Lurking on the Essential Attributes Required in Industrial Revolution 4.0

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Abstract
Purpose: Education market has evolved since the first technological revolution. Emerging technologies affect people's education enormously. Industry 4.0's skills needed have also changed due to technology changes. In addition, there was also considerable debate about graduate characteristics in higher education, defined as graduate attributes. The goal of this study is to define the essential graduate feature that Industry 4.0 needs from graduate perspectives. These graduates' dimensions of attributes and performance are considered in five broad areas, namely knowledge, skills, abilities, emotional quotient, and spiritual quotient.
Design/methodology/approach: The data was collected using snowball and quota sampling techniques. The respondents are graduates of selected universities of Malaysia, were asked to address 5-point Likert scale questions. SPSS version 24 and Smart-PLS tools is used for the descriptive and inferential data processing respectively.
Findings: The results of this analysis indicate that the R2 value of the model was 0.738 which indicate that the five variables collectively explained 73.8% of the variance in graduate attributes. This study determines that spiritual quotient (0.332) was the most important out of five constructs for graduates.
Research limitations/implications: This study provides significant ramifications to both academics and professionals, demonstrating the attribute of value of graduates in venturing facing industry 4.0.
Practical implications: It is anticipated that the study findings would support new curriculum programs, by incorporating the following qualities to prepare students with abilities to face complex global challenges.

Keywords: Industry 4.0, Knowledge, Ability, Skills, Emotional Quotient, Spiritual Quotient, Education, Graduates

Introduction
The technological advances allow significant industry changes in the era of Industrial Revolution 4.0. The Industry 4.0 is a combination of physical, digital, and biological domain elements. It has become the forerunner to disruption in all fields which has an impact on

changes in human characteristics and behaviors (Chusniyah et al., 2020; Tran, 2018; Umachandran, Jurcic, Ferdinand-James, Said, & Abd Rashid, 2018). A World Economic Forum report (WEF, 2016) also outlines the vast changes the Industry 4.0 will bring. The advent of this revolution is here and higher education like most other sectors of society will be affected (Andrews & Osman, 2015; Hornsby & Osman, 2014; Maree, 2015; McGhie & Du Preez, 2015).

Education is also known as the key to achieve professional goals as in this competitive environment, it offers knowledge to preserve one's self. The National Education Philosophy (Falsafah Pendidikan Negara) Malaysia is intended to create intellectually, physically, emotionally and spiritually harmonious and intellectual individuals (Rayung & Ambotang, 2018). Governments have also gradually encouraged universities to deliver graduates with a set of qualities now deemed essential to make a productive contribution to a knowledge-based economy (Schrempf, Kaplan, & Schroeder, 2013).Other than that, according to Gunawan (2019), there is little awareness of the skills required to work in Industry 4.0, since previous work on Industry 4.0-related technical skills are more based on personality profiles for recruiting purposes than skills that can be built in education.

Additionally, other studies have also identified certain problems that exist, such as the suitability of the university to train students for workplaces in ever-changing industries. Today's demanding circumstances have increased stakeholder pressure on universities to ensure that students are prepared with more than academic skills. Universities also focus on developing the student's entire personality, including intellectual, emotional, spiritual, physical and social skills that will help graduates in their future endeavor's (Effendi, Matore, & Khairani, 2016).

With the above trends, this study's key contribution is to identify the essential qualities for graduates at selected public and private universities in Malaysia. The attributes of these graduates are assessed in five dimensions, which are knowledge, skills, ability, emotional quotient and spiritual quotient (KSAESq).

Literature Review
Graduates perspectives on important attributes for Industry 4.0
In today's fast-changing technological landscape, the 4th Industrial Revolution has set the need to reinvent the education framework to change learning and teaching methods worldwide. Frey and Osborne (2013) suggested that although Industry 4.0 offers possibilities for those eager to accept it, this age still creates great obstacles for graduates employed in the conventional profession. This is due to the changes in revolution of industry that may have massive effect on the education of people especially in higher learning institutions (Benešová & Tupa, 2017). Graduate attributes are the quality or abilities that graduates seek to acquire and need to be built in higher educational institutions (Bozalek, 2013). Industry needs two attributes: technological abilities and capabilities and generic characteristics. Generic qualities comprise soft skills, specific attributes and principles that graduates learn independent of their field of study (Daud, Abidin, Sapuan, & Rajadurai, 2011). Daud et al. (2011) found the focus on potential considerations like soft skills and personality growth. Meanwhile, aspects such as explicit experience, hard skills, analytical capability, awareness and mental health have to be retained. Deloitte (2018) found that imagination, the complex problem solving, partnership development, empathy, emotional intelligence, and analytical thinking are progressively required for "soft skills," which are the key skills employers are pursuing in the future. From World Economic Forum report 2016, the evolving skills that have been defined for potential workers, namely an industrial 4.0 climate, involve negotiations, cognitive stability, service orientation, decisions and decision-making, an emotional quotient, communication with others,

management of people, innovation, analytical thinking and complex solving problems (Evarina, Azlan, & Kamalularifin, 2019).

