The Employability Skills of Engineering Students': Assessment at the University

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Employability can be an alternative solution to increase individual chances of getting a job. The study aims to identify indicators that can measure students' employability skills and attributes. The research model, based on The Conference Board of Canada (Employability Skills 2000+), is divided into fundamental skills, personal management skills, and cooperative skills. The method used Confirmatory Factor Analysis (CFA) with primary data obtained from surveys of students through a questionnaire will be analyzed using the AMOS program. These samples included 528 respondents who had done the work practices of the industry. The research respondents were students of the Faculty of Engineering, Universitas Negeri Makassar, divided into several majors. The results of the study identified that the low value of communication indicators in the variable of fundamental skills compared to other indicators was due to the lack of foreign language communication activities in the learning process. Communication is a vital aspect possessed by students, especially in global level competition. The study results were used to measure educational institutions to develop and improve low work skills indicators so that new graduates will better be prepared for work.

Keywords: confirmatory factor analysis, fundamental skills, personal management skills, soft skill, teamwork skills

INTRODUCTION

Along with the rapid changes in the world of work, education has also experienced a change. One change that has taken place is an increase in students' numbers at the primary, secondary, and tertiary levels of education. The United Nations Educational, Scientific, and Cultural Organization (UNESCO) estimates that in 2007 there were 150.6 million higher education participants worldwide (Altbach et al., 2009). The high demand for higher education institutions has led to many new educational institutions and educational programs in public and private institutions. This increases the number of graduates produced and competition in the world of work. The negative impact of increased competition in the world of work is an increase in the number of unemployed. Data from the International Labor Office (ILO) for Indonesia shows that young people in Indonesia were 5.97 times more unemployed than those aged and over 25 years, and more than 55% of the unemployed were young people (International Labour Office (ILO), 2014). The Organization for Economic Cooperation and Development (OECD) states that Indonesia's youth unemployment rate stands at 17.10%. This figure is higher than the OECD country average of 14.90% (Organization for Economic Cooperation and Development (OECD), 2004). Data from the Central Statistics Agency shows that the open joblessness rate of the population aged 15 years and over originating from university education is 4.31% (Central Bureau of Statistics, 2014).

The industry or company chooses prospective workers who have academic skills (hard skills) and is accompanied by excellent soft skills to produce human resources with maximum skills. Currently, universities only provide an average portion of soft skills in the curriculum, and the rest are hard skills, while the needs of the world of work are inversely proportional to the development of soft skills in universities that want high soft skills than hard skills (Gill, 2018). Higher education is expected to increase students' soft skills and hard skills in a balanced portion so that it suits the needs sought by employers. Efforts to anticipate the increase in unemployment carried out by identifying the number of workers needed by graduate users. Many studies show that graduate users (companies/industries) need workers who can adapt to new circumstances (Bridgstock, 2009; Caballero et al., 2011; Hinchliffe & Jolly, 2011; Litchfield et al., 2010; Parker et al., 2014; Senior et al., 2010; Spowart, 2011). The ability to adapt and require cognitive excellence following their scientific fields also requires some general skills. General skills, i.e., identified competencies, exist in all scholars from various science fields at a certain level (Brewer, 2013; Gonzáles & Wagenaar, 2005; Murdoch-Eaton & Whittle, 2012; Shafie & Nayan, 2010). UNESCO and ILO provide an overview of general skills, namely: being able to adapt, knowing how to learn, being able to organize and process information to solve problems independently, lifelong learning, being able to read, write and count well, listening and communicating effectively, think creatively, interact with colleagues, work in groups, master basic technology, be able to lead and follow directions effectively (Altbach et al., 2009; Brewer, 2013).

