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Modelling the Implications of Delayed Payments on Contractors' Cashflows on Infrastructure Projects

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Abstract

The consideration of payments to contractors is not only a legal obligation but a necessity for assuring the continuity and completion of a construction project. However, consistent payments to facilitate project cash flows are uncommon in the construction industry. Within the context of a small island developing state, this paper aims to uncover leading risks factors contributing to implications of delayed payments, on contractors' cash flows and uncover causalities and effects on relationships among these factors. A two-tiered quantitative approach was adopted. Firstly, a compiled list of delay factors was collated from the literature review. Semi-structured interviews were conducted with experienced construction professionals to determine the factors' relevance and applicability in Trinidad and Tobago. A closed-ended survey questionnaire was subsequently developed and administered to primary construction stakeholders. Secondly, the responses obtained were collated, validated, and ranked using the relative importance index. A confirmatory factor analysis (CFA) was carried out using SPSS, and thereafter, SPSS Amos was used to determine the best-fit Structural Equation Model (SEM). The results strongly indicate that the issue of delayed payments is very prevalent within public sector projects. Unstable political climates and the delay in employers' issuance of variation orders were found to be the main causes of delayed payments within the industry. Delays in sub-contractor and supplier payments as well as an increase in the contractor's debt were the leading effects of delayed payments on the contractor's cash flows. Based on these findings, a risk response framework was outlined to assist small to medium-contracting enterprises to cope with payment delays, both locally and internationally. This research contributes to the advancement of construction management knowledge by informing construction professionals and policy makers of the implications of delaying approved payments, the consequential causes and effects, and a risk response technique to mitigate the negative effects on contractors' cash flows.

Keywords: Contractor Payments; Risk Response Framework; Construction Industry; Cash-Flow; Construction Projects.

1. Introduction

A pivotal role of the construction industry in any economy is the provision of social and economic infrastructure, thereby increasing the overall quality of life for the nation's citizens. A direct causal link is established between the tangible benefits of infrastructural development and overall economic development, to the construction industry [1]. For example, major construction projects are strategic in nature, geared towards improving positive social change from the derived benefits of these projects and, in turn, directly improving the current standard of living within the particular society [2]. These major projects are complex in their nature [3], requiring a seamless multi-tiered integration of specialist human capita, sustainable materials, machinery and methods, all within a temporary organization setting [4]. Concomitantly, construction projects are known to be costly initiatives, often forecasted in millions and even billions of

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dollars. It is also not uncommon to see construction projects overrun their contracted sums by more than 100% [2]. To facilitate the integration of these multi-tiered, dynamic stakeholders' networks and supply chains, the forecasted and timely disbursement of cash flows, defined as the back-and-forth movement of money inside an organization, throughout the network is vital for both quality and the on-time completion of projects.

The challenge for contractors, therefore, with pervasive difficulty, is to develop strategies that guarantee adequate cash flows throughout all phases of construction project execution. To facilitate cash flows, it is common for contracting parties to agree on a payment schedule with interim payments measured against the completion of tasks or milestones. This strategy is essential as the injection of financing at set intervals enables the ongoing advancement of a construction project in the form of material and labour expenditures, culminating in timely project delivery. Still the phenomena of delayed payments, and cash flows from client to contractors, do not possess a simple solution of paying on time at set intervals [5]. The challenges associated with obtaining continuous project finances are a global concern and impede project completion by placing undue financial strain on contractors and project stakeholders. There are many interconnected factors that increase complexity in releasing funds, which in turn hamper timely payments and subsequently starve the project of cash flows.

Internationally, in the developed nations such as the UK and European nations, less than 50% of companies in the construction industry pay invoices on time [6]. On average, 42.8% of companies in the European Union pay invoices on time, as compared to the dismal record of 32.7% for the UK [7]. Delayed payments in the United Kingdom, for example, are recorded to have climbed from £18 billion to £35 billion, impacting 125,000 firms and leading to the closure of 4,000 companies [8]. Also, delayed payments have a domino effect within the contractor's sphere of operations, which consequently impacts the cash flows. Insufficient cash flows can result in several adverse financial outcomes, such as cost overruns [9]. The lack of funding and continual recurrence of late payments retard cash flows, which subsequently delay the progress of a project and extend the project's duration. Consequently, cash flow limitations have been shown to reduce an organization's profitability and induce cost overruns in all aspects of a contractor's business [10]. The combination of issues such as procurement delays, reductions in labour, and delayed payments to relevant subcontractors can result in a stalled and abandon project and even bankruptcy for the contractor's business [11, 12].