Toolib, Mohamad, Daud, and Wan Hanafi (2019), on the other hand, have come out with a new model known as KSAESq (knowledge, skill, abilities, emotional quotient (EQ) and spiritual quotient (SQ). As growing emotional quotient and moral quotient may not only enhance the learning process, boost work judgment and the probability of success, increase the likelihood of better personal and social adaptation in general. Increasing the emotional and moral quotient will not only enhance the learning process, boost job decisions and the probability of achievement, but may also raise the probability of better personal and social adaptation in general. This study therefore, will be using the model which will combines knowledge, skill, abilities, emotional quotient and spiritual quotient, which could result in a multitude of beneficial private, social and societal outcomes. All of the attributes are explained details below:

Knowledge, Skills and Abilities (KSAs)

Bunney, Sharplin, and Howitt (2015), Clarke (2017) and Stewart, Wall, and Marciniec (2016) has identified that most of the newly hired graduates need to demonstrate performances that can meet with employer needs and expectation and at the same time willing and able to give contribution in the workplace. Employer expectation is for graduates to master in higher-level knowledge and information-based skills or known as knowledge, skills and abilities (KSAs). Each of the elements of KSAs is discussed as below:

i. Knowledge is what can be referred to as structural knowledge, the facts and information that are used to perform the work. Knowledge is a structured data body, generally of a factual or procedural nature, making job performance possible if implemented. Knowledge relates to factual or procedural data needed to perform a job effectively (Daud et al., 2011).

ii. Skills represent the application of knowledge which is the ability to perform tasks and solve problems (Halász & Michel, 2011). Skills are often quantifiable and calculated as controlling or controlling objects, records, or individuals, either orally, manually, or mentally, to achieve a goal. With experience or preparation, skills may be developed.

iii. Ability is synonymous with capability, potential or capacity. It determines whether you possess the means to do something. It is an on-going evaluation of what a person can do. The general capabilities of an individual consist mainly of two sets of variables, i.e. intellectual and physical capabilities (Robbins & Judge, 2007).

Employer expectation will be fulfilled when graduates possess knowledge, skills and abilities. Graduates with KSA will easily occupy high value industries and at the same time will help to boost the nation economy.

Emotional Quotient

Bar-On (1997) describes emotional quotient as a collection of non-cognition, competence, and abilities that affect one's capacity to face environmental challenges. Khalid, Hamid, and Azhar (2005) contends that the emotional quotient allows students to encourage a successful reaction, respond and adjust to evolving environmental circumstances in order to gain progress in places they are interested. Universities can concentrate on improving the student's whole identity, including academic, emotional and social skills to support learners in their potential activities (Seal, Naumann, Scott, & Royce-Davis, 2011). Goleman (1998) stress that IQ contributes just around 20% of life performance, while Emotional Quotient (EQ) contributes another 80%. Individuals are said to have some emotional capacity to improve thinking effectively than

others (Rastegar & Karami, 2013). Analysis also found that employers favor graduates with higher emotional quotient ratios. By becoming emotionally quotient, learners can develop self-awareness , self-management abilities in terms of mood, and use their feelings to self-motivate and strive towards reaching objectives (Jameson, Carthy, McGuinness, McSweeney, & Sciences, 2016).

Spiritual Quotient

Zohar (2007) describe spiritual quotient as knowledge to face and reveal the sense and significance issue. The spiritual quotient guides human activity and existence to comply with the wider sense background, particularly in evaluating and doing more substantive acts than others. Salovey and Mayer (1990) and Goleman (2001) states that high spiritual quotient levels render an individual more successful and willing to absorb all social issues around him. Meanwhile, Wiggles Worth (2004) indicates spiritual intelligence is one of the main influences in maximizing student achievement. This result also confirms results from Arbabisarjou, Raghib, Moayed, and Rezazadeh (2013) studies that strongly impact students who show emotional and spiritual quotient achievement. They also mention spiritual quotient having more impact on accomplishment than emotional quotient. Skilled students therefore ought to follow a more spiritual lifestyle that might help them face difficult life circumstances. Pursuing a spiritual quotient allows an individual to empty from the mind all unpleasant thoughts and disturbances and lets one develop a constructive attitude towards nagging life circumstances.

