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ORIGINAL ARTICLE

Applying the Delphi Technique in Developing the Employability Scale for Engineering Technology Graduates

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ABSTRACT
The employability scale is crucial in implementing graduates' employability measurement. The research group's previous study proposed applying the Delphi method to develop the employability scale for engineering technology graduates. This paper reports on exploiting the Delphi method in practice. The employability scale was proposed to cover 51 items in four constructs of technical knowledge, technical skills, generic skills, attitude and other attributes. The Delphi process involves 20 experts from industry employers and university lecturers in the two rounds to adjust the employability scale. In the first round, expert assessments were collected by using a three-point Likert scale. In the next round, the same experts were invited for a group interview to revise the first-round reports and concur on the modifying constructs and items. The expert responses were analysed by descriptive statistical techniques. After two rounds of expert feedback with the addition of 3 items, deletion of 2 items and adjustment of 23 items, the employability scale was updated to consist of four constructs with 52 items. It is recommended that further studies should validate this employability scale and measure the employability of graduates from a Vietnamese university.

1. INTRODUCTION

The development of a scale is one of four steps to implement psycho-social measurements (Wu et al., 2016). The previous study by Pham et al. (2023) proposed the employability scale with four first-order constructs: technical knowledge, technical skills, generic skills, attitude and other attributes. Scale revision aims to improve the scale's reliability and validity. This paper proposes second-order constructs and the implementation of feedback collection from experts to adjust the employability scale. Furthermore, employability scales were developed for university graduates in engineering (Yusof et al., 2012) or accounting (Senan & Sulphey, 2022), but these previously published studies are limited to the development of an employability scale for university graduates in engineering technology.

The Delphi technique plays a vital role in reaching agreements among experts (Green, 2014). Expert discussions allow the respondents to interact more, reconsider, and adjust their responses. Thus, taking expert feedback is necessary to make changes to the scale. The Delphi technique was applied in several studies in education (Tran et al., 2020; Vu & Dinh, 2021; Nguyen et al., 2023), but to the best of our knowledge, exploiting the Delphi technique to adjust the employability scale of graduates in engineering technology has been under-researched. The study aims to answer the following questions: What items are involved in the employability scale for engineering technology graduates from experts' perspectives?. This paper starts with the introductory part, which depicts the necessity of developing a measurement scale with the involvement of experts. The next part is a literature review that presents

previous studies on the employability scale to measure graduates' competence and the proposed employability scale for engineering technology graduates. Furthermore, the research methodology shows the study sampling, data collection and analysis. The fourth part is the study results and discussion. Finally, the conclusion summarises the study with the key results and shortcomings. It also provides suggestions for future studies.

2. LITERATURE REVIEW

This section aims to discuss the employability scale for engineering technology graduates. A reliable and valid employability scale was formed based on seven steps (Hinkin et al., 1997). Items creation and content adequacy assessment are the two initial steps in this seven-step process. Item generation can be conducted deductively or inductively, but the minimum number of items is required so that the domain of interest can be measured adequately. For each second-order construct, four or more items are gathered to ensure internal consistency (Hinkin et al., 1997). Content adequacy assessment can involve panelists. The questionnaire can be sent promptly to experts to collect assessments extensively, yet it provides a limited assessment of contents which are under conflict. Thus, qualitative interviews can be conducted as a follow-up activity to review the results of the previous step. Group discussions need to be implemented so that the group decision can be made.

From the previous studies (Zaharim et al., 2010; Park & Hill, 2018; Hossain et al., 2020; Leandro Cruz & Saunders-Smits, 2022; Pažur Aničić et al., 2023) and the authors' proposal, the employability scale was proposed to cover four first-order constructs and 11 second-order constructs (Table 1).

Table 1. The proposed employability scale

No.	First-order constructs	Second-order constructs	Items
1	Technical knowledge	1	7
2	Technical skills	1	5
3	Generic skills	5	21
4	Attitude and other attributes	4	18
	Total	11	51

Among 51 items are 47 items taken from previous studies and four items proposed by the authors from working experiences with graduates in engineering technology (Table 2).

