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The Use of Fuzzy Delphi Method in Developing Soft Skills of Industrial Revolution 4.0 In Pdpc at Malaysian Institute of Teacher Education

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Abstract

The Fourth Industrial Revolution (IR4.0) is based on simulation technology, industrial Internet of Things (IoT), systems integration, cybersecurity, cloud computing, additive manufacturing, reality augmentation systems, big data analytics, and robotic process automation. All these technologies are responsible for replacing human tasks via machines and robotic augmentations. However, the implementation of IR4.0 is hindered by various issues, such as the soft skills gap among the employees, the lack of job marketability and soft skills competency that are in line with the job scopes required for IR4.0 as well as the lack of readiness to embrace changes. All these confounding factors also resulted in graduate unemployment. On top of that, the effectiveness of soft skills implementation in PdPc through the classroom setting can be brushed up. Another implication, as stated by the industrial employers, is the unsatisfactory performances and quality of graduates, and also deflation. As a consequence, these implications affect the country's economic development as a whole. Therefore, this study aims to develop the soft skills of graduates for IR4.0 through Teaching and Facilitating (PdPc) at the Malaysian Institute of Teacher Education (IPGM). The study was conducted by using the Fuzzy Delphi Method (FDM) to obtain experts consensus on the proposed dimensions. The study sample was selected by sampling that involves 17 field experts from various institutions. The data obtained were analysed according to the steps and

conditions set out by the FDM. This study confirmed the expert consensus on the key dimensions, including interpersonal relationship, creativity, decision-making, and leadership skills, in the development of soft skills for Industrial Revolution 4.0 in PdPc at IPGM. The findings of the study could help in designing the enhancement of soft skills specific for IR4.0 in PdPc at the IPGM, improving the national education system, supporting the Malaysian Education Blueprint (2013-2025), with the primary objective of reaching towards the National Transformation 2050 (2021-2050), and National Policy on Industry 4.0 that is the country's Industrial Revolution 4.0 Policy, in order to overcome unemployment issues and to improve the country's economy.

Keywords PdPc soft skills, industry revolution 4.0, Malaysian Institute of Teacher Education, interpersonal relationship, creativity, decision-making, leadership skills

Introduction

Background of Study

The definition of soft skills is always in synonym with transferable skills, emotional skills, generic skills, occupational skills, behavioural skills, business skills, competency skills, core skills, common skills, work skills, essential skills and crowd skills (Abdulllah et al., 2012: Salleh et al., 2010). Klaus research (2010) reported that 75% of success in employment depends on people skills while the remaining 25% rely on technical knowledge. Therefore, the lack of soft skills can negatively affect an individual's career opportunities, despite having individual and professional skills but no interpersonal qualities (Klaus 2010). In addition, Schwab (2016) stated that Industry Revolution 4.0 (IR4.0) had changed how we live and work. These changes are driven by three key technology domains; physical, digital and biological domains, which cut across nine pillars of IR4.0. These nine pillars are simulation and virtual reality, vertical and horizontal system integration, industrial Internet of Things, cybersecurity, cloud computing, additive manufacturing, supply chain, big data analytics, and robotic process automation. Engtoft Larsen (2018) added that the catalyst of IR4.0 in the manufacturing sector is generally based on advances in autonomous robots, big data, augmented reality, cloud computing, Internet of Things, 3D printing, cybersecurity, simulation, and digital system integration.

Concurrently, in Budget 2018, Badrul Alias (2017) stated that the government aims to make Malaysia a high-income economy by 2020, with current economic and trade value to grow to RM2 trillion by 2025 and to enjoy the benefits of IR4.0 significantly by 2030. Badrul Alias (2017) also stated that the government aims for every student to be proficient in soft skills to produce competent students and excellent human capital. This objective aligns with the government's vision under the Malaysian Education Development Plan (2013-2025).

In the higher education system, Ahmad (2017) stated that in facing the challenges of IR4.0, university students at the tertiary education level must step out of their comfort zone. This urge aligns with the importance of mastering the 4C elements as outlined by the World Economic Forum (WEF) at all levels of learning, including tertiary, which focus specifically on critical thinking and problem solving, communication, collaboration, and creativity. While schools emphasise Higher Order Thinking Skills (HOTS), students at the tertiary level should master the 4C elements in every aspect of their lives. Therefore, it is high time that academic administration in higher education institutes adjusts the current curriculum to meet the challenges of IR4.0. For example, Universiti Malaysia Sarawak, Center for Quality Assurance

and Academic Development (2018), in its Summary Information, reported changes in its academic programmes according to the criteria of IR4.0. The changes included modifications to programme structure, course content, implementation of teaching and learning activities, course assessment and evaluation methods, and IR4.0 technologies in teaching and learning activities.

