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Quantity Surveyors' Role in Enhancing Green Construction Performance via Dispute Resolution

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Abstract

Dispute resolution significantly enhances construction performance as it facilitates effective time, cost, quality and scope management, which may be disrupted in the presence of conflicts and disputes. Quantity Surveyors (QSs) play multiple roles in construction and act as contract administrators. Yet, dispute resolution was not formally adapted into the profession of QS in the Sri Lankan green construction sector to a considerable extent. Therefore, this study explores the extent to which construction companies have adopted ADR (Alternative Dispute Resolution) methods, human skills required for QSs in effective dispute resolution, and the impact of QSs involvement in ADR on the organizational performance, following a quantitative analysis. The research outcomes mainly discovered possibilities of utilizing ADR for the purpose of reducing carbon emissions and energy consumption in Sri Lankan green building construction through QSs involvement. While identifying essential human skills and competencies required for QSs in handling disputes, this study further exposed a slightly significant traditional gender domination in the QSs' involvement towards ADR, common occurrences of disputes in green building projects, and a significant relationship between QSs' experience and their involvement in disputes. The recommendations include enhancement of QSs' involvement in ADR for green construction through developing policies and formalities, providing sufficient ADR- and green construction-related training, encouraging female participation in green construction, and collaborative dispute resolution.

Keywords: Alternative Dispute Resolution (ADR); Quantity Surveyors (QSs); carbon emission reduction; energy consumption; green construction

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1. Introduction

The construction industry possesses many challenges for professionals who practice in the industry. One of the key challenges is the industry's reliance on the impact of professionals' ability to manage projects [1]. This is due to the complex nature resulted by uncertainty and excessive stakeholder engagement patterns [2]. Therefore, resolution and management of disputes is one of the most important processes for ascertaining the performance of construction projects, and it depends largely on the deep understanding of disputes [3]. Different skills are essential for industrial professionals for effective dispute resolution.

According to Cakmak and Cakmak [4], if conflicts are unsolvable, it could be controversial and have the potential to turn into a dispute. In the event of a dispute, the consultant

can lead the issue within the litigation process which is financially expensive [5]. If they are not effectively resolved, they may grow and eventually require litigation, which can be highly expensive for all parties involved [6]. ADR (Alternative Dispute Resolution) methods such as negotiation, mediation, and arbitration are highly known internationally and are based on attributes such as cost friendliness, effectiveness and collectiveness [4]. The main outcomes of a dispute could be classified as the inability to manage time, cost, and quality of a project [2]. Hence, dispute resolution becomes essential in enhancing overall project performance adhering to the triple constraint theory. Hietanen-Kunwald and Haapio [7] pointed out that the purpose of dispute management is to minimize the number of losses and damages in construction.

Green construction combines sustainable building strategies and techniques that minimize buildings' environmental impact with strengthening its social and economic effects [8]. As construction industry contributes to excessive energy consumption and carbon emissions, critical assessment of QSs' (Quantity Surveyors') role in green construction becomes significant. Sri Lanka has recently increased its commitment towards green construction [9]. Yet, challenges exist due to lack of expertise, limited resources and green technologies, and undefined standards [10]. In considering the study of Jayasinghe and Ramachandra [11], ADR methods are highly useful in handling construction disputes, and they are still developing. Therefore, this research aims at identifying the role of QSs in enhancing green construction performance through dispute resolution.

In this modern era, QSs' role has evolved towards more sophisticated activities rather than covering works related to financial and cost control [12]. Such new roles include contract administration, value engineering, dispute resolution, risk management, and advanced technology integration. However, various studies including Ekanayaka and Bandara [13] stated that dispute resolution was not formally adapted into the profession of Quantity Surveying in the Sri Lankan green construction sector to a considerable extent. Sri Lankan green construction projects are subjected to disputes [14]. Hence, this study becomes significant in addressing the identified study gap by exploring the extent to which construction companies have adopted ADR (Alternative Dispute Resolution) methods, roles and skills required for Quantity Surveyors in effective dispute resolution, and the impact of Quantity Surveyors' involvement in ADR on the organizational performance within the green building construction sector in Sri Lanka.

2. Literature Review

The construction industry is complex in its nature and labor-intensive, unlike a capital-intensive sector such as the manufacturing industry [15]. If construction disputes were unsolved, it may lead to project delays, disrupt team spirit, interrupt project operations, increase project costs, and most importantly, undermine business relationships [16]. Dispute resolution is one of the areas where Quantity Surveyors' involvement matters [17]. Various studies discovered that Sri Lankan green construction projects are prone to disputes due to its unique inner complexities such as frequent change orders, challenging sustainability needs and regulations, contractual limitations and project mismanagement [10,14]. However, Ekanayaka and Bandara [13] illustrated QSs' lack of engagement in dispute resolution in the Sri Lankan green construction sector to be one of the constraints. Hence, exploration of involvement methods and the impact of QSs' participation in ADR process becomes significant to enhance the project performance.