Table 2. Scale items and their sources

Code	Items	Sources
I	**TECHNICAL KNOWLEDGE (KT-7 items)**	
KT_1	Demonstrate knowledge of basic science	Zaharim et al. (2010)
KT_2	Demonstrate knowledge of social sciences	Moaveni (2010)
KT_3	Identify technology trends	Aliu & Aigbavboa (2020)
KT_4	Build technological processes	Moaveni (2010)
KT_5	Understand workplace safety requirements	Curtis & McKenzie (2001)
KT_6	Analyse professional problems	Zaharim et al. (2010)
KT_7	Apply theoretical knowledge to solve specific work problems	Pažur Aničić et al. (2023)
II.	**TECHNICAL SKILLS (ST-05 items)**	
ST_1	Determine the order of work to be done	Nguyen & Nguyen (2015)
ST_2	Exploit technical documents	Zaharim et al. (2010)

Code	Items	Sources
ST_3	Understand technical drawings	Zaheer et al. (2020)
ST_4	Use engineering software to solve technical problems	Hossain et al. (2020)
ST_5	Use proper engineering tools for specific tasks	Zaharim et al. (2010)
III.	**GENERIC SKILLS (GS-21 items)**	
3.1.	**Communication skills (GSC-5 items)**	
GSC_1	Report the work plans and results	The author's proposal
GSC_2	Use a foreign language at work	Pažur Aničić et al. (2023)
GSC_3	Comprehend opinions and comments at work	Chen et al. (2018)
GSC_4	Communicate about technical issues through written words in the mother tongue	Pažur Aničić et al. (2023)
GSC_5	Communicate about technical problems orally in the mother tongue	Pažur Aničić et al. (2023)
3.2.	**Problem-solving skills (GSP-4 items)**	
GSP_1	Identify the problem to be solved	Zaharim et al. (2010)
GSP_2	Prioritize the problem to solve	Robinson (2006)
GSP_3	Identify the cause of the problem	Robinson (2006)
GSP_4	Propose the appropriate solution	Zaharim et al. (2010)
3.3.	**Adaptability (GSA-4 items)**	
GSA_1	Adapt to changes at work	Chen et al. (2018)
GSA_2	Work in a multicultural environment	Pažur Aničić et al. (2023)
GSA_3	Perform well under pressure	Pažur Aničić et al. (2023)
GSA_4	Take initiatives at work	Pažur Aničić et al. (2023)
3.4.	**Teamwork (GST-4 items)**	
GST_1	Set the team's common goals	Leandro Cruz & Saunders-Smits (2022)
GST_2	Collaborate with colleagues	Chen et al. (2018)
GST_3	Promote teamwork spirit	Pažur Aničić et al. (2023)
GST_4	Implement the team decisions	Chen et al. (2018)
3.5.	**Lifelong learning (GSL-4 items)**	
GSL_1	Acquire new knowledge steadily and continuously	Robinson (2006)
GSL_2	Actively participate in courses for personal development	Leandro Cruz & Saunders-Smits (2022)
GSL_3	Stay up to date with new methods for professional development	Leandro Cruz & Saunders-Smits (2022)

Code	Items	Sources
GSL_4	Identify personal strengths and weaknesses to propose appropriate improvement methods.	Leandro Cruz & Saunders-Smits (2022)
IV.	**ATTITUDE AND OTHER ATTRIBUTES (AA-18 items)**	
4.1.	**Attitude (AAA-6 items)**	
AAA_1	Work seriously	Dipboye (2018)
AAA_2	Work autonomously	Pažur Aničić et al. (2023)
AAA_3	Be ready to take up more responsibilities	Dipboye (2018)
AAA_4	Be comfortable working with colleagues	The author's proposal
AAA_5	Have a long-term commitment to work at the workplace	Dipboye (2018)
AAA_6	Promote the enterprise's brand image	The author's proposal
4.2.	**Dependability (AAD-4 items)**	
AAD_1	Complete the work as planned	The author's proposal
AAD_2	Comply with the workflow	Park & Hill (2018)
AAD_3	Get the job done correctly	Park & Hill (2018)
AAD_4	Maintain honesty at work	Park & Hill (2018)
4.3.	**Thoughtfulness (AAT-4 items)**	
AAT_1	Demonstrate industry manners	Park & Hill (2018)
AAT_2	Be mindful to avoid making mistakes	Park & Hill (2018)
AAT_3	Manage pressure properly in difficult situations	Tran et al. (2022)
AAT_4	Give constructive advice to colleagues	Leandro Cruz & Saunders-Smits (2022)
4.4.	**Initiative (AAI-4 items)**	
AAI_1	Accept work challenges	Park & Hill (2018)
AAI_2	Generate new ideas at work	Pažur Aničić et al. (2023)
AAI_3	Be eager to complete work	Park & Hill (2018)
AAI_4	Be committed to doing decent work	Park & Hill (2018)

3. MATERIALS AND METHODS

Sampling

The Delphi technique does not rely on "a statistical sample that attempts to be representative of any population". However, it depends on a group decision mechanism that needs qualified experts with a profound understanding of the issues (Okoli & Pawlowski, 2004). As Mullen (2003) suggested, 20 experts are the most suitable size. Therefore, fifteen employers and five lecturers were invited to attend the Delphi process to decide which construct is suitable for the employability scale.