For the smaller, weaker developing economies of the small island developing states (SIDS), no cogent policy or legislation exists to incentivize clients to pay as per contractual agreement [13]. In Trinidad and Tobago (T&T), a Caribbean SIDS, the construction industry has been severely impacted in recent years and suffers from negative growth rate [9], contracting from 7.1% of the country's GDP [14] to 4.8% of GDP [8]. The contraction of the construction industry led to further financial shortages to execute projects and was on the verge of collapse as the government was unable to honour overdue payments to contractors for public sector projects [15]. The resilience of contractors to survive a transitional period without producing a profit or even incurring a loss is noteworthy, however, many small and medium-sized contractors were unable to continue business operations. Though the economic difficulties of a country are the leading causes of business failure [16], the trickle-down effect to contractors to continue construction works are mainly attributable to a lack of cash flow.

Based on the above critical challenges facing contractors to ensure business continuity and maintain a consistent streamline of cash flow at all stages of a construction project lifecycle, there is a need for a closer examination between cash flow and the performance of the construction industry. For SIDS such as T&T, other issues such as climate change, dependency on larger economies and financial aid, smaller economies of scale and higher importation and logistic costs [9, 17] affect costs, contractors' performances on projects and profitability. Therefore, an understanding of the impediments of cash flows, within specific construction industry context, is a critical consideration to achieve a successful project outcome. To address this research gap, the study aims to examine the leading causes and inter relationships contributing to payment delays and cash flow impediments in Trinidad and Tobago. This aim is further represented by three objectives; firstly, to identify the perceived main factors to delay payments and cash flows. Secondly, to determine the strength of correlation among these perceived factors and thirdly, to propose a risk response framework to a starting solution to mitigate payment delays and further cost overruns. This study adds to the body of literature on the economic effects of cash flow theory on bargaining power of contractors in volatile economies of the SIDS and seeks to encourage further broader debates among construction practitioners, academia and government stakeholders of the key implications of delayed payments on contractors' cash flows. Consequently, the overall ambition of this study is to educate the industry stakeholders on the modelled risks and present a starting point of mitigation strategies as potential solutions.

2. Theoretical Foundation

Previous studies in construction revealed that the unstable cash flow is the most significant factor that leads to a project's delay followed by late payment [18–23]. One of the crucial project success criteria in the construction industry can be considered to be efficient and effective payments as per the related work [24–26]. Unlike other industries, timely completion of the construction projects is significantly affected by the delayed payments [27–29]. As a result, in time

extension due to delayed payments, leads to increase the construction cost, loss of productivity, work disruption, and revenue loss [28].

The challenge of obtaining continuous project finance is a global concern, as it impedes project completion and places an undue financial strain on contractors and project members. According to a survey of forty small and medium-sized Turkish construction companies, the country's economic difficulties are one of the leading causes of business failure [16]. Due to its dependent relationship with the country's economy, public projects frequently suffer from financial shortages and cost overruns caused by escalated costs, delays caused by supply chain concerns and ongoing conflicts in Europe. The Trinidad and Tobago's Contractors' Association lamented on the impact of such delays on both government and corporate enterprises, expressing while costs for inflation are accounted for within the fixed contract sum, other unforeseeable macroeconomic events account for inaccurate project pricing and potentially costing millions of dollars [19]. The intended project cost is underestimated, and insufficient money are obtained to fund the project. Therefore, delays in payment, under-payment and late payment were responsible for 56.7% of disputes in the construction sector [28, 30]. From 2008 to 2012, the number of delayed payments in the United Kingdom climbed from £18 billion to £35 billion, impacting 125,000 firms and leading to the closure of 4,000 [31]. Within a five-year period, the local construction industry in Trinidad and Tobago (T&T) was on the verge of collapse because of many overdue payments to contractors for public sector projects [15].

A major cause of delayed payment can be attributed to the Client's poor financial management [32]. Funding infrastructure projects require sizable investments, and in the absence management and financial controls, moral adversities are likely to occur in the procurement of goods and services by public and private entities. Funds mismanagement can be caused by a variety of circumstances, most notably unscrupulous behaviours and inadequate management procedures [33]. In many public infrastructure projects, strategic mismanagement leads to expansive work scopes, increasing complexity, insufficient budget allocations and consequently financial imbalance between the corresponding Ministry and the government agency. Ultimately, other sectors of society suffer from these overruns in infrastructure expenditures, leading to social inequality and slow economic progress [9].

Often, delayed payments have a dominant effect within the contractor's sphere, resulting in negative outcomes due to a lack of funding, extending to all aspects of a contractor's business, such as procurement delays, reduction in labour, and delayed payments to relevant subcontractors and stalled projects. A persistent pattern of late payments on a project can potentially result in total project standstill and forced closure of the contractor's business. To alleviate these issues, payments and cash flows in the construction phase of a project are controlled by contractual provisions agreed among contracting parties. The FIDIC standard form of Condition of Contract for design-bid-build projects contains specific conditions on when payments can be withheld. For example, payments may be withheld if the Contractor's completed work is not in accordance with the specified requirements. Subclause 14.6, Issue of Interim Payment Certificates states that no amount will be certified or paid until the Employer has received and approved the Performance Security [34].

