STUDY ON THE IMPLEMENTATION OF QUALITY ASSESSMENT SYSTEM IN CONSTRUCTION (QLASSIC) IN MALAYSIA

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Abstract

Construction quality in Malaysia could be better if more effort were put into it. Ensuring quality in the construction industry is crucial for enhancing residents' quality of life. Hence, CIDB Malaysia has implemented the Quality Assessment System in Construction Industry (QLASSIC) as an industry-specific framework for measuring construction quality. Unfortunately, the adoption of QLASSIC is still not favourable. Hence, this research study aims to analyse the implementation of the QLASSIC in Malaysian construction industry. Four independent variables and one dependent variable were included in the study based on the extensive literature review. The independent variables were knowledge and awareness barriers, cost barriers, regulatory and enforcement barriers, and time-related barriers. The dependent variable was the company's readiness to adopt QLASSIC. In this study, a questionnaire survey was developed to collect the data for analysis by using SPSS software. There were 165 responses collected and used for the data analysis and interpretation. The study found that the adoption rate of QLASSIC is still low and the perception barriers were relatively important to the implementation of QLASSIC as indicated by Spearman's Rank correlation coefficient. The correlation was high among the perceived barriers with the company's readiness to adopt QLASSIC. This research study can be a guideline for QLASSIC adoption and provide valuable insight for future research studies.

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1.0 INTRODUCTION

The construction industry possesses distinct characteristics and qualities that set it apart from other sectors. Its unique nature, future orientation, and diverse range of professions, specialities, and suppliers distinguish it. However, the construction environment has often been criticised for emphasising inferior quality compared to other industries. Criticisms have been directed towards quality, construction processes, participating organisations, and materials, among other aspects. There is a pressing need to enhance and elevate standards, quality, and professionalism across all disciplines within the construction sector (Janipha & Ismail, 2013; Manap *et al.,* 2017).

Ensuring quality in the construction industry is crucial for enhancing the residents' quality of life. Hence, it is imperative to improve the quality of construction projects continually. Since the construction sector significantly contributes to the country's economic growth, improving its quality is essential. Hence, implementing a quality management or assessment system is vital for enhancing the standard of construction work. In Malaysia, the CIDB has implemented the Quality Assessment System in Construction Industry (QLASSIC) as an industry-specific framework for measuring construction quality. QLASSIC assesses and maintains construction project quality requirements to improve Malaysia's construction sector (Manap *et al.,* 2017). The Construction Quality Assessment System (CONQUAS) utilised by Singapore's Building and Construction Authority serves as the basis for this standard's evaluation system. QLASSIC and CONQUAS share important similarities in building categorisation and weight distribution (Ali *et al.,* 2012). Similarly, in Hong Kong, Hong Kong Housing Authority (HKHA) created the Performance Assessment Scoring System (PASS) in 1990, in reaction to numerous complaints of poor building quality. Singapore's CONQUAS, which was deployed in 1989, inspired this system. Furthermore, the Maintenance Assessment Scoring System (MASS) was developed to evaluate and maintain structural quality (Kam & Abdul Hamid, 2012; Manap *et al.,* 2017).

QLASSIC assesses the quality of workmanship in building projects based on the Construction Industry Standard (CIS 7). Consequently, the QLASSIC evaluation will be conducted on the pieces examined for the first time. Rectification or correction made after the evaluation will not be reevaluated (Construction Industry Development Board Malaysia, 2021a). Adopting QLASSIC offers several benefits, including greater quality assurance, a stronger competitive edge and market positioning, as well as improved customer satisfaction.

Despite the introduction of QLASSIC, its adoption in Malaysia faces challenges, primarily due to the lack of government enforcement and other accompanying barriers (Construction Industry Development Board Malaysia, 2021a).

However, research on the barriers to QLASSIC adoption and their impact on company readiness remains limited. This study aims to analyse the adoption of QLASSIC in Malaysian construction industry. Therefore, among the key objectives of this research are to determine the adoption level of QLASSIC among the construction industry, investigate the perceived barriers affecting the implementation of QLASSIC and establish the correlation between perceived barriers and company readiness to adopt QLASSIC. It is ultimately proposed that the findings of this research will significantly help the construction industry to recognise the challenges in implementing QLASSIC and discover improvement strategies. This study also guides the construction company to prioritise the efforts to overcome the most significant barrier in QLASSIC implementation. Lastly, it provides a knowledge-based approach for future researchers who study similar topics.

2.0 LITERATURE REVIEW

Developers and construction companies always consider quality in building construction. They strive to achieve recognition for their workmanship and establish themselves as superior to their competitors. However, many companies have not yet fully realised the advantages of quality standards. Enhancing an organisation's performance can be achieved by simplifying its procedures, ensuring client satisfaction, and reaching company objectives. This can be accomplished by prioritising quality (Janipha & Ismail, 2013; Manap *et al.,* 2017). Even though adopting QLASSIC offers benefits, its adoption remains low. Some barriers, such as knowledge and awareness, cost, regulatory, enforcement, and time-related barriers, may hinder its adoption.