In assessing the causes of disputes in the Sri Lankan sustainable construction sector, lack of clarity in contracts and project specifications were found to be the main grounds [14]. Meanwhile, the primary cause of disputes occurrence too as project delays, including payment delays [18]. Continuous project scope changes are also responsible for disputes

in construction [10]. As QSs' role ranges over the above specified areas such as contract administration, facilitation of timely payment, and change order management, this research happens to be important in examining ways to optimize Quantity Surveyors' potential in dispute resolution for reduction of carbon emissions and energy consumption.

In the Sri Lankan construction industry, due to considerable disadvantages associated with the litigation method (i.e., being an expensive and lengthy process), the industry has moved towards ADR, and found it to be an effective, efficient, and cost-friendly approach [19]. Unlike the traditional formal method of litigation, ADR practice within the construction industry is a win-win resolution that can mitigate the damages of business and commercial relations [20]. According to current practices in the Sri Lankan construction industry, implications of ADR methods for managing disputes are common and contracting parties include the clauses of required ADR methods by stipulating it on the standard conditions of contracts [21]. The ADR methods can be illustrated under Figure 1.

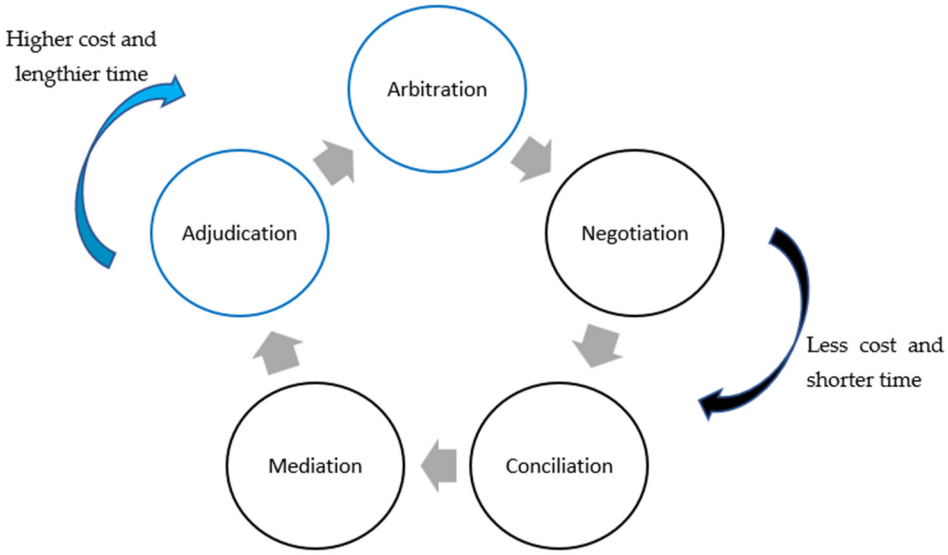

Figure 1. Alternative Dispute Resolution [4].

While the research conducted by Gamage and Kumar [16] revealed 'negotiation' to be the most repeatedly applied ADR method in Sri Lankan construction industry, Edirisinghe [22] argued that application of highly beneficial and less complex methods such as negotiation, mediation, and conciliation is restrained in the Sri Lankan construction industry due to their executability and stakeholders' mindsets. While this study explores ways to bound existing dispute resolution mechanisms into highly complex ones, it plays a critical role in enhancing the Sri Lankan green construction performance through identifying Quantity Surveyors' role in dispute resolution. Disputes could adversely impact on the main project performance parameters: time, cost, and quality [23].

Worldwide accepted contract forms and public sector standards are commonly practiced for procurement and contracting in the construction sector of Sri Lanka. The Standard Bidding Documents (SBDs) and FIDIC are the most commonly utilized varieties of contracts in construction projects [21]. In order to effectively settle conflicts without turning to litigation, these forms encourage including provisions for Alternative Dispute Resolution (ADR) procedures including adjudication and arbitration [21,24]. Hence, examining QSs' role in dispute resolution is noteworthy as it includes contract administration.

The impact caused by construction disputes on green construction performance is severe. Often construction stakeholders were strained to settle with low-cost green construction materials due to the excessive impact of conflicts and disputes ongoing in green construction projects [10]. Thusharika and Abeynayake [25] further revealed that attain-

ment of prolonged sustainability is challenging for construction firms which are dealing with disputes due to its impact on proper project planning and strategic decision making. The study conducted by Wijesinghe [14] highlighted that construction companies become unsuccessful in on-time project completion and tend to use low-quality construction materials or avoid green construction certifications due to the tension caused by disputes. As disputes disrupt progressive implementation of green applications, ADR becomes significant in reducing carbon emissions by minimizing construction delays, attaining sustainability standards, and avoiding unnecessary reworks through quality construction [26]. This could also be explained via the triple constraint theory, as time, cost, and quality are interrelated. Table 1 below demonstrates adoption of ADR to reduced carbon emissions, grounded in previous research.

Table 1. Pathway from ADR adoption to carbon emissions reduction.

