employability skills

Based on the previously mentioned impact, there is a discussion about the required and needed skills to support employees in their current jobs. Based on the OECD survey published in 2013 about employability skills, around one-third of employees are not qualified either they are under-qualified or over-qualified for their current jobs. Accordingly, such skills gap, skills mismatch, and shortage affect employability as well as labour efficiency.

On the other side, the job market is flooded with graduates who hold similar qualifications competing in the same job market. Additionally, employers are reducing their workforce due to unstable economics, which is especially typical for graduates (Yoon, 2018). Accordingly, the labour market becomes more competitive and flexible than before.

All these changes caused by the growth of higher education, globalization, and the development of the global economy influence the employment requirements of employers (Al-Harthi, 2011). As from an employer's perspective, the decision to employ a graduate is based on the graduate's abilities in addition to their area of specialties in specific fields and skills. Thus, employers are linking the employability discourse to behavioural skills and the broader range of personal, performance, and organizational capabilities (Shivoro et al., 2017).

Additionally, Rosenbaum (2012) observed that if students didn't develop basic employability skills before their employment, they might not be able to learn them after they got hired. Since employers are hesitant to invest in training and development after hiring (Kőnig et al., 2016), training and development should be considered an investment in a sustainable future of a burden cost (Kyrieri & Roidou, 2012). This gap can be filled to some extent in case of academic mobility if it aims at employability increase due to professional skills improvement (Kabanbayeva et al., 2019), the same effect can be achieved via students' educational migration (Mishchuk et al., 2019).

Such fact has led to many kinds of research to decide what employability attributes are required by employers in a certain field because individuals who acquire more knowledge and skills have a better opportunity to excel at their work, receive better compensation and job offers compared to those with less knowledge and skills (Weber, 2014).

Regardless of the ongoing debate about the capability of higher education and whether it should or can integrate the improvement of employability skills within their curriculum, employers remain reporting that graduates are not equipped with the necessary skills needed for today's job market. Similarly, research and different studies continue to report that graduates are missing the skills required for the modern workplace (Bowers-Brown & Harvey, 2004; Cumming, 2010; Heaton et al., 2008).

For instance, in the UK, the 2008 survey by the Confederation of British Industry reported that 48% of firms were facing difficulties in hiring graduates with the needed skills. Branine (2008) reports on a survey of 700 UK-based employers that more than 60% stated the issue of poor employability skills of the graduates. Cumming states that; "a dominant theme emerging . . . is that many graduates lack appropriate skills, attitudes, and dispositions, which in turn prevents them from participating effectively in the workplace" (Cumming, 2010). Interestingly, the undergraduate's opinion, who is considered the receivers of the employability development, is not well known. Undergraduate's opinion is essential based on the learning theory. According to this theory, motivation and engagement with the process are important to ensure effective outcomes (Garavan, 2010).

Similarly, different studies claimed that employability stakeholders presented by higher education, employers, and students have conflicting views regarding the knowledge, skills, and qualities essential for employment. Higher education students are not fully aware of employability skills and how it's perceived by stakeholders (Rae, 2007). Accordingly, there is a huge gap between the skills and qualities appreciated by the employers and the skills and qualities appreciated by higher education students (Kinash et al., 2016). The author claim that employability needs cooperation between the stakeholder presented by Higher education, employers, students and graduates to set a strategy to overcome and brig such gap (Harvey & Shahjahan, 2013; Walkington, 2014).

2. Methodological approach

Since the main aim of this research is to identify higher education students' perspectives of employability in order to compare it to labour market needs and demands, an exploratory study was conducted, where students' perspectives about employability were obtained by conducting a quantitative study.