Data collection and analysis

First, the proposed employability scale of 51 items was sent to 20 experts for their assessment. The criteria to select experts, as proposed by Bayona-Ore et al. (2018), cover their job position, workplace, qualifications, and years of experience. There are two or more rounds in the Delphi process based on the consensus level at the prior round (Keeney et al., 2006; Bayona-Ore et al., 2018). The initial round can begin with a questionnaire in case the constructs of the scale are identified. In other words, the Delphi process can start with an open-ended questionnaire when the scale's constructs need to be clarified (Hsu & Sandford, 2007). The next round requires experts to review the report of the first round and propose changes if necessary. The items obtaining agreement and the ones remaining in disagreement are also distributed to experts. It is feasible for investigators to ask the experts to justify their opinions regarding the items under debate (Hsu & Sandford, 2007).

In this study's first round, 20 experts, including ten heads of technical divisions, five human resource recruiters and five university lecturers, were invited to provide their assessment. They were requested to select "Agree", "Neutral", and "Disagree" to decide whether the item is suitable for the evaluation of graduate employability. The result of assessing the four scale constructs in the first round was reported before the group interviews in the next round.

In the second round, group discussions were conducted "to assess if the themes that emerged from one group also emerged from other groups" (Onwuegbuzie et al., 2009, p.8). Following Onwuegbuzie et al. (2009), 20 participants who joined the first round were invited to group interviews. The experts were briefed about the interview aims. Afterwards, they were asked to discuss the statements with below 75% agreement. They were asked whether they would change their assessment result and revise the scale by answering the following questions: "Are such constructs appropriate? Do any constructs need to be added/deleted? Is the number of items sufficient to represent each dimension? Which items are not clear? Why? How to adjust? Which items should be removed? Why? Which items should be added? Why?".

The group discussion by the group of lecturers was performed face-to-face. Afterwards, the first-round report and the lecturer group's second-round findings were presented to the human resource group at the beginning of an online meeting. In the following online meeting, the first-round result and summary of the second round findings of the two previous groups were announced to the technical group.

Microsoft Excel 2017 was used to analyse the data. It was used to count the percentage of agreement level with the given items. Consensus on an item can be decided in case a certain percentage of the ratings lies within a prescribed range. Keeney et al. (2006) set a 75% level of consensus as the minimum standard for keeping items for future use.

4. RESULTS AND DISCUSSION

4.1. Results

Experts' detailed characteristics

20 experts accepted the invitation to share their viewpoints in the expert feedback rounds. The expert characteristics were described in the three following groups.

For the technical group, ten experts met the selected requirements. They had the following specific characteristics. First, they worked for six large-scale enterprises owned by Japan, Korea, China, and Taiwan (China). Their enterprises' names were coded into DEN, HYU, LGH, WIS, LUX, and CAN. Second, they were confirmed by their enterprises' human resource departments to have worked with ET graduates from different universities. Their technical tasks were related to product design, manufacturing, quality assurance, research and development. Third, among the ten technical experts, 90% received Bachelor's degrees in ET and 10% achieved a Master's in ET. With regards to the 90% with Bachelor's degrees, 40% who got a Bachelor's degree in Electronics and Telecommunications ET, 10% a Bachelor's degree in Mechanical ET, 10% a Bachelor's degree in Mechatronic ET, 10% a Bachelor degree of Automobile ET, 10% a Bachelor degree of Electric and Electronic ET, and 10% a Bachelor's degree in Control and Automation ET. Fourth, the technical experts were all male. Their working experience ranged from 9 to 17 years. Lastly, they comprehended technical knowledge and technical skills for the career promotion of ET graduates. In the journey to becoming leaders of technical divisions, they experienced individual and team-based technical improvement activities, which required solid technical knowledge and practical technical skills. They also trained new graduates for practical knowledge and skills for specific work positions.

Regarding the human resource group, five chosen members were human resources recruiting team leaders in foreign enterprises owned by Taiwan (China), China, Switzerland, and Korea. Second, all of them were females who directly recruited ET graduates from universities such as Hanoi University of Industry, Hung Yen University of Technology and Education and the University of Economics-Technology for Industries. Third, these group members obtained their qualifications relating to human resource management, which preferred graduates in economics-related majors (Accounting, Economics, and Business Administration) or English-related majors (Commercial English and English Linguistics) for effective communication with foreign owners. Furthermore, they had working experience of five to twelve years in the profession of recruiting, which was suitable for comprehending and updating generic skills and attributes of Generation Z graduates. One member of the recruiting team attended one university's Industrial Consultation Board and possessed varied experience in group interviews to adjust and update ET training programs.