Pathway	Description	Literature
ADR adoption	ADR adoption is beneficial in attaining project outcomes in construction.	[19,20]
Timely dispute resolution.	ADR enables timely dispute resolution compared methods such as litigation.	[2,19]
Minimized delays and rework	Timely dispute resolution reduces delays, and reworks. Hence, project quality enhances.	[10,14]
Attainment of green specifications	ADR enables attainment of green specifications (i.e., green materials, green certifications, etc.).	[10,25]
Construction waste minimization.	Timely dispute resolution minimizes waste due to limited need for extra work and rework.	[19]
Energy consumption minimization.	Ontime project completion and less rework reduces excessive energy consumption.	[19]
Reduction of Carbon Emissions	Outcome of the pathways explained above.	[19]

The previous literature explores green construction performance and ADR applications in construction. In assessing the Sri Lankan context, the green construction sector is found to be dealing with frequent disputes, and QSs' participation in dispute resolution is limited. The present study becomes significant in analyzing ways to enhance QSs' involvement in enhancing green construction performance via dispute resolution.

3. Research Objectives

1. To examine the extent to which Quantity Surveyors are involved in Alternative Dispute Resolution (ADR) processes within Sri Lankan green building construction projects.
2. To identify the roles and human skills required for Quantity Surveyors in effective dispute resolution in Sri Lankan green building construction projects.
3. To evaluate the degree to which construction companies have adopted ADR methods In Sri Lankan green building construction projects.
4. To assess the impact of Quantity Surveyors' involvement in ADR on the organizational performance of construction companies in Sri Lankan green building construction.

4. Methodology

Following a quantitative approach, this research has implemented a questionnaire survey to gather views and opinions of the QSs who practice in the industry. The data collection procedure was subjected to the UK GDPR laws while obtaining informed consent forms from participants. Even though data did not represent dealing with human tissues,

young people or people with special needs, animals or similar information, responses were anonymous, and the informed consents were treated with confidentiality. The data was retained for no longer than 6 months following data protection protocol. The questionnaire consisted of three main sections which are [i] demographic information, [ii] closed-ended multiple-choice questions with an ordinal scale, and [iii] Likert scale questions. The [ii] and [iii] questions were related to dispute resolution and management, application of ADR methods within organizations, and performance of construction projects. The Likert scale questions were structured in a 5 point "Likert" scale (Strongly Agree–Strongly Disagree) to compute the dimensions. The questionnaire used in this study has been deposited in Zenodo and is openly accessible at https://doi.org/10.5281/zenodo.16889361 (accessed on 10 December 2024). Yamane's formula was incorporated to determine the sample size as the estimated population is relatively small {[The estimated population (N) = 62] According to the IQSSL data published, QSs population = 1230; estimated greenhouse construction percentage = 5% [20]; n = sample size; N = estimated population size; and e = margin of error (commonly 5%)}.

$$n = \frac{N}{1 + N\,(e^2)} = 54$$

A reliability test was conducted to examine the consistency of Likert scale questions. The demographic information was analyzed using a sample characteristics analysis. Descriptive statistics are brief descriptions of summarized data sets which represent the entire or a sample of a population [27]. Accordingly, closed-ended multiple-choice questions were analyzed using the central tendency and the measure of dispersion, following descriptive statics. An inferential analysis was adapted in attaining the final research objective, which is to examine the relationship between a few variables. It is recommended to use an inferential statistical analysis by using regression analysis to examine relationships among variables [28]. This was applied in analyzing the Likert scale questions using the IBM SPSS software (version 29.0). Although the Likert scale data demonstrates original and subjective perceptions of the respondents, they were treated as interval data for the purpose of inferential analysis following similar research [28,29]. Scale responses could be considered as interval data, especially when the number of scale points are five or more [30,31]. In addition, the data distribution of this study approaches normality, indicating possibility of adopting a parametric analysis. Moreover, this research utilized treating Likert data as interval data to statistically extend the capacity of examining complex relationships between variables; QSs' participation in ADR and green construction performance followed similar studies such as Janda and Endresen [28] and Chen and John [29] that examined areas where latent variables potentially fall along the spectrum. Accordingly, this research has combined statistical techniques with prudent interpretation.

5. The Analysis of Data

This study has recovered 74.10% of the data from its original sample. This is due to the availability of a limited number of green construction projects and limited QSs' involvement in dispute resolution. Similarly, the composition of the sample demonstrates a well-balanced representation of the response ranges over various levels (i.e., Senior QSs, QSs, AQSs) as follows (Table 2).

Table 2. Overall analysis of the data sample.

Construction Party	Profession	Qty
Client	Senior Quantity Surveyors	10
	Quantity Surveyors	5
	Assistant Quantity Surveyors	5
Contractor	Senior Quantity Surveyors	10
	Quantity Surveyors	5
	Assistant Quantity Surveyors	5
		40

6. Reliability Test

The reliability test assures the consistency of the data set. Among many other choices, the Cronbach Alpha tool is used to determine the reliability of the collected data. As the data depicts more than 70% consistency (0.7), it is suitable for the subsequent statistical analysis (Table 3).

