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Overcoming Challenges Faced by Quantity Surveying's Graduates in Adopting Skills for Future Employment: Employer's Perspective

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Abstract

The evolving nature of the construction industry demands a diverse set of skills and competencies from Quantity Surveying (QS) graduates. The skills of QS graduates align closely with the practice of project management which involved the practice of skills, knowledge, tools, techniques to complete tasks such as cost estimation, contract management and value engineering which important in delivering successful projects. However, the existing research falls short in providing solutions to address the significant gap between the skills possessed by QS graduates and those demanded by the industry resulting in high unemployment and underemployment rates among them. Hence, the aim of this study is to propose solutions for QS graduates to enhance their employment skills in order to meet the needs of the construction industry. The questionnaire survey was distributed among 312 experienced QS professionals working in QS consultancy firms mainly based in Selangor and Kuala Lumpur through cluster sampling technique. The findings were then further analysed by using descriptive statistics and the Relative Important Index (RII). This research revealed that inviting experienced QS professionals as guest lecturers to deliver talks is a highly effective solution to minimize the challenges encountered by QS graduates as it gives fresh insights into the construction industry. The findings from this research provide the basis for HEIs, the construction industry and QS graduates in implementing the proposed solutions to address the challenges and gaps in the skills and competencies of QS graduates. The findings are ought to contribute to the overall enhancement of employability skills among QS graduates particularly in Malaysia and optimize the productivity of construction industry.

Keywords: Quantity Surveying (QS) Graduates, Challenges, Skills, Employment

1.0 INTRODUCTION

The role of Quantity Surveyors (QS) in the construction industry is crucial as they manage project costs to ensure budget adherence. According to Karunasena et al. (2015), QS is one of the key resource persons in the construction industry as it shifts its focus into diversifying the roles to achieve resource efficiency. As the construction industry keeps evolving to meet current market expectations, QS are among the construction industry players that contribute to the indicator of national growth.

Furthermore, Shayan et al. (2019) emphasize that the construction industry demands advanced technology and complex designs with sustainable solutions to fulfil client needs. This is in line with Yap et al. (2022) which states that the QS graduates must be able to handle the implementation of a new advanced construction technology to meet the demands the of construction industry. As the demands grow, it becomes crucial for QS graduates to possess employability skills alongside their fundamental knowledge. These skills which is part of the project management include the practice of using knowledge, tools, techniques to complete a series of tasks to deliver value and achieve desired outcome.

QS is expected to obtain the skills required from Higher Education Institutions (HEIs) encompassing hard skills (technical skills) and soft skills as stated by Habizah Sheikh Ilmi et al. (2021). HEIs provide the perfect platform for QS graduates to hone their skills through formal education as stated by Yap et al. (2022) as it necessitates the blending of theoretical knowledge and practical skills through professional degree programmes. In this context, Dada and Jagboro (2018), also indicated that educational training contributes as much as 34% to QS competency. Chai (2017) also acknowledges that the QS graduate skills are directly related to the HEIs which emphasises HEIs' role in providing quality education that aligns with the needs of the construction industry.

The evolving needs of the construction industry force QS graduates to adopt diverse employability skills to compete in the competitive working environment. To completely understand what skills QS graduates gained during their educational period, the feedback from the employers is important to comprehend the skills that are currently possessed by QS graduates in the workforce and the challenges that they faced to equip the employability skills.

2.0 LITERATURE REVIEW

2.1 Research Gap

New opportunities within the construction industry require upgraded skills for QS professions and yet this profession still faces challenges in meeting industry expectations. As a result, the most affected by this are the QS graduates who are still new in this industry. Yap et al. (2021) find that QS graduates are not meeting the current expectations of the construction industry as the QS in developing countries especially in Malaysia are still bound to their conventional responsibilities. This creates a lack of awareness of the evolving roles required by them to meet the current market of the construction industry (Yap et al., 2021).

Despite a 4.7% increase in graduates' employability in 2021, the issues still persist as 35.2% are employed in low-skilled jobs and only 16.6% are employed in professional fields (DOSM, 2022). Yee (2022) states that graduates face job mismatches and underutilization of expertise leading to a rise in underemployment rates from 31.2% (1.36 million people) in 2020 to 33.9% (1.55 million people) in 2021. Besides, the high unemployment rates among graduates could not be denied even though the research regarding HEIs issues has been highlighted by Yap et al. (2022). Hence, this underlines the need to address HEIs issues to enhance QS graduates' employability skills.

In discussing the needs of the present market in the construction industry, one should acknowledge the challenges that might be faced by the QS in the construction industry. According to Shayan et al. (2019), the most critical challenges for QS have been further acknowledged and discussed thoroughly such as the technological changes regarding Building Information Modelling (BIM) adoption in the construction industry and the lack of sustainability knowledge in developing the cost estimate. However, the research in addressing solutions for QS graduates to enhance employability skills and minimize those challenges remains limited.

In the evolving construction industry, QS graduates must acquire diverse skills to meet industry demands. Previous research has highlighted the necessary QS skills and challenges. However, the need to address these challenges is crucial to be able to enhance QS employability skills. Therefore, this research is crucial in proposing

solutions to equip QS graduates with the required employment skills, bridging the gap between education and industry needs and enhancing their performance in the construction industry.

2.2 Skills Required by QS Graduates in The Construction Industry

Employability skills can be interpreted as essential skills, generic skills, key skills, transferable skills as well as job-readiness skills (Chai, 2017). Although the concept of employability is not new, it is challenging to define clearly and precisely because it covers a wide range of abilities or skills required by graduates. Additionally, the employability skills also comprise the hard skills and soft skills that need to be adopted by the QS graduates to further develop and enhance their skills.