2.1 Knowledge and Awareness Barrier

There are a significant lack of knowledge regarding QLASSIC (Seman *et al.,* 2021). Although researchers introduced the concept, they emphasised that industry participants still have a restricted comprehension, highlighting a persistent difficulty (Azir *et al.,* 2018). Researchers also emphasised the need for more understanding of QLASSIC, and the essential new technologies required for its application will hinder them from adopting it (Zahrizan *et al.,* 2023). Then, the small construction firms have a limited understanding of the advantages of QLASSIC and view it as an unnecessary cost (Kam & Abdul Hamid, 2015). The lack of industry knowledge in combining QLASSIC with ISO 9001 QMS to improve overall quality performance will cause an obstacle in improving the adoption of QLASSIC (Ali, 2013).

The contractors frequently lack awareness of the QLASSIC system (Seman *et al.,* 2021). Similarly, it had been found that developers in Malaysia, including well-known construction enterprises, possess a restricted level of awareness regarding the QLASSIC quality rating system (Azir *et al.,* 2018). As a result, since developers are unaware of the system, they are unwilling to participate in CIDB for QLASSIC assessment (Sulaiman *et al.,* 2019).

The absence of familiarity among important stakeholders presents substantial difficulties in implementing QLASSIC, hindering knowledge and awareness. It had been found that contractors frequently need more competence and abilities, impeding their capacity to effectively participate in the Quality Assessment System in Construction (QLASSIC) (Seman *et al.,* 2021). The inadequate comprehension of the system also affects developers and contractors in Malaysia, hence impeding its acceptability (Khalid & Tamjehi, 2020). In addition, the companies often encounter difficulties caused by a lack of individuals who possess the necessary skills to carry out QLASSIC evaluations. The persistent hesitance to use QLASSIC is worsened by challenges in identifying competent QLASSIC assessors and facilitating information exchange inside companies (Zahrizan *et al.,* 2023).

2.2 Cost Barrier

There are significant obstacles in implementing QLASSIC: the impression of higher expenses and limited advantages linked to its methods and practices (Sulaiman *et al.,* 2019). Researchers have also emphasised that the high training costs and low benefits provide substantial obstacles to the implementation of QLASSIC from a technical point of view. Industry stakeholders may not fully comprehend the significant advantages of QLASSIC, resulting in a hesitance to allocate time and money towards obtaining certification. Companies that specialise in small projects or restorations may consider QLASSIC accreditation unnecessary, further increasing their reluctance (Zahrizan *et al.,* 2023).

The additional expenses associated with fulfilling the quality criteria for QLASSIC implementation are substantial. Experts in the construction field argue that QLASSIC places financial strain on project budgets, resulting in higher costs throughout the application and construction stages (Construction Industry Development Board Malaysia, 2021b; Manap *et al.,* 2017). Research indicates that incorporating QLASSIC into construction projects might lead to increased financial responsibilities for contractors, impacting the expenses associated with getting QLASSIC certification and the construction costs (Azir *et al.,* 2018).

The QLASSIC evaluation entails supplementary expenses comprising the costs involved with the application and construction procedure and the fees required for implementation (Construction Industry Development Board Malaysia, 2021b; Seman *et al.,* 2021). QLASSIC can also significantly impact construction expenses, potentially leading to increased financial responsibilities for developers. The QLASSIC assessment fees are calculated based on the project's gross floor area. Consequently, a larger project area will result in higher QLASSIC assessment charges (Azir *et al.,* 2018).

2.3 Regulatory and Enforcement Barrier

The lack of adequate government enforcement has been a major obstacle to implementing QLASSIC in building projects. The absence of a sense of urgency results from insufficient implementation of regulations (Kam & Abdul Hamid, 2015). In addition, an absence of promotion and engagement from pertinent authorities, which further hinders the incorporation of QLASSIC into business practices (Zahrizan *et al.,* 2023). The problems are worsened by the lack of strong coercion, such as government mandates, and the effect of competing forces that encourage imitation (Zahrizan *et al.,* 2023). The low acceptance rate of QLASSIC can be related to stakeholders considering it superfluous and the lack of compulsory prerequisites for implementation (Construction Industry Development Board Malaysia, 2021b; Manap *et al.,* 2017).

Additionally, the researchers emphasised the administrative obstacles linked to the implementation of QLASSIC. Organisations seeking QLASSIC accreditation face considerable difficulties due to the complex application and implementation procedures. These regulatory obstacles might discourage businesses from actively participating in the QLASSIC system, thus hindering its general adoption and efficiency in enhancing construction quality (Azir *et al.,* 2018).