Also, payments would be delayed for work completed are not in accordance with the contract, or if the Contractor fails to perform works in accordance with the contract agreement. This is typically seen in the construction sector when contractors claim for additional time and/or funding on a project. Frequently, claims are deemed invalid due to the Contractor's failure to provide a written notice of claim and show a legitimate foundation or an improper reference to a sub-clause within the FIDIC contract. Additionally, the claim may be inadequate if the Client is unable to provide the necessary supporting papers or submit claims within stipulated time bar provisions. A client can also deliberately withhold money owed to contractors to improve economic standing [35, 36]. This was observed in the 2016 case of the Bynoe Rowe Wiltshire Partnership vs. the State which involved efforts to collect fourteen million dollars in retention payments on contracts issued by the Ministry of Education for the restoration of schools [37]. Retention payments are money received by the contractor for completed work that are held by the Employer until all work is finished. The contractor's claim for USD 2.3 million in retention sums was dismissed by the court under the Limitation of Certain Actions Act Chapter 7:09, on the grounds that the claim was not filed within the 4-year limitation period.

In efforts to curb the effects of delayed payments among stakeholders, professionals, developed nations such as New Zealand, Singapore, Poland and the United Kingdom implemented specialized legislative payment security regimes, which establish requirements to resolve urgent payment concerns within the construction sector, to further eradicate improper payment practices and smoothen contractor's cash flows. In the United States, the US Federal Prompt Payment Act or PPA was developed to curb delayed payments on federally funded construction projects. It accomplishes this through the provision of a payment schedule, which is further disclosed to the contractor, relevant subcontractors, and other suppliers. In Trinidad and Tobago, specialized legislation to mitigate late and non-payment of goods and services are non-existent, resulting in a gap in satisfying present demands of the construction industry [38, 39]. The Limitation of Certain Actions Act specifies time limits for certain claims. This limitation period of 4 years sets a deadline for filing a lawsuit against an entity, however this framework does not provide enough security for timely contractor payments, as it is inconvenient and requires judicial precedent.

A lack of proper delayed payment legislation has created a relaxed cultural attitude, increasing tolerance levels in the acceptance of late, non-payments, and nonadherence to the agreed contract terms for payment [35, 36]. The issue of delayed payments in Trinidad runs deep and has been the demise of local contractors for many years. This repetitive cycle has become a new norm within the local industry and a negative stigma is associated with a contractor's reputation if legal action is taken against the state, which discourage contractors from pursuing their legal avenues to recoup funds. Due to the contractor's failure to get funds, the acquisition of supplies and equipment becomes challenging. Suppliers hesitate to deliver equipment and materials, or conduct business with contractors who are unable to pay due to financial difficulties [40]. Given the economic instability caused by the global pandemic, suppliers have limited their credit facilities until all outstanding obligations are paid. Delayed payments extending throughout this unstable economic period would lead to the Contractor paying for materials and labour out of pocket, increasing cash outflow with an insignificant cash inflow. Contractors may seek loans from financial institutions out of desperation, to maintain their daily operations. These loans from the bank must be returned with interest, increasing contractor's exposure to debt. Late or non-payment might result in higher financing costs, which lowers business margins, and as a result, has a negative impact on future borrowing [13, 41] and social and psychological effects on the individual hierarchy of needs [42].

Mitigation strategies to reduce the impact of delayed payments to contractors are sparsely established in the literature. Contractors might receive financial training as part of short-term solutions. Without good cash flow management, building contractors cannot prosper in the highly competitive industry [43]. This suggests that contractors with a greater understanding of cash flow forecasting are better positioned to manage their finances throughout construction, hence avoiding further financial challenges and unfavourable project results. Also, employing a commercial manager is another short-term solution available to contractors. According to FRICS and FCIArb's (1997) definitions, commercial management is the monitoring of profits inside a corporation, which is achieved through minimizing expenses and maximizing income [44]. A commercial manager oversees and balances both incoming and outgoing money flows, while producing payment projections and utilizing their financial experience to estimate the project's eventual financial outcome. Long-term approaches include incorporating Prompt Payment Laws [13]. The construction industry's cultural attitude toward late payments can be altered by the enforcement of regulations. Additionally, it offers contractors with greater financial stability and reduces substantial financial and legal risk. Enforcing regulations would also permit a written record of financial allocations, which would increase Client responsibility; however, this way of mitigation is outside the contractor's control.

Delays in construction payments have recently attracted the attention of several researchers [28, 45, 46]. However, there are few research assessing the extent of payment delays in Trinidad and Tobago. Addressing the previous research gaps, this research study aimed to examine the occurrence of payment delays in public and private sector projects in Trinidad and Tobago. The main deliverable of this research include (a) finding main factors associated with payment delays to the contractor (private/public sector) through semi-structured interviews after compiling the factors using a comprehensive literature survey (b) the correlation of the delay factors to the response criteria and its interrelatedness among other factors to develop a Structural Equation Model (SEM). Based on the findings a risk response framework is proposed to curb cost overruns and payment delays.