Statement of Problem

The need to provide soft skills development and training is crucial. However, the implementation of soft skills teaching is highly challenging (Taylor, 2016) and more complicated than teaching academic or hard skills. Furthermore, the implementation of soft skills in the classroom can be improved (Taylor, 2016), and the effectiveness of soft skills teaching also can be enhanced (Groh et al., 2016). Additionally, difficulties in assessing changes in soft skills or lack of expertise have been issues and bottlenecks in the development efforts (Groh et al., 2016). Thus, the capability of educators in mastering the knowledge of soft skills needs to be improved as it directly impacts the students under the existing education system.

The lack of soft skills has been recognised as one of the main factors which cause the high unemployment of graduates of higher learning institutions (Amiruddin & Zainudin, 2015). The Future of Jobs Report lists complex problem-solving, critical thinking, creativity, human management, and coordination with others among the 10 most essential skills by 2020 (World Economic Forum, 2016). In general, these skills are identified as part of soft skills. A study by Cotet et al. (2017) stated several dimensions of soft skills in IR4.0 and included creativity. Hence, it is necessary to have relevant soft skills to meet the requirements for future employment. The competency approach of human resource management is not only about employee-specific skills, IQ level or academic achievement. Instead, the process of recruitment, evaluation, development and planning, soft skills is essential to ensure an individual's marketability and job performance (Balcar, 2014) in achieving the set productivity goals.

Among the human capital and IR4.0 related issues outlined by Sung (2018) are skills gap, threats to the less skilled workforce, and change aversion. Thus, every organisation needs to be vigilant and take appropriate measures, especially in identifying and shaping significant human capital in IR4.0. Furthermore, Kamaruddin (2019) stated that IR4.0 demands all parties to act quickly alongside the rapid development of technological products and intelligent automation systems, without boundaries separating technology and biological systems such as humans. There is a two-way relationship between humans and electronic equipment, which makes humans part of technology. Some examples that can elaborate this statement are robotic technology operating in the same environment as humans, cybersecurity protecting data and minimising risks, 3D printing facilitating the development of prototypes, Virtual Reality providing virtual visual information, and Big Data Analytics producing more accurate projections.

Consequently, there is a need for highly skilled and creative workers (soft skill), while low-skilled workers are replaced with robots that do not require a large labour force. In education, Shahroom and Hussin (2018) claimed that IR4.0 had changed the technological landscape through the Digital Age. As a result, new technologies have been created that have not been mastered by employees. Therefore, universities need to continuously anticipate and be well prepared for shifts in skills (including soft skills) and new knowledge.

Purpose of the Study

The main purpose of the study is to develop the soft skills of IR4.0 in PdPc at the Malaysian Institute of Teacher Education (IPGM).

Objectives of Research

The specific objectives of this research are

1. To develop the soft skill of IR4.0 in PdPc at the IPGM, namely the dimension of interpersonal relationship.
2. To develop the soft skill of IR4.0 in PdPc at the IPGM, namely the dimension of creativity.
3. To develop the soft skill of IR4.0 in PdPc at the IPGM, namely the dimension of decision-making.
4. To develop the soft skill of IR4.0 in PdPc at the IPGM, namely the dimension of leadership skills.

Literature Review on Previous Studies

According to Ahmad (2017), skill dimensions in the IR4.0 outline readiness in facing the challenges of IR4.0. University students need to consider honing their complex problem-solving skills because the nine pillars of IR4.0 are complex. In addition to technical knowledge, charisma and innovative leadership are the ingredients to successful teamwork and constant creativity. Furthermore, skill dimensions in the IR4.0 incorporate all generic skills, including thinking skills (Salih, 2008).