The researchers used a semi-structured questionnaire to test graduate students' perspectives on employability using the World Economic Forum predefined ten employability skills required by 2020. The semi-structured nature of the survey, allowed the researcher to include both open and close-ended questions to gain more insights on the employability skills neccessary for future market skills. The skills were adopted from the World Economic Forum's "future of jobs report" issued in 2016 with the main theme *"Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution"*. The report stated ten skills that will be required in the job market by employers by the year 2020. Thus, the questionnaires was grouped into four sections where instructions were provided in each section. The first sections aimed to gather general information on the employablity skills necessary for future market skills. These skills included; complex problem solving, analytical thinking, innovation, critical thinking, creativity, emotional intelligence, system analysis, evaluation, leadership and social influence, judgment, and decision making. This set of skills was used to measure the awareness of students in terms of their employability skills. However, additional skills (future foresight) was added in this section to examine participants' perceptions of possible future changes in the external environment and how these changes might affect the individual (scenario-based analysis). The reason for adding "future foresight" skill was that within the current challenging job market, employees should be able to predict future changes, adapt, and adjust their skills based on it. The second section aimed to collect data on the practical skills regarding the employability skills necessary for future market skills based on the 11 skills used in the first section. The third section contained a set of follow-up questions to gain more information regarding future employability skills and recommendations for improvements. Thus, this set of questions contained open-ended questions to allow the participants to give more information in support of the employability skills for the future market skills. A fourth section was also included in the questionnaire to gather demographic information of the participants.

Since the chosen scale was tested on a global level and those ten skills were specified, it is crucial to assess United Arab Emirates' higher education graduating students' perspective toward future employability skills. This can allow us to test and compare between UAE's students' perspective and the global perspective.

2.1. Measures

The measures of the employability skills were adopted from the future skills specified by The World Economic Forum's "future of jobs report" issued in 2016 with the main theme *"Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution"*. In addition to these skills, the researchers also added "future foresight" for the reasons mentioned before.

Students were requested to state the importance of each skill for the future job market of the 11 skills based on two aspects. The first one is the student's general knowledge acquired from either their educational or extracurricular background or both. The second aspect is their practical experience either through work placement, internship, or practical Training during university years. The total number of items in the survey is 22 items. Students were asked to assess the importance of each skill based on a 5-point Likert scale, where (1)

represents "strongly agree" and (5) represents "strongly disagree". The collected data can be generalized to other federal universities in UAE and all private universities operating in UAE specifically and, to a certain degree, to GCC; this can be done because almost all universities and students in GCC share similar characteristics.

2.2. Sample

This study's target population consisted of 465 students from a governmental university in the United Arab Emirates. Simple random sampling was in administering the questionnaires via the online platform. Based on a target population of 465 students and a sampling error of 0.05, Slovin's formula was used to calculate the appropriate sample size that would ensure generalization of this study's findings to all students in the UAE schools of higher learning. The sample size was calculated as follows;

$$n = \frac{N}{1 + Ne^2}$$

Where N was the target population, n - the desired sample size, and e the sampling error. The sampling formula yielded a sample size of 216 participants. Thus, the questionnaires were randomly administered to the 216 participants, who successfully completed the surveys.

The inclusion criteria involved students who have completed either a work placement or an internship. They were considered appropriate for this study as they were assumed to be more able to reflect on their own experience in terms of employability skills importance. In addition, the minimum requirements to be eligible to participate were to be a federal university student and potential graduate. Therefore, more than half of the university students were eligible to participate. The survey was distributed to around 216 federal university students through direct visits. One research team visited males and females' classes of different majors and requested the students to fill the online version of the survey. The total number of participants who completed the survey was 216 (students of various majors). To ensure the validity and reliability of this study's findings, a pilot study was conducted before the actual study. The pilot study was based on 50 participants, and the results revealed that the questionnaire was suitable and appropriate to yield reliable results.

2.3. Questionnaire

The questionnaire was designed by the researcher based on a literature review in general, and more specifically, it was designed to test the skills presented by the World Economic Forum skills report. Testing the same skills specified and tested by the World Economic Forum will allow by the end of the research and as part of the research findings to conduct a comparative study between the research findings and previous research findings undertaken in different contexts.

The questionnaire consisted of 33 items in total. As 20 items were used to test 11 skills, and 1 item was used to check students' predictions about the jobs that will be in more demand in the future. In addition to 3 open-ended questions. The first question asked students to investigate the actions that students might need to undertake in the future to increase their employability. The second one asked them to state the training or workshops that they think might improve their future employability skills. While the third question asked them to share any thoughts, they might have regarding employability in the fourth industrial revolution. Moreover, seven demographic questions were asked. The demographic profile included: gender, age, marital status, educational major, work status, work experience, and job sector.

A five-point Likert scale was used to check to what extent students consider each skill is important for the future job market, where (1) represents strongly agree, and (5) represents strongly disagree. The questionnaire was distributed using an online version and was shared

with the students by doing direct visits to their classrooms. The questionnaire was completed by around 216 participants, which means that the response rate was around 107 %. This shows a high response rate and engagement from students.