3. Research Methodology

Using the triangulation technique, the structure of the research was done in three stages. The first stage consisted of a local and international literature evaluation between 2006 and 2021. Books, journal papers, news items, websites and academic research were examined to better comprehend the implications of delayed payments to contractors. This permitted the compilation of a list of delay factors connected with the Implications of Delayed Payments on Cash Flow for Contractors. At stage 2, the list of delay reasons was reviewed via two semi-structured interviews with construction experts with more than ten years of field experience.

A questionnaire survey developed utilizing a combination of open ended, Likert scale and multiple- choice questions engaged construction experts in discussions pertaining to delayed payments in both the private and public sector. The first section collected demographical information, ensuring the small to medium contracting parameter was met, as well as gender, age, years of experience and job positions. Section two allowed respondents to share perspectives and experiences with delayed payments in Trinidad and Tobago, as well as its impact on business operations. Section three presented the assembled list of delays, with opportunities for responders to indicate their agreement with each factors likelihood of contributing to the consequences of delayed payments to contractors, achieved using a five-point Likert scale. Section four contained open-ended questions to gain deeper insights into different contract strategies that are employed within the local industry. Lastly, section five consisted of open-ended questions, allowing for first-hand accounts from the experts on the issue of delayed payments. Questionnaires were administered to a targeted audience of professionals within the industry, and 47 responses were received. Figure 1 provides a flowchart of the methodology approach undertaken for this study.