The last expert group comprises five university lecturers. First, all group members owned a doctor's degree. Four members received doctorate degrees in engineering, such as Automobile Engineering, Mechatronic Engineering, Automation Engineering, Electronics and Telecommunications Engineering. One member had a doctorate in Educational Management, and his thesis concerned thermal engineering. Second, 100% of the members had lectured ET undergraduates. Noticeably, 60% of members had the position of heads of department. The remaining 40% of the members took part in preparatory activities for ABET accreditation. Third, the lecturer experts had multiple years of experience in teaching undergraduates. All members had taught at higher education institutions for at least nine years. 40% of the members had worked with ET undergraduates for over 20 years.

Employers' feedback

There were 43 items which received broad agreement from at least 75% of experts. These items could be adjusted in expressions to achieve better semantic meaning. On the other hand, eight items (KT_2, KT_4, GSC_4, GPS_4, GSA_4, GSL_4, AAA_5, and AAT_4) reached lower levels of agreement from 50% to 70% of the experts, so they needed to be clarified to retain or remove in the next round. 20% to 50% of the experts who had expressed neutral opinions for some items were suggested to adjust the neutral ratings into agreement or disagreement in the second round.

Expert feedback results regarding the four constructs in the first round

As regards technical knowledge (Table 3), five items were rated good, and two items needed more expert discussions. KT_1, "Demonstrate knowledge of basic science", gained the highest level of agreement (95%) by 20 experts, followed by KT_5 "Understand workplace safety requirements" (80%). As reported in Table 3, the three items, including KT_3, KT_6, and KT_7, ranked third in expert consensus (75%). However, KT_2 "Demonstrate knowledge of the social sciences" received the second lowest level of agreement (65%) with the highest proportion of neutrality (35%), while KT_4 "Build technological processes" obtained the lowest consensus (60% agreement) and the highest disagreement level (20% disagreement).

Table 3. Expert feedback on technical knowledge in the first round

Code	Items	Agree (%)	Neutral (%)	Disagree (%)
KT_1	Demonstrate knowledge of basic science	95	5	0
KT_2	Demonstrate knowledge of the social sciences	65	35	0
KT_3	Identify technology trends	75	25	0
KT_4	Build technological processes	60	20	20
KT_5	Understand workplace safety requirements	80	15	5
KT_6	Analyse professional problems	75	20	5
KT_7	Apply theoretical knowledge to solve specific work problems	75	15	10

All items regarding technical skills were rated as suitable, with agreement levels ranging from 75% to 80%, meeting the standard set by Keeney et al. (2006). As presented in Table 4, ST_2, "Exploit technical documentation", ST_3, "Understand technical drawings", and ST_5 "Use proper engineering tools for specific tasks", were considered good items to demonstrate graduates' technical skills by at least 80% of the experts. Moreover, ST_1, "Determine the order of work to be done", and ST_4 "Use engineering software to solve technical problems", were accepted as the indicators of technical skills by 75% of the specialists. Noticeably, 15% to 25% neither agreed nor disagreed with the four items for technical skills. Such items were further examined in the second round because some experts might find something inappropriate which could be adjusted or rejected.

Table 4. Expert feedback on technical skills in the first round

Code	Items	Agree (%)	Neutral (%)	Disagree (%)
ST_1	Determine the order of work to be done	75	25	0
ST_2	Exploit technical documents	80	20	0
ST_3	Understand technical drawings	85	15	0
ST_4	Use engineering software to solve technical problems	75	15	10
ST_5	Use proper engineering tools for specific tasks	80	20	0

Table 5 presents the result of the experts' assessment of generic skills. Among the five sub-constructs of generic skills, teamwork consisted of four items which all received approval from at least 90% of experts. The remaining four sub-constructs of generic skills obtained high consensus from the experts (over 75% agreement) while only four items (GSC_4, GSP_4, GSA_4, and GSL_4) received experts' approval at a lower level than 75% and high levels of neutrality (35% to 50%).

Table 5. Expert feedback on generic skills in the first round

Code	Items	Agree (%)	Neutral (%)	Disagree (%)
3.1.	**Communication skills**			
GSC_1	Report the work plans and results	75	25	0
GSC_2	Use a foreign language at work	75	15	10
GSC_3	Comprehend comments at work	90	10	0
GSC_4	Communicate about technical issues through written words in the mother tongue	70	30	0
GSC_5	Communicate about technical problems orally in the mother tongue	80	20	0
3.2.	**Problem-solving skills**			
GSP_1	Identify the problem to be solved	85	15	0
GSP_2	Prioritize the problem to solve	75	25	0
GSP_3	Identify the cause of the problem	75	25	0
GSP_4	Propose the appropriate solution	60	40	*0*
3.3.	**Adaptability**			
GSA_1	Adapt to changes at work	90	10	0