There are seven soft skills, namely communication skills, critical thinking and problem-solving skills, teamwork skills, lifelong learning, entrepreneurial skills, professional ethics and morals, as well as leadership skills (Salih, 2008; Shakir, 2009; Zakaria et al.,2017). These skills should be integrated with various teaching and learning programmes and activities (including curricular and co-curricular elements). This initiative is in line with the WEF that outlines the importance of mastering the 4C elements, namely critical thinking and problem-solving, communication, collaboration and creativity at all levels of learning, including tertiary education. Since the basis of schools is HOTS, university students need to master the 4C elements in every aspect of their lives.

The importance of soft skills in this millennium enables employees to drive change in organisations (Massaro et al., 2016). Backed by Petrillo et al. (2018), professional development for future jobs is vital at the school level (work transition). Therefore, it is not only important to strengthen technical skills but also to improve soft skills. Furthermore, the collaboration between the university and companies is essential to keep up with the industry needs and challenging working environment.

The demand of the labour market in Africa for future work requires a wide range of skills and experience, as prescribed by companies, where these skills include soft management and social skills (Frey et al., 2016).

The findings of a study by Ilias & Ladin (2018) are alarming. They demonstrated that knowledge and understanding of IR4.0 among Malaysia's public universities (IPTA) students are still at a moderate level. Additionally, the importance of soft skills in facing the Industrial

Revolution 4.0 is explained in a study by Ramli et al. (2018), which identified the relationship between employability skills of Agricultural Vocational College students and readiness to face IR4.0. The study is based on the nine domains of Schultz's theory of human capital, namely communication skills, teamwork skills, leadership skills, entrepreneurial skills, ethical and moral skills, technology and information skills, social skills, critical thinking and problem-solving skills, as well as spirituality. The findings showed a significant relationship between employability skills and readiness in facing the challenges of IR4.0. Thus, it is hoped that this empirical study can guide technical and vocational educators to improve students' employability skills and expose them to IR4.0.

In general, the model of this study is based on a combination of the dimensions from the soft skills of the Ministry of Higher Education Malaysia (KPTM) (Badusah et al., 2019 and 2009), soft skills of IR 4.0 (Cotet et al., 2017; Nikitina & Furuoka, 2012; Salih, 2008; Shakir, 2009; Zakaria et al.,2017; World Economic Forum, 2016; Center for Future-Ready Graduates, 2017; Gray, 2016: HR Vision Content Hub (n.d): Ilias & Ladin, 2018; Irianto, 2017; Career FAQS, 2016; BRICS Skill Development Working Group, 2016), soft skills in the 21st Century (Soffel, 2016: Abdul Majid et al., 2017; Trillling & Fadel, 2009) and Elements of 4C (critical thinking, creativity, communication and collaborative) and 1N (Values and ethics) (IAB, 2017).

Research Methodology

This study used the survey method and Fuzzy Delphi Method (FDM) to collect data, as used in studies of Borhan et al. (2021) and Anak Wan et al. (2021). In developing the instruments of soft skills of IR4.0 in PdPc at IPGM, the study included interpersonal relationships, creativity, decision-making skills and leadership skills. On the other hand, a questionnaire was designed based on instruments reported in Alang Osman (2016), Cecilia et al. (2017), Ginting (2016); Osmana et al. (2010) and Marjorie et al., (2015).

A panel of 17 experts were selected for this study. The number of experts was chosen based on Jones and Twiss (1978), who suggested that the optimal number of experts for the Delphi Method to be between 10 to 50 experts, while Burn (1998) indicated that 15 experts are sufficient. The FDM is an analysis technique in decision-making, combining fuzzy theory with the traditional Delphi Method (Murray & Hammons, 1995). The Delphi Method was developed by Dalkey dan Helmer (1963) and is widely used to obtain a consistent response from questionnaires.

As one of the decision-making methods (Linstone & Turoff, 2002), the Delphi Method has several iterations of anonymous questionnaires with controlled feedback to obtain opinions from experts. According to Okoli and Pawlowski (2004), when a panel of experts is given information to formulate an opinion, they reach a logical consensus by focusing on relevant issues. Therefore, the Delphi Method is a suitable approach and better than the response from one expert only. Furthermore, Murry and Hammons (1995) stated that a panel of experts from various locations could benefit from gathering diverse thoughts and opinions compared with a panel of experts from the same location.