Moreover, the application of QLASSIC also raises problems regarding the reliability of the assessor. It had been found that insufficient personnel at CIDB is a significant obstacle, necessitating external assessors' involvement in evaluations (Ali *et al.,* 2014). These assessors, usually persons with specialised knowledge in the construction field, must go through a thorough selection procedure to fulfil the CIDB's requirements for QLASSIC assessors. Nevertheless, a notable concern arises over the possible prejudice from these external evaluators, especially if they are from competitor organisations. This condition will erode the fairness of the evaluations (Ali *et al.,* 2014).

2.4 Time-Related Barrier

Several academics have shown evidence of the intricate temporal barrier in implementing QLASSIC. Some of them found that attaining the minimal criteria specified in the QLASSIC standards frequently results in project delays since extra construction time is needed to rectify or redo work (Seman *et al.,* 2021).

The QLASSIC evaluation process now necessitates more time due to heightened managerial obligations, an increased volume of documentation, and more bureaucratic protocols (Seman *et al.,* 2021). In addition, the assessment process linked to QLASSIC might result in disruptions to construction activities (Azir *et al.,* 2018). The intricate nature of the procedures necessary for compliance also results in additional delays (Lee *et al.,* 2020). Moreover, the QLASSIC assessors frequently require a substantial duration to complete evaluation reports. Consequently, developers delay acquiring QLASSIC reports and scores from CIDB, with certain instances requiring up to six weeks from the assessment date (Subramaniam *et al.,* 2019).

Researchers have emphasised that incorporating QLASSIC into building projects poses a significant problem in managing project schedules. The challenge is managing the conflicting needs of prolonged construction time, evaluation tasks, and training obligations within project timeframes (Azir *et al.,* 2018; Lee *et al.,* 2020; Seman *et al.,* 2021; Zahrizan *et al.,* 2023). Coordinating different tasks within the project timeline will significantly hinder the seamless incorporation of QLASSIC into building projects.

3.0 METHODOLOGY

This study integrated a comprehensive methodology and work plan to examine the objectives outlined. The outlined objectives were to determine the adoption of QLASSIC in the construction industry, investigate the perceived barriers affecting the implementation of QLASSIC, and establish a correlation between perceived barriers and company readiness to adopt QLASSIC. The first step involved establishing a conceptual framework to guide the study. To achieve the stated objective, this study utilised quantitative research methods. Data collection involved using primary and secondary sources, employing tools such as questionnaire surveys and literature studies to gather the needed information. Subsequently, the sampling design outlined the protocols for participants' selection, determined the sample size, and conducted pilot studies to improve the questionnaire. Then, the data gathered from the questionnaire survey were analysed using the Statistical Package for the Social Sciences (SPSS), a software used to analyse data.

3.1 Conceptual Framework

A problem is viewed comprehensively in the conceptual framework. The statistical conceptual framework illustrates the relationship among a study's main concept. Its logical framework helps to see how research ideas link. The framework simplifies the idea definition for the researcher's study problem. The conceptual frameworks might be graphical or narrative, presenting the significant variables or structures to be researched and their hypothesised relationships. The conceptual framework provides several advantages to research (Adom & Kamil, 2018). In this research, the conceptual framework was generated based on the literature review done. From the extensive literature review, the independent variables and dependent variables, which may have a relationship, were established. The conceptual framework of this study is shown in Figure 1.

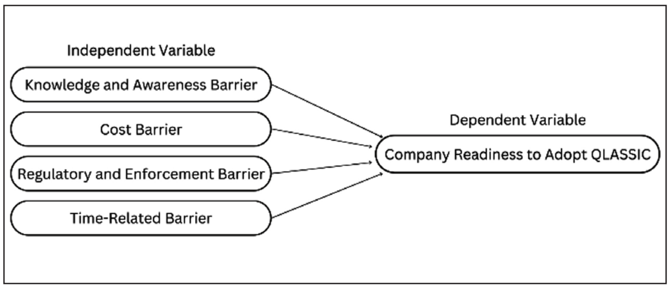

Figure 1: Conceptual framework of the study

3.2 Data Collection

Collecting primary data necessitates methodically making observations or measurements to collect crucial information. Data collection is a crucial research technique, whether for governmental, commercial, or scholarly objectives (Kabir, 2018). In this research, developers, consultants, and on-site contractors were the target population that involved in the quantitative survey, which is a questionnaire. This is because most of them are included in the building projects for which the QLASSIC may be adopted.

3.3 Questionnaire Survey

In this research study, the questionnaire was developed by Google Form. The methods used to reach the respondents were mail questions, online questions, and face-to-face respondents filling out the questionnaire via Google Form. The questionnaire consisted of five sections (Sections A, B1, B2, C, and D). Table 1 displays the summary of the questionnaire.