2.4. Ethical consent

Ethical consent was added at the beginning of the survey and participants were given sufficient information and details at the survey, its aims and objectives. Moreover, participants were given total freedom to participate or withdraw from participation as well as total freedom to withdraw in the middle of the data collection stage without any penalty and the collected data from them would have been excluded from the actual data set. The data was collected with high level of confidentiality and were coded in order to prevent participants' identity from being tracked or revealed - no student withdrawn from the study.

3. Conducting research and results

To assess university students' perspectives about employability, the following hypothesis was tested using SPSS software:

H_0: The students are fully aware about the fourth industrial revolution employability skills in the UAE.

H_1: The students are not fully aware about the fourth industrial revolution employability skills in the UAE.

H_0: There is no gap between the future labour market demands and the students'' perspectives about future employability skills in the UAE.

H_1: There is a gap between the future labour market demands and the students'' perspectives about future employability skills in the UAE.

From the data, it is evident that most of the participants are students hence do not have working experience. As a result, they may not have the knowledge of employability skills in this era of the fourth industrial revolution. However, they have been exposed to a certain degree of practical experience through training, work placement, or internships. The chi-squared statistical test was used to determine the existence of the gap between the future labor market demands and the students' perceptions on the future employability skills. Similarly, the chi-square technique was used to assess the knowledge of the students in regard to the fourth industrial revolution employability skills in the United Arab Emirates. Ideally, the chi-squared statistical technique is used to determine the level of association between two or more categorical variables. Given that the data collected consist of categorical or nominal data, the chi-squared test was deemed to be appropriate to ascertain the assumptions of the study.

In testing the students' general knowledge on employability skills in regard to the future in-demand labor market, the Chi-square test results were summarized and presented in the below table, table 2.

Using the significance level of 0.05, if the p-value of the test is less than 0.05, we reject the null hypothesis; otherwise, we accept the null hypothesis. In this case, the outcome results in the rejection of the null hypothesis, indicating that most students are not fully aware of the fourth industrial revolution employability skills in the UAE. However, coordination with others and emotional intelligence registered a p-value greater than the significance level (0.05), indicating that some of the students were aware of the employability skills in the fourth industrial revolution.

Table 2. Chi-square values

P-Value	Employability skills	Outcome
0.013	Complex problem solving	Reject the null hypothesis
0.012	Critical thinking	Reject null hypothesis
0.001	Creativity	Reject the null hypothesis
0.007	People management	Reject the null hypothesis
0.117	Coordination with others	Accept null hypothesis
0.347	Emotional intelligence	Accept null hypothesis
0.046	Decision making	Reject null hypothesis
0.010	Service orientation	Reject null hypothesis
0.051	Negotiation	Reject null hypothesis
0.017	Cognitive flexibility	Reject null hypothesis
0.001	Future foresight	Reject null hypothesis

Note. n =216, If the p-value is less than 0.05, we reject the null hypothesis; otherwise, we fail to reject the null hypothesis.
Source: Developed by the authors

To determine if there is a gap between the future market demand on labor and the students' perspective on the future employability skills, the chi-square test was also used and the results obtained in the table below (table 3). Based on the significance level of 0.05, the results of p-values from the analysis of the association between the future demand of the on the market and the students' perception on the employability of the skills, we reject the null hypothesis and conclude that there is a gap between the future market labor demands and the students' perceptions on the future employability skills in the UAE.

Table 3. Hypothesis Report

P-Value	Employability skills	Outcome
0.009	Complex problem solving	Reject null hypothesis
0.000	Critical thinking	Reject null hypothesis
0.000	Creativity	Reject null hypothesis
0.125	People management	Accept the null hypothesis
0.011	Coordination with others	Reject the null hypothesis
0.851	Emotional intelligence	Accept the null hypothesis
0.025	Decision making	Reject the null hypothesis
0.010	Service orientation	Reject the null hypothesis
0.005	Negotiation	Reject null hypothesis
0.338	Cognitive flexibility	Accept the null hypothesis
0.000	Future foresight	Reject the null hypothesis

Note. n =216, If the p-value is less than 0.05, we reject the null hypothesis; otherwise, we fail to reject the null hypothesis.
Source: Developed by the authors

In regard to the relationship between education major and the in-demand future on market, we can set the null hypothesis as there is no association between educational major of the students and their perception on the future demand of the job market. Based on the results in the table below (Table 4), the p-value of 0.000 is less than the significance level of 0.05 hence we reject the null hypothesis and conclude that there is an association between the educational major of the students and their perception on the in-demand future market of labour.