Code	Items	Agree (%)	Neutral (%)	Disagree (%)
GSA_2	Work in a multicultural environment	90	10	0
GSA_3	Perform well under pressure	90	10	0
GSA_4	Take initiatives at work	65	35	*0*
3.4.	**Teamwork**			
GST_1	Set the team's common goals	90	10	0
GST_2	Collaborate with colleagues	95	5	0
GST_3	Promote teamwork spirit	90	10	0
GST_4	Implement the team decisions	90	10	0
3.5.	**Lifelong learning**			
GSL_1	Acquire new knowledge steadily and continuously	95	5	0
GSL_2	Actively participate in courses for personal development	85	15	0
GSL_3	Stay up to date with new methods for professional development	85	15	0
GSL_4	Identify personal strengths and weaknesses to propose appropriate improvement methods.	50	50	0

Furthermore, attitude and other attributes covered four sub-constructs of "Attitude", "Dependability", "Thoughtfulness", and "Initiative". As illustrated in Table 6, sixteen out of 18 items were accepted by at least 75% of specialists. Two items (AAA_5 and AAT_4) received the expert agreement level below 75%. Such two items could be considered for exclusion after receiving the specialists' assessment in the second round. To be specific, the two sub-constructs of "dependability" and "initiative" contained the items with good internal consistency. All items in such sub-constructs were accepted by at least 75% of the experts. The other two sub-constructs of "Attitude" and "Thoughtfulness" involved two items, AAA_5 and AAT_4, achieving low agreement (60% and 65% respectively) and high neutrality (35%), which needed to be clarified by experts in the next round.

Table 6. Expert feedback on attitude and other attributes in the first round

Code	Items	Agree (%)	Neutral (%)	Disagree (%)
4.1.	**Attitude**			
AAA_1	Work seriously	95	5	0
AAA_2	Work autonomously	85	15	0
AAA_3	Be ready to take up more responsibilities	95	5	0
AAA_4	Be comfortable working with colleagues	95	5	0
AAA_5	Have a long-term commitment to work at the workplace	60	35	5
AAA_6	Promote the enterprise's brand image	75	25	0
4.2.	**Dependability**			
AAD_1	Complete the work as planned	90	10	0

AAD_2	Comply with the workflow	85	15	0
AAD_3	Get the job done correctly	75	25	0
AAD_4	Maintain honesty at work	95	5	0
4.3.	**Thoughtfulness**			
AAT_1	Demonstrate industry manners	95	5	0
AAT_2	Be mindful to avoid making mistakes	80	20	0
AAT_3	Manage pressure properly in difficult situations	80	20	0
AAT_4	Give constructive advice to colleagues	65	35	0
4.4.	**Initiative**			
AAI_1	Accept work challenges	95	5	0
AAI_2	Generate new ideas at work	80	20	0
AAI_3	Be eager to complete work	90	10	0
AAI_4	Be committed to doing decent work	95	5	0

Expert feedback results regarding four constructs in the second round

In the first place, the expert discussion group for technical knowledge was summarised in Table 7. The report of the first round highlights the focus on KT_2 and KT_4. Item KT_2, which received the second-lowest level of agreement and the highest neutrality among the experts in the first round, was eventually removed from the instrument because it was not much related to technical knowledge, as explained by the lecturer group. It was also a secondary criterion as evaluated by technical experts. Furthermore, as for item KT_4, the verb "Build" was suggested for adjustment because it was difficult to obtain by the graduates, as stated by the lecturer group. According to the technical group, building technological processes involves several high-level competencies and is suitable for managerial-level positions. The three groups of experts reached approval to modify "Build" to "Describe". There were three other items (KT_3, KT_6, and KT_7) which were advised to change. In conclusion, the construct "technical knowledge" changed from seven to six items after the second round.

Table 7. Expert feedback on technical knowledge in the second round

Code	**Items**	**Lecturer Group**	**HR group**	**Technical group**
KT_1	Demonstrate knowledge of basic science	Demonstrate → Apply, add "to solve technical problems"	✓	✓
KT_2	Demonstrate knowledge of the social sciences	Delete	✓	✓
KT_3	Identify technology trends	Technology trends →engineering technology trends	✓	Identify → update
KT_4	Build technological processes	Build → Describe	✓	Build → Describe
KT_5	Understand workplace safety requirements	Agree	✓	✓
KT_6	Analyse professional problems	Analyze → Recognize	✓	Analyse → Recognize the suitable tool

Code	Items	Lecturer Group	HR group	Technical group
KT_7	Apply theoretical knowledge to solve specific work problems	theoretical knowledge → specialized knowledge	✓	✓

* Note: "✓" means "Agree with the previous group."