Table 1: Summary of the questionnaire

Section	Item
A	Section A of the questionnaire focuses on the respondents' profiles, capturing key information such as their education level, the company's main scope of services, their role within the company, work experience in the construction industry, company size, and whether the company has previously or currently adopted QLASSIC.
B1	Section B1 of the questionnaire addresses the awareness and adoption level of QLASSIC among respondents who have previously or are currently implementing it. This section aims to assess the company's adoption status, gather specific details about respondents' experience with QLASSIC, and evaluate the respondents' overall awareness of the system.
B2	Section B2 of the questionnaire focuses on the awareness and adoption level of QLASSIC among respondents who have never implemented the system. This section evaluates the respondents' awareness of QLASSIC and explores their plans or intentions regarding potential future adoption.
C	Section C of the questionnaire addresses the perceived barriers to implementing QLASSIC, assessing respondents' views by rating the barriers they believe hinder the system's adoption.
D	Section D of the questionnaire evaluates the company's readiness to adopt QLASSIC, assessing various factors that indicate their preparedness for implementing the system.

3.4 Data Analysis Using SPSS

After data collection through a questionnaire survey, the data was analysed using SPSS (Statistical Package for the Social Sciences). Descriptive analysis was used to investigate the demographics of respondents in Section A, as well as the awareness and adoption levels of QLASSIC in Sections B1 and B2. To assess the validity and reliability of the findings, data measurements, including reliability, multicollinearity, and normality tests, were carried out on Sections C and D, which used a 5-point Likert scale in the questionnaires. Subsequently, regression analysis, including Spearman's Rank correlation coefficient and multiple linear regression analysis, was conducted to establish the correlation between perceived barriers with the company's readiness to adopt QLASSIC and the effect of the perceived barriers on the company's readiness to adopt QLASSIC.

Table 2: Hypothesis of the study

H_{01}	Knowledge and awareness barriers do not have a significant relationship with the company's readiness to adopt QLASSIC.
H_{A1}	Knowledge and awareness barriers have a significant relationship with the company's readiness to adopt QLASSIC.
H_{02}	Cost barriers do not have a significant relationship with the company's readiness to adopt QLASSIC.
H_{A2}	Cost barriers have a significant relationship with the company's readiness to adopt QLASSIC.
H_{03}	Regulatory and enforcement barriers do not have a significant relationship with the company's readiness to adopt QLASSIC.
H_{A3}	Regulatory and enforcement barriers have a significant relationship with the company's readiness to adopt QLASSIC.
H_{04}	Time-related barriers do not have a significant relationship with the company's readiness to adopt QLASSIC.
H_{A4}	Time-related barriers have a significant relationship with the company's readiness to adopt QLASSIC.

3.5 Hypothesis Development

Since the investigator must assume no variance or connection among variables unless contrary evidence is shown, hypothesis testing may be unclear. Two hypotheses must be developed for this process: null and alternative hypotheses. There is always no distinction between a particular group (A) and another (B), according to the null hypothesis (H0). The contrary, suggesting there is a distinction between a particular group (A) and another (B), is put forward in the alternative hypothesis (H1). The goal is to reject or demonstrate the invalidity of the null hypothesis (Rana *et al.,* 2021). Table 2 shows the proposed hypothesis of this study.

4.0 RESULTS AND DISCUSSION

In this section, the data collected was analysed and discussed. Before the final data collection, the questionnaire underwent a pilot test with 30 participants to determine the improvement needed for the questionnaire design, for the main data collection to proceed. The collected final data was analysed through different analysis methods. In this study, 165 responses were collected from the questionnaire survey.

4.1 Pilot Study

A pilot study is a feasibility study or pre-testing of the questionnaire. In this study, Cronbach's Alpha of the four perceived barriers and company readiness for the pilot test were all above 0.8 as shown in Table 3. Cronbach's Alpha above 0.8 is considered good, which means the pilot test in this study showed at least good reliability of data collected from the questionnaire survey. The data collection can be proceeded since it was proven that the questionnaire survey was easy to understand, hence it requires no revision, and the intention of the questions can be effectively conveyed to the respondents (Siswaningsih *et al.,* 2017).

Table 3: Cronbach's alpha of pilot test

Variables	Cronbach's Alpha
Independent Variables (IV)	
IV1: Knowledge and Awareness Barrier	0.831
IV2: Cost Barrier	0.811
IV3: Regulatory and Enforcement Barrier	0.881
IV4: Time-related Barrier	0.816
Dependent Variable (DV)	
Company's Readiness to Adopt QLASSIC	0.935

4.2 Descriptive Analysis

Descriptive analysis uses statistical techniques to summarise a dataset, offering clear insights from raw data. This approach is widely favoured for its simplicity and accessibility. However, it does not aim to predict future results. Instead, it uses various manipulations to draw important conclusions from historical data (Bush, 2020). Consequently, Table 4 displays the comprehensive demographic profile of the respondents, including their education level, the company's main scope of services, their role within the company, work experience in the construction industry, and company size.