For this study, which is in phase 2 of FDM, a panel of 17 experts were selected from public universities, Institutes of Teacher Education, District Education Office, and the Board of Inspectors, all of whom are from Malaysia. These experts have expertise in Educational Management, Education, Social Sciences, Science, Mathematics, and Technology. They were selected to obtain varied and comprehensive opinions, with each of them has a doctorate degree

(PhD) and teaching experience of at least 5 years (Berliner, 2004).

Instruments For Fuzzy Delphi Method

The questions consisted of items on a seven-point Likert-type scale: Extremely Disagree, Strongly Disagree, Disagree, Partially Agree, Agree, Strongly Agree and Extremely Agree, to obtain expert consensus on the items. The seven-point scale was selected as the structure of the questionnaire because it is the best approach for questionnaires to be used in usability evaluations (Finstad, 2010). The instrument consists of two parts: the first part was demographics, while the second part was a set of questions on development activities of soft skills of IR4.0 in PdPc, which are interpersonal relationships, creativity, decision-making, and leadership skills.

The FDM processes applied in this study are as follows:

1. Experts were selected and invited to participate in the survey.
2. To address the issues of vague views and recommendations by the experts, a scale was designed to determine the respondents' feedback.
3. Experts responded with a scale number of their opinion on a given model. The response was then stored in Excel.
4. The difference between the expert evaluation data and the mean value of each item, which was the threshold value (d), was calculated using the following formula:

$$d\left(\tilde{m},\tilde{n}\right)=\sqrt{\frac{1}{3}\left[\left(m_1-n_1\right)^2+\left(m_2-n_2\right)^2+\left(m_3-n_3\right)^2\right]}.$$

Based on the formula, "m1", "m2" and "m3" are the mean values of all expert opinions, while "n1", "n2", and "n3" are the fuzzy value of the overall mean of each participant. The following section reports the analysis of the FDM. In this analysis, the report was divided into 2 parts: i) Triangular Fuzzy number and ii) Average Defuzzificatioi. Triangular Fuzzy numberThreshold Value (d) ≤ 0.2The first condition is that the threshold value must be equal to or less than 0.2. In the context of this research, three decimal points were used. Every item which threshold value is 0.3 and smaller is considered as consensus by the experts was achieved. To determine the threshold value (d), the following formula was used:

$$d\left(\tilde{m},\tilde{n}\right)=\sqrt{\frac{1}{3}\left[\left(m_1-n_1\right)^2+\left(m_2-n_2\right)^2+\left(m_3-n_3\right)^2\right]}.$$

Percentage of experts' consensus ≥ 75%

The second condition is the percentage of expert consensus. This condition is based on the traditional Delphi Method, where the percentage value was determined based on the number of items with a threshold value (d) of 0.3 and less. This means that every item with a threshold value (d) equal to 0.2 and less is accepted and converted to a percentage based on the traditional Delphi Method.

1. ii.Defuzzification value
2. Fuzzy Score (A) ≥ α - cut value = 0.5

The third condition, the value of fuzzy score (A), is based on the α-cut value of 0.5. If the fuzzy score (A) value is less than 0.5, it means that the item has not gained consensus from the experts. If the value is equal to 0.5 and above, it means that it has gained consensus from

the experts. In addition, the process of sorting the items to determine their importance could be carried out according to the fuzzy value (A), where the item with the highest fuzzy score (A) is placed first. The formula to obtain the fuzzy score (A) is as follows: A = (1/3)*(m1 + m2 + m3).

Research Findings

Table 1 shows the mean values of the interpersonal relationship dimension, which has 8 activities. Sub-activity 1.8: "Sharing responsibilities in completing learning tasks" has a threshold value (d) of 0.108, with an expert consensus percentage of 88.0. The mean of each row of sub-activity 1.8 were 0.794 (m1), 0.935 (m2) and 0.988 (m3), respectively, with the fuzzy score (A) of 0.906. Based on the conditions by the FDM, the sub-activity 1.8 is acceptable and is placed in the first position, as the threshold value (d) was 0.108, which was lower than 0.20. The percentage of expert consensus was 88.0, and the fuzzy score (A) was 0.906, which was higher than 0.5.