Hard skills are fundamental skills that need to be fully mastered to complement employability skills gained during studies. Information technology and computer literacy skills including knowledge of programs like Auto-CAD, Microsoft Excel and Revit are crucial for tasks like cost estimation and measurement in the QS role (Musa et al., 2010). Chai (2017) notes that Microsoft Word and Microsoft Excel are integral parts of the QS curriculum in HEIs. Moreover, strong management skills are important as QS graduates must have the ability to plan and execute their tasks systematically within deadlines (Said et al., 2010). Karunasena et al. (2015) emphasize that exceptional management abilities set QS graduates apart in the job market as employers value these skills. Additionally, Kornelakis and Petrakaki (2020) affirm that self-management skills are integral within a broader set of management skills and should be emphasized in their career growth.

Soft skills are another skill that complements the employability skills that deal with non-technical skills such as communication skills, higher-order thinking skills, teamwork skills and leadership skills (Chai, 2017). The overall assessment of soft skills primarily centres on the communication prowess of QS graduates Arowoiya & Akinradewo (2022). Effective communication skills are essential to resolved conflicts and secure employment as employers prioritize candidates with strong communication skills (Suarta et al., 2017; Ting et al., 2017; Mustapa et al., 2022). Besides, higher-order thinking skills are also essential as they encompass problem solving, analytical thinking, decision-making, and critical thinking (Latisha Shafie & Surina Nayan, 2010). Problem-solving ability involves recognizing, analysing, and integrating with critical thinking (Kar, 2011; Islam et al., 2013). Additionally, Mustapa et al. (2022) assert that employers consistently prioritize candidates who demonstrate a high level of higher-order thinking skills during the recruitment process.

Teamwork skills are crucial for QS graduates as they involve the ability to collaborate toward shared goals and objectives (Chai, 2017). Teamwork also encompasses building relationships from diverse cultural backgrounds and respecting different perspectives to increase productivity within the workplace (Rahmat et al., 2018; Mustapa et al., 2022). Additionally, having leadership skills involves being accountable for the task given, and directing and coordinating the team to ensure the team will not stray from the intended objectives (Chai, 2017). Clayton (2015) emphasizes the significance of practical exposure in fostering leadership skills among QS graduates encompassing effective time management, strategic task planning, and adept problem identification. These skills are vital in preparing QS graduates to navigate the demands of the construction industry and assume their professional roles.

2.3 Challenges Faced by QS Graduates in Obtaining the Required Skills

In the evolving construction industry, QS professionals must adapt and equip themselves with various skills to succeed. Failure to do so can worsen QS performance, making it crucial to recognize and address challenges especially for QS graduates as they enter the workforce. QS graduates faced challenges including their reluctance to embrace the application of new information technology (Chong, et al., 2012). Moreover, the absence of proper mentorship during orientation training can result in QS graduates being misguided in their work tasks. Besides, the lack of transfer of skills of the QS graduates will lead to the delay of the task that needs to be performed (Mthethwa, 2016).

A low level of problem-solving and decision-making skills was stated as a crucial challenge by Shafie et al. (2014) as it can cause project delays, budget overruns, compromised safety measures, and client dissatisfaction. Additionally, poor communication skills among QS graduates pose a crucial challenge which can result in misinterpretations, disputes, and project setbacks (Khalid et al., 2014). Lastly, the difficulty in understanding complex terms especially when using software serves as a critical challenge which can lead to poor management of advanced software like BIM (Latiffi et al., 2015).

2.4 Solutions to Minimise the Challenges Faced by QS Graduates in Obtaining the Required Skills

In order to overcome those challenges, multiple solutions will be taken into consideration in order to minimize the challenges faced by the QS graduates. These solutions include establishing partnerships between employers and HEIs, improving the course structure to meet industry demands, inviting guest lecturers with practical experience, implementing industrial training programs, and enhancing orientation training. Table 1 summarises the solutions to minimize the challenges faced by QS graduates gathered from the literature review.

Table 1. Summary of solution to minimize the challenges faced by the QS graduates

No	Solutions	Summary
1	The partnership between employers and HEIs	• HEIs are required to consult with employers regarding the development of degree programs in quantity surveying (Lowden et al., 2011). • HEIs can collaborate with employers to make a programme in which QS students could participate to enrich their experience and knowledge regarding the construction industry which helps in bridging the gap between employers' expectations and employees' satisfaction with their skills (Ang, 2015).
2	Improve the designation of course structure	• Academic programs should be revised periodically to reflect various talents and attributes for employment as well as incorporating employability skills in both the teaching and learning process (Ang, 2015). • Establishing a legitimate assessment activity such as interviews, group discussions, case studies, role-playing presentations, questionnaires, and tests which can be conducted in either a group or individual setting that should be in line with the standards set by businesses and needs of the construction industry (Kinash, 2015).
3	Invite guest lecturer	• The provision or invitation of guest lecturers to QS undergraduates is to increase their employability and marketability after graduation (RICS, 2018). • The guest lecturer should be an expert in their field who can provide much knowledge on the subject from the institution's faculty, from outside the institution's faculty, or from the community and present diverse perspectives that complement theoretical lessons (Miller, 2014; Kinash, 2015; Li & Guo, 2015). • Networking opportunities arise from inviting guest lecturers which aid in establishing relationships between students and industry professionals (Mahadewi & Pudjawan, 2020).
4	Industrial training programme	• The industrial training programme was the best way to help QS graduates improve their employability skills by filling the knowledge gap between education and the demand for qualified QS (Chai, 2017). • It is an excellent chance for QS graduates to see the working world, to gain professional experience, and hone their abilities and knowledge of their field.
5	Enhancing orientation training	• Employers should implement orientation training programs for QS graduates in quantity surveying firms with the aim of training and educating freshly hired QS graduates regarding the policies and procedures of performance of the firm (Tesha et. al, 2018). • Orientation training entails an early job experience which greatly influences an individual's career within the organization (Gupta, 2007).

