Development of the employability skills assessment

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ABSTRACT: The 21st Century skills, also known as employability or soft skills, are a set of skills that recent graduates and other employees should possess to be successful in the workplace. They include skills, such as problem solving, teamwork and communication. Internationally, numerous organisations have repeatedly stressed the importance of these skills for workplace success, and at the same time pointed to a misalignment between the skill set of recent graduates and what is needed by industry employers. The challenge facing universities and industry is that these employability skills are notoriously difficult to teach and assess. Currently, there is no trustworthy method available to industry for assessing this set of skills. In this article, the authors describe the initial development of the employability skills assessment (ESA), a tool designed for industry to use in the assessment of these skills amongst their new employees. Through a pilot implementation with information technology students at a national university, results indicate that student groups performed at or near the expected level, but also that the assessment tool requires further modification, so that meaningful performance at the individual level can be measured.

Keywords: 21st Century skills, soft skills, industry collaboration, engineering education, learning outcomes

INTRODUCTION

Employability skills, often referred to as soft skills, core skills or at the turn of the century as 21st Century skills, are the skills applicable to all professions. They include problem solving, teamwork, communication, critical thinking, digital literacy, work ethic, professional attitude, and in some cases intercultural fluency [1]. They are different from hard skills which are job-specific, technical skills and are often applicable to a certain career.

Employability or soft skills are personal qualities and traits that impact how effectively you work. Across disciplines or professions soft skills are important for recent graduates and employees because they can help them better navigate a career in the modern workplace. These skills can help recent graduates and employees become more adaptable and better equipped to handle the challenges and ever-evolving changes within the modern workforce. Often, it is the soft or employability skills that differentiate equally skilled technical employees for things, such as raises, promotion or other forms of recognition. Because employability skills are so important for success in the workplace, they must be a priority. Though they may be difficult to improve, by being aware of them and by focused practice, they can be bettered.

Within the United Arab Emirates (UAE) substantial investment and effort has been made by the government to increase the employability skills of its young citizens. Numerous reports highlight the lack of employability skills exhibited by graduates and entry-level employees. For example, a study published by the British Council regarding the UAE's future workforce noted that job market evidence shows that graduates lack critical employability skills like critical thinking, communication and teamwork [2]. The challenges facing UAE tertiary education, UAE industry, the UAE government, and other governments regionally and globally, due to the weakness of graduates and entry-level employees in the employability skills is what makes the development and assessment of employability skills so vital.

Until now, industry within the UAE has been unable to come up with a suitable method of assessing participants in their training programmes with regards to the employability skills. The development and use of the employability skills assessment (ESA), in partnership with a large industrial corporation, NMDC, is expected to yield results that will greatly enhance industry's training programmes. The NMDC and other industry organisations, conduct extensive training in the employability skills for their employees and want to ensure quality in their training programmes. Organisations like the NMDC need an effective, valid, reliable, objective, and cost-effective system to conduct ongoing competency development and evaluations of their trainees.

Considering employability skills, nearly all existing instruments assess skills individually without consideration of the implicit interaction necessary to achieve a skill set. Further, they are often cumbersome to implement, and they evaluate skills indirectly. Disparate measurement tools that were not designed to complement one another and that rely heavily on perceptions are inadequate for data-driven decision making, as well as high stakes assessment. Without a valid and reliable method for assessing and evaluating training programmes and participants, organisations are unable to get meaningful and actionable data which is necessary for the development and continuous improvement of their programmes. Because effective assessment is an integral component of the learning process, it is hoped that the development of the ESA will ensure a better understanding of entry-level employees, provide a rich on-line learning opportunity for trainees, improve trainee achievement of targeted learning outcomes, and gather direct evidence for continuous improvement.