Table 4. Chi-square results

Chi-Square Tests			
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	174.399[a]	45	.000
Likelihood Ratio	165.496	45	.000
N of Valid Cases	216		

Note. a. 48 cells (80.0%) have expected count less than 5. The minimum expected count is .00.
Source: Developed by the authors

Binary logistic regression is another suitable statistical technique that is used to evaluate the contribution of the independent variables which are often explanatory variables on the dependent variable in the case, gender. The main purpose of the test is to evaluate whether gender can be influenced by other factors such as work status, work experience, educational major and job sector. Table 5 illustrates the model summary.

Table 5. Model summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	155.726[a]	.325	.483

Note. a. Estimation terminated at iteration number 20 because maximum iterations have been reached. The final solution cannot be found.
Source: Developed by the authors

From the output of the analysis above, it is evident that gender plays a key role in the educational major, job sector, work experience as depicted by the R squares of 32.5% and 48.3% respectively. However, there is minimal accountability of the independent variables (job sector, work experience, educational major) to the dependent variable (gender). Therefore it means that gender does no play a key role in determining the educational major of the students including the job sector and the work status.

The correlation is another statistical technique that is applicable to the data and it helps to show the level of association between two variables. There can either be negative or positive correlation with the latter indicating a strong association between the variables. In this case, we analyzed the correlation between the future in-demand jobs in the market against the educational major of the students. The results are provided in the Table 6 below.

Table 6. The correlation between the future in-demand jobs in the market against the educational major of the students

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Interval by Interval	Pearson's R	.560	.051	9.867	.000[c]
Ordinal by Ordinal	Spearman Correlation	.615	.050	11.391	.000[c]
N of Valid Cases		216			

Note. a. Not assuming the null hypothesis. b. Using the asymptotic standard error assuming the null hypothesis. c. Based on normal approximation.
Source: Developed by the authors

Based on normal approximation, the Spearman correlation of in-demand jobs in the market and educational major was significant, r (216) = 0.615, indicating a strong positive

relationship between the in-demand jobs in the future market and the educational major of the students. This means that students tend to rely on the in-demand jobs in the market when selecting the educational major to pursue. Ideally, the correlation is measured from -1 to 1 with both figures being the extremes of the correlation. Between 0 and 0.5 is referred to as weak correlation while 0.5 to 1 is referred to as strong correlation. Below 0, we have negative correlation between variables. In this case, r (216) = 0.560, indicated a strong indicating a strong correlation between educational major and the in-demand jobs in the future market according to the students' perceptions. Therefore, what the students pursue in the university or college as a career corresponds to what they think will be the in-demand jobs in the market.

Implications

This study investigated the status and the perception of university students about future required employability skills and their evaluation of the effectiveness of the university educational programs in maximizing their skills and career competencies. The practical implications of this study are on several levels. Firstly, this research acts as an essential step toward improving university students' skills and readiness by investigating the current status of students' perception of essential employability skills. Based on that, higher education practitioners and policymakers can set future strategies and policies to improve students' readiness and prepare them for future career competencies. Secondly, it helps in narrowing the gap between employers and graduates' perspective of employability and fourth industrial revolution future skills. This gap is considered one of the main barriers for employers in attracting the right talents as employers are concerned with attracting talents that possess a specific set of skills and competencies. At the same time, fresh graduates and junior employees focus on acquiring other skills and competencies. Narrowing this gap will result in having a unified perception between all the stakeholders: employers, employees, universities about the future employability skills that employees need to acquire. Thirdly, the study findings assist higher education practitioners to redesign their educational programs and adjust their learning outcomes in order to help students to acquire future employability skills and thus compete in the job market.

Additionally, the university students' perception about future required employability skills highlighted in the study findings enable universities to target the misunderstanding in students' perception by raising students' awareness about the future employability skills that they need to acquire. Moreover, according to the findings of the students' evaluation of the effectiveness of the university educational programs in maximizing their skills and career competencies, universities can rely on the students' evaluation in evaluating the quality and effectiveness of their educational programs in preparing students to the fourth industrial revolution employability skills. To conclude, this study acts as a cornerstone for testing both the UAE graduate students' perspective of the employability skills required by employers and the students' evaluation of the readiness of the university educational programs for preparing them to the job market.