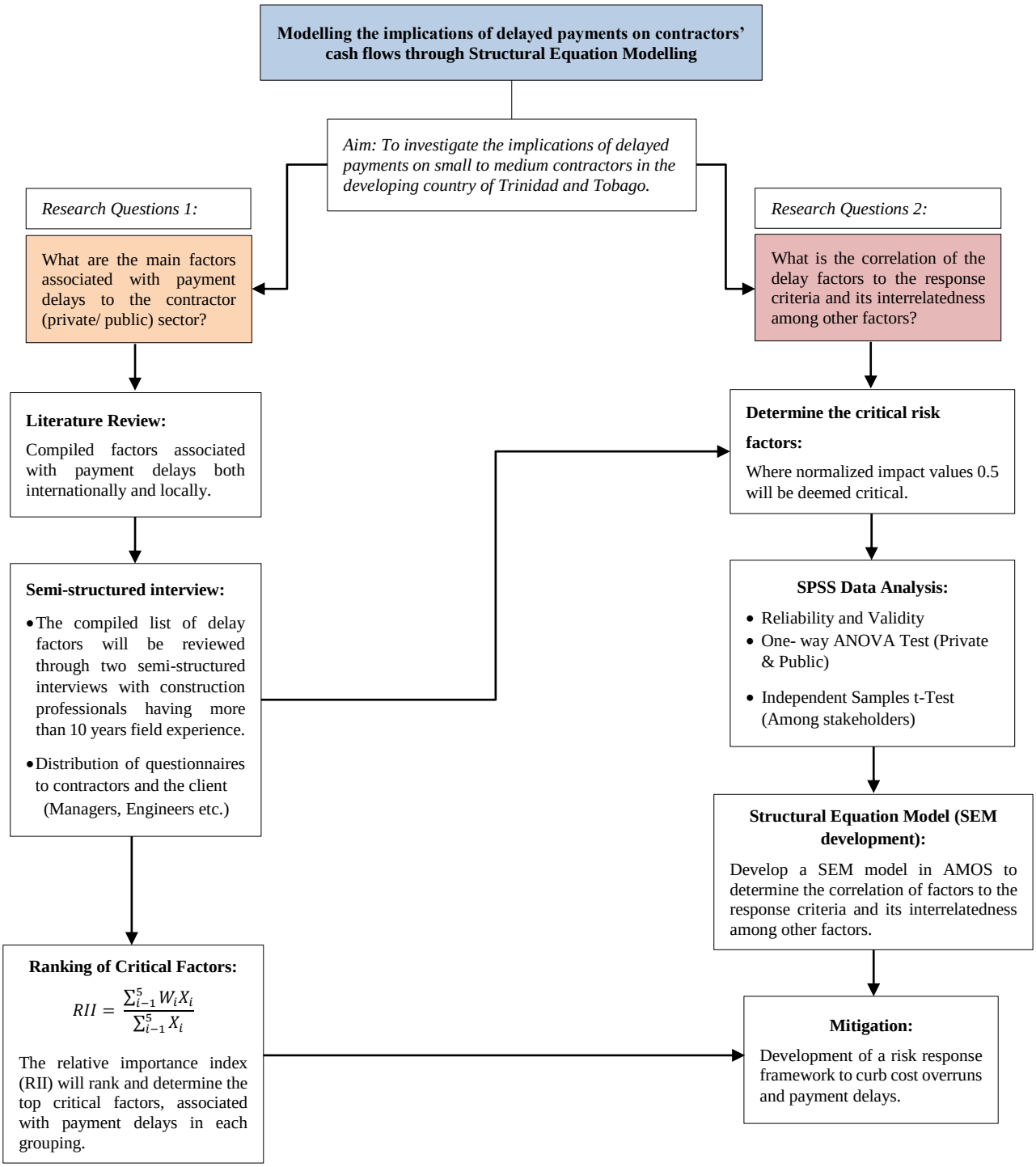

Figure 1. Workflow of the study

3.1. Readability and Validity

Cronbach's index and the Spearman-Brown coefficients were used to assess the reliability of the scale used to quantify the probability of varying causes and effects of delayed payments. According to Adeleke (2017) [47], a Cronbach's alpha (α) and Spearman-Brown reliability coefficient greater than 0.70 is considered reliable. The survey findings were analysed using Statistical Package for Social Science (SPSS®) software. An α value of 0.749 (74.9% scale reliability) and 0.942 (94.2% scale reliability) for section two and three of the questionnaires, respectively. These results demonstrate the consistency and reliability of the scales used. The results of the Bartlett's Test of Sphericity for sections two and three were zero. This is less than the cut-off value of 0.05, proving the validity of the scale as a measurement tool [48]. The Kaiser-Mayer Olkin Measure of Sampling Adequacy (KMO) test assesses the scale's adequacy. This value was found to be 0.734, which was above the acceptable value of 0.5 [49].

3.2. Demographics- ANOVA and t-Test

A frequency study was done using descriptive statistics in SPSS. The following independent variables were subjected to one-way ANOVA testing: gender, age, construction sector experience, education, occupation status, job position and employees within their organization. Perspectives include Contractors, Clients, Consultants, Engineers, Finance Managers etc.

The (One Way) ANOVA test was performed to determine if the group means varied significantly. This test aimed to answer the following questions:

- *Research Question 1:* "Is there a statistical significance difference between the Perspectives of the respondents based on the Causes and Effects of Payment Delay?"
- *Research Question 2:* "Is there a statistical significance difference between the Perspectives of the respondents based on Late Payments?"
- *Research Question 3:* "Is there a statistical significance difference between the Perspectives of the respondents, based on Impacts of Delayed Payments?"

Results can be statistically significant at a 5% and 10% confidence interval ($p<0.05$ and $p<0.1$). From the data output, no statistical significance was observed when respondents were questioned about the probability of the implications of delayed payments, as well as when asked about the issue of delayed payment within Trinidad and Tobago and its effect on business function. However, there was statistical significance when respondents were asked if the adoption of laws to prevent late payments would contribute to reducing the frequency of late payments ($p=0.042$).

A T-test is used to compare the means of two sets of data to see if they differ significantly. A T-test was run on the sample sizes of the two groups, Client, and Contractor, to see whether there was a statistically significant difference between their means. Because the groups are independent of one another, the independent sample T-test is utilized.

This was done under the assumption that the null hypothesis reflected no significant difference between the client and the contractors, based on their views on the causes and effects of delayed payments.

3.3. Relative Importance Index (RII)

To rank each reason of delayed payments, the Relative Importance Index (RII) values for each cause were determined. In construction research, the Relative Important Index (RII) is a common and successful ranking tool. This study's RII values give the highest value the highest rank because a higher value indicates a greater probability of a cause and effect. The equation used to calculate the RII is as follows:

$$\text{RII} = \frac{\sum_{i-1}^{5} W_i X_i}{\sum_{i-1}^{5} X_i} \quad (1)$$

where: i = response category index Where 1- strongly disagree, 2- disagree, 3- neutral, 4- agree, 5-strongly agree. Wi= the weight assigned to the i the response, as = 1, 2, 3, 4, and 5 Xi = frequency of the i the response given as percentage of the total response for each cause.

3.4. Structural Equation Model Development

Inferential statistics are employed to draw conclusions or generalizations about the larger population. On the questionnaire results, a typical confirmatory factor analysis was conducted in AMOS, and a model was constructed. The acceptability of a model is determined by the model fit reference metrics in Tables 1 and 2 seen below. Significant paths can be identified if the model is acceptable. Acceptable fit indices do not imply robust relationships [50]. When correlations between variables are low rather than strong, it is typically simpler to acquire high fit indices since the potential to recognize deviations from expectations is enhanced.