Table 4: Demographic profile of the respondents

	Percentage	Respondent (N=165)
Highest Education Level		
Secondary School (e.g. SPM, STPM, A-Level, UEC)	1.2%	2
Diploma	23%	38
Bachelor's Degree	66.1%	109
Postgraduate (e.g. Master, PhD)	9.7%	16
Company's Main Scope of Service		
Developer / Project Owner	13.9%	23
Architectural Consultant	9.1%	15
Engineering Consultant	18.2%	30
Quantity Surveying Consultant	10.3%	17
Construction Contractor	48.5%	80
Role in Company		
Management (e.g. Director, CEO, COO, General Manager/ Project Manager)	7.3%	12
Architect	15.2%	25
Engineer	29.1%	48
Quantity Surveyor	20.6%	34
Site Supervisor	27.9%	46
Working Experience		
Less than 5 years	29.1%	48
6-10 years	31.5%	52
11-15 years	21.2%	35
16-20 years	13.9%	23
More than 20 years	4.2%	7
Company Size		
Less than 5 employees	0%	0
5 – 29 employees	35.8%	59
30 – 75 employees	41.8%	69
Over 75 employees	22.4%	37

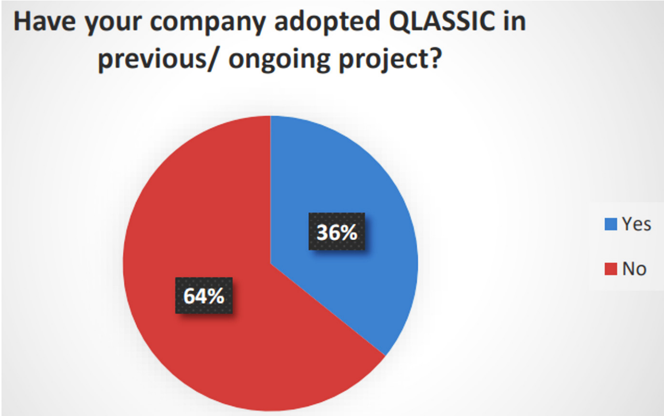

Figure 2: Adoption of QLASSIC

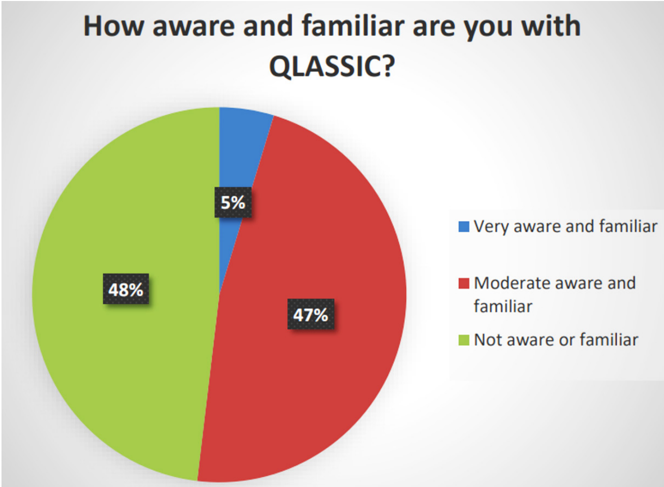

Figure 3: Awareness and familiarity of QLASSIC

4.2.1 Adoption of QLASSIC

Figure 2 shows the pie chart of the company's QLASSIC adoption. Based on the questionnaire survey, 36% of the respondents' companies have adopted QLASSIC, either in the past or currently. The results indicated that the adoption of QLASSIC has not been favourable since CIDB introduced it in 2006. Eighteen years have gone by, yet adoption remains below 50%.

4.2.2 Awareness and Familiarity of QLASSIC

Figure 3 displays a pie chart of the awareness and familiarity of respondents through QLASSIC. Based on the questionnaire survey, 48% of respondents were not aware or familiar with the QLASSIC, followed by 47% of respondents are moderately aware and familiar with QLASSIC. Only 5% of respondents were very aware of and familiar with QLASSIC. The respondents in this section were lack of experience with QLASSIC, which limit their knowledge of QLASSIC. There has also been a lack of research on QLASSIC, which has limited the dissemination of information about it.

4.3 Measurements of the Data

Measuring data is crucial for ensuring the collected information is reliable and valid for subsequent analysis. This process includes conducting reliability tests, multicollinearity tests, and normality tests. The reliability test ensures the reliability of the collected data. If it does not fulfil the criteria, more responses shall be collected to increase its reliability. Multicollinearity test was checked on the collinearity issues of the independent variable. If a multicollinearity issue happens, the independent variables are overlapping. Also, the normality test assessed whether the collected data is normally distributed or not.