Conclusion

In UAE, federal universities play a major role in influencing students towards specific study areas/majors. This is done also based on the employment market opportunities. Assessing students' perception is a first step into the evaluation of academic program effectiveness as well. Generally, employers focus on talent attraction with a specific set of skills (e.g. communication, IT skills, and foreign languages, ability to work in team and so on)

along academic knowledge. Meanwhile, students focus is more on technical skills according to their major. It is obvious that universities as well as students rely on market demand when deciding their educational major.

As noted, students do not have real work experience (except internships, work placement, volunteering) so their perception about skills might be somehow altered. Here comes the role of university to advise, mentor, nurture and develop them.

In researchers' opinion, traditional universities might reduce the gap between their programs and industry needs by moving towards more practical knowledge and skills assessments rather than traditional pen and paper (or online testing nowadays) exams.

The universities should take a much more proactive approach regarding practical skills incorporation into academic programs and assessments, as well as longer work placement sessions (up to a full semester every 2 years). The fourth industrial revolution should impact heavily the educational sector as well but more towards practical applications, using technology into practice and new perspective on individual development.

We are living in interesting times and we are at a turnaround point. Technology replaces a lot of human interaction and this affects all the stakeholders from the educational sectors. Students feel overwhelmed, alone and to a certain degree depressed. They feel they "wake up with zoom and fell asleep with zoom" which impact on their practical skills. In researchers' opinion, online education will never be so effective as face-to-face one who benefits from human interaction and that personal "touch".

Limitations and future research

Limitations of an academic study represents future research opportunities. This research did not focus on analyzing the factors that lead to the gap between stakeholders like fresh graduates, employers and universities regarding their perception of the future employability skills required in the job market. It represented a first step in testing the extent of the existence of this gap. Based on that, future research needs to investigate these factors using a qualitative research approach. Moreover, due to the methodological approach of this study, the current study did not enable the researchers to gain in-depth insights about the reasons of the students' choices and research findings.

Further research needs to be conducted to analyze the matter from a qualitative research approach using case studies. Another study's limitation is the generalizability of the research findings and can happen to an extent. However, due to similarities between majority of UAE and GCC universities students, the results could be generalized to other universities in UAE and other GCC countries. However, it could not be generalized to other MENA region countries for instance. Therefore, future studies need to collect data on a larger scale in order to compare future research findings to the current research findings.

Moreover, data needs to be collected from university students in other MENA region countries. This will enable having a clear insight about the status of employability in the region. Finally, based on the research findings, the phenomena of employability and future career skills needs to be further investigated qualitatively through conducting interviews and case studies with both employers and students to further elaborate deeply on the study findings (e.g. how was problem solving interpreted?) as proposed by Chhinzer & Russo (2018).

Acknowledgement

The authors did not receive any funds or grants to carry out this research.

References

Ahmad, S., & Pesch, M. (2017). Essential Work Skills and Readiness: Perceptions of Employers, MBA Students and Undergraduates. *Abacademies.org*.

Al-Harthi, H. (2011). University student perceptions of the relationship between university education and the labour market in Egypt and Oman. *Prospects*, *41*(4), 535-551. doi:10.1007/s11125-011-9216-4

Bilan, Y., Mishchuk, H., Samoliuk, N., & Grishnova, O. (2019). ICT and Economic Growth: Links and Possibilities of Engaging. *Intellectual Economics*, *13*(1). https://doi.org/10.13165/IE-19-13-1-07

Boaden, R. (1997). What is total quality management … and does it matter?. *Total Quality Management*, *8*(4), 153-171.

Bowers-Brown, T., & Harvey, L. (2004). Are There too Many Graduates in the UK?. *Industry and Higher Education*, *18*(4), 243-254. doi:10.5367/0000000041667538

Bridgstock, R. (2009). The graduate attributes we've overlooked: Enhancing graduate employability through career management skills. *Higher Education Research & Development*, *28*(1), 31-44.

Brougham, D., & Haar, J. (2017). Smart Technology, Artificial Intelligence, Robotics, and Algorithms (STARA): Employees' perceptions of our future workplace. *Journal of Management & Organization*, *24*(2), 239-257. doi:10.1017/jmo.2016.55

Brown, P., Hesketh, A., & Wiliams, S. (2003). Employability in a knowledge-driven economy. *Journal of education and work*, *16*(2), 107-126.