Table 1. Model fit reference value

Measure	Output
CMIN/DF	1.44
CFI	0.917
RMSEA	0.098
PClose	0.016

Table 2. Model output values

Measure	Terrible	Acceptable	Excellent
CMIN/DF	>5	>3	>1
CFI	<0.90	<0.95	>0.95
RMSEA	>0.08	>0.06	<0.06
PClose	<0.01	<0.05	>0.05

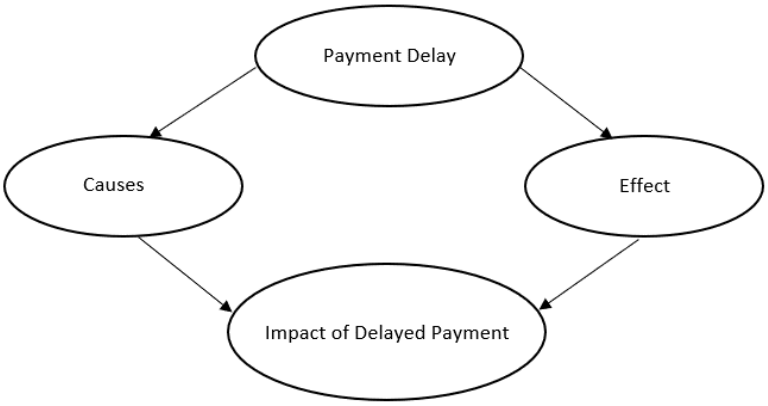

Figure 2. Proposed SEM model

4. Results and Discussion

As per the collected data, 91.5% of the respondents were male and 8.5% were female, as shown in Figure 3. 44.7% of respondents belonged to the 25–35 year age group, 34% belonged to the 36–45 year age group, 12.8% belonged to the 46-55 year age group, and 4% were over 55 years old, as shown in figure 4. Accompanying this, 25.5% of respondents had 5–10 years, 11–15 years, and over 20 years of experience within the construction sector. The remaining 23.4% lied within the other categories. A large population of respondents (51.1%) possess a bachelor's degree, while the remainder have a mixture of CAPE, Master's Degree and Diploma as their highest level of education. Most of the sample are employed full time and belong to small to medium companies with employees between 21-50 persons.

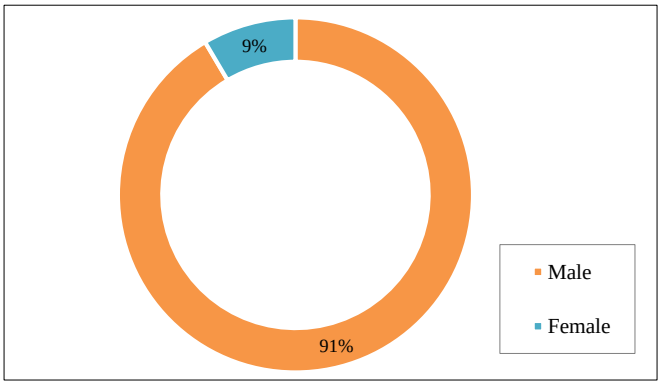

Figure 3. Distribution of respondents according to gender

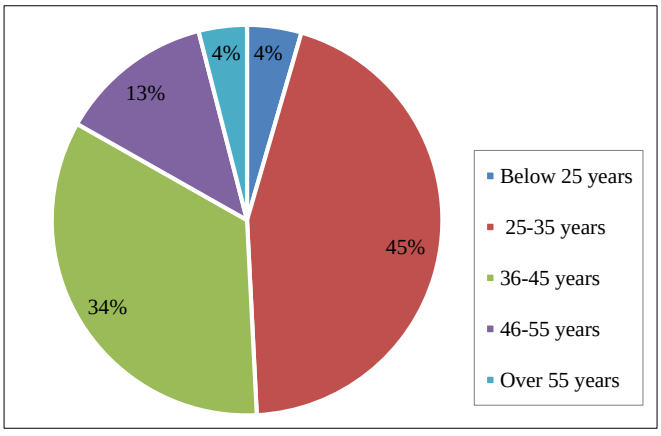

Figure 4. Distribution of respondents by age group

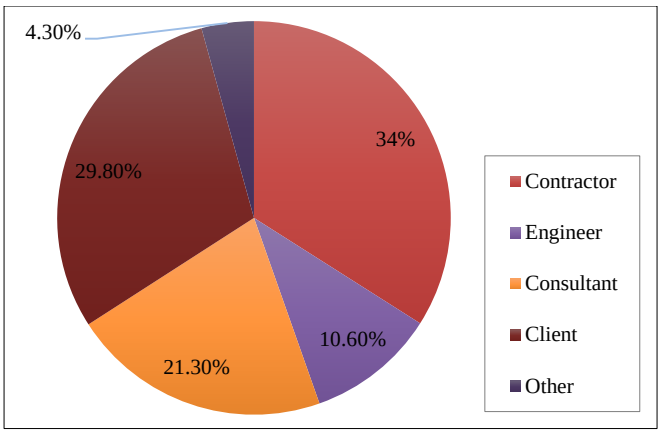

Figure 5. Distribution of respondents by their profession

Table 3. One-way ANOVA (dependent variables: S2Q1, S2Q2, S2Q3 independent variables: perspectives: client, consultant, contractor, engineer, other)

ANOVA						
		Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Delayed payments are problematic	Between Groups	1.244	4	0.311	2.421	0.063
	Within Groups	5.395	42	0.128		
	Total	6.638	46			
The issue of delayed payments is problematic within Trinidad and Tobago	Between Groups	1.165	4	0.291	1.405	0.249
	Within Groups	8.707	42	0.207		
	Total	9.872	46			
Delayed payments frequently affect business function.	Between Groups	1.962	4	0.491	2.212	0.084
	Within Groups	9.314	42	0.222		
	Total	11.277	46			