3.0 METHODOLOGY

The questionnaire was designed based on a literature review from relevant publications databases such as Emerald, Science Direct and ResearchGate with range of years from 2018 to 2023. It comprises five sections including Section A which covers the respondents' demographic information, Section B and C both covers the level of skills required (B1-B24) and currently possessed by QS graduates (C1-C24), Section D covers the challenges faced by QS in acquiring the required skills (D1-D9), and Section E covers the proposed solutions in minimizing the challenges faced by QS graduates (E1-E12). The five-point Likert-Scale from unimportant to very important and strongly disagree to strongly agree were used in Sections B, C, D and E to measure the importance of those variables.

The respondents are experienced QS professionals from the QS consultancy firm in Selangor and Kuala Lumpur who had experience working with fresh graduates who graduated within 1 to 2 years. The research utilizes cluster sampling, dividing the population into smaller geographic groups called clusters and randomly selecting

samples from these clusters. Based on the sample size calculation, a minimum of 156 respondents is required for this research based on Krejcie and Morgan's (1970) formula. Given the historically low response rate in the Malaysian construction industry, the sample size was doubled to minimize sampling error (Hair et al., 2008; Waris et al., 2014). Consequently, 312 questionnaires were distributed to experienced QS professionals. Out of these, 70 responses were received resulting in an overall response rate of approximately 23%. While this rate falls below the ideal 30%, it is considered acceptable and in line with response rates commonly observed in the construction industry (Akintoye, 2000; Dulaimi et al., 2003; Bamgbade & Kamaruddeen, 2017).

This research will use various data analyses, including Cronbach's Alpha, descriptive statistics, and the Relative Important Index (RII). Cronbach's Alpha ensures data reliability and captures intended survey concepts on a scale of 0 to 1 (Frost, 2022). Descriptive statistics aid in categorizing data by using mean, mode, median and standard deviation as well as percentages (Kaliyadan & Kulkarni, 2019). RII indicate the variables' importance using a Likert-Scale with values ranging from 0 to 1 (Aibinu & Jagboro, 2002; Kassem et al., 2020; Duratul Ain Tholibon et al., 2021).

4.0 RESULTS

4.1 Respondents' demographics

The questionnaire surveys included four questions aimed at gathering background information from the respondents. These questions covered details such as the respondents' based of firms, job title, their experience in the construction industry, and their experience working with QS graduates who graduated within the past one to two years. Among the respondents, the most common job title is Quantity Surveyor, representing 38.5% with approximately 56.4%, possess working experience exceeding 18 years. It is notable that all respondents have reported previous experience working with QS graduates who graduated within the past 1 to 2 years. The general summary of the demographic information can be found in Table 2.

Table 2: General Overview of Demographic Information

Demographic Information	Groups	Frequency	Percent (%)
Firm Based	Kuala Lumpur	31	44
	Selangor	39	56
Job Title	Assistant Director	2	2.8
	Associate	2	2.8
	Branch Manager	2	2.8
	Consultant	2	2.8
	Contract Executive	2	2.8
	Contract Manager	3	4.4
	Director	6	8.6
	General Manager	2	2.8
	Manager	2	2.8
	Managing Director	2	2.8
	Principal	11	15.7
	Project Executive	4	5.7
	Project Manager	2	2.8
	Quantity Surveyor	32	45.7
	Senior Quantity Surveyor	4	5.7
Working Experience	3 years - 7 years	12	17.1
	8 years - 12 years	14	20.0
	13 years - 17 years	8	11.4
	More than 18 years	36	51.4
Experienced Working with QS Graduates (Graduated within 1-2 years)	No	0	0
	Yes	70	100

4.2 Analysis of skills required by QS graduates in the construction industry

The skills required by QS graduates were further categorised into six categories namely information technology and computer literacy skills, management skills, communication skills, higher-order thinking skills, teamwork skills and leadership skills. The Cronbach's Alpha for all 24 skills required by QS graduates (B1-B24) is 0.975, indicating high reliability (Manerikar & Manerikat, 2015). Based on each category, the skill with the highest mean value and RII value was observed and identified which can be seen in Table 3. Table 3 also shows the mean and standard deviations for each skill required with the mean value ranging from 3.538 to 4.385 and RII values ranging from 0.708 to 0.877. Additionally, an average RII value was calculated for each skill within their categories to provide an overview of the required skills for QS graduates. The 5-point Likert Scale used was from unimportant (1) to very important (5). Then, the top five most required skills in the construction industry were ranked based on overall importance which includes: -

1. Able to operate Microsoft Excel programs or any equivalent programs.
2. Able to operate Microsoft Words programs or any equivalent programs.
3. Able to attentively listen to instruction during tasks.
4. Able to work well together with other team members that have different backgrounds, ages, ethnicities, genders etc.
5. Able to manage time to complete the task before the deadline.

4.3 Analysis of current skills that qs graduates have

The current skills that QS graduates have were further analysed based on the skills required by QS graduates. The reliability of the 24 skills currently possessed by QS graduates (C1-C24) is high with a Cronbach's coefficient alpha of 0.978 which indicates strong consistency and reliability of data (Manerikar & Manerikat, 2015). Mean values for each skill ranging from 3.000 to 4.077 along with RII values ranging from 0.708 to 0.877 are presented in Table 4. The 5-point Likert-Scale used ranged from strongly disagree (1) to strongly agree (5). In each category, the skill with the highest mean value and RII value was identified which can be seen in Table 4. Furthermore, an average RII value was computed for each skill within their respective categories, offering an overview of the required skills for QS graduates Then, the top five skills that are currently possessed by QS graduates were ranked based on overall importance which are: -

1. Able to operate Microsoft Word programs or any equivalent programs.
2. Able to operate Microsoft Excel programs or any equivalent programs.
3. Able to speak fluently in Bahasa Malaysia, English and other third languages.
4. Able to attentively listen to instruction during tasks.
5. Able to work well together with other team members that have different backgrounds, ages, ethnicities, genders etc.