Chhinzer, N., & Russo, A. M. (2018). An exploration of employer perceptions of graduate student employability. *Education+ Training*.

Cumming, J. (2010). Contextualised performance: reframing the skills debate in research education. *Studies in Higher Education*, *35*(4), 405-419. doi:10.1080/03075070903082342

Dacre Pool, L., & Sewell, P. (2007). The key to employability: developing a practical model of graduate employability. *Education + Training*, *49*(4), 277-289. doi:10.1108/00400910710754435

Dean, J. & Sharfman, M. (1993). Procedural Rationality in the Strategic Decision-Making Process*. *Journal of Management Studies*, vol. 30 (4), pp. 587-610.

Deming. (1982). "Out of the Crisis". *The MIT Press* [online]. [Accessed 21 December 2019]. Available at: https://mitpress.mit.edu/books/out-crisis

De Vos, A., De Hauw, S., & Van der Heijden, B. (2011). Competency development and career success: The mediating role of employability. *Journal of Vocational Behavior*, *79*(2), 438-447. doi:10.1016/j.jvb.2011.05.010

Fugate, M., Kinicki, A. J., & Ashforth, B. E. (2004). Employability: A psycho-social construct, its dimensions, and applications. *Journal of Vocational behavior*, *65*(1), 14-38.

Fugate, M., & Kinicki, A. J. (2008). A dispositional approach to employability: Development of a measure and test of implications for employee reactions to organizational change. *Journal of Occupational and Organizational Psychology*, *81*(3), 503-527.

Garavan, T. (2010). Human Resource Development: Theory and Practice20102Jeff Gold, Rick Holden, Paul Iles, Jim Stewart and Julie Beardwell. Human Resource Development: Theory and Practice. New York, NY: Palgrave Macmillan 2010. 488 pp., ISBN: 9780230216877 £36.99 ($59.95, paperback). *Journal of European Industrial Training*, *34*(6), 579-581. doi:10.1108/03090591011061257

Harvey, & Shahjahan. (2013). Employability of Bachelor of Arts graduates. *Ltr.edu.au*.

Heaton, N., McCracken, M., & Harrison, J. (2008). Graduate recruitment and development. *Education + Training*, *50*(4), 276-288. doi:10.1108/00400910810880524

Heijde, C. M. V. D., & Van Der Heijden, B. I. (2006). A competence-based and multidimensional operationalization and measurement of employability. *Human Resource Management: Published in Cooperation with the School of Business Administration, The University of Michigan and in alliance with the Society of Human Resources Management*, *45*(3), 449-476.

Hirschi, A. (2018). The Fourth Industrial Revolution: Issues and Implications for Career Research and Practice. *The Career Development Quarterly*, vol. 66 (3), pp. 192-204.

Jazdi, N., 2014, May. Cyber-physical systems in the context of Industry 4.0. In *2014 IEEE international conference on automation, quality and testing, robotics* (pp. 1-4). IEEE.

Kabanbayeva, G., Gureva, M., Bielik, P., & Ostasz, G. (2019). Academic mobility and financial stability: A case of Erasmus student exchange program. *Journal of International Studies, 12(1)*, 324-337. doi:10.14254/2071-8330.2019/12-1/22

Kinash, S., Crane, L., Judd, M., & Knight, C. (2016). Discrepant stakeholder perspectives on graduate employability strategies. *Higher Education Research & Development, 35*(5), 951-967. doi:10.1080/07294360.2016.1139555

Knight, P., & Yorke, M. (2002). Employability through the curriculum. *Tertiary Education and Management, 8*(4), 261-276. doi:10.1080/13583883.2002.9967084

Kőnig, L., Juric, P., & Koprivnjak, T. (2016). Graduate Employability: A Gap between Perspectives - the Case of Croatia. *Advances in Economics and Business*, *4*(10), 525-538. doi:10.13189/aeb.2016.041002

Lasi, H., Fettke, P., Kemper, H., Feld, T. & Hoffmann, M. (2014). Industry 4.0. *Business & Information Systems Engineering*, vol. 6 (4), pp. 239-242.