Recent discussions with the NMDC and other engineering and IT-related companies about developing a method for assessing the employability skills within their organisations has helped determine the requirements for the ESA. Built around the earlier method and instrument, the computing professional skills assessment (CPSA) [3], there is a solid, research-backed starting point for further development. Through these mechanisms and current research into employability skills, the following skills have emerged as of primary importance:

- Critical thinking/problem solving;
- Teamwork/collaboration;
- Communicating with diverse audiences;
- Considering ethical, legal, financial, environmental, societal aspects;
- Digital fluency/ICT literacy;
- Interpreting, representing and seeking information;
- Business acumen.

The exploratory nature of this pilot project has limited the focus of this study to the first three employability skills. Later research will expand the method and instrument under development to include all seven of the employability skills above. Because of this, the method and instrument will be evaluated and reviewed as part of this pilot.

LITERATURE REVIEW

Over the last decade, numerous reports have identified significant skills gaps in job-ready youth and entry- to mid-level employees across the Middle East, Gulf Cooperation Council countries and the UAE. The skills most identified as lacking are the employability skills. These skills include, for example: a) the ability to function successfully on multi-cultural, multi-lingual and/or multi-disciplinary teams to resolve current problems; and b) the ability to evaluate impacts of proposed solutions in environmental, economic, societal/cultural and legal contexts [1].

In spite of substantial investment made by the UAE to increase the workforce readiness of its young citizens, reports continue to highlight the lack of employability skills exhibited by UAE graduates and the mismatch to the demands of UAE employers. This continued misalignment is a serious impediment to the attainment of the goals outlined in the 2016 Abu Dhabi Competitiveness Report [4], the UAE National Vision 2021 [5], the UAE Science Technology and Innovation Policy [6], and the Abu Dhabi Economic Vision 2030 [7]. Worldwide, tertiary education and industry training programmes strive to develop a solid foundation of employability skills in students and employees. Educating students to become gainfully employed, productive members of society is the focus of public education across the region. Abu Dhabi, in particular, has emphasised the building of a capable national workforce.

In their 2012 Skills Gap Throughout the World report, UNESCO warned, that competency deficiencies constrain companies' ability to mature, innovate, produce timely products and services, meet criteria for quality and environmental, cultural and societal requirements in countries where they operate [8]. The report also identified the lack of available talent and trained resources in the Middle East as the greatest threat for sustainable development of the region. The most significant gaps in employability skills were classified into four categories: technical, cultural, interpersonal and intrapersonal.

In 2013, UAE employers said they valued employability skills more than specific disciplinary skills [9]. A survey of 100 employers in the GCC conducted in 2014 by EY found that only 29% believed that the public educational systems adequately prepared graduates for success in the workplace [10]. The report urged GCC governments to …*reform national skills and education models… and rethink how education is provided to deliver the ultimate objective of work-ready young adults.* The 2016 Abu Dhabi Competitiveness Report considers human capital as a critical input for national competitiveness, stating *Enhancing the match between education outputs and job market requirements and improving workforce skills are expected to carry the Emirate to competitiveness champion levels in human capital* [4]. The report underscores the need for graduates and employees with strong employability skills who will assume greater responsibilities as managers and leaders in both the public and private sectors.

A study by the British Council published in 2018 entitled Future Skills Supporting the UAE's Future Workforce noted …*evidence from the job market demonstrates that graduates lack essential skills like critical thinking, communication, creativity, team work and the ability to work under pressure* [2].

The challenge surrounding these skills is that employers prioritise them, graduates may lack them, and they are considered difficult to teach and measure [11]. Academic programmes and industry alike struggle in generating accurate and actionable data to increase learning and application of core employability skills. Most existing instruments assess skills individually without consideration of the implicit interaction necessary to achieve a skill set. These constraints are problematic because they: a) do not provide direct measures of learning; and b) can make the assessment process resource intensive and cumbersome to implement.