4.4 Analysis of challenges faced by QS graduates in obtaining required skills

Cronbach's Alpha for the 9 challenges (D1-D9) is 0.873 which indicates good internal consistency (Manerikar & Manerikat, 2015). Analyses using descriptive statistics and RII were conducted on the challenges faced by QS graduates in acquiring the required skills. The challenges are ranked based on mean value which ranges from 2.821 to 3.744 and RII value ranging from 0.564 to 0.749 (see Table 5). The 5-point Likert-Scale point used was strongly disagreed (1) to strongly agreed (5). Then, the top five challenges faced were ranked based on overall importance and cruciality which include: -

1. Low level of problem-solving and decision-making skills of QS graduates to tackle problems related to construction projects.
2. Poor communication skills of QS graduates when interacting with clients and other project consultants.
3. Has difficulty in understanding complex terms when using advanced software for construction projects.
4. Demand for diverse services of QS graduates
5. Incorporation of sustainable elements in the construction industry, urging QS graduates to explore new costing methods for accurate estimates.

Table 3. Skills required by QS graduates in the construction industry

No.	Skills Required by QS Graduates in Construction Industry	Mean	Standard Deviation	Relative Important Index (RII)	Average RII Based on Category	Rank by Category of Skills	Overall Ranking	Average Ranking Based on Category
Information Technology and Computer Literacy Skills								
B1	Able to operate Microsoft Excel programs or any equivalent programs.	4.385	0.810	0.877	0.793	1	1	4
B2	Able to operate Microsoft Word programs or any equivalent programs.	4.282	0.754	0.856		2	2	
B3	Able to operate PowerPoint programs or any equivalent programs.	3.769	0.925	0.754		3	19	
B4	Able to operate the BIM-based cost estimation software (e.g.: Cubicost, CostX, etc).	3.769	1.104	0.754		3	19	
B5	Able to operate the advanced software (e.g.: AutoCAD, Revit, etc.).	3.615	1.035	0.723		5	23	
Management Skills								
B6	Able to manage time to complete the task before the deadline.	4.154	0.774	0.831	0.815	1	5	2
B7	Able to plan and accomplish the task efficiently and systemically with the required standards.	4.128	0.888	0.826		2	6	
B8	Able to adapt to a fast-paced environment and work under pressure.	3.949	0.910	0.790		3	14	
Communication Skills								
B9	Able to attentively listen to instructions during tasks.	4.282	0.754	0.856	0.796	1	2	3
B10	Able to provide relevant feedback on tasks.	4.051	0.992	0.810		2	9	
B11	Able to convey information or instructions clearly to achieve mutual understanding.	4.026	1.057	0.805		3	11	
B12	Able to speak fluently in Bahasa Malaysia, English and other third languages.	4.000	0.912	0.800		4	12	
B13	Able to write effectively in Bahasa Malaysia, English and other third languages.	3.974	0.897	0.795		5	13	
B14	Able to present information and project tasks confidently.	3.795	1.024	0.759		6	17	
B15	Able to negotiate regarding tasks to reach an agreement.	3.744	0.959	0.749		7	21	
Higher Order Thinking Skills								
B16	Able to identify and analyse the problems to implement relevant solutions	3.872	0.972	0.774	0.762	1	15	5
B17	Able to interpret, analyse and assess data and information.	3.846	1.082	0.769		2	16	
B18	Able to think creatively or critically to generate new ideas.	3.718	1.138	0.744		3	22	
Teamwork Skills								
B19	Able to work well together with other team members who have different backgrounds, ages, ethnicities, genders etc.	4.205	0.858	0.841	0.826	1	4	1
B20	Able to communicate information with other team members.	4.103	0.934	0.821		2	7	
B21	Able to contribute and assist team members in tasks to achieve goals.	4.077	0.977	0.815		3	8	
Leadership Skills								
B22	Able to bear responsibility for the tasks given.	4.051	0.992	0.810	0.757	1	9	6
B23	Able to direct and coordinate team members during tasks that are related to the project.	3.769	1.056	0.754		2	19	
B24	Able to motivate team members to achieve the intended objectives during various tasks.	3.538	1.113	0.708		3	24	

Table 4. Current skills that QS graduates have

No.	Skills Required by QS Graduates in Construction Industry	Mean	Standard Deviation	Relative Important Index (RII)	Average RII Based on Category	Rank by Category of Skills	Overall Ranking	Average Ranking Based on Category
Information Technology and Computer Literacy Skills								
C1	Able to operate Microsoft Word programs or any equivalent programs.	4.077	0.894	0.815	0.731	1	1	1
C2	Able to operate Microsoft Excel programs or any equivalent programs.	4.077	0.923	0.815		1	1	
C3	Able to operate PowerPoint programs or any equivalent programs.	3.590	1.012	0.718		3	7	
C4	Able to operate the advanced software (e.g.: AutoCAD, Revit, etc.)	3.333	1.002	0.667		4	14	
C5	Able to operate the BIM-based cost estimation software (e.g.: Cubicost, CostX, etc).	3.205	1.121	0.641		5	18	
Management Skills								
C6	Able to manage time to complete the task before the deadline.	3.462	0.878	0.692	0.446	1	10	5
C7	Able to plan and accomplish the task efficiently and systemically with the required standards.	3.410	0.932	0.682		2	11	
C8	Able to adapt to a fast-paced environment and work under pressure.	3.282	1.068	0.656		3	16	
Communication Skills								
C9	Able to speak fluently in Bahasa Malaysia, English and other third languages.	3.769	0.925	0.754	0.597	1	3	3
C10	Able to attentively listen to instruction during tasks.	3.641	0.897	0.728		2	4	
C11	Able to write effectively in Bahasa Malaysia, English and other third languages.	3.564	0.906	0.713		3	9	
C12	Able to convey information or instructions clearly to achieve mutual understanding.	3.385	1.060	0.677		4	12	
C13	Able to provide relevant feedback on tasks.	3.359	1.105	0.672		5	13	
C14	Able to present information and project tasks confidently.	3.308	1.073	0.662		6	15	
C15	Able to negotiate regarding tasks to an reach agreement.	3.179	1.181	0.636		7	19	
Higher Order Thinking Skills								
C16	Able to identify and analyse the problems to implement relevant solutions.	3.128	0.998	0.626	0.621	1	20	2
C17	Able to interpret, analyse and assess data and information.	3.128	0.998	0.626		1	20	
C18	Able to think creatively or critically to generate new ideas.	3.051	1.183	0.610		3	23	
Teamwork Skills								
C19	Able to work well together with other team members who have different backgrounds, ages, ethnicities, genders and etc.	3.641	1.006	0.728	0.482	1	4	4
C20	Able to contribute and assist team members in tasks to achieve goals.	3.615	0.901	0.723		2	6	
C21	Able to communicate information with other team members.	3.590	0.959	0.718		3	7	
Leadership Skills								
C22	Able to bear responsibility for the tasks given.	3.256	0.986	0.651	0.424	1	17	6
C23	Able to direct and coordinate team members during tasks that are related to the project.	3.103	1.180	0.621		2	22	
C24	Able to motivate team members to achieve the intended objectives during various tasks.	3.000	1.184	0.600		3	24	