Lee, M., Yun, J., Pyka, A., Won, D., Kodama, F., Schiuma, G., Park, H., Jeon, J., Park, K., Jung, K., Yan, M., Lee, S. & Zhao, X. (2018). How to Respond to the Fourth Industrial Revolution, or the Second Information Technology Revolution? Dynamic New Combinations between Technology, Market, and Society through Open Innovation. *Journal of Open Innovation: Technology, Market, and Complexity*, 4(3), 21.

Lowden, K., Hall, S., Elliot, D., & Lewin, J. (2011). Employers' Perceptions of the Employability Skills of New Graduates. *S3.amazonaws.com*.

Manyika. (2018). Jobs lost, jobs gained: What the future of work will mean for jobs, skills, and wages. *McKinsey & Company*.

Mishchuk, H., Roshchyk, I. Sułkowska, J. &Vojtovič, S. (2019). Prospects of Assessing the Impact of External Student Migration on Restoring the Country's Intellectual Potential (Case Study of Ukraine). *Economics & Sociology*, 12(3), 209-219. doi: 10.14254/2071-789X.2019/12-3/14

OECD (2013). OECD Skills Outlook 2013: First Results from the Survey of Adult Skills, OECD Publishing. Available at: https://www.oecd.org/skills/piaac/Skills%20volume%201%20(eng)--full%20v12--eBook%20(04%2011%202013).pdf

OECD (2018). The future of education and skills. *Education 2030.* Available at: https://www.oecd.org/education/2030/E2030%20Position%20Paper%20(05.04.2018).pdf

Pool, L. D., & Sewell, P. (2007). The key to employability: developing a practical model of graduate employability. *Education+ Training*.

Prisecaru, P., 2016. Challenges of the fourth industrial revolution. *Knowledge Horizons. Economics*, *8*(1), 57.

Rae, D. (2007). Connecting enterprise and graduate employability. *Education + Training*, *49*(8/9), 605-619. doi:10.1108/00400910710834049

Sanders, J., & De Grip, A. (2004). Training, task flexibility and the employability of low-skilled workers. *International Journal of Manpower*.

Schwab, K. (2016). *The fourth industrial revolution*. New York, NY: Journal of Career Assessment.

Schwab, K., & Samans, R. (2016). The Future of Jobs Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution. *Www3.weforum.org*.

Singh, R., Chawla, G., Agarwal, S., & Desai, A. (2017). Employability and innovation: development of a scale. *International Journal of Innovation Science*, *9*(1), 20-37. doi:10.1108/ijis-10-2016-0041

Shivoro, R., Shalyefu, R., & Kadhila, N. (2017). Perspectives on graduate employability attributes for management sciences graduates. *South African Journal of Higher Education*, *32*(1). doi:10.20853/32-1-1578

Small, L., Shacklock, K., & Marchant, T. (2017). Employability: a contemporary review for higher education stakeholders. *Journal of Vocational Education & Training*, *70*(1), 148-166. doi:10.1080/13636820.2017.1394355

Teng, W., Ma, C., Pahlevansharif, S., & Turner, J. (2019). Graduate readiness for the employment market of the 4th industrial revolution. *Education + Training*, *61*(5), 590-604. doi:10.1108/et-07-2018-0154

Tomlinson, M. (2008). 'The degree is not enough': students' perceptions of the role of higher education credentials for graduate work and employability. *British Journal of Sociology of Education*, *29*(1), 49-61. doi:10.1080/01425690701737457

Tymon, A. (2013). The student perspective on employability. *Studies in Higher Education*, *38*(6), 841-856. doi:10.1080/03075079.2011.604408

Walkington, H. (2014). Enhancing the STEM student journey. *Heacademy.ac.uk*.

Weber, S. (2014). Human capital depreciation and education level. *International Journal of Manpower*, *35*(5), 613-642. doi:10.1108/ijm-05-2014-0122

Wickramasinghe, V., & Perera, L. (2010). Graduates', university lecturers' and employers' perceptions towards employability skills. *Education + Training*, *52*(3), 226-244. doi:10.1108/00400911011037355

Yoon, D. (2018). Rising unemployment among young people and improved employment policy: The case of South Korea. *Economics and Sociology, 11(4),* 246- 264. doi:10.14254/2071-789X.2018/11-4/16

Yun, J., Yang, J. & Park, K. (2016). Open Innovation to Business Model. *Science, Technology and Society*, *21*(3), 324-348.