Table 4. One-way ANOVA (dependent variables: CF1-CF13 independent variables: perspectives: client, consultant, contractor, engineer, other)

ANOVA						
		Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Client mismanagement of funds	Between Groups	9.859	4	2.465	2.042	0.106
	Within Groups	50.695	42	1.207		
	Total	60.553	46			
Miscommunications	Between Groups	10.268	4	2.567	2.555	0.053
	Within Groups	42.200	42	1.005		
	Total	52.468	46			
Invalid claims	Between Groups	3.409	4	.852	0.670	0.616
	Within Groups	53.400	42	1.271		
	Total	56.809	46			
Contractual Disputes	Between Groups	2.050	4	.513	0.318	0.864
	Within Groups	67.695	42	1.612		
	Total	69.745	46			
Cultural Attitudes	Between Groups	2.501	4	.625	0.397	0.810
	Within Groups	66.138	42	1.575		
	Total	68.638	46			
Lack of Legislation	Between Groups	6.795	4	1.699	0.952	0.444
	Within Groups	74.950	42	1.785		
	Total	81.745	46			

Design changes during construction	Between Groups	7.103	4	1.776	1.298	0.286
	Within Groups	57.450	42	1.368		
	Total	64.553	46			
Unstable political climate	Between Groups	5.088	4	1.272	0.673	0.614
	Within Groups	79.338	42	1.889		
	Total	84.426	46			
Complex contractual requirements	Between Groups	2.699	4	0.675	0.879	0.485
	Within Groups	32.238	42	0.768		
	Total	34.936	46			
Failure to submit claims	Between Groups	4.430	4	1.107	0.961	0.439
	Within Groups	48.379	42	1.152		
	Total	52.809	46			
Failure to perform work in accordance with the Contract	Between Groups	10.400	4	2.600	1.666	0.176
	Within Groups	65.557	42	1.561		
	Total	75.957	46			
Delay in Employer's issuance of variation orders	Between Groups	1.676	4	0.419	0.402	0.806
	Within Groups	43.729	42	1.041		
	Total	45.404	46			
Contractor's inability to understand contractual terms and conditions	Between Groups	6.961	4	1.740	1.419	0.244
	Within Groups	51.507	42	1.226		
	Total	58.468	46			

Statistical significance can be defined as a quantifiable measure in which a result is likely due to chance or to some factor interest [51]. As seen from the data output above, no statistical significance was observed within section 2 and section 3 between groups of the mean values of the Independent Variables: Perspectives: Client, Consultant, Contractor, Engineer, Other. However, within section 5, when respondents were asked if the introduction of legislation to curb delayed payments would aid in the lessening the frequency of delayed payments, there existed statistical significance. This significance (p-value) was 0.042, falling in the significant statistical difference category as explained in Table 5. This means that the result of the question asked is less likely to be a result of chance. Upon further examination, it was determined that a wide sample size representing a variety of viewpoints agreed that the implementation of regulations in the construction sector will reduce the incidence of late payments. Legislation provides parties with security and legal accountability [52, 53]. According to the responses, this protection is desired by all viewpoints. The results demonstrated no statistical significance between research questions 1 and 2, however, research question 3 exhibited statistical significances as well as no statistical significances depending on the questions offered to the responder.

Table 5. One-way ANOVA (dependent variables: EF1-EF11 independent variables: perspectives: client, consultant, contractor, engineer, other)

ANOVA						
		Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Project suspension	Between Groups	3.608	4	0.902	0.724	0.580
	Within Groups	52.307	42	1.245		
	Total	55.915	46			
Delays in paying financial institutions	Between Groups	2.725	4	0.681	0.642	0.635
	Within Groups	44.552	42	1.061		
	Total	47.277	46			
Delays in supplier payments	Between Groups	7.997	4	1.999	1.700	0.168
	Within Groups	49.407	42	1.176		
	Total	57.404	46			
Delays in sub-contractor payments	Between Groups	8.210	4	2.052	1.684	0.172
	Within Groups	51.195	42	1.219		
	Total	59.404	46			

Social Unrest, e.g., Protests	Between Groups	1.190	4	0.297	0.264	0.899
	Within Groups	47.279	42	1.126		
	Total	48.468	46			
Sub-Contractors or Suppliers refusal to continue providing services	Between Groups	4.073	4	1.018	1.059	.389
	Within Groups	40.395	42	0.962		
	Total	44.468	46			
Project abandonment/termination	Between Groups	1.263	4	0.316	0.311	0.869
	Within Groups	42.695	42	1.017		
	Total	43.957	46			
Increase in Contractor's debt	Between Groups	4.126	4	1.031	1.228	0.314
	Within Groups	35.279	42	0.840		
	Total	39.404	46			
Bankruptcy	Between Groups	7.977	4	1.994	2.134	0.093
	Within Groups	39.257	42	0.935		
	Total	47.234	46			
Contractor downsizing labour force	Between Groups	5.200	4	1.300	1.143	0.350
	Within Groups	47.779	42	1.138		
	Total	52.979	46			
Sub-standard material usage	Between Groups	1.989	4	0.497	0.314	0.867
	Within Groups	66.564	42	1.585		
	Total	68.553	46			