Table 5. Challenges faced by QS graduates in obtaining required skills

No	Challenges Faced by QS Graduates in Obtaining Required Skills	Mean	Standard Deviation	Relative Important Index (RII)	Overall Ranking
D1	Low level of problem-solving and decision-making skills of QS graduates to tackle problems related to construction projects.	3.744	0.932	0.749	1
D2	Poor communication skills of QS graduates when interacting with clients and other project consultants.	3.718	0.938	0.744	2
D3	Has difficulty understanding complex terms when using advanced software for construction project.	3.718	0.881	0.744	2
D4	The demand for diverse services of QS graduates.	3.615	0.983	0.723	4
D5	The incorporation of the sustainable element in the construction industry urges QS graduates to explore a new type of costing method in order to provide an accurate cost estimate.	3.590	0.874	0.718	5
D6	Competitive job market among QS graduates.	3.462	0.935	0.692	6
D7	Lack of mentorship during the industrial training period.	3.436	0.988	0.687	7
D8	Lack of transfer of skills of QS graduates.	3.205	0.945	0.641	8
D9	The unwillingness of QS graduates to adapt to the application of new technology (e.g.: CostX, Revit, etc.)	2.821	1.225	0.564	9

4.5 Analysis of solutions to minimize the challenges faced by QS graduates in obtaining required skills

Cronbach's Alpha for all the 12 solutions (E1-E9) is 0.933 which indicates excellent internal consistency (Manerikar & Manerikat, 2015). The solutions are ranked based on the mean value which ranges from 3.615 to 4.205 and RII value ranging from 0.564 to 0.749 (see Table 6). The 5-point Likert-Scale point used was unimportant (1) to very important (5). Then, the top six solutions were assessed based on its overall importance which include: -

1. Invite an experienced Quantity Surveyor as a guest lecturer to deliver talks and provide fresh insights regarding the construction industry.
2. Periodically revised the course structure to meet the demand of the present construction industry.
3. Incorporating employability skills in teaching and learning.
4. Establishing assessment activities aligned with industry expectations to evaluate the strengths and weaknesses of QS graduates' and whether their skills meet the needs of the construction industry.
5. Encouraging QS graduates to secure internships to gain professional experience and improve their employability skills.
6. Encourage equal collaboration between higher education institutions and experienced Quantity Surveyor in course design or review to ensure the course content meets the needs of the construction industry.

Table 6. Solutions to minimize the challenges faced by QS graduates in obtaining those skills

No	Solutions To Minimize the Challenges Faced by QS Graduates in Obtaining Required Skills	Mean	Standard Deviation	Relative Important Index (RII)	Overall Ranking
E1	Invite an experienced Quantity Surveyor as a guest lecturer to deliver talks and provide fresh insights regarding the construction industry.	4.205	0.945	0.841	1
E2	Periodically revised the course structure to meet the demand of the present construction industry.	4.154	0.774	0.831	2
E3	Incorporate employability skills in teaching and learning.	4.128	0.945	0.826	3
E4	Establish assessment activities that are in line with the industry expectations to assess the strengths and weaknesses of QS graduates and whether their skills meet the needs of the construction industry.	4.128	0.858	0.826	3
E5	Encourage QS graduates to secure internships to gain professional experience and improve their employability skills.	4.103	0.906	0.821	5
E6	Encourage equal collaboration between higher education institutions and experienced Quantity Surveyor in course design or review to ensure the course content meets the needs of the construction industry.	4.026	0.868	0.805	6
E7	Provide a sufficient duration of orientation training and regular evaluation to assist the freshly hired QS graduates in integrating into the organization of the firm.	3.821	1.041	0.764	7
E8	QS graduates participate actively in various workshops and talks to enhance their skills and capabilities.	3.795	1.062	0.759	8
E9	Enhance orientation training in quantity surveying firms to educate freshly hired QS graduates regarding the policies of the firm.	3.769	1.080	0.754	9
E10	QS graduates conduct additional research to prepare themselves to meet the workplace requirements.	3.744	1.062	0.749	10
E11	Extend the duration of an industrial training programme or internship.	3.692	1.097	0.738	11
E12	Schedule the industrial training programme between the semesters of the curriculum.	3.615	1.060	0.723	12

5.0 DISCUSSION

5.1 Skills required by QS graduates in the construction industry

The findings on the skills required by QS graduates in the construction industry concluded that the most important skill required is able to operate Microsoft Excel programs or any equivalent programs with an RII value of 0.877. The spreadsheet software provided by Microsoft Excel is typically used among QS as it assists them in completing the calculation works and scheduling a significant amount of figures with fewer human errors (Musa et al., 2010; Chai, 2017). Yap et al. (2021) also emphasize that this skill is crucial for QS as it involves both basic and advanced software usage.