4.3.1 Reliability Test

After the final data collection, Cronbach's alpha reliability test was conducted to determine the reliability of the data. Based on the SPSS software, Cronbach's Alpha of the four perceived barriers and company readiness are all above 0.8. If Cronbach's Alpha is lower than 0.7, the extra responses must be collected to increase the reliability of the data. In this study, all the Cronbach's Alpha were above 0.8, which is considered reliable with appropriate responses (Brown, 2002; Siswaningsih *et al.,* 2017). Hence, the data can be used, analysed and proceed. Table 5 shows Cronbach's Alpha on the reliability test.

Table 5: Cronbach's alpha on reliability test

Variables	Cronbach's Alpha
Independent Variables (IV)	
IV1: Knowledge and Awareness Barrier	0.915
IV2: Cost Barrier	0.875
IV3: Regulatory and Enforcement Barrier	0.856
IV4: Time-related Barrier	0.886
Dependent Variable (DV)	
Company's Readiness to Adopt QLASSIC	0.967

Table 6: VIF and tolerance of multicollinearity test

Model	VIF	Tolerance
IV1: Knowledge and Awareness Barrier	2.407	0.415
IV2: Cost Barrier	4.545	0.220
IV3: Regulatory and Enforcement Barrier	4.200	0.238
IV4: Time-related Barrier	4.613	0.217

4.3.2 Multicollinearity Test

The variance inflation factor (VIF) and collinearity tolerance in this research study were obtained from SPSS software and shown in Table 6. The VIFs obtained were acceptable, ranging between 1 and 5, which considered moderately correlated. The tolerance values obtained were greater than 0.2, indicating that multicollinearity is unlikely to occur. Therefore, the independent variables do not overlap and measure the same aspects. Thus, no adjustments or combinations are necessary (Kim, 2019); the results were reliable in this research study.

4.3.3 Normality Test

In this research, the Kolmogorov-Smirnov test was employed and conducted using SPSS software. This is because the Kolmogorov-Smirnov test is suitable for a sample size of more than 50 respondents. The significant value was the outcome, which indicates normality. A significant value (p-value) of more than 0.05 indicates that the data is normally distributed (Mishra *et al.,* 2019). The determination of normality determines the type of correlation analysis method to be used. The Pearson correlation coefficient test was used if the data is normally distributed. Conversely, Spearman's rank correlation coefficient was used for those not normally distributed (Field, 2018). The normality test result in this research study was obtained from SPSS software and shown in Table 7.

Based on Table 7, the data was not normally distributed compared with the criteria because the significant value was less than 0.001, which is less than the criteria (0.05). In other words, the data was more biased toward one side, and the data was more reliable and valid. Hence, Spearman's Rank correlation coefficient was used for correlation analysis.

Table 7: Kolmogorov–smirnov test

	N	Sig
IV1: Knowledge and Awareness Barrier	165	<0.001
IV2: Cost Barrier	165	<0.001
IV3: Regulatory and Enforcement Barrier	165	<0.001
IV4: Time-related Barrier	165	<0.001

4.4 Regression Analysis

Regression analysis, including Spearman's Rank correlation coefficient and multiple linear regression analysis, was conducted to establish the correlation between perceived barriers (IV) with the company's readiness to adopt QLASSIC (DV) and the effect of the perceived barriers (IV) on the company's readiness to adopt QLASSIC (DV).

4.4.1 Spearman's Rank Correlation Coefficient

The degree of linear relationship between two variables was known as correlation. The correlation coefficient is a statistical indicator of the degree of connection among the correlated shifts of two variables. Spearman's correlation coefficient assesses the significance of a monotonic connection among paired datasets. The correlation coefficient is from -1 to +1; closer to -1 or 1 means the correlation strength is stronger (Statstutor, 2018).

Table 8 shows the correlation coefficient between perceived barriers and the company's readiness to adopt QLASSIC. Based on criteria in Statstutor (2018), cost, regulatory and enforcement, and time-related barriers strongly correlate with the company's readiness to adopt QLASSIC. They have a correlation coefficient of 0.721, 0.752 and 0.718, respectively. Whereas, knowledge and awareness barrier with a 0.576 correlation coefficient have a moderate correlation with the company's readiness to adopt QLASSIC.

Table 8: Correlation coefficient between IVs and DV

	Correlation Coefficient
IV1: Knowledge and Awareness Barrier	0.576
IV2: Cost Barrier	0.721
IV3: Regulatory and Enforcement Barrier	0.752
IV4: Time-related Barrier	0.718

Table 9: Value of standardised coefficient beta, β

	Standardised Coefficient Beta, β
IV1: Knowledge and Awareness Barrier	0.141
IV2: Cost Barrier	0.153
IV3: Regulatory and Enforcement Barrier	0.406
IV4: Time-related Barrier	0.278

4.4.2 Multiple Linear Regression

Multiple regression may also find the entire fit (variation described) of the predictive model and the corresponding contribution of each predictor towards the total variance described (Laerd Statistics, 2018). Equation 1 is the standard equation for multiple regression. The slope coefficient, b of the independent variable is β value in the table provided in SPSS after analysis, which concludes in Table 9. It can be subtracted into the equation below, thus knowing which independent variable most affects the dependent variable.