Table 3. Reliability test.

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.718	0.723	14

7. Characteristic Analysis

This study has utilized demographic information to determine the characteristics of the respondents (Table 4).

Table 4. Cross tabulation of gender and dispute occurrence.

		Gender		Total
		Male	Female	
Amount of D Occurrence	Rare	0	9	9
	Occasionally	17	3	20
	Always	11	0	11
Total		28	12	40

The cross tabulation (Table 4) illustrates a participation of 70% males in the sample. The denoted imbalance of gender composition demonstrates a significant male domination in its nature. Accordingly, it generates a possibility of Quantity Surveyors' involvement in the ADR process being influenced by the traditional gender domination. This is a substantively significant finding for various reasons. According to Powell and Sang [32], gender domination bounds problem solving which is a vital component in ADR. The input generated by women is critical in attaining sustainability and social aspects which are elements of green construction [24]. Hence, evaluation of gender and disputes occurrence is not only vital to attain effective dispute resolution, but also to consequently enhance performances of green construction projects. Hence, this study suggests the necessity of encouraging female participation in both QS and ADR roles to enhance team dynamics. The Chi-Square test (Table 5) further revealed that there is a statistically significant relationship among

the QSs' gender and their involvement in the ADR process, as the $p < 0.005$. However, as the expected count of 3.3 > 2.7, further studies could be carried out in search of the impact of QSs gender towards their ADR involvement in green construction. In addition, a larger sample could be utilized to generalize gender imbalance as the current sample is relatively small.

Table 5. Chi-Square test of gender and disputes occurrence.

	Value	df	Asymptotic Significance (2-Sided)
Pearson Chi-Square	27.857 [a]	2	<0.001
Likelihood Ratio	31.961	2	<0.001
Linear-by-Linear Association	21.502	1	<0.001
N of Valid Cases	40		

[a]. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 2.70.

In considering the experience of the respondents in the construction industry (Figure 2), more than 65% of them had proper experience for more than one or two years. The sample's academic qualification analysis (Figure 3) depicts a good sound-minded sample as more than 80% of the respondents acquired an undergraduate degree.

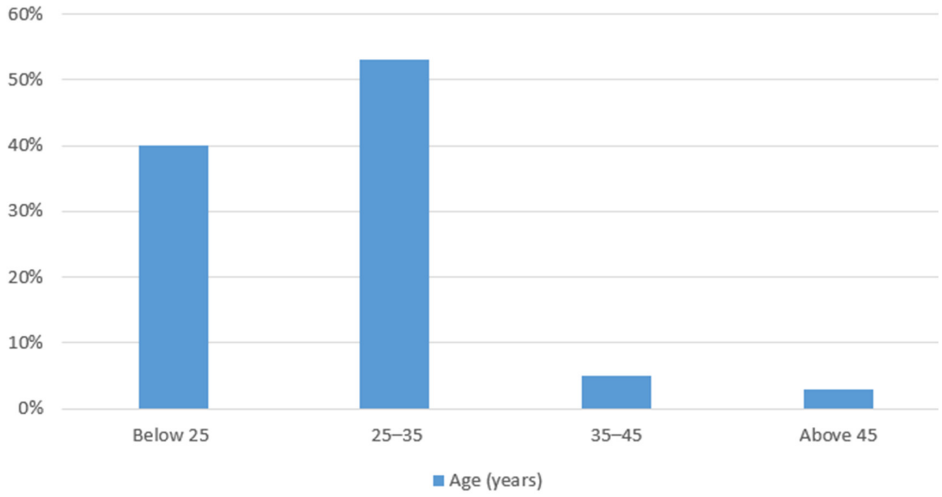

Figure 2. Sample Age analysis.

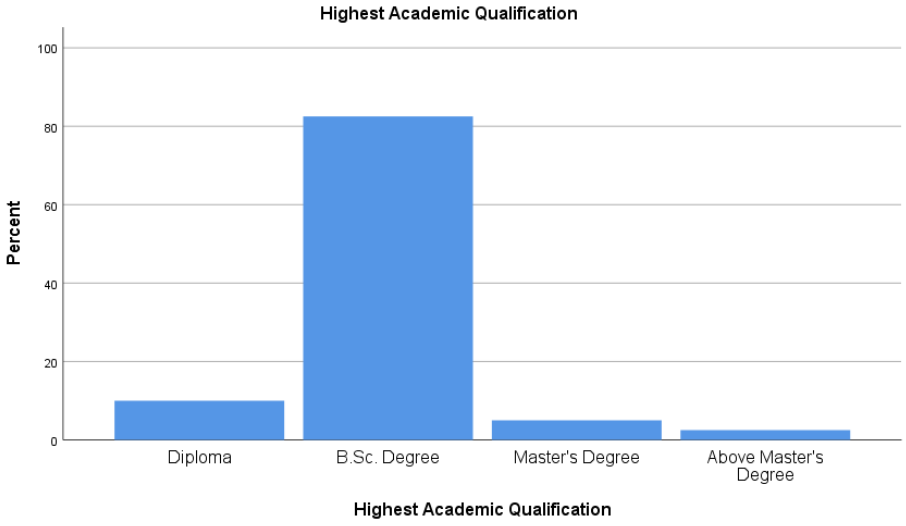

Figure 3. Sample academic qualification analysis.