Hypothesis Development

Over the past decades, study has centered primarily on skills that labor market graduates need (Balcar, 2016; Eshet, 2004). An individual's general skills consist of two sets of variables, i.e. analytical and physical strengths (Robbins & Judge, 2007). The current condition demonstrates that graduates are constantly faced with multiple obstacles and face fact either by taking lower-level jobs or non-competent professions (Clarke, 2017). Inflammatory feelings and disturbances from one's mind, helping one develop a constructive outlook about life circumstances. Therefore, this study proposes the following hypotheses;

Hypotheses 1 (H1): There is a significant effect between abilities and graduate's attributes.

Khalid et al. (2005) contends that emotional quotient allows students to respond appropriately, adjust, and react to evolving environmental conditions to gain performance in environments where they are active. Emotional quotient is essential for emotional self-control and internal desires as it allows a person to maintain their impulse and react to it at the right moment, to self-encourage when facing challenges and difficulties (Sitsira-at, 2020). Emotional quotient plays a critical function in graduate qualities.

Hypotheses 2 (H2): There is a significant effect between emotional quotient and graduate's attributes.

Knowledge relates to factual or procedural data needed to perform a job effectively (Daud et al., 2011). Hurd, Beaven, and Ortega (2001) and Fisher, Chaffee, Tetrick, Davalos, and Potter (2017) suggest that students need a way to bring their expertise in the classroom to practice and improve their mastery of the curriculum, thereby enhancing their readiness for work in the field.

Hypotheses 3 (H3): There is a significant effect between knowledge and graduate's attributes

Skills represent the application of knowledge which is the ability to perform tasks and solve problems (Halász & Michel, 2011). Some research also shown a gap between the skills students learn through their research and the skills employers require (Moalosi, Oladiran, & Uziak, 2012). Equipping students with required generic skills is much more challenging than deciding if they have skills (Felder & Brent, 2003). Skill plays crucial functions in graduates attributes.

Hypotheses 4 (H4): There is a significant effect between skills and graduate's attributes.

SQ is the foundation of personal beliefs and has a significant role in individuals' reactions and forming their lives (Sisk, 2002). Zohar (2007) consider SQ as the most important attribute for graduate and a foundation for both IQ and EQ

Hypotheses 5 (H5): There is a significant effect between spiritual quotient and graduate's attributes

Method
A cross-sectional sampling was used to gather data using questionnaires at a given period. This study also employed snowball and quota sampling techniques. The unit of analysis in this study was the graduates from university in Malaysia. A total of 600 questionnaires have been given out to chosen universities, public and private. A total of 327 eligible questionnaires were obtained yielding 54.5% response rate.

The measurement scales used in the questionnaire comprised items representing knowledge, skill, ability, emotional quotient, and spiritual quotient. Questions for Knowledge, Skills and Ability is adopted from (Daud et al., 2011), emotional quotient is measured by adopting emotional quotient inventory (EQ-i) from Goleman (2001), Bar-On (2004), Ishak, Iskandar, and Ramli (2010), and Lee (2014), and spiritual quotient is measured by adopting Spiritual Intelligence Self-Report Inventory (SISRI) from DeCicco (2009), and LindaS (2011). All items used in this questionnaire were tested using a five-point Likert scale ranging from 1 = "strongly disagree" to 5 = "strongly agree" to estimate the level of agreement or disagreement of the respondents with each statement in the questionnaire.

For data analysis, in evaluating the important graduate attribute, IBM SPSS Statistics version 24 was used for descriptive analysis, and in addition, SmartPLS version 3.2.7(Ringle, Wende, & Becker, 2015) was also used to conduct Structural Equation Modeling (SEM). PLS-SEM is used for predictive and reflective research. PLS-SEM is also used to approximate the measurement model (Hair, Sarstedt, Ringle, & Gudergan, 2017).