Similarly, expert group discussions were implemented for technical skills. As Table 8 summarises, all five items (ST_1, ST_2, ST_3, ST_4, and ST_5), which had been evaluated to properly measure technical skills in the first round, continued to be highly approved in the second round. Only one item, ST_3, needed to be edited. The lecturer group asserted that graduates' good reading skills in technical drawings helped develop their enterprise jobs. Reading to comprehend technical drawings was a core technical skill of engineering technology graduates at the primary level for most jobs after graduation instead of just understanding to know. Moreover, the technical group agreed with all items and focused on explaining item ST_2. To be specific, common technical documents at enterprises refer to manual guidebooks which graduates could use for their work or for training fresher groups. The construct "technical skills" was kept intact with all five items after the second round.

Table 8. Expert feedback on technical skills for the second round

Code	Items	Lecturer group	HR group	Technical group
ST_1	Arrange the order of work to be done	Agree	✓	✓
ST_2	Exploit technical documents	Agree	✓	✓
ST_3	Understand technical drawings	Understand → Read	✓	✓
ST_4	Use engineering software to solve technical problems	Agree	✓	✓
ST_5	Use proper engineering tools for specific tasks	Agree	✓	✓

* Note: "✓" means "Agree with the previous group."

Thirdly, Table 9 illustrates the expert viewpoints on generic skills in the second round. Specifically, three items were added, one was deleted, and ten were modified. Three added items included GSP_5, GSA_5, and GST_5. One deleted item was GSA_4. Ten modified items were GSC_1, GSC_2, GSC_4, and GSC_5 (Communication skills), GSP_4 (Problem-solving skills), Adjust: GST_2 (Teamwork), GSL_1, GSL_2, GSL_3, and GSL_4 (Lifelong learning). The human resource group proposed to add GSP_5, "Implement the proposed solution", and GSA_5 "Adapt to the workplace environment after graduation". They explained that graduates had to put the solution into practice after presenting the potential solution to the problem. The workplace environment after graduation was novel to new graduates and they were required to get used to the enterprise's regulations such as coming to the office early and tidying up the workplace before leaving after working hours. Graduates are also expected to make their voices heard in the group meeting instead of just sitting and following the instructions, which contradicts their lectures in the university hall.

Furthermore, the lecturer group proposed to add the GST_5 "Contribute to teamwork's results". They stated that it was a circle of teamwork that started with team goal setting, then maintaining good communication among team members, and overcoming teamwork conflicts to reach decisions as a team. After the plan and a list of specific works are presented, each graduate needs to implement the assigned work and finish with outstanding individual contributions to teamwork achievement.

In summary, the construct "generic skills" expanded with 2 extra items in the second round. Specifically, problem-solving skills and teamwork changed 4 to 5 items per sub-construct. Communication skills, adaptability, and lifelong learning preserved their items after the second round with 5, 4, and 4 items, respectively.

Table 9. Expert feedback on generic skills for the second round

Code	Items	Lecturer group	HR group	Technical group
3.1.	**Communication skills**			
GSC_1	Report the work plans and results	Agree	Add "on time"	✓
GSC_2	Use a foreign language at work	Use → Communicate by	Add "at the basic level"	✓
GSC_3	Comprehend comments at work	Agree	✓	✓
GSC_4	Communicate about technical issues through written words in the mother tongue	Agree	✓	Communicate → Communicate in written Vietnamese
GSC_5	Communicate about technical problems orally in the mother tongue	Agree	Agree (reflected through presentation skills at work)	Communicate → Communicate in spoken Vietnamese
3.2.	**Problem-solving skills**			
GSP_1	Identify the problem to be solved	Agree	✓	✓
GSP_2	Prioritize the problem to solve	Agree	✓	✓
GSP_3	Identify the cause of the problem	Agree	✓	✓
GSP_4	Propose the appropriate solution	Agree	appropriate → possible	✓
GSP_5			**Add** "Implement the proposed solution"	✓
3.3.	**Adaptability**			
GSA_1	Adapt to changes at work	Agree	✓	✓
GSA_2	Work in a multicultural environment	Agree	✓	✓
GSA_3	Perform well under pressure	Agree	✓	✓
GSA_4	Take initiatives at work	**Delete**	✓	✓
GSA_5			**Add** "Adapt to workplace environment after graduation"	✓
3.4.	**Teamwork**			
GST_1	Set the team's common goals	Agree	✓	✓
GST_2	Collaborate with colleagues	Colleagues → team members	✓	✓

Code	Items	Lecturer group	HR group	Technical group
GST_3	Promote teamwork spirit	Agree	✓	✓
GST_4	Implement the team decisions	Agree	✓	✓
GST_5		**Add** "Contribute to teamwork's results"	✓	✓
3.5.	**Lifelong learning**			
GSL_1	Acquire new knowledge steadily and continuously	steadily and continuously → frequently	✓	✓
GSL_2	Actively participate in courses for personal development	Courses → self-study activities	✓	✓
GSL_3	Stay up to date with new methods for professional development	Methods → science and technology applications	✓	Stay up to date → Update
GSL_4	Identify personal strengths and weaknesses to propose appropriate improvement methods.	Add "in each period to make learning plans" after "weakness"	✓	Propose appropriate improvement methods → to make learning plans

* Note: "✓" means "Agree with the previous group."