The second and third most important skills that are agreed by respondents are able to operate Microsoft Words programs or any equivalent programs and able to attentively listen to instruction during tasks share the same RII value of 0.856. Chai (2017) supported that mastering Microsoft Word software was an integral part of QS roles as this skill could be gained during studies. On the other hand, Johari and Jha (2021) underscore that enhancing listening skills can boost construction labour productivity (CLP). This is also supported by Mustapa et al. (2022) that indicate employers prioritize candidates with strong communication skills.

Furthermore, the fourth most important skill that reached consensus among the respondents is able to work well together with other team members that have different backgrounds, ages, ethnicities, genders and etc with RII of 0.841. This is supported by Rahmat et al., (2018) who state that employers will seek out graduates who can work together with other team members. Additionally, Mustapa et al. (2022) emphasize that strong teamwork skills especially the ability to collaborate effectively are crucial for boosting workplace productivity.

Lastly, the fifth most important skill in the construction industry is able to manage time to complete the task before the deadline with an RII of 0.831. Time management and task organization which include in self-management are critical to the success of construction projects as they allow the QS to handle client's negotiations, execute budget changes and supervise the work of the staff members (Kornelakis & Petrakaki, 2020).

5.2 Current skills that QS graduates have

The findings on current skills possessed by QS graduates in the construction industry have led to the conclusion that the most crucial skills possessed by QS graduates are able to operate Microsoft Word programs or any equivalent programs and able to operate Microsoft Excel programs or any equivalent programs with RII of 0.815. QS graduates are expected to possess these skills considering these software tools play a crucial role in the daily tasks and responsibilities of QS professionals. Chai (2017) highlighted that QS programmes incorporate the use of these fundamental software applications as part of the curriculum. This alignment with the industry's expectations is significant, considering the increasing demand for technological adaptation in the construction industry as stated by Yap et al. (2021). In response to the evolving industry landscape, HEIs have recognized the importance of equipping students with basic and advanced software knowledge and skills (Mustafa et al., 2019).

The third most crucial skill possessed by QS graduates in the construction industry is able to speak fluently in Bahasa Malaysia, English and other third languages with an RII value of 0.754. Effective communication in multiple languages is crucial for QS graduates to navigate various work environments and handle diverse situations. This finding aligns with the research conducted by Shafie et al. (2014), emphasizing the importance of English and Bahasa Malaysia proficiency for QS graduates in any professional setting. Proficiency in other third languages can boost their ability to connect with international clients and participate in global projects (Shafie et al., 2014). It also helps in aiding with conflict resolution as it requires clear communication (Ting et al., 2017). Therefore, this skill helps QS graduates to bridge communication gaps and establish rapport with a wider range of stakeholders.

The fourth and fifth skills that are currently possessed by QS graduates are able to attentively listen to instruction during tasks and able to work well together with other team members that have different backgrounds, ages, ethnicities, genders, etc with RII value of 0.728. Effective listening entails actively engaging with verbal and non-verbal cues, comprehending information accurately, and demonstrating empathy towards stakeholders which further enhances CLP (Johari & Jha, 2021). Besides, it is crucial for QS graduates to exhibit strong teamwork capabilities which involve coordinating with fellow team members, fostering consensus, and mitigating conflicts in a professional setting (Rahmat et al., 2018). Malaysian employers highly regard the ability of QS graduates to collaborate effectively in a team as emphasized by Mustapa et al. (2022). Thus, QS graduates must actively contribute to team dynamics, communicate openly, and demonstrate a willingness to collaborate as effective teamwork enhances productivity and project outcomes.

5.3 Skills required by QS graduates in the construction industry vs. current skills that QS graduates have

A noticeable gap exists between the skills required by QS graduates in the construction industry and the skills currently possessed by these graduates. This is supported by Herberta et al. (2020) who highlighted that there is a mismatch between the employability skills sought by employers and skills that QS graduates possess upon completing their studies. When examining the overall rankings, it becomes evident that the top five skills required by the construction industry are closely aligned with the current skill set of QS graduates. For instance, both required and possessed skills rank able to operate Microsoft Excel programs or any equivalent programs as 1st, demonstrating a shared emphasis on this skill. Similarly, the skill able to operate Microsoft Word programs or any equivalent programs was ranked 2nd among the required skills and ranked 1st among the skills currently possessed by QS graduates.

Interestingly, there's a noteworthy difference in the skill able to attentively listen to instruction during tasks, which is slightly lower in the possessed skills compared to its higher rank in the required skills (see Table 3). Lastly, the skill of able to manage time to complete the task before the deadline" is ranked 5th among the required skills but drops to the 10th position among the current skills possessed by QS graduates (see Table 3). This highlights a need for further enhancing the time management skills of QS graduates to bridge the gap between industry expectations and their current skill set. The findings reveal both areas of alignment and gaps between industry demands and QS graduate competencies. QS graduates must enhance their skills and adapt to industry demands through continuous self-improvement to boost their job prospects.

5.4 Challenges faced by QS graduates in obtaining required skills

The top five challenges faced by QS graduates in attaining the required skills are of significant concern. The first challenge encountered by QS graduates is the low level of problem-solving and decision-making skills of QS graduates to tackle problems that related to construction project which ranked as the most crucial with an RII value of 0.749. Shafie et al. (2014) have identified there were deficiencies in problem-solving and decision-making skills among Malaysian graduates. While problem-solving is rated as relatively less crucial within the category of higher order thinking skills required for QS graduates, it remains essential for their job prospects (Mustapa et al., 2022).