The demands of work requirements in the current era of globalization are becoming increasingly challenging. Roekel stressed that workers' success in the future is the importance of mastering innovation skills (4C innovation skills): critical thinking,

Communication, Collaboration, and Creativity (Jefferson & Anderson, 2017; Romero, 2015). In line with this opinion (Azmi et al., 2018; Scott et al., 2019) concluded that the primary skills needed by industry and companies are the strength of interpersonal skills such as communication, problem-solving skills, teamwork, entrepreneurial skills and project, and process-oriented work. Employability skills can occur through introductory lecture activities, affective learning, student-centered learning strategies/methods, assignment of lecture assignments, extracurricular and student activities, and industrial work practices. Nevertheless, what happens in the field is the low level of knowledge and experience about employability skills or how they developed in learning so that this becomes an obstacle in implementing employability skills in the classroom (Asonitou, 2015; Chhinzer & Russo, 2018; Jackson, 2016). This situation is a significant challenge for developing countries because they must inevitably increase their human resources to compete and have a competitive advantage in all industrial sectors and service sectors. This increase in competitiveness starts from preparing quality human resources, so that the human resources possessed have the expertise and skills, especially for labor in sufficient numbers at all levels (Ybema et al., 2017). Employability skills are one of the breakthroughs in increasing the competitiveness of human resources, especially labor. Employability skills are essential skills that every worker must have to be used to adapt to the workplace (Chan et al., 2017; Nghia, 2019).

Preparation of students to have technical skills and skills that are generic (employability skills) stem from the quality of learning programs (Williams, 2015). In the learning program's implementation, interaction occurs between various factors, raw input factors (students), and instrumental input. Various research results indicate factors that interact with each other in the learning process, including the learning system, the learning environment created when the learning process occurs as a factor that mediates student skills (Singh & Singh, 2017). The learning system is a description of the approach used by teachers in implementing learning activities. Educational institutions must produce flexible, skilled, qualified, self-discipline, self-confidence, leadership, problem-solving skills, and responsible personal (Asonitou, 2015; Ito & Kawazoe, 2015). Work readiness is physical, mental maturity, and learning experience so that the individual can complete his work with the capabilities he has. Regarding the problems mentioned above and considering the critical role of employability skills in preparing graduates to enter the workforce, it deemed necessary to develop a model that can measure vocational tertiary graduates' employability skills. This research is expected to find indicators that can measure students' employability skills and attributes.

METHOD

Population and Sampling

This study uses a quantitative approach with a non-experimental design survey type because what is studied is sample data obtained from the population and using a questionnaire as a data collector (Mitchell & Jolley, 2012). The research process from primary data collection to data analysis was carried out for six months from May - October 2019. The population of the study was all students majoring in active engineering at Universitas Negeri Makassar, amounting to around 4127 students

consisting Department of Civil Engineering and Planning, Department of Electronic Engineering, Department of Electrical Engineering, Department of Information and Computer Engineering, Department of Mechanical Engineering, Department of Automotive Engineering, and Department of Agricultural Technology. The sampling method uses the Purposive Sampling technique because not all samples have criteria that fit the phenomenon to be studied. Specific considerations or criteria that must by the samples used. The research sample used is students who have carried out industrial work practices. This was done to see how student skills development after doing practical work with a total sample of 528 respondents.

Table 1
Distribution and characteristics of respondents

Category	Indicator	Total
Faculty of Engineering	Department of Civil and Planning Engineering Education	78
	Department of Electronics Engineering Education	76
	Department of Electrical Engineering Education	81
	Department of Information and Computer Engineering	88
	Department of Mechanical Engineering Education	78
	Department of Automotive Engineering Education	74
	Department of Agricultural Technology Education	53
Gender	Man	464
	Women	64

Instrument and Procedure

Distributed questionnaires have been designed to maintain respondents' confidentiality by not including the respondent's identity and facilitating filling in the questionnaire by attaching an explanation of filling instructions that are made brief and clear. The selection using this questionnaire model is based on the consideration that (a) the respondent has time to answer questions; (b) respondents have the freedom to give answers. This study uses a questionnaire to get answers from respondents. The questionnaire's contents are based on the Employability Skills Profile 2000+ sourced from the Conference Board of Canada (The Conference Board of Canada, 2000), which consists of three parts: Fundamental Skills, Personal Management and Teamwork Skills.