The following Table 6 indicates the cross tabulation between respondents' experience in the construction industry and the occurrence of disputes within their experience.

Table 6. Cross tabulation for QSs industrial experience and their involvement in ADR.

		Less Than 5 Years	5 Years and 5+ Years	Total
Amount of D Occurrence	Rare	9	0	9
	Occasionally	8	12	20
	Always	2	9	11
Total		19	21	40

According to the cross tabulation, more experienced QSs are found to deal with more disputes compared to the ones with less experiences in the industry. Therefore, this study has integrated into a Chi-Square test to descriptively examine this trend (Table 7).

Table 7. Chi-Square test of QSs' industrial experience and their involvement in ADR.

	Value	df	Asymptotic Significance (2-Sided)
Pearson Chi-Square	14.190 [a]	2	<0.001
Likelihood Ratio	18.000	2	<0.001
Linear-by-Linear Association	12.417	1	<0.001
N of Valid Cases	40		

[a]. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 4.27.

As the p-value < 0.05, a statistically significant relationship is revealed among the QSs' industrial experience and their involvement in ADR. Consequently, more experienced QSs are found to deal with more disputes compared to those with less experience in the industry. The Chi-Square test is believed valid when below 20% and expected cell counts do not exceed 5, and when no expected cell count is less than 1 [33,34].

7.1. Objective 1: The Involvement of Quantity Surveyors in Alternative Dispute Resolution (ADR) Processeses Within Sri Lankan Green Building Construction Projects

Table 8 strongly depicts that construction disputes are common. About 77.5% of QSs are involved in disputes at least occasionally. Similarly, the uses of arbitration and adjudication are found to be limited in Sri Lankan green building projects in reference to Table 9. This emphasizes the necessity of adapting relevant dispute resolution methods.

Table 8. QSs Experience in ADR.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Rare	9	22.5	22.5	22.5
	Occasionally	20	50.0	50.0	72.5
	Always	11	27.5	27.5	100.0
	Total	40	100.0	100.0	

Table 9. Application of Adjudication and Arbitration in Green Building Projects.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	1	2.5	2.5	2.5
	Rare	9	22.5	22.5	25.0
	Occasionally	23	57.5	57.5	82.5
	Always	7	17.5	17.5	100.0
	Total	40	100.0	100.0	

Figure 4 below demonstrates the application of other ADR methods. Accordingly, application of ombudsmen, trade association council, mini trails and private trails are found to be relatively less.

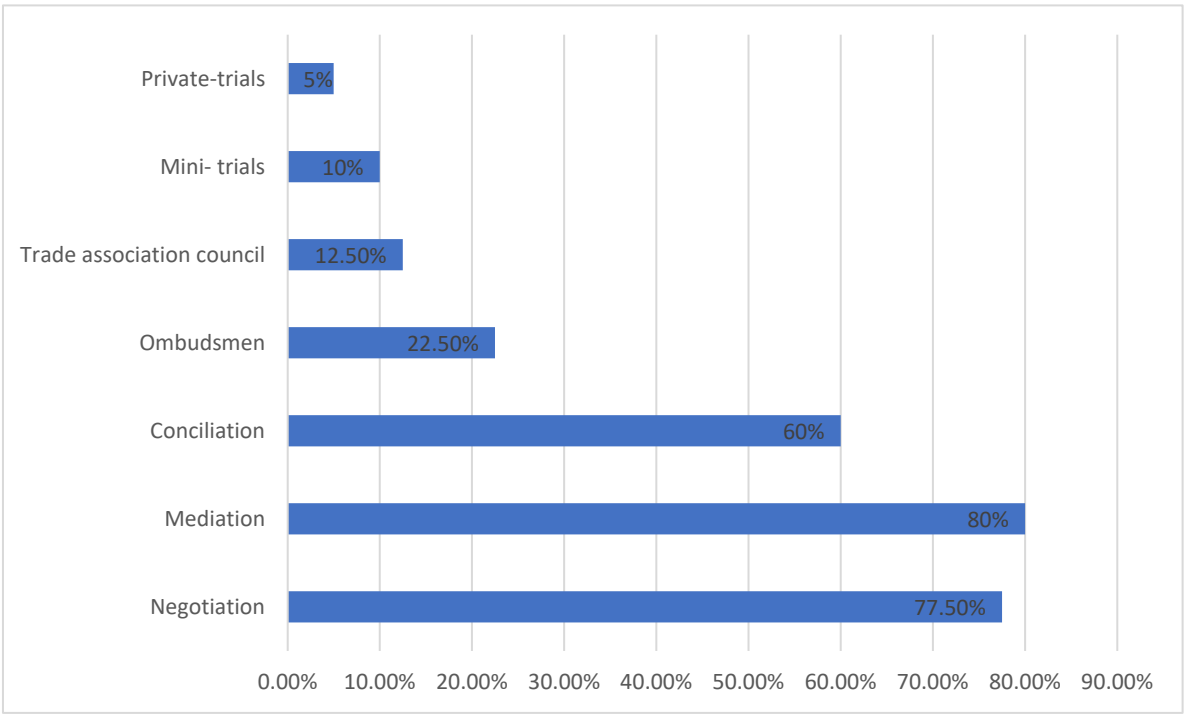

Figure 4. Application of ADRs except adjudication and arbitration.