Various assessment methods have been applied to assess delivery and demonstration of the employability skills. In tertiary education settings the experience of student internships has been utilised with some success to assess employability skills [12], mainly because all the skills can be addressed. Students are given the opportunity to utilise the full range of employability skills, however ratings can lack control or standardisation if performance is evaluated by the employer. More traditional methods have also been employed, such as take-home written examinations [13], which can test the theoretical aspects of whether students understand the use of the employability skills, but not assess the practical application of them dependably. Written examinations allow the students to reflect, for example on a performance task where they may have applied the employability skills, but this does not directly measure or demonstrate their proficiency in this skill. Another traditional form of assessment applied to measure student production of the employability skills has been portfolios [14], but these also rely on reflection and so are an indirect measurement of the skills.

Many of the measurement methods evaluate the employability skills separately, and as distinct from each other, whereas the employability skills are inter-relational and thus best assessed with tools which can measure the skills concurrently. Some of these methods are further problematic as they rely on perceptions, which is an indirect measurement, and so are inadequate for valid and reliable assessment. A further constraint of these assessments, in particular portfolios and internships, is that the assessment process may be resource intensive and cumbersome to implement. Poorly performing assessment tools can be harmful to programmes because the inadequate or inaccurate data they provide can ill-inform course and programme-level decisions [15].

This research team developed a method to evaluate the professional skills in the disciple of computing in a tertiary setting. It is known as the CPSA and it assesses all the skills prescribed by ABET for the field of computing [16]. It is the first published method to simultaneously measure all skills in a direct manner. It is a rigorous method that is proven to be valid and reliable and repeated implementations of the method has been shown to significantly improve participants' professional skills. There is no published method to directly and simultaneously measure employability skills in industry trainees. This challenge is faced by the NMDC and other industry organisations. A considerable amount of the training conducted by industry focuses on employability skills. However, they have a major challenge - how to measure trainee attainment of the skills. Currently, they have no trustworthy means of assessing participants and evaluating their programmes to ascertain effectiveness.

METHOD

Sample

Participants in this study are from two male sections of a mandatory computing course for 3rd year Information Technology students at a gender-segregated, English-medium, public university in the UAE. Nearly all of the students are Emirati nationals of traditional tertiary education age and are native speakers of Arabic. Though this is a face-to-face course, this project utilised the learning management software, BlackBoard, a system with which the students are quite familiar. With approval from the institution's research ethics committee students from these sections were asked to participate in the research project as their identity would remain confidential. All 51 students agreed to participate, but data from only 27 students was used because 3 groups of 3-6 students were randomly selected from each of the 2 sections - it was felt that this was an adequate sample size for this pilot project. In addition, though the primary target population for the ESA are entry-level employees at the UAE's NMDC for a pilot project the use of students was again seen as acceptable at this time.

ESA Development

The ESA has evolved directly out of the engineering professional skills assessment (EPSA) [17] and the more recent CPSA [16] along with discussions with the NMDC. While the CPSA included 6 professional skills learning outcomes of problem-solving, teamwork, communication, ethics, information literacy and the consequences of solutions, at this stage the ESA is focussed only on critical thinking, teamwork and communication. This was done for two reasons. First, these seem to be the most generic of the employability skills [1] and second, to simplify the implementation and assessment of these skills.

ESA Method

The ESA has been designed in a very similar manner to its precursors, but the EPSA was conducted face-to-face, and the CPSA was implemented on an on-line discussion board. The CPSA has proven to be a reliable and valid way to assess 21st Century, professional or employability skills [18] that have been prioritised by employers.

The ESA is an on-line discussion board that allows groups of employees to solve complex and open-ended problems with no clear answer. These are the types of problems that engineering, IT, and other professionals must solve in order to be successful in the workplace. The ESA consists of three components: 1) a 700 - 800 word computing-related scenario (the computing focus is for this pilot study only given the sample); 2) a standardised set of instructions and discussion prompts; and 3) an analytic rubric with sections for each of the 3 employability skills learning outcomes.

The ESA follows a well-established procedure mirroring the previously designed instruments. To enhance familiarity with the ESA process and the discussion board, participants complete a practice discussion, and are then formally assessed on the second discussion. The process is that the instructor assigns students to working groups of about four to six participants through BlackBoard. Within each group's digital workspace, they are provided with a discussion board, and within this, participants are given the scenario and accompanying prompts to guide the discussion. Though the plan is to develop scenarios specific to the needs of the NDMC and other organisations that may participate in this project, for the pilot, two scenarios from the CPSA were utilised. Both scenarios were created following a strict development protocol with writing guidelines and a review process. A sample from the guidelines and the entire set of prompts have been provided (see Table 1).