The method of data collection is done by distributing questionnaires to come directly following the determined research sample. After being given a certain period to fill in (provide answers) to the questionnaire, it is confirmed back to the respondent, and then the data collected by the researcher is made into primary data. The data measurement technique uses a Likert scale. Likert scale is a data measurement technique to measure the attitudes, opinions, and perceptions of a person or group of people towards an event. The measured variables are translated into indicators—the indicators use as starting points for compiling statement items (Bogdan & Biklen, 2016). Measurement data in this study uses an ordinal scale with levels 1 to 5 categories for each question/statement,

namely category 1 (one) for strongly disagree answers, category 2 (two) for disagree answers, category 3 (three) for answers three doubtful, category 4 (four) for answers agree, and category 5 (five) for answers strongly agree.

Research Model

Of the several research models that have been described in this study, the model used is based on the Conference Board of Canada (Employability Skills 2000+), which is divided into three parts, namely Fundamental Skills, Personal Management Skills, and Teamwork Skills. More details can be seen in Figure 1 as follows:
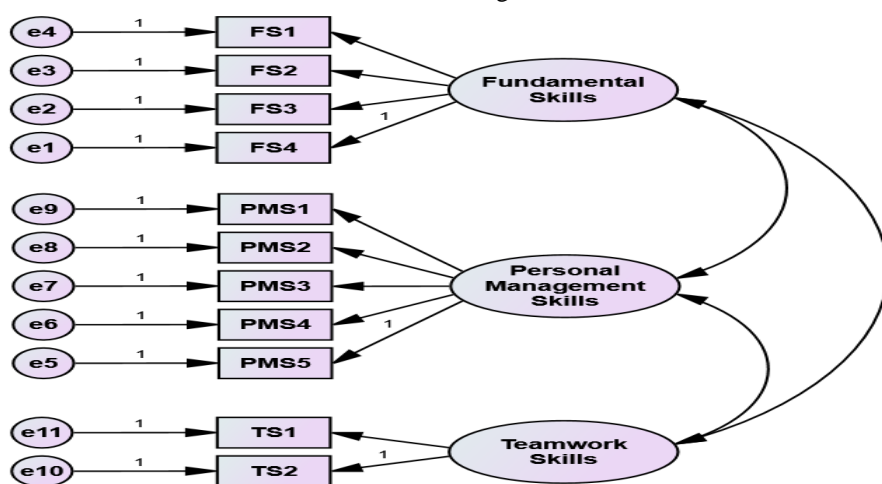

Figure 1
The measurement model

Table 1
Description of research measurement model

Field of Skills	Indicator
Fundamental Skills	Communicate (FS1)
	Manage Information (FS2)
	Use Numbers (FS3)
	Think and Solve Problems (FS4)
Personal Management Skills	Demonstrate Positive Attitudes and Behaviors (PMS1)
	Be Responsible (PMS2)
	Be Adaptable (PMS3)
	Learn Continuously (PMS4)
	Work Safely (PMS5)
Teamwork Skills	Work with Others (TS1)
	Participate in Projects and Tasks (TS2)

Data Analysis

The Cronbach Alpha coefficient is one of the widely used instrument reliability tests. Another method is the Confirmatory Factor Analysis (CFA) (Reynolds, 2020). According to Joreskog and Sorborn, CFA is used to test unidimensional, validity, and reliability of construct measurement models that cannot be measured directly (Jöreskog, 1993). Measurement model or also called the descriptive model (Garson, 2012), measurement theory (Hair et al., 2019), or confirmatory factor model (Collier, 2020; Long, 1998), which shows the operationalization of research variables or constructs into measurable indicators that formulated in the form of equations and or specific path diagrams.

From the model previously described, the proper analysis was used, namely the Confirmatory Factor Analysis (CFA). CFA is carried out to confirm or test the model, which is a measurement model whose formulation is derived from theory (Brown, 2015). Thus, CFA can have two focus studies: (1) whether the indicators conceptualized are unidimensional, precise, and consistent; (2) what are the dominant indicators that form the construct under study. Because there is already a construct model formed and tested, the Confirmatory Factor Analysis (CFA) uses LISREL or AMOS software to test it. CFA saw a partial Structural Equation Modeling (SEM). This study uses the IBM AMOS 22 Program, which is used to manage research data. Thus, CFA is not intended to produce a model but rather to test the measurement model developed based on the study of specific theories (Harrington, 2009; Kline, 2015; Xiao et al., 2019).