Sub-activity 1.1: "Collaborating with peers in building a professional learning community" has a threshold value (d) of 0.198, with an expert consensus percentage of 94.0. The mean of each row of sub-activity 1.1 were 0.700 (m1), 0.853 (m2) and 0.947 (m3), respectively, with the Fuzzy score (A) of 0.833. Based on the conditions by the FDM, the threshold value (d) was 0.198, which was lower than 0.20. The percentage of expert consensus was 94.0, which was higher than 75.0. The Fuzzy score (A) was 0.833, which was higher than 0.5, indicating that sub-activity 1.1 is acceptable.

$$d\left(\tilde{m},\tilde{n}\right)=\sqrt{\frac{1}{3}\left[\left(m_1-n_1\right)^2+\left(m_2-n_2\right)^2+\left(m_3-n_3\right)^2\right]}.$$

$$d\left(\tilde{m},\tilde{n}\right)=\sqrt{\frac{1}{3}\left[\left(m_1-n_1\right)^2+\left(m_2-n_2\right)^2+\left(m_3-n_3\right)^2\right]}.$$

Table 1 *Key Dimension 1: Interpersonal Relationship*

No	Elements	Triangular Fuzzy Numbers		Defuzzification value				Position	Expert consensus
		Threshold Value (d)	Percentage of expert consensus (%)	m_1	m_2	m_3	Fuzzy Score (A)		
1	Collaborating with peers in building a professional learning community	0.198	94%	0.700	0.853	0.947	0.833	7	Accepted
2	Effectual collaboration skills in PdPc	0.129	76%	0.735	0.894	0.976	0.869	5	Accepted
3	Ability to work in groups	0.129	76%	0.735	0.894	0.976	0.869	5	Accepted
4	Respecting group members with different opinions	0.142	76%	0.771	0.912	0.976	0.886	4	Accepted
5	Ability to adapt to various situations when making decisions in a group	0.125	82%	0.782	0.924	0.982	0.896	2	Accepted
6	Appreciating the contribution of every group member	0.125	82%	0.782	0.924	0.982	0.896	2	Accepted
7	Respecting the cultural differences of group members	0.212	82%	0.741	0.876	0.935	0.851		Rejected
8	Sharing responsibilities in completing learning tasks	0.108	88%	0.794	0.935	0.988	0.906	1	Accepted

Table 2 *Key Dimension 2: Creativity*

		Triangular Fuzzy Numbers		Defuzzification value				Position	Expert consensus
No	Elements	Threshold value (d)	Percentage of expert consensus (%)	m_1	m_2	m_3	Fuzzy score(A)		
1	Using creativity and innovation in learning	0.125	82	0.794	0.929	0.982	0.902	1	Accepted
2	Sharing input creatively and innovatively during PdPc in the classroom	0.125	82	0.782	0.924	0.982	0.896	2	Accepted
3	Using elements of creativity in the learning process	0.125	82	0.782	0.924	0.982	0.896	2	Accepted
4	Using specific methods (SWOT analysis etc.) in problem-solving during PdPc	0.132	71	0.793	0.927	0.980	0.900		Rejected

Table 2 shows the mean values of the creativity dimension, which has 4 activities. Sub-activity 2.1: "Using creativity and innovation in learning" has a threshold value (d) of 0.125, with an expert consensus percentage of 82.0. The mean of each row of sub-activity 2.1 were 0.794 (m1), 0.929 (m2) and 0.982 (m3), respectively, with the fuzzy score (A) of 0.902. Based on the conditions by the FDM, sub-activity 2.1 is acceptable and is placed in the first position due to the threshold value (d) of 0.125, which was lower than 0.20. The percentage of expert consensus was 82.0, and the fuzzy score (A) was 0.902, which is higher than 0.5.

Sub-activity 2.2: "Sharing input creatively and innovatively during PdPc in the classroom" has a threshold value (d) of 0.125, with an expert consensus percentage of 82.0. The mean value of each row of sub-activity 2.2 were 0.782 (m1), 0.924 (m2), and 0.982 (m3), respectively, with the fuzzy score (A) of 0.896. Based on the FDM conditions, with the threshold value (d) of 0.125 where it was lower than 0.20, the percentage of expert consensus was 82.0, which was higher than 75.0. The fuzzy score (A) was 0.896, which was greater than 0.5. This result indicated that sub-activity 2.2 is acceptable.

Sub-activity 2.3: "Using elements of creativity in the learning process", has a threshold value (d) of 0.125, with an expert consensus percentage of 82.0. The mean value of each row of sub-activity 2.3 were 0.782 (m1), 0.924 (m2), and 0.982 (m3), respectively, with the fuzzy score (A) of 0.896. Based on the conditions by the FDM, sub-activity 2.3 is acceptable because the threshold value (d) was 0.125, which was lower than 0.20. The percentage of expert consensus was 82.0, which was higher than 75.0, and the fuzzy score (A) was 0.896, which was greater than 0.5.