$$Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 \quad (1)$$

$$DV = a + 0.141 IV_1 + 0.153 IV_2 + 0.406 IV_3 + 0.278 IV_4 \quad (2)$$

4.5 Hypothesis Testing

A p-value lower than 0.05 is generally regarded as statistically significant, and the null hypothesis needs to be denied. When the p-value is higher than 0.05, the null hypothesis has been accepted since the divergence from it is not statistically significant (Rana *et al.,* 2021). Hypotheses are developed to undergo hypothesis testing to establish the correlation between perceived barriers and the company's readiness to adopt QLASSIC. After data analysis in SPSS software, p-values are obtained and displayed in Table 10.

Table 10: Significant value of hypothesis testing

	Significant Value, p
IV1: Knowledge and Awareness Barrier	0.010
IV2: Cost Barrier	0.040
IV3: Regulatory and Enforcement Barrier	<0.001
IV4: Time-related Barrier	<0.001

All the *p*-values for the perceived barriers were lower than 0.05. Therefore, the null hypotheses were rejected in this study, and the alternative hypotheses were accepted for each barrier. The alternative hypothesis for each barrier is that the perceived barriers (knowledge and awareness, cost, regulatory, enforcement, and time-related barriers) have a significant relationship with the company's readiness to adopt QLASSIC. Thus, it can be concluded that all the studied perceived barriers had a significant relationship with the company's readiness to adopt QLASSIC.

5.0 CONCLUSIONS

The study contributes to a deeper understanding of the factors influencing the adoption of QLASSIC in the Malaysian construction industry. The descriptive analysis highlighted a persistent low adoption rate, with only 36% of respondents' companies implementing QLASSIC. This indicated that industry-wide adoption remains a significant challenge even 18 years after its introduction by CIDB in 2006. This reluctance to adopt QLASSIC underscores a need to further explore the barriers companies face in aligning with these quality standards.

Further analysis, using Spearman's Rank correlation and multiple regression, revealed a strong relationship between regulatory enforcement and a company's readiness to adopt QLASSIC. Regulatory and enforcement barrier emerged as the most influential factor, followed closely by cost, time, and knowledge barrier. This suggested that while regulatory support is crucial, the time and cost required to meet QLASSIC standards are also significant concerns that influence company's readiness. The study confirmed a statistically significant relationship between perceived barriers and company's readiness to adopt QLASSIC, further solidifying these findings.

In conclusion, several barriers, most notably regulatory and cost-related challenges, hindered the adoption of QLASSIC. This study recommended enhancing industry awareness through on-site training, seminars, and targeted outreach to key stakeholders to improve the adoption rates. It is also suggested that the government make the QLASSIC mandatory to improve the adoption rate. Additionally, reducing implementation costs and streamlining evaluation processes are essential to making QLASSIC more accessible, particularly for smaller companies. Future research should explore other international quality systems, such as Singapore's CONQUAS and Hong Kong's PASS, to provide comparative insights and identify best practices that can be applied locally.

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AUTHORS CONTRIBUTIONS

- **Chung Xiao Yen:** Conceptualisation, study design, data collection, analysis, writing—original draft preparation, visualisation, and software implementation.
- **Wong Chee Fui:** Supervision, guidance on conceptual direction, format and structure, and final manuscript approval.
- **Gan Chin Heng:** Supervision, format and structure, language refinement, and final manuscript approval. ■

REFERENCES

[1] Adom, D., & Kamil, E. (2018). Theoretical and conceptual framework: Mandatory ingredients of a quality research. International Journal of Scientific Research, 7(1), 438–441.

[2] Ali, M. C. (2013). Exploring the potential of integration quality assessment system in construction (QLASSIC) with ISO 9001 quality management system (QMS). International Journal for Quality Research, 8(1), 73–86.

[3] Ali, M. C., Ismail, R., Kam, K. J., & Dzulkalnine, N. (2014). Preliminary findings on potential areas of improvement in QLASSIC. Elixir International Journal, 76, 28341–28349.

[4] Ali, M. C., Pakir, A. H. K., Hamid, Z. A., Anuar, K., & Dzulkalnine, N. (2012). QLASSIC - Can it be an effective continual quality improvement tool for industrialized building system (IBS) projects? Malaysian Construction Research Journal, 11(2), 37–54.

[5] Azir, K. M. A. K., Muhammad, W. M. N., Othman, M. N. F., & Daeng, D. H. (2018). The insight on quality assessment system in construction (QLASSIC) implementation in Sarawak. IOP Conference Series: Materials Science and Engineering, 429, 012103. https://doi.org/10.1088/1757-899X/429/1/012103

[6] Brown, J. (2002). The Cronbach alpha reliability estimate: How should we interpret Cronbach alpha? JALT Testing & Evaluation SIG Newsletter, 6(1), 17–18.