FINDINGS AND DISCUSSIONS

The goodness of fit (GOF)

Analysis using SEM also requires requirements like a standard assumption; the difference between SEM requirements known as Goodness of Fit. The Goodness of Fit test results from this study in Table 3.

Table 3
The goodness of fit (GOF) measurement results

Criteria	Value	Threshold	Result
Normal Chi-Square (CMIN/DF)	0.943	≤ 2.000	Fit
Goodness of Fit Indices (GFI)	0.936	≥ 0.900	Fit
Root Mean Square Error of Approximation (RMSEA)	0.006	≤ 0.080	Fit
Tucker Lewis Index (TLI)	0.972	≥ 0.900	Fit
Comparative Fit Index (CFI)	0.974	≥ 0.900	Fit
Incremental Fit Index (IFI)	0.925	≥ 0.900	Fit
Goodness of Fit Index (GFI)	0.912	≥ 0.900	Fit
Parsimony Normed Fit Indices (PNFI)	0.516	≥ 0.500	Fit

According to (Lomax & Schumacker, 2004), recommending criteria that must be met as a GOF requirement is RMSEA, CFI, NFI, and GFI. The GOF measurements in Table 3 show that all the criteria as standard requirements below the threshold value (Marsh et al., 2020), which means the measurement model (CFA) carried out, can continue.

Table 4
Result of confirmatory factor analysis (CFA) for the measurement model

Construct	Indicator	Loading Factor
Fundamental Skills	Communicate (FS1)	0.503
	Manage Information (FS2)	0.694
	Use Numbers (FS3)	0.710
	Think and Solve Problems (FS4)	0.687
Personal Management Skills	Demonstrate Positive Attitudes and Behaviors (PMS1)	0.727
	Be Responsible (PMS2)	0.718
	Be Adaptable (PMS3)	0.728
	Learn Continuously (PMS4)	0.723
	Work Safely (PMS5)	0.736
Teamwork Skills	Work with Others (TS1)	0.773
	Participate in Projects and Tasks (TS2)	0.782

Communication skills, problem-solving skills, skills in using numbers, and managing information skills have a level of importance below average. This also supported by the fact that shows the average value of loading factors from the constructs of fundamental skills that perceive communication skills, problem-solving, manage information, and use numbers in the category of less and relatively high which vary between 0.782 to 0.503 with an average value of loading factors amounted to 0.649. The loading factor is a coefficient that explains the level of relationship of indicators with latent variables. In general, the higher the loading factor, the better the loading, and values below 0.50 are not interpreted. As a general rule, loading above 0.71 is perfect, 0.63 is very good, 0.55 is good, 0.45 is fair, and 0.32 is poor (Tabachnick & Fidell, 2007). This implies that the ability to receive and convey information verbally and in writing effectively provides the smallest contribution in explaining employability skills.

Fundamental Skills

Look further, these four indicators of employability skills are fundamental skills that are not necessarily unimportant. Communication skills are an indicator of employability skills with the lowest factor loading value, which is only 0.503, and if referring to the rules mentioned above, the loading factor value is in the fair to excellent category. This does not mean that communication skills are not relevant compared to other indicators studied. The communication indicator is the most different factor among the other indicators. Students generally only prioritize their academic abilities and do not develop the employability skills needed at work. Related to the most challenging skills to master,

students as respondents in the study have various opinions and sorted from highest to lowest, the most difficult skills to learn to show English speaking skills at the highest level (difficult to understand). With the lack of knowledge of grammar and English vocabulary, it is difficult to memorize, and pronunciation is problematic because it is different from the language used daily is why it is complicated for students to learn speaking skills in English. Practical factors of students as one of the factors causing speaking in English to be challenging to understand. Then the difficulty of students who are low and able to learn is reading. According to most students, the easiest thing to do is reading skills because their interest in reading activities became the foundation by students in answering.