Table 1: Group scores on CPSA learning outcomes.

Guidelines and prompts
Guidelines
To guide your discussion, five questions are provided for you to consider. These guiding questions are in line with the steps and main considerations when examining and solving complex issues. Each team member should make between 4 (minimum) and 6 (maximum) posts. The posts should take into consideration what others have said in previous posts. As part of a team, you need to keep in mind that ultimately the team should reach a consensus on your recommendations. So, as a team member you need to be checking carefully what others have said and ensuring that it is correct. You need to be sure that your team is working from facts and giving opinions based on facts, so you need to scrutinise the information to ensure it is accurate.
Prompts
Consider the following guiding questions as you work on this. 1. What is/are the problem/problems here? Is there an underlying fundamental problem? 2. Who are the major stakeholders and what are their perspectives? 3. What are the major ethical, legal, and security aspects associated with the problem? 4. What are (1) the global and (2) the local impacts of existing solutions on individuals, organisations, and society? 5. What recommendations do you propose that may lead to potential solutions?

For about 12 days, groups work through the prompts discussing the scenario (writing discussion board posts and responses) and try to come up with a realistic solution to the complex problem that has been posed via the scenario. The open-ended, complex nature of the scenarios means that there is not a single solution; there is no one correct answer. There is little to no instructor involvement in the second discussion because the ESA is mostly used for assessment and to learn participants' level of proficiency in the employability skills.

When the discussion period has completed, a trained rater uses the ESA rubric to assess each of the group discussions (see Figure 1). Using an iterative process of reading and re-reading the entire discussion, the rater should highlight examples of critical thinking, teamwork and levels of communication. Based on the descriptors within each of the table cells, a score of either 0 - missing, 1 - emerging, 2 - developing or 3 - mastering is chosen for each of the employability skills. The target for this pilot project was chosen as 2 - developing based on the descriptors at each level on the rubric. Since there are two criteria for critical thinking, the two cells selected are added together and a mean score is calculated for that skill with only a whole number permitted. For example, if a 2 and 3 are selected for critical thinking, the mean of 2.5 is rounded to the correct whole number of 3. At conclusion of the ratings, each group has one score for the critical thinking, teamwork and communication.

1 - Participants demonstrate critical thinking			
0 - missing	1 - emerging	2 - developing	3 - mastering
Source information is integrated without any interpretation/ evaluation. Viewpoints are taken as facts.	Source information is integrated with some interpretation/evaluation, but not enough to develop a coherent argument. Viewpoints are mostly taken as fact.	Source information is integrated with enough interpretation/evaluation to develop a coherent argument. Viewpoints are subject to questioning.	Source information is integrated with enough interpretation/evaluation to develop a comprehensive argument. Viewpoints are thoroughly questioned.
Only a single approach is considered and used to solve the problem.	Considers and rejects less acceptable approaches to solving problem.	Selects from among alternatives and develops a logical, consistent plan to solve the problem.	Besides developing a logical, consistent plan to solve the problem, also recognises consequences of the solution and can explain reason for choosing the solution.

2 - Participants work together as a team			
0 - missing	1 - emerging	2 - developing	3 - mastering
Participants do not acknowledge or encourage participation of others.	Participants notice other students' ideas. Students may make attempts to bring others into the discussion. Students may pose individual opinions without linking to what others say.	Participants acknowledge, build on, clarify and/or critique other's ideas with some success.	Participants encourage contributions from all team members, generate ideas together, actively help each other, and clarify and/or critique each other's ideas.
3 - Participants communicate professionally			
0 - missing	1 - emerging	2 - developing	3 - mastering
Communication does not follow standard rules of grammar, punctuation and spelling.	Communication occurs with some inaccurate and/or unconventional use of grammar, punctuation and spelling.	Communication follows accepted conventions in grammar, punctuation and spelling.	Communication strictly adheres to accepted conventions of grammar, punctuation and spelling expected of a professional in the workplace.