The second challenge faced by QS graduates is poor communication skills of QS graduates when interacting with clients and other project consultants which ranked 2nd with an RII value of 0.744. Chaudhari (2022) stated that soft skills typically revolve around communication skills. Khalid et al. (2014) further support this notion by highlighting that Malaysian employer often find graduates lacking necessary soft skills despite their good academic qualifications. Consequently, insufficient communication skills can lead to misunderstandings, conflicts, and delays in project execution.

Furthermore, the third challenge faced by QS graduates is difficulty in understanding complex terms when using advanced software for construction projects. This challenge shares a similar rank as the previous one with an RII value of 0.744. The emergence of new and advanced software such as BIM is anticipated as a great challenge towards QS in general (Shayan et al., 2019). The complexity of software terms especially in the context of operating BIM for construction projects leads to difficulty in operating it for the construction projects (Latiffi et al., 2015). To secure future employment, QS graduates must adapt quickly to new technology particularly advanced software like BIM by taking on roles that involve the usage of BIM (Cunningham, 2014; Kim & Park, 2018).

The fourth challenge faced by QS graduates is the demand for diverse services of QS graduates which ranked 4th with the RII value of 0.723. Shayan et al. (2019) noted that understanding and adapting to diverse cultural requirements pose a significant challenge for QS graduates. Additionally, meeting diverse service demands also requires heightened cultural awareness to effectively adapt to varying project environments in different locations (Shayan et al., 2019). The increasing demand for diversified services compels QS graduates to continually update their skills to align with evolving industry practices.

Lastly, the fifth challenge faced by QS graduates is the incorporation of the sustainable element in the construction industry urges QS graduates to explore a new type of costing method in order to provide an accurate cost estimate that ranked 5th with an RII value of 0.718. As the focus on energy efficiency and sustainable materials intensifies, the challenge of creating accurate cost estimates and plans has grown more complex (Shayan et al., 2019). This forces QS graduates to explore innovative costing methods to ensure accurate estimates for projects that incorporate sustainability elements. The QS graduates must expand their knowledge about sustainable construction principles, materials, and technologies while staying informed of the latest trends in sustainability assessment schemes (Shayan et al., 2019).

5.5 Proposed solutions for QS Graduates to enhance their employability skills

The top six solutions to minimize the challenges are crucial in proposing suitable solutions to enhance QS graduates' employability skills. The first solution is to invite experienced Quantity Surveyor as a guest lecturer to deliver talks and provide fresh insights regarding construction industry which was ranked 1st with an RII value of 0.841. The role of guest lecturers presents pertinent material by presenting diverse perspectives and practical examples which complement the theoretical lesson provided by regular lectures (Li & Guo, 2015). Moreover, this solution creates networking opportunities and facilitates connections between students and industry professionals (Mahadewi & Pudjawan, 2020).

The second solution is to periodically revise course structure to meet the demand of present construction industry which ranked 2nd with an RII value of 0.826. The construction field continuously embraces new technologies which require HEIs to play a vital role in updating the curriculum to match construction industry requirements (Chua, 2000). This entails integrating areas such as sustainable practices, digitalization, BIM and project management techniques (Kibwami et al., 2021).

Furthermore, the third solution is to incorporate employability skills in teaching and learning which ranked 3rd with an RII value of 0.826. HEIs are responsible in determining the suitable type of employability skills after

periodically revising the course structures. The inclusion of employability skills in curriculum will undoubtedly enhance the educational experience of QS graduates (Kibwami et al., 2021). Overall, incorporating employability skills will contribute to the professional development of QS graduates.

The fourth solution is to establish assessment activities that are in line with the industry expectations to assess strengths and weaknesses of QS graduates whether their skills meet the needs of the construction industry which was also ranked 3rd and has the same RII value as the previous solution. Kibwami et al. (2021) further emphasized the importance of practical teachings such as incorporating case studies with site visits and problem-solving approaches in assignments and tutorials. Additionally, Ang (2015) states that industry-aligned assessments provide valuable feedback on graduates' strengths and weaknesses and help them pinpoint areas for improvement of specific skills.

The fifth solution is to encourage QS graduates to secure internships to gain professional experience and improve their employability skills which ranked 5th with an RII value of 0.821. Internships act as a link between theoretical knowledge acquired in HEIs and practical demand in the construction industry as they can bridge the gap between education and industry requirements (Asonitou, 2014). Additionally, internships provide exposure to broad aspects of the construction industry through hands-on experience and should be emphasised by HEIs to produce excellent quality QS graduates (Kibwami et al., 2021).

Lastly, the sixth solution is to encourage equal collaboration between HEIs and experienced QS professionals in course design or review to ensure the course content meets the needs of the construction industry which ranked 6th with an RII value of 0.805. The inclusion of experienced QS professionals in course design is crucial in bringing the perspectives from real world industry into the educational framework of HEIs. Kibwami et al. (2021) emphasize the value of such collaboration in facilitating work-integrated learning and fostering culture of lifelong learning. Therefore, this exposure to the professional working setting helps nurture a mindset of continuous improvement to remain relevant in a rapidly evolving industry.

By implementing these solutions, the challenges faced by QS graduates can be effectively addressed to foster conducive an environment for skills improvement. Table 6 presents the proposed solutions based on the top five challenges to minimize the challenges faced by QS graduates to enhance their employability skills.

6.0 RESEARCH IMPLICATIONS

These proposed solutions can be utilized by various stakeholders including HEIs, employers, QS students, and QS graduates to address the challenges and bridge the gap between the skills required by the construction industry and the skills possessed by QS graduates. Educational institutions particularly HEIs that offer quantity surveying programs can utilize these by proposing proper solutions to facilitate career development workshops to empower QS graduates in their professional journey. It also can be applied for industry associations and construction companies which can offer proper internships and partnerships with HEIs by allowing industry professionals to share expertise as guest lecturers. Additionally, it primarily benefits QS graduates as they progress in their professional growth to overcome their challenges through internships and continuous self-improvement by staying updated with the latest advancements in construction technology and sustainable aspects of construction.