With the development and change of the world that is increasingly fast demanding that Indonesian citizens can communicate with people throughout the world through several minimal languages accepted internationally and understood, one of them is English. An adequate understanding of English is vital, especially for educated people in Indonesia. The use and need for English are related to communicating verbally and understanding readings delivered in English about various life fields, including at work. The ability of foreign languages is one of the distinguishing factors for new university graduates; with this ability, the company or industry will provide its value. Given that almost all aspects of work financed by foreign aid must provide reports in foreign languages, especially English. One of the causes of such low English proficiency is the teaching-learning environment, which lacks students' opportunities to speak English actively. When English proficiency is inadequate, multinational companies' high-paying service job offers often move to countries with a multilingual workforce. This study's results are in line with previous research conducted by Robinson, showing that more than 81% of respondents stated that it was essential to have employability skills, such as communication, managing information, problem-solving, responsibility, and adaptability, and teamwork. Furthermore, they also stated that employability skills had been identified as a skill that workers must be mastered by workers to be able to compete in the world of work (L. L. Robinson, 2006).

Personal Management Skills

Work skills and attitudes as one of the competencies that graduates must have can be created and developed during the learning process. Educational institutions, as institutions, must provide supporting facilities and facilities, the involvement of educators convey and provide experience from all elements of work skills in the learning process (Idkhan & Djuanda, 2019). The effectiveness of developing work skills depends on its development in learning and student readiness. In line with Robles' research, employability skills in personal management that are considered most important by company executives are interpersonal, responsibility, social skills, and positive attitudes that must had when entering the workforce (Robles, 2012). Employability skills as the Basis for Work Eligibility are vital skills in any job and any career path (Jackson, 2012). Essential skills are several capacities that can be used in everyday life at work and can transfer in various fields of work and professions, such as teamwork, communication skills, problem-solving skills, adaptability, self-management skills (Hager & Holland,

2007). Educational institutions are the basis of employability skills, which can help graduates get jobs. Employability skills are also considered necessary for bachelor graduates to maintain employment and contribute to their work (Iyer & Dave, 2015).

The characteristics of the world of work and the workforce's qualifications needed by the industry are changing rapidly. One feature of the industrial revolution is the increasing need for generic skills attributes workers must possess that. Research conducted by the Commonwealth Scientific and Industrial Research Organization (CSIRO) related to the demand for skills needed by industry, the results of the study show that communication skills and 'people skills' are becoming increasingly important which requires that communication skills grow very high when compared to technical skills (Mason et al., 2017). Employment recruitment by companies prioritizes employability skills/soft skills rather than hard skills. Therefore, work-oriented education through mastering technical skills and employability skills is needed to sustain economic development in the current industrial revolution (Harun et al., 2017; Līce & Sloka, 2019).

The job market today is worried about the rapid changes in technology and highly competitive industries. As a result, the industry is more enthusiastic about accepting employees who are matched with technical skills and have employability skills to adjust to rapid changes in the industry (Fong et al., 2014). The industry demands employability skills as the primary capital to achieve satisfactory work performance. As educational institutions, universities must find appropriate ways to develop these skills in educational programs and develop appropriate and accurate ways to assess them. The curriculum used must provide students with opportunities to practice and develop employability skills in contexts appropriate to the discipline of his knowledge (Gonzáles & Wagenaar, 2005; Hawkins et al., 2015; Yusof et al., 2012). Employability skills, specifically related to working with various people, can think critically, communicate effectively, and have the strength and enthusiasm to continue learning and working. Employability skills considered very importantly because the current job characteristics require the creativity, flexibility, and ability of an individual to handle another job. Preparing students to have technical skills and generic skills (employability skills) stem from the quality of the implementation of learning programs (Ogbeide, 2006; J. P. Robinson, 2000; Wu, 2005). Some research results indicate factors that interact with each other in the learning process, including learning systems.