Findings
Demographic Profile
Of 327 respondents holding bachelor's degree in selected private and public university, 63.0% are females and 37.0% are males. The Malay and Malaysian citizen dominated the survey with 240 respondents (73.4%), and (93.9%) respectively. In terms of years of study, highest numbers of respondents are from third year with a total of 193 respondents (59%). In terms of the discipline of study, majority of the respondents studied Social Sciences, with 199 respondents (60.9%), followed by Art and Applied Arts with 80 respondents (24.5%), and Technology and Engineering, with 40 respondents (12.2%). The demographic profile of respondents is presented in Table 1.

Table 1: Demographic profile of respondent

Variables	Category	Frequency	Percentage
Gender	Male	121	37
	Female	206	63
Race	Malay	240	73.4
	Chinese	27	8.3
	Indian	36	11
	Others	24	7.3
Nationality	Malaysian	307	93.9
	Non-Malaysian	20	6.1
Year of Study	First Year	9	2.8
	Second Year	74	22.6
	Third Year	193	59
	Fourth Year	51	15.6
Field of Study	Pure Science	2	0.6
	Applied Science	5	1.5
	Technology and Engineering	40	12.2
	Social Science	199	60.9
	Art and Applied Arts	80	24.5
	Natural Sciences and National Heritage	1	0.3

4.2 Measurement model analysis

Evaluating the measurement model revolve first analyzing the validity and reliability. Convergent validity is analyzed for validity and it sustains that the indicators of a variable are positively correlated with it. Therefore, the Average variance Extracted (AVE) must surpass 0.500 (Ali, Rasoolimanesh, Sarstedt, Ringle, & Ryu, 2018; Hair, Risher, Sarstedt, & Ringle, 2019; Rasoolimanesh, Ringle, Jaafar, & Ramayah, 2017). Table 2 shows that the AVE is less than 0.500, however, the AVE is still accepted, as according to Fornell and Larcker (1981) and Lam (2012), if CR is more than the recommend value (0.600), AVE which is less than 0.500 is accepted.

In terms of discriminant validity in this analysis, correlation ratio Heterotrait-Monotrait (HTMT) is tested. This method reveals the real connexion of two latent variables. To gain distinguishing validity, HTMT ratio values must be below than 0.85 (Henseler, Ringle, & Sarstedt, 2015). This study therefore concludes that the measurement model has established its discriminant validity since all values in Table 3 are lower than 0.85.

Table 2: Reliability and Validity Result

Construct	Items	Loadings	CR	AVE
Knowledge	K1	0.739	0.853	0.455
	K2	0.736		
	K3	0.675		
	K4	0.625		
	K5	0.716		
	K7	0.607		
	K9	0.611		
Skills	S5	0.617	0.902	0.507
	S14	0.660		
	S15	0.738		
	S16	0.720		
	S17	0.768		
	S18	0.707		
	S19	0.786		
	S20	0.739		
	S21	0.659		
Abilities	A1	0.716	0.899	0.497
	A2	0.641		
	A3	0.682		
	A4	0.727		
	A5	0.728		
	A6	0.723		
	A7	0.684		
	A8	0.694		
	A9	0.747		
Emotional Quotient	EQ2	0.662	0.883	0.459
	EQ9	0.627		
	EQ10	0.636		
	EQ13	0.717		
	EQ14	0.648		
	EQ15	0.755		
	EQ16	0.790		
	EQ17	0.619		
	EQ21	0.617		
Spiritual Quotient	SQ4	0.656	0.915	0.452
	SQ7	0.628		
	SQ8	0.711		
	SQ10	0.620		
	SQ11	0.673		
	SQ12	0.764		
	SQ13	0.640		
	SQ14	0.643		
	SQ15	0.684		
	SQ16	0.728		
	SQ19	0.628		
	SQ23	0.686		
	SQ24	0.666		

Table 3: HTMT result – Discriminant validity

	Abilities	Emotional Quotient	Knowledge	Skills	Spiritual Quotient
Abilities					
Emotional Quotient	0.783				
Knowledge	0.786	0.634			
Skills	0.778	0.669	0.778		
Spiritual Quotient	0.568	0.699	0.569	0.525	

Lastly for reliability, for indicator reliability, after dropping out values which are less than recommended value of 0.600, all the item loadings than surpass the recommended value of 0.600 (Hair, Matthews, Matthews, & Sarstedt, 2017). Next, for internal consistency, CR was used to assess internal consistency and it should be >0.700 for each variable (Hair, Matthews, et al., 2017). Interestingly, CR values for all the constructs are above 0.700 (see Table 2).