Lastly, the number of items in the construct "attitude and other attributes" in the second round stayed the same as in the first round (18 items). As indicated in Table 10, seven out of 18 items were modified: AAA_4, AAA_5, AAA_6 in "attitude", AAD_3 in "dependability", AAT_3, AAT_4 in "thoughtfulness", and AAI_2 in "initiative". The lecturer group was the most proactive group, with five proposals to make the items (AAA_4, AAA_5, AAD_3, AAT_3, and AAI_2) clear and measurable. The human resource group suggested word choice modification for two items (AAA_6 and AAT_4). Similarly, the technical group recommended changes in two items (AAA_4 and AAA_5) belonging to the "Attitude" second-order construct.

Specifically, AAA_4 and AAA_5 in the second-order construct "Attitude" were suggested for adjustment by the lecturer and technical groups. Attitude can be classified into "cognitive, affective, and behavioural" components (Gelisli & Kazykhankyzy, 2021, p.466). As the lecturer and technical groups commented, items AAA_4 should be modified from an affective attitude into a behavioural attitude. At the same time, AAA_5 could be changed from a cognitive attitude to a behavioural attitude. For the second-order construct "dependability", four items got the agreement of three expert groups except for a minor change in the item AAD_3. The lecturer group proposed that getting the job completed correctly was a good item for assessing the dependability of high school leavers or advanced associate graduates, not for university graduates. Instead, the AAA_3 item could be reworded to "getting the job finished effectively". The four items in the third second-order construct of "thoughtfulness" were regarded as appropriate. Two items of AAT_3 and AAT_4 were advised for modifications to better reflect the second-order construct. Firstly, managing stress in difficult situations was hard for fresh graduates. The lecturer group suggested that the ability to self-monitor in problem situations was practical for engineering technology graduates, while managing work pressure was a higher competency level for personnel working at managerial levels.

Secondly, from the perspective of the human resource group, newly graduated students are perceived to be troublesome in providing constructive advice to their co-workers. Preferably, they are expected to have a more straightforward ability. As explained, the engineering technology graduates tend to be independent and silent, so they

are shown to be thoughtful when they are concerned about their colleagues' problems and can offer their solutions without properly considering issues in the implementation of their colleagues. Regarding the second-order construct "Initiative", the three groups of experts approved three items: AAI_2, AAI_3, and AAI_4. There was a slight adjustment in AAI_1. The challenges at work were perceived to come frequently, so the graduates were proposed to develop their competencies to fight against the disadvantages in work rather than accept them without showing a positive perspective.

To sum up, the construct "attitude and other attributes" in the employability scale contained 18 good indicators after the second round of expert feedback. The four lower levels of the construct, "attitude and other attributes", were kept unchanged the first round.

Table 10. Expert feedback on attitude and other attributes for the second round

Code	Items	Lecturer group	HR group	Technical group
4.1.	**Attitude**			
AAA_1	Work seriously	Agree	✓	✓
AAA_2	Work autonomously	Agree	✓	✓
AAA_3	Be ready to receive more work	Agree	✓	✓
AAA_4	Be comfortable working with colleagues	Feel comfortable working → Cooperate actively	✓	Cooperate actively with colleagues → Cooperate with colleagues actively
AAA_5	Have a long-term commitment to work at the enterprise	Have a long-term commitment to work at → Contribute effectively to development	✓	Contribute effectively to development at the enterprise → Contribute to the enterprise's development
AAA_6	Promote the enterprise's brand image	Agree	Advertise → Respect	✓
4.2.	**Dependability**			
AAD_1	Complete the work as planned	Agree	✓	✓
AAD_2	Comply with the workflow	Agree	✓	✓
AAD_3	Get the job done correctly	Correctly → effectively	✓	✓
AAD_4	Maintain honesty at work	Agree	✓	✓
4.3.	**Thoughtfulness**			
AAT_1	Show industry manners	Agree	✓	✓
AAT_2	Be mindful to avoid making mistakes	Agree	✓	✓

AAT_3	Manage pressure properly in difficult situations	Manage pressure → Self-control	✓	✓
AAT_4	Give constructive advice to colleagues	Agree	advice → some advice	✓
4.4.	**Initiative**			
AAI_1	Accept work challenges	Accept → Face	✓	✓
AAI_2	Generate new ideas at work	Agree	✓	✓
AAI_3	Be eager to complete work	Agree	✓	✓
AAI_4	Be committed to doing decent work	Agree	✓	✓

* Note: "✓" means "Agree with the previous group."