Considering the outcomes of Tables 8 and 9 and Figure 5, it is evident that QSs are required attend formal ADR trainings within the industry.

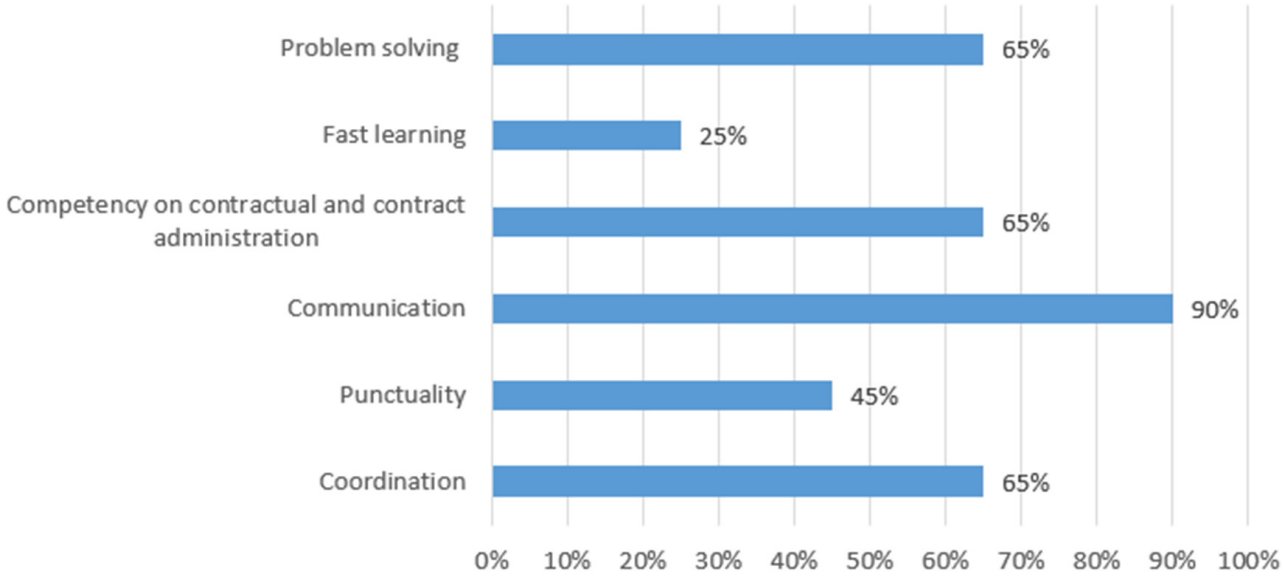

Figure 5. Essential skills or QSs in dispute resolution.

7.2. Objective 2: The Roles and Human Skills Required of Quantity Surveyors for Effective Dispute Resolution in Sri Lankan Green Building Construction

According to the Figure 5, enhancement of QSs' communication skills is a priority while development of skills in coordination, contract administration, and problem solving are also important. The QSs' punctuality and ability to learn fast were least prioritized. This

emphasized the necessity of embedding professional development programs in QSs' careers while integrating ADR techniques and green construction-related knowledge. However, this study examined the second research objective via a self-evaluation, which could have resulted in bias. Hence, further studies could be carried out to include an objective point of view.

7.3. Objective 3: The Extent to Which Construction Companies Have Adopted ADR Methods in Sri Lankan Green Building Construction Projects

The description analysis (Table 10) demonstrated a high amount of compliance with the SBDs (Standard Bidding Documents) together with adjudication and arbitration. The high mean, low standard deviation, and negative skewness (−0.41) proposed an inclination toward agreement on this aspect. SBD consists of clauses for predefining ADR methods and processors [35]. Conflicts and disputes are causes of project delays [36]. Accordingly, SBD facilitates approaching ADR in real time and in the presence of a dispute, avoiding delays and extended resources/energy consumption. This helps to reduce carbon emissions and energy consumption in the construction industry.

Table 10. Application of ADR Methods. SD = strongly disagree, D = disagree, N = neutral, A = agree, SA = strongly agree.