Figure 1: ESA rubric.

RESULTS AND DISCUSSION

The results of this study indicate that student groups performed at or near the expected level of performance on the three employability skills; however, results also show that the existing method does not provide adequate granularity to assess individuals, and that changes and expansion of the rubric are required. Results will be presented by sharing some overall descriptive statistics about the discussion posts at the group and individual level and then through the performance of the groups on the learning outcomes that encompass the ESA rubric.

Firstly, across the six groups there were a total of 168 posts, so an average of 28 posts per group. The average length of each post was 169 words. However, one group had 73 posts and of these a full 44 were superfluous to the discussion- posts such as …*Well done, keep up your progress.* Given this issue, a more meaningful analysis finds 124 total posts, with an average 20.67 posts per group. Eliminating these 44 superfluous posts brings the average length per post to 221.23 words. The range of posts per group was 12-29. At the individual level, the post per person average was 4.76 and the range was 1-9.

Secondly, in terms of performance on the learning outcomes, groups performed at or near expectations (see Table 2). The preliminary target that was set for this iteration of the ESA was 2 - developing as it shows a fairly sophisticated level of critical thinking, solid teamwork and robust communication, but in all of the learning outcomes there remains room for growth. On the critical thinking learning outcome all six of the groups scored the target of 2. This was the only skill in which there was complete consistency across groups.

The teamwork learning outcome had a range of scores from 1-3, so some groups were rated below expectations, while others were at or exceeding what was expected. Three groups were scored as a 1 - emerging because there was often little meaningful communication between members - the discussion was far too siloed. However, in two of the groups, members actively worked together to generate substantive ideas, so they were scored a 3 - mastering.

The communication skill is another where the groups performed above expectations. Five of the groups achieved a 2 - developing, while the other group was scored a 3 - mastering. Examining the means of the means, there is a range from 1.8-2.2 with an overall mean of 2.0. This shows target attainment, that is, expected performance of the learning outcomes even though three groups within teamwork did not perform to the expected level of 2 - developing.

Table 2: Group rubric scores.

Group	Critical thinking	Teamwork	Communication
A	2	3	2
B	2	1	3
C	2	1	2
D	2	1	2
E	2	3	2
F	2	2	2
Mean	2	1.8	2.2

Overall, the rubric and the method were quite successful, but in several ways, changes are required. Firstly, the existing 3-part rubric was easy to apply to the discussion transcripts, but the employability skill of critical thinking was challenging because it has two criteria. This should be modified to a single criterion like the other two employability

skills. Additionally, the rubric needs to be expanded to all seven of the employability skills that were noted in the introduction, and they should follow the single criterion guideline that has been determined through this pilot implementation.

The next modifications to occur must focus on the method itself. A new set of discussion prompts will be needed because they currently align with the requirements of the CPSA. They need to be aligned with the ESA, specifically the seven employability skills. Furthermore, all the guidelines and the scenarios must be re-created or re-worked to better align with the needs of the industry partner. Conceptually, their frameworks are fine, but they need to be more specific to the partner, not computing students. Finally, in a later phase of implementation, the ESA must be trialled at the individual rather than the group level. This will be the granularity required to make the findings more meaningful.

CONCLUSIONS

As the value of the employability skills only continues to grow in today's workplace [1][11], having a method and instrument that can reliably and validly assess these skills is of the utmost importance. Given that the precursors to the ESA, the EPSA and CPSA, have proven to be trustworthy in an academic setting, there is a strong base from which to construct the ESA. While this pilot implementation has shown students were able to achieve the desired levels of performance in this truncated version of the ESA, it is clear that modifications and expansion of the entire instrument and method must occur before it can be trialled by the University's industry partner.

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BIOGRAPHIES

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