Structural model analysis
This analysis is intended to recognize the essential graduates' attributes. Each indicator's weight reveals the relative value, and loading is the total value that can be tested by bootstrapping. Bootstrapping includes instances with at least equivalent numbers to the initial study observation. Next, the path coefficient and t-statistics value is analyze by running bootstrapping procedure in PLS-SEM (Hair et al., 2019). Lohmöller (1989), suggested indicator weight > 0.1. Results show that the route coefficient is over 0.1 recommended. Path coefficient reflects the intensity and orientation of the component interaction. If the direction coefficient is positive, implying a positive impact when a negative benefit is opposed to the negative result.
As present in Table 4 below, the path coefficient shows that all variable has a positive path coefficient which indicate that the variable use in measuring the graduate attribute have positive influence. The important attributes are spiritual quotient (0.369), skills (0.257) and abilities (0.259) (refer Figure 1) are the top three most important attributes for graduates in Industry 4.0. The results of the current research show that R^2 values for graduates attributes was 0.738 which is acceptable as suggested by Cohen (1988). Additionally, study model predictive relevance was evaluated by Q^2, also known as Stone-Geisser's. Centered on blindfolding, Q^2 evaluates a model's predictive validity through PLS. Q^2 values 0.244 higher than 0 demonstrated predictive significance for a certain endogenous construct (Cohen, 1988) (see Table 4).

Table 4: Bootstrapping Results

| Hypothesis	Path Coefficient	Standard Deviation	T-Value	Decision	R^2	Q^2
Abilities -> Graduate Attributes	0.259	0.022	11.738**	Accepted	0.738	0.244
Emotional Quotient -> Graduate Attributes	0.181	0.019	9.466**	Accepted		
Knowledge -> Graduate Attributes	0.158	0.017	9.273**	Accepted		
Skills -> Graduate Attributes	0.257	0.020	12.722**	Accepted		
Spiritual Quotient -> Graduate Attributes	0.369	0.023	16.354**	Accepted		
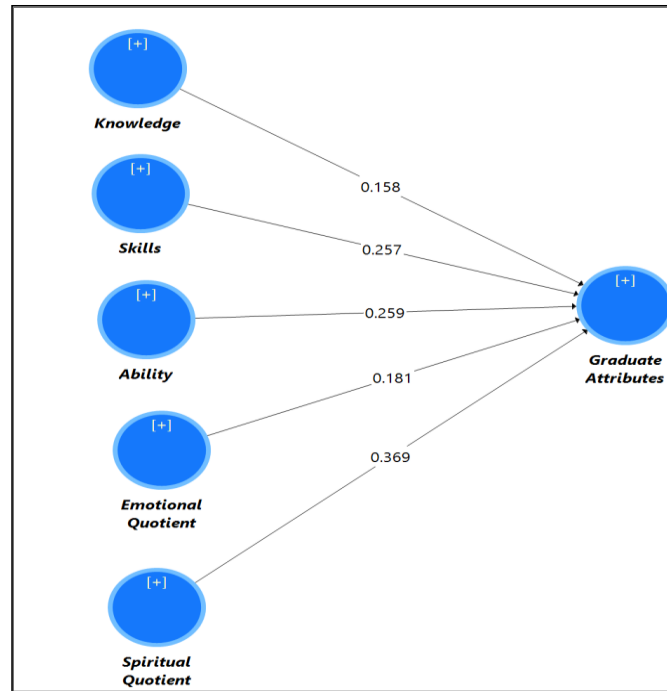
Figure 1: Structural Model

Importance performance matrix (IPMA)

This section extends the results of the study by employing the importance performance matrix analysis (IPMA) focusing on graduate attributes as the target variable. The aim of this test is not only to classify predictors relatively significant to the goal criterion, but also those with relatively low output (Ringle & Sarstedt, 2016). As in Figure 2 below, IPMA can be split into four partitions. This plot classifies characteristics in four classes or quadrants to prioritise scarce resource distribution. Usually, the four quadrants are identified as 'keep up the good work' (Q1), 'possible overkill'(Q2),' 'low priority'(Q3) and 'concentrate here'(Q4) (Figure2).
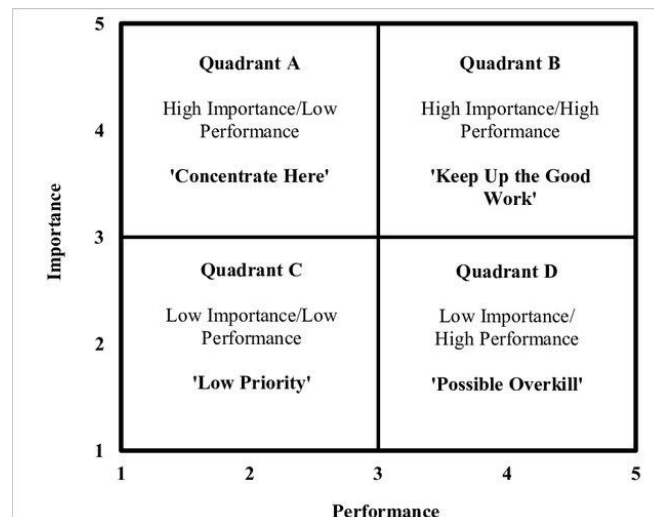