Factor	SD %	D %	N %	A %	SA %	Mean	Mode	SD	Skewness
The degree of which Standard Bidding Documents (SBDs) govern and follows adjudication and arbitration for dispute resolution.	0	2.5	20	62.5	15	3.90	4.00	0.67	−41
Recruitment of professionals such as negotiators/mediators/conciliators in dispute resolution.	0	7.5	20	57	15	3.80	4.00	0.79	−0.60
Dispute resolution via negotiation, mediation, and conciliation during the last 5 years.	2.5	2.5	32.5	45	17.5	3.70	4.00	0.87	−0.62
The degree of which negotiation, mediation, and conciliation were prioritized rather than arbitration and adjudication.	0	2.5	15	65	17.5	3.97	4.00	0.66	−0.53

In assessing the recruitment of ADR professionals, a majority agreed that professionals such as negotiators, mediators, or conciliators were recruited in their organizations. The slightly higher SD value (0.79) reflected a normal distribution of responses. This research has also discovered a high amount of continuous application and a prioritization of informal ADR methods such as negotiation, mediation, and conciliation compared to arbitration and adjudication. According to Gamage and Kumar [16], ADR methods such as negotiation, mediation, and arbitration are highly significant in reducing schedule slippage, budget escalations, and assuring successful project completion. As this study strongly indicates that most companies have adapted professionals to handle such ADR methods, the projects are more likely to be completed on time, and within the expected budgets. Accordingly, avoiding excessive energy consumption becomes a possibility with on-time project completion. In the absence of cost overruns, the quality of green construction projects and environmental priorities shall be attained with sufficient funds. Consequently, this study argues that QSs should be further fortified to engage in collaborative dispute resolution to utilize the best outcomes of ADR for green projects.

7.4. Objective 4: The Impact of Quantity Surveyors' Involvement in ADR on the Organizational Performance of Construction Companies in Sri Lankan Green Building Construction

The descriptive statistics (Table 11) illustrate QSs contribution in quality project delivery (facilitated by effective time, cost, and quality management). The QSs' involvement in time management results in energy and carbon saving due to less energy/resources consumption associated with on-time project delivery, as disputes often lead to schedule escalations with increased use of energy through machinery and plants. As the triple constraint theory suggests that time management leads to cost management, and because QSs are specialized in cost management in construction, the quality of green projects and environment related priorities could be successfully attained with adequate finances. A lack of funds results in reducing the quality of green construction projects [35]. Quality installation of green building elements reduces life cycle costs preventing rework and repairs. Association of limited extra work and rework helps to reduce carbon and energy usage in green projects over time.

Table 11. The Impact of Quantity Surveyors' involvement in ADR. SD = strongly disagree, D = disagree, N = neutral, A = agree, SA = strongly agree.

Factor	SD %	D %	N %	A %	SA %	Mean	Mode	SD	Skewness
The QSs' contribution in project delivery (including time, cost and quality management).	0	0	17.5	52.5	30	4.12	4.00	0.68	−0.16
The QSs' contribution in the coordination of business relationships.	0	5	20	60	15	3.85	4.00	0.74	−0.56

This research also highlights a significant involvement of QSs' in business relationships. Positive business relations are essential in avoiding construction disputes [36]. This benefits in preventing excessive carbon emissions that would result from prolonged/extra activities associated with construction delays. Avoiding disputes through establishment of positive business relationships also lets the project flow smoothly, evading greater complexities. Consequently, it generates more opportunities for green construction with developed long-term associations and trust. In a broader context, this produces an extensive green supply chain with carbon saving practices. This also empowers green procurement and supports reducing carbon emissions and preserving energies.

This study further examined the relationship between the implication of ADR methods and the performance of green building construction projects in Sri Lanka. The implication of ADR methods is considered as the independent variable while referring the dependent variable to organizational performance. The hypothesis testing (Table 12) is carried out for the slope of the regression model, which is also known as the regression coefficient, and if the regression slope is proven as positive, then there is a positive relationship between above mentioned variables.

$$Y_i = \beta_0 + \beta_1 X_i + \varepsilon_i$$

Null Hypothesis [H_0]: There is no relationship between the implication of ADR methods and the performance of green building construction projects in Sri Lanka.

$$[H_0: \beta_1 = 0]$$

Alternative Hypothesis [H_1]: There is a relationship between the implication of ADR methods and the performance of green building construction projects in Sri Lanka.

$$[H_1: \beta_1 \neq 0]$$

In conducting the regression analysis, the level of significance is taken as 0.05 with 95% confidence interval for the hypothesis test.

Table 12. Hypothesis Test.

ANOVA [a]						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	3.317	1	3.317	30.229	0.000 [b]
	Residual	4.169	38	0.110		
	Total	7.486	39			

[a] Dependent Variable, [b] Predictors (Constant), and Alternative Dispute Resolution methods.

The *p*-values of ANOVA and coefficient tables are 0.000 and 0.001, respectively (Table 13). As both of these values are less than the significant level, which is 0.05, the null hypothesis shall be rejected. Since the regression coefficient is a positive value (0.63), it can be concluded that there is a positive relationship between the implication of ADR methods and the performance of green building projects in Sri Lanka. In other words, this indicates that effective application of ADR methods such as negotiation, mediation and conciliation with Quantity Surveyors' involvement results in enhancing the project performance. Attainment of adequate balance among time, cost and quality in construction projects results in reducing carbon emissions and excessive energy consumption as detailed above. Accordingly, it implies that the QSs should be encouraged to include in ADR processes in green construction. It is possible to formalize via policy or contractual arrangements. This study also suggests adopting longitudinal research approaches to reconfirm enduring aspects contrary to this study's strategy.