Table 3 *Key Dimension 3: Decision-Making*

No	Elements	Triangular Fuzzy Numbers		Defuzzification value				Position	Expert consensus
		Threshold value (d)	Percentage of expert consensus (%)	m_1	m_2	m_3	Fuzzy score (A)		
1	Practicing learning using the problem-solving approach	0.147	82	0.771	0.912	0.971	0.884	8	Accepted
2	Connecting the courses to the realities of daily life	0.128	88	0.806	0.935	0.976	0.902	1	Accepted
3	Using various problem-solving strategies	0.133	82	0.800	0.931	0.975	0.902	2	Accepted
4	Debating using a variety of (inductive, deductive etc.) appropriate to the situation	0.130	82	0.763	0.913	0.975	0.883	9	Accepted
5	Making judgement in resolving an issue effectively	0.130	88	0.782	0.924	0.976	0.894	4	Accepted
6	Synthesizing using appropriate information and arguments	0.149	82	0.782	0.918	0.971	0.890	6	Accepted
7	Analyzing an alternative point of view	0.134	82	0.788	0.925	0.975	0.896	3	Accepted
8	Solving various types of problems in the conventional way	0.287	24	0.663	0.813	0.900	0.792		Rejected
9	Solving various types of problems in an innovative way	0.147	76	0.750	0.900	0.969	0.873	10	Accepted
10	Identifying and asking questions and opinions to get to the best solution	0.154	76	0.788	0.919	0.969	0.892	5	Accepted
11	Ability to use past experience in decision-making	0.197	82	0.753	0.888	0.947	0.863	11	Accepted
12	Ability to identify problems when facing difficulty	0.262	88	0.706	0.847	0.918	0.824		Rejected
13	Ability to describe a problem when facing difficulty	0.259	41	0.694	0.841	0.918	0.818		Rejected
14	Reflecting critically on a problem	0.128	88	0.771	0.918	0.976	0.888	7	Accepted

Table 3 shows the mean values of the decision-making dimension involving 14 activities. Sub-activity 3.2: “Connecting the courses to the realities of daily life” has a threshold value (d) of 0.128, with an expert consensus percentage of 88.0. The mean of each row of sub-activity 3.2 were 0.806 (m1), 0.935 (m2) and 0.976 (m3), respectively, with the fuzzy score (A) of 0.902. Based on the FDM conditions, with the threshold value (d) of 0.128, which was lower than 0.20, the percentage of expert consensus was 88.0, which was higher than 75.0. The fuzzy score (A) = 0.902, which was higher than 0.5. Therefore, sub-activity 3.2 is acceptable and was placed in the first position.

Sub-activity 3.11: “Ability to use past experience in decision-making” has a threshold

value (d) of 0.197, with an expert consensus percentage of 82.0. The mean of each row of sub-activity 3.11 were 0.753 (m1), 0.888 (m2), and 0.947 (m3), respectively, with the fuzzy score (A) of 0.863. Based on the conditions by the FDM, with the threshold value (d) of 0.197, which was lower than 0.20, the percentage of expert consensus was 82.0, which was higher than 75.0. The fuzzy score (A) was 0.863, which was higher than 0.5. Therefore, sub-activity 3.11 is acceptable.

Table 4 *Key Dimension 4: Leadership Skills*

		Triangular Fuzzy Numbers		Defuzzification value				Position	Expert consensus
No	**Elements**	**Threshold value (d)**	**Percentage of expert consensus (%)**	**m_1**	**m_2**	**m_3**	**Fuzzy score (A)**		
1	Coordinating the group when there are too many ideas in the group	0.190	76	0.747	0.888	0.953	0.863	6	Accepted
2	Contributing to the group when there are very few ideas in the group	0.144	76	0.782	0.918	0.976	0.892	5	Accepted
3	Motivating group members in completing a task	0.125	82	0.794	0.929	0.982	0.902	3	Accepted
4	Identifying the strengths of group members in task distribution	0.103	88	0.818	0.947	0.988	0.918	1	Accepted
5	Coordinating work processes to ensure learning goals are achieved	0.103	88	0.818	0.947	0.988	0.918	1	Accepted
6	Successfully fostering the spirit of cooperation among group members	0.143	76	0.794	0.924	0.976	0.898	4	Accepted