[7] Bush, T. (2020). Descriptive analysis: How-to, types, examples. Pestle Analysis. https://pestleanalysis.com/descriptive-analysis/

[8] Construction Industry Development Board Malaysia. (2021a). CIS 7: 2021 Quality assessment system for building construction works.

[9] Construction Industry Development Board Malaysia. (2021b). IBS and QLASSIC: Making it work for the industry.

[10] Field, A. (2018). Discovering statistics using IBM SPSS statistics (5th ed.). Sage Publications.

[11] Janipha, N. A. I., & Ismail, F. (2013). Conceptualisation of quality issues in Malaysian construction environment. Procedia - Social and Behavioral Sciences, 101, 53–61. https://doi.org/10.1016/j.sbspro.2013.07.178

[12] Kabir, S. M. S. (2018). Methods of data collection. Basic Guidelines for Research, 201–276.

[13] Kam, K. J., & Abdul Hamid, A. H. (2012). Malaysia, Singapore and Hong Kong approach towards quality assurance initiative in the building construction industry: The three major countries which have small land for fast development progress. Elixir International Journal, 8525–8529.

[14] Kam, K. J., & Abdul Hamid, A. H. (2015). The true motives behind the adoption of QLASSIC-CIS 7: 2006. International Journal of Quality & Reliability Management, 32(6), 603–616. https://doi.org/10.1108/IJQRM-07-2013-0108

[15] Khalid, Z., & Tamjehi, S. D. (2020). Contractor's understanding towards the implementation of quality assessment system in construction (QLASSIC) in construction industry. IOP Conference Series: Materials Science and Engineering, 849(1), 012052. https://doi.org/10.1088/1757-899X/849/1/012052

[16] Kim, J. H. (2019). Multicollinearity and misleading statistical results. Korean Journal of Anesthesiology, 72(6), 558–569. https://doi.org/10.4097/kja.19087

[17] Laerd Statistics. (2018). How to perform a multiple regression analysis in SPSS statistics. Laerd Statistics. https://statistics.laerd.com/spss-tutorials/multiple-regression-using-spss-statistics.php

[18] Lee, H. C. B., Chan, Z. Y., Fo, K. W., & Kong, S. K. (2020). A study on the potential of making quality assessment system (QLASSIC) mandatory to the contractors. International Journal of Construction Management, 066, 2600–7320.

[19] Manap, N., Goh, Y. K., & Syahrom, N. (2017). Compulsory of Malaysia's quality assessment system in construction (QLASSIC). IOP Conference Series: Earth and Environmental Science, 109, 012008. https://doi.org/10.1088/1755-1315/109/1/012008

[20] Mishra, P., Pandey, C. M., Singh, U., Sahu, C., Keshri, A., & Gupta, A. (2019). Descriptive statistics and normality tests for statistical data. Annals of Cardiac Anaesthesia, 22(1), 67–72. https://doi.org/10.4103/aca.ACA_157_18

[21] Rana, J., Gutierrez, P. L., & Oldroyd, J. C. (2021). Quantitative methods. Global Encyclopedia of Public Administration, Public Policy, and Governance, 1–6. https://doi.org/10.1007/978-3-319-31816-5_460-1

[22] Seman, M. S., Esa, M. R., & Yusof, M. R. (2021). Roles of contractors in implementing quality assessment system in construction (QLASSIC) in construction projects. International Journal of Real Estate Studies, 15(S1), 53–69. https://doi.org/10.11113/intrest.v15ns1.117

[23] Siswaningsih, W., Firman, H., & Khoirunnisa, A. (2017). Development of two-tier diagnostic test pictorial-based for identifying high school students' misconceptions on the mole concept. Journal of Physics: Conference Series, 812, 012117. https://doi.org/10.1088/1742-6596/812/1/012117

[24] Statstutor. (2018). Spearman's correlation. Statstutor. https://www.statstutor.ac.uk/resources/uploaded/spearmans.pdf

[25] Subramaniam, N., Omar, R., Sarpin, N., Nasrun, M., & Nawi, M. (2019). Effectiveness of quality assessment in construction project. International Journal of Supply Chain Management, 8(6).

[26] Sulaiman, S. B., Jusoh, A., Kwok, S. Y., & Soheilirad, S. (2019). Customer satisfaction in CONQUAS and QLASSIC certified housing projects. Journal of Public Value and Administration Insights, 2(1), 10–17. https://doi.org/10.31580/jpvai.v2i1.478

[27] Zahrizan, Z., Affendy, O. M., & Johan, A. H. K. (2023). Exploring the barriers in implementation of QLASSIC in Malaysian construction industry from the perspective of contractors. IOP Conference Series: Earth and Environmental Science, 1140(1), 012013. https://doi.org/10.1088/1755-1315/1140/1/012013

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