Table 13. Inferential analysis correlation.

Coefficients [a]						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	1.617	0.444		3.639	0.001
	Alternative Dispute Resolution Methods	0.630	0.115	0.666	5.498	0.000

[a] Dependent Variable.

8. Conclusions

This study aimed at discovering various domains of QSs' involvement in ADR processors within Sri Lankan green building projects. While a character analysis was conducted in the beginning of this study, it exposed a slightly significant traditional gender (male) domination in the QSs' involvement towards ADR. We suggest conducting further studies for an in-depth analysis on the impact of QSs gender towards their ADR involvement in green construction. In assessing the first objective, the extent to which QSs are involved in ADR is determined by disputes found to be common in green building projects. This emphasizes the necessity of enhancing professionals' skills in construction planning, predefining ADR in the tendering stage, and adapting suitable ADR methods where necessary. Avoidance of disputes is critical in reducing energy consumption and carbon emissions, as explained in the research analysis. Moreover, the study discovered experienced QSs to be dealing with more disputes compared to those with less experience in the industry. Accordingly, it is recommended to develop structural mentorship and leadership training programs to transfer the seniors' knowledge and expertise to emerging QSs.

The research also examined its second objective: essential human skills/competencies for QSs in handling disputes. While communication is ranked first, problem solving, contract administration, and coordination were found to be important as well. The QSs' punctuality and ability to learn were least prioritized. Identification of these skills and competencies helps in curriculum development, institutional training, continuous professional development, attainment of green construction goals, and organizational success in green housing projects. The third objective evaluated the degree to which construction companies have adopted ADR methods in Sri Lankan green housing construction projects following a descriptive analysis. Accordingly, the study exposed a high compliance with the SBDs (Standard Bidding Documents) together with adjudication and arbitration; recruitment of specialized professionals for ADR; and continuous application of ADR methods such as negotiation, mediation, and conciliation compared to arbitration and adjudication. This ensured that approaching ADR in real time in the presence of a dispute while avoiding delays and extended resources/energy consumption results in reduced carbon emissions. As the absence of project delays enables cost savings, the quality of green construction projects and environmental priorities shall be attained with sufficient funds. Consequently, this study suggests strengthening ADRs by identifying gaps and constraints associated in each application and developing the identified skills and competencies for QSs. The study also argues that QSs' engagement in the identified fields of ADR and business relations generates benefits from the preventing of excessive carbon emissions and resource/energy consumptions which would result from prolonged/extra activities associated with construction delays caused by disputes. In examining the final research objective, this study discovered a positive relationship between the ADR implications and green building project performance. This stressed the necessity of effectively applying of ADR methods such as negotiation, mediation, and conciliation with QSs' involvement.

9. Recommendations

This study recommends enhancement of QSs' involvement in ADR for green construction through developing policies and formalities in Sri Lanka as QSs' participation in ADR is found to be inadequate. In evaluating the identified skills and competencies required for QSs, it is important to provide sufficient ADR and green construction-related training for QSs to enhance effectiveness of green construction performance. Improvement of sustainably literacy among construction professionals and professional organizations becomes noteworthy in this process. This research has also identified a gender imbalance in QSs' involvement in ADR. Hence, encouraging female participation, adaptation of inclusive recruitment processes, and leadership programs are significant to address the gender imbalance. As the research outcomes stressed the necessity of collaborative dispute resolution, construction stakeholders could foster teamwork and team dynamics.

10. Limitations and Further Study Directions

The descriptive and inferential analyses revealed a slightly significant ($p < 0.01$) traditional gender domination in the QSs involvement towards ADR. Hence, further studies could be carried out in search of the impact of QSs gender towards their ADR involvement in green construction. This study only examines QSs' involvement in ADR methods following diverse domains. Therefore, it does not analyze the effectiveness of each ADR method in its application. Similarly, the present study defined project performance in terms of management of time, cost, and quality following the triple constraint theory. Further studies could be carried out integrating more measures of project performance such as productivity, employee turnover, growth rates, etc. Moreover, a qualitative approach could be adapted in similar future studies as this research followed a quantitative methodology.

It is also beneficial to conduct a cross-country comparison to enhance the scope of the study as the current analysis is limited to the Sri Lankan context. This may also enable effective generalization of research findings due to its existing constraint of small sample size, non-probability sampling technique, and external validity.

As this study also contains sources of possible response biases via self-evaluation within the survey, further studies could integrate other construction stakeholders to include an objective point of view. Despite the affirmed internal consistency value (Cronbach's Alpha = 0.723), expert validation and factor analyses could be embedded to increase validity. Enhancement of the sample size in future research may enable conducting assumption testing for linear regression, controlling confound variables and low expected frequencies resulted in Chi-Square tests.

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