Table 4 shows the mean values of the dimension of leadership skills involving 6 activities. The sub-activity 4.4: "Identifying the strengths of group members in task distribution", has a threshold value (d) of 0.103, with an expert consensus percentage of 88.0. The mean of each row of sub-activity 4.4 were 0.818 (m1), 0.947 (m2) and 0.988 (m3), respectively, with the fuzzy score (A) of 0.918. Based on the conditions by the FDM, with a threshold value (d) of 0.103 where the value (d) was lower than 0.20, the percentage of expert consensus was 88.0, which was higher than 75.0. The fuzzy score (A) of 0.918 was higher than 0.5. Therefore, sub-activity 4.4 is acceptable and placed in the first position.

Sub-activity 4.5: "Coordinating work processes to ensure learning goals are achieved" has a threshold value (d) of 0.103, with an expert consensus percentage of 88.0. The mean of each row of sub-activity 4.5 is 0.818 (m1), 0.947 (m2) and 0.988 (m3), respectively, with the fuzzy score (A) = 0.918. Based on the FDM conditions, with a threshold value (d) of 0.103, which was lower than 0.20, the percentage of expert consensus was 88.0, which was higher than 75.0. The fuzzy score (A) of 0.918 was higher than 0.5. This result indicated that sub-activity 4.5 is acceptable and placed in the first position.

Sub-activity 4.1: "Coordinating the group when there are too many ideas in the group"

has a threshold value (d) of 0.190, with an expert consensus percentage of 76.0. The mean value of each row of sub-activity 4.1 were 0.747 (m1), 0.888 (m2), and 0.953 (m3), respectively, with the fuzzy score (A) of 0.863. Based on the conditions by the FDM, sub-activity 4.1 is acceptable due to the threshold value (d) of 0.190, which was lower than 0.20. The percentage of expert consensus was 76.0, which was higher than 75.0 and the fuzzy score (A) of 0.863, which was greater than 0.5.

Discussion and Conclusion

In this study, the FDM was used to develop the soft skills of IR4.0 in PdPc at the IPGM. There are 4 dimensions, namely interpersonal relationship, creativity, decision-making, and leadership skills. A total of 17 experts have participated in the workshop organised by the researchers to conduct the FDM research process. The analysis of the questionnaires in the FDM was based on the triangular fuzzy numbers and defuzzification process requirements. The triangular fuzzy numbers should respond to the threshold value (d), where the value (d) of each item should be equal to 0.2 or below. At the same time, the percentage of expert consensus should be equal to 75% or higher. In the defuzzification process, the condition is that the fuzzy score (A) needs to be equal to or greater than 0.5.

In the interpersonal relationship dimension, 7 out of 8 items were accepted in developing the soft skills of IR4.0 in PdPc at the IPGM. In the second dimension, i.e. creativity, only 3 out of 4 items were accepted. In the dimension of decision-making, 11 out of 14 items were accepted, while in the dimension of leadership skills, all 6 items were accepted. Based on the findings of the study of the four dimensions, all of them were accepted in the development of the soft skills of IR4.0 in PdPc at the IPGM. In the dimension of interpersonal relationship, sub-activity 1.8: "Sharing responsibilities in completing learning tasks" was in the highest position. In the dimension of creativity, the sub-activity in the first position was 2.1: "Using creativity and innovation in learning". In the dimension of decision-making, sub-activity 3.2: "Connecting the courses to the realities of daily life", was in the first position. While in the dimension of leadership skills, sub-activity 4.5: "Coordinating work processes to ensure learning goals are achieved" and sub-activity 4.4: "Identifying the strengths of group members in task distribution" ware in the first position.

This study implied that we would be able to overcome or reduce the problem of unemployment, and in turn, improve the country's economy in the era of Industry 4.0. This action is to achieve the goals of the Ministry of Human Resources. In addition, this study has also supported the Malaysian Education Blueprint (2013-2025). Furthermore, this study could also help in achieving the National Transformation 2050, which is the continuity of the country's development plan 2021-2050. The National Transformation 2050 aims to transform and empower the country's economy, social interaction and intellect.

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