7.0 CONCLUSION

The skills of QS graduates align closely with the practice of project management which involved the practice of skills, tools, techniques to complete tasks such as cost estimation, contract management and value engineering which plays a vital role in achieving overall objectives of project management.

This study reveals that there is limited research on effective solutions to enhance employability skills among QS graduates despite its importance towards the construction industry. The skill gaps and challenges faced by graduates in obtaining the skills required were also identified in this study. The key solutions were proposed such as inviting experienced QS professionals as guest lecturers to alleviate those challenges and subsequently enhance their employability skills. These solutions can benefit QS graduates, HEIs and employers by contributing to improving employability skills and enhancing productivity in the construction industry. However, this study is limited towards specific regions namely Selangor and Kuala Lumpur which may restrict applicability towards general context. Thus, future research should expand its scope to encompass a wider range of QS graduates and the construction industry as a whole.

Table 6. Proposed solutions for QS graduates to enhance their employment skills

Skills That QS Graduates Lack	Challenges Faced by QS Graduates in Obtaining the Required Skills	Proposed Solutions to Elevate the Challenges
• Ability to identify and analyse the problems to implement relevant solutions. • Ability to interpret, analyse and assess data and information. • Ability to think creatively or critically to generate new ideas.	Low level of problem-solving and decision-making skills of QS graduates to tackle problems related to construction projects.	• Promote equal collaboration between HEIs and experienced QS professionals throughout the course design or evaluation to ensure the curriculum emphasises on problem-solving and decision-making skills. • Integrate realistic case studies and real-life scenarios coursework that requires students to apply problem-solving skills in the context of construction projects. • Encourage project-based learning so that students can proactively engage and participate in problem-solving activities in simulated construction projects. • Promote collaborative problem-solving activities in group projects or team-based assignments to foster teamwork and problem-solving skills.
• Ability to write effectively in Bahasa Malaysia, English and other third languages. • Ability to convey information or instructions clearly to achieve mutual understanding. • Ability to provide relevant feedback on tasks. • Ability to present information and project tasks confidently. • Ability to negotiate regarding tasks to reach an agreement.	Poor communication skills of QS graduates when interacting with clients and other project consultants.	• Incorporate training in effective communication techniques in the teaching and learning process. • Include role-playing activities such as mock meetings and simulations that mimic the actual communication scenarios with the client and other project stakeholders. • Offers seminars that focus on professional etiquette and professional communication skills in the construction industry, business writing as well as other communication techniques with guest lecturers. • Encourage participation in public speaking events, construction industry conferences and project presentations. • Incorporate communications skills development into courses or modules including verbal and written communications as well as effective presentation techniques.
• Ability to operate the advanced software (e.g.: AutoCAD, Revit, etc.) • Ability to operate the BIM-based cost estimation software (e.g.: Cubicost, CostX, etc). • Ability to understand complex terms and concepts related to the software.	Has difficulty understanding complex terms when using advanced software for construction projects.	• Offer thorough training on advanced construction software programs that focus on understanding the complex and difficult terminologies of the software. • Provide a practical training session, assignments and tutorials to familiarise the QS graduates as well as QS students with the efficient use of advanced software tools. • Collaborate with software providers and industry experts to provide workshops addressing the software challenges as well as offering a hands-on experience on the usage of advanced software. • Integrate case studies and software demonstrations in coursework to illustrate how the software can be applied towards the projects. • Facilitate access to resources such as user manuals, online forums and video tutorials to support self-learning and address any software-related challenges.

Skills That QS Graduates Lack	Challenges Faced by QS Graduates in Obtaining the Required Skills	Proposed Solutions to Elevate the Challenges
• Ability to operate the BIM-based cost estimation software (e.g., Cubicost, CostX, etc.). • Ability to manage time to complete the task before the deadline. • Ability to plan and accomplish the task efficiently and systemically with the required standards. • Ability to adapt to a fast-paced environment and work under pressure. • Ability to negotiate regarding tasks to reach an agreement. • Ability to identify and analyse the problems to implement relevant solutions. • Ability to interpret, analyse and assess data and information. • Ability to think creatively or critically to generate new ideas. • Ability to communicate information with other team members. • Ability to bear responsibility for the tasks given. • Able to direct and coordinate team members during tasks that are related to the project. • Able to motivate team members to achieve the intended objectives during various tasks.	The demand for diverse services of QS graduates.	• Expand and diversify the range of skills and competencies through a series of workshops and seminars by inviting guest speakers from relevant fields. • Regularly update and revise the course structure to meet the changing needs of the construction industry. • Offer elective courses or specialization tracks in the final years of QS students that cater to the specific areas of demand in the construction industry. • Encourage multidisciplinary cooperation through joint projects or educational programmes with the related fields such as finance, architecture, or engineering. • Offer exposure to the diverse projects and construction projects through internships, site visits and guest lectures from professionals who are specialized in different areas in construction industry. • Promote continuous professional development (CPD) through industry certifications, professional development programmes, postgraduate programmes that tailored to the specific areas of demands in construction industry.
	The incorporation of the sustainable element in construction industry urges QS graduates to explore a new type of costing method in order to provide an accurate cost estimate.	• Introduce modules or courses that focus on the importance of sustainable construction practices and their impact on the cost estimation of sustainable construction projects. • Organise workshops or seminars on lifecycle costing strategies, sustainable construction methods, green building certifications as well as renewable energy considerations in association with industry experts and construction organizations that focus on sustainable elements in building. • Delegate tasks or assignments and projects that require analysing and evaluating or estimating the cost that associated with sustainable construction practices. • Encourage innovation and research to develop a new cost estimation model that integrates the sustainability factors. • Provide access to the resources and tools that can support sustainable cost estimation by including the databases that provide sustainable materials as well as energy-efficient technologies.

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