Teamwork Skills

Another part of the study results as indicators of teamwork skills perceived in the high category with an average loading factor of 0.778. It is the highest number compared to other indicators and ranks highest in the employability skills indicators' loading factor. This result is in line with research conducted by (Buntat et al., 2013; Su & Zhang, 2015), which shows the skill of working with other indicators of employability skills that are considered very important by supervisors. These results indicate that it is imperative to build cohesiveness to facilitate the achievement of company targets in the supervisor's view. The results of these studies are not much different from the results of previous studies conducted by Arensdorf, where the ability to manage themselves as an indicator

of employability skills with the highest level of importance, then followed by the ability to work in teams, problem-solving, the ability to innovate, and the ability to communicate (Arensdorf, 2009).

The problem of unemployment in new graduates is a worldwide discussion because of the lack of quality knowledge, skills, and new graduates (Gowsalya & Kumar, 2017). Unemployment is one of the impacts of the lack of quality employability skills in new graduates. Employability skills become an issue that is often discussed every year because it is considered a problem of increasing unemployment (Likhitkar & Verma, 2020). The quality of the employability skills of undergraduate graduates is still lacking. Currently, many graduate users are looking for graduates who are competent in academic matters, communication skills, adaptability, problem-solving skills, teamwork skills, creative and innovative thinking skills, high enthusiasm, proactiveness, and critical thinking skills (Asirvatham & Priya, 2017; El Mansour & Dean, 2016; Olojuolawe et al., 2019; Tejan & Sabil, 2019). There is still a gap between the needs in the world of work with graduates' skills, even though educational institutions have made policies to conduct training and skills development, hard skills, and soft skills.

Attention to improving students' employability skills is believed to prepare human resources who can adapt quickly to the world of work (Idkhan, 2018; O'Dell & Sulastri, 2019). The qualifications required by the labor market in the knowledge-based economy are essential to be considered by vocational tertiary education providers so that graduates can be absorbed into the world of work. A critical aspect of increasing the relevance of graduates is the education curriculum. Empirical observation of the applied curriculum shows that the curriculum used does not explicitly contain employability skills in each competency unit that is the learning objective. This condition will undoubtedly have implications for the teaching and learning process, where learning implementation to develop student employability skills neglected. These empirical observations clearly illustrated that the education system has not yet given adequate attention to developing generic skills.

Using a slightly different approach, previous research (Yeung et al., 2007) shows that the three dimensions of employability skills have varying structural coefficients. The three dimensions of employability skills are: (a) socio-cognitive, (b) academic, and (c) self. The socio-cognitive dimension includes communication skills, problem-solving skills, creativity, and interpersonal skills. Academic dimensions include necessary academic skills such as knowledge of foreign languages, arithmetic, and computer skills. At the same time, the self-dimension consists of responsibility, initiative, effort, and self-learning. In the process of formation, employability skills are inseparable from various factors that can influence it. Individual factors, social relations factors, and contextual factors can influence employability skills in new graduates (McQuaid et al., 2005). Individual factors consist of personal attributes that determine a person can be employed or not, such as age, gender, race, personal competence, physical and mental health, and education and work experience. Social relations factors can then affect one's ability, desire, or social pressure to take up job opportunities. This factor is related to a person's social and family circumstances, consisting of parenting and external

motivation. Meanwhile, contextual factors consist of factors related to conditions outside a person, such as work demands, work culture, organizational characteristics, recruitment and technology.

CONCLUSION

Students can train themselves to improve their fundamental skills, personal management skills, and cooperative skills to increase their ability to enter the workforce. Especially for communication indicators that are considered low, communicating, and talking directly to colleagues regarding work or tasks entailed. The development of students' employability skills directed at efforts to improve the competency attributes, which are indicators of communication skills, teamwork skills, problem-solving skills, skills in taking the initiative and effort, skills in planning and organizing activities, self-management skills, skills in learning, skills in using technology, and skills in terms of occupational health and safety. Further research also recommended being carried out with an expanded research scope, involving all other existing institutions. This is useful for identifying critical aspects of employability skills that need priority in their development.

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