4.2. Discussion

Employability studies have witnessed greater interest from universities due to the requirement for providing work-readiness graduates to employers. Engineering technology graduates' employability has become more of a concern recently when many big high-technology enterprises invest in Vietnam following the COVID-19 pandemic, and universities tend to be more competitive in attracting Vietnamese high school students and international students to study and research. Prior employability scale studies focused more on developing the employability scale for vocational high school students (Tentama & Anindita, 2020) and college students (Awwad, 2021) but were limited to university graduates. This study acts as an initial step in contributing to constructing an employability scale for tertiary graduates in engineering technology.

The study followed the procedure to implement the Delphi process proposed by Hsu and Sandford (2007) to modify the proposed employability scale. As Keeney et al. (2006) stated, no strict rule is applied to the number of rounds because the Delphi process depends on the experts' time condition and a broad level of questions. In this study, the employability scale was revised in two rounds. The study applied an online questionnaire for the first round. Keeney et al. (2006) set a 75% level of consensus as the minimum standard for keeping items for future use. According to the standard set by Keeney et al. (2006), 43 out of 51 items were rated qualified. The second round concentrated on discussing eight items (KT_2, KT_4, GSC_4, GPS_4, GSA_4, GSL_4, AAA_5, and AAT_4) which reached a level of agreement lower than 75% in the first round. The degree of consensus on these eight items was improved after three group discussions. After two rounds of receiving feedback from three groups of lecturers, human resources, and technical divisions, the employability scale for engineering technology graduates included four constructs and an increase of one item from 51 to 52 items (Table 11). The technical knowledge decreased by one item, "KT_2", compared with the proposed instrument. The items in two constructs of "Attitude and other attributes" and "technical skills" were stable with 18 and 5 items, respectively. Generic skills received the most expert feedback with deleting one item and adding three items.

Table 11. Scale component after taking feedback

First-order constructs	Second-order constructs (Before)	Second-order constructs (After)	Items (Before)	Items (After)	Changes
Technical knowledge	1	1	7	6	***Delete***: KT_2; Adjust: KT_1, KT_3, KT_4, KT_6, KT_7
Technical skills	1	1	5	5	Adjust: ST_3
Generic skills	5	5	21	23	

First-order constructs	Second-order constructs (Before)	Second-order constructs (After)	Items (Before)	Items (After)	Changes
Communication skills			5	5	Adjust: GSC_1, GSC_2, GSC_4, GSC_5
Problem-solving skills			4	5	Adjust: GSP_4, **Add:** GSP_5
Adaptability			4	4	***Delete***: GSA_4, **Add**: GSA_5
Teamwork			4	5	Adjust: GST_2; **Add**: GST_5
Lifelong learning			4	4	Adjust: GSL_1, GSL_2 GSL_3, GSL_4
Attitude and other attributes	4	4	18	18	
Attitude			6	6	Adjust: AAA_4, AAA_5, AAA_6
Dependability			4	4	Adjust: AAD_3
Thoughtfulness			4	4	Adjust: AAT_3, AAT_4
Initiative			4	4	Adjust: AAI_1
Total	**11**	**11**	**51**	**52**	

5. CONCLUSION

The Delphi method was beneficial for reaching an expert agreement on constructs and items in the employability scale, which requires "the disciplinary areas of expertise" Hsu and Sandford (2007) to make decisions. The employability scale was revised by exploiting the Delphi method. Twenty experts of enterprise employers and university lecturers participated in the scale adjustment in December 2023 and January 2024. From the initial instrument of 51 items collected primarily from prior academic studies, after two rounds of expert feedback, two items were deleted, three items were added, and several items were adjusted, which led to the employability scale being adjusted to comprise 52 items.

The adjusted employability scale could provide an initial basis for developing a reliable and valid scale for engineering technology graduates. This scale could be helpful for higher education institutions in measuring graduates' competencies at the phase of graduation and then provide suitable changes in engineering technology training programs to prepare undergraduates with better employability. Industry employers can exploit this developed tool to measure graduates' current employability and actively participate in cooperation with universities to implement experiential learning activities in the enterprises for undergraduates and industrial field trips for lecturers to foster their perceptions of graduates' employability.

The study is restricted to approaching its participant sample. The technical and human resource experts in this study came from some Asian and European countries (Taiwan, China, Japan, Korea, and Switzerland). Other foreign enterprises which originate from African or American regions were not invited to the Delphi process due to difficulties in access.

The study has the following implications for future research. Firstly, the current study proposed the employability scale with four constructs and 52 items. Further studies could be conducted using data collected from enterprises which hired and used engineering technology graduates from a public university in Vietnam to validate the employability scale. Secondly, further empirical examinations in employability measurement could be taken by applying a reliable and valid scale to collect the employer's assessment for each graduate.

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