Figure 2: Partition of IPMA
Source: Martilla and James (1977)

For this study, the importance performance matrix are mapped as in Figure 3 below, all five attributes are mapped based on the four quadrant, where three attributes, ability, skills and

spiritual quotient falls under the "keep up the good work" quadrant (high importance, high performance). This shows that the universities have prepare graduates with the right attributes in facing industry 4.0. Meanwhile, the other two attributes (emotional quotient and knowledge), falls under "concentrate here" quadrant (high importance, low performance). For these attributes, universities, need to improve the graduates emotional quotient and knowledge to meet with the Industry 4.0 requirement, for example, prepare graduates with knowledge on technology, and as for emotional quotient universities should include emotional quotient in the curriculum.
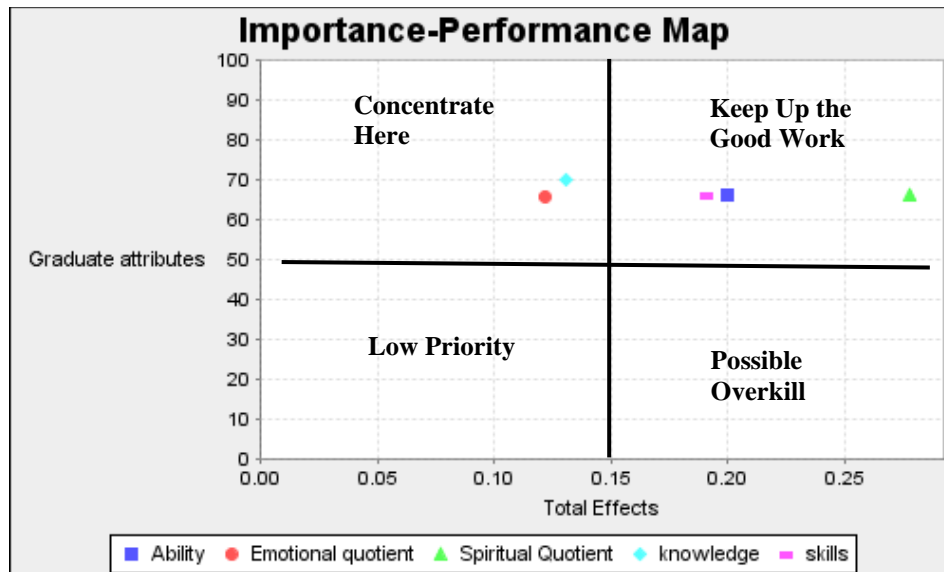

Figure 3: Importance Performance Map (IPMA)

Discussion and Conclusion

In the age Industry 4.0, it is essential for graduates to be acquainted with high knowledge, skills and abilities. This study is primarily aimed to identify the importance attributes among graduates in selected public and private university in Malaysia. As present in the result above the important graduates attributes are spiritual quotient, skills and ability, this is similar with findings by Hossein, Zeynab, and Hamideh (2017), (Daud et al., 2011), Ewan, Zamri, Mistima, Adila, and Rina (2018), Kotnala (2014), who also suggest that spiritual quotient, skills and abilities are one of the importance attributes for graduates. At the same time, graduates also must possess high emotional in order for them to be able face the challenges in the industry. As one's success in life does not depend solely on intellectual intelligence. The inclusion of a focus on emotional quotient and spiritual quotient as part of the program can contribute to a number of positive personal, social and societal outcomes. Growing emotional quotient and moral quotient can not only enhance the learning process, boost career choice and probability of achievement, but may also increase the probability of improved personal and social adaptation overall. Thus, today's curriculum can provide emotional quotient and moral quotient to equip students with skills for complex global challenges.

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