Table 6. One-way ANOVA (dependent variables: S5Q2, S5Q9, S5Q10, S5Q14 independent variables: perspectives: client, consultant, contractor, engineer, other)

ANOVA						
		Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Do you agree with the following statement: "Cash flow is the backbone of any successful construction project "[20]	Between Groups	1.025	4	0.256	0.878	0.485
	Within Groups	12.252	42	0.292		
	Total	13.277	46			
Delayed payments are caused by the Client's inability to pay the Contractor.	Between Groups	4.065	4	1.016	1.351	0.267
	Within Groups	31.595	42	0.752		
	Total	35.660	46			
Delayed payments to the Contractor can be self-inflicted (e.g., invalid claims)	Between Groups	4.706	4	1.177	1.145	0.349
	Within Groups	43.166	42	1.028		
	Total	47.872	46			
Introduction of Legislation to curb delayed payments would aid in lessening the frequency of delayed payments.	Between Groups	7.391	4	1.848	2.717	**0.042***
	Within Groups	28.566	42	0.680		
	Total	35.957	46			

The t-test assumes a normal distribution and equal variances between groups. The t-test statistical results were compared to the t-distribution table's critical value. If the test statistic exceeds the critical value in the table, the null hypothesis of the t-test is rejected, and the test results are statistically significant. Based on the findings, it was determined that the critical value is 2.048. The independent sample t-test revealed that the average level of "Delays in supplier payments," was significantly higher among Contractors (M=4.6250, SD=0.50) than Clients (M=3.7143, SD=1.54), t (28) = 2.238, ρ=0.033. Hence there is a 95% confidence that the true difference between these means is CI = [-1.74412, -0.07731]. Similarly, "Increase in Contractor's debt" [Contractors (M=4.6250, SD = 0.50) and Clients (M=3.9286, SD = 1.14), t (28) = -2.214, ρ=0.035] and "Bankruptcy" [Contractors (M=4.250, SD = 0.68313) and Clients (M=3.2857, SD = 1.1387), t (28) = -2.855, ρ=0.008], revealed statistical significance between the two groups.

Table 7 illustrates the rating of each cause of delay. Based on the ranking of the RII, participants said that the leading reasons of delayed payments include an unpredictable political atmosphere, a delay in the employer's issue of change orders, design modifications during construction, contractual disagreements, and client misuse of finances. At the bottom

of the list were miscommunications and failure to submit claims. The replies collected were directly related to Hasmori et al. (2012) [25] and Mohamed et al. (2014) [33]. It may be inferred that, among the causes of delayed payments, the fragile political situation is the most significant. Most respondents were asked if they worked in the public sector replied affirmatively. This indicates that respondents based their selections on past personal encounters with government projects. However, if the sample size is increased, the outcome may vary. If the contractor specializes in public sector projects, the client's squandering of finances may be due to an uncertain political context. The ranking of each delay impact attributable to delayed payments can be seen in Table 8. According to the data, the most significant consequence of late payment is a delay in payments to suppliers and subcontractors, followed by a delay in payments to financial institutions. These replies are closely related to the conclusions presented in Peters et al.'s literature review in 2019 [13]. The inability to pay labourers, suppliers, personnel, and financial institutions in the form of loans would raise the contractor's debt. When regarded as a whole, these impacts are ripple effects resulting from previous catastrophic events. Due to the time bar nature of issuing a notice of the impact, the contractor should not overlook the remedies under the suspension of works conditions, and even terminate works when the suspension time under notice has expired, and/or no payment certificates honoured.

Table 7. Ranking of critical factors for the causes of delayed payments

Grouping Rank	Rank (Overall)	Causes of Delayed Payments	RII
5	12	Client Mismanagement of Funds (CF1)	0.668
11	18	Miscommunications (CF2)	0.579
10	17	Invalid Claims (CF3)	0.587
4	11	Contractual Disputes (CF4)	0.698
7	14	Cultural Attitudes (CF5)	0.634
4	11	Lack of Legislation (CF6)	0.698
3	10	Design changes during construction (CF7)	0.732
1	8	Unstable political climate (CF8)	0.753
6	13	Complex contractual requirements (CF9)	0.651
10	17	Failure to submit claims (CF10)	0.587
8	15	Failure to perform work in accordance with the Contract (CF11)	0.630
2	9	Delay in Employer's issuance of variation orders (CF12)	0.745
9	16	Contractor's inability to understand contractual terms and conditions (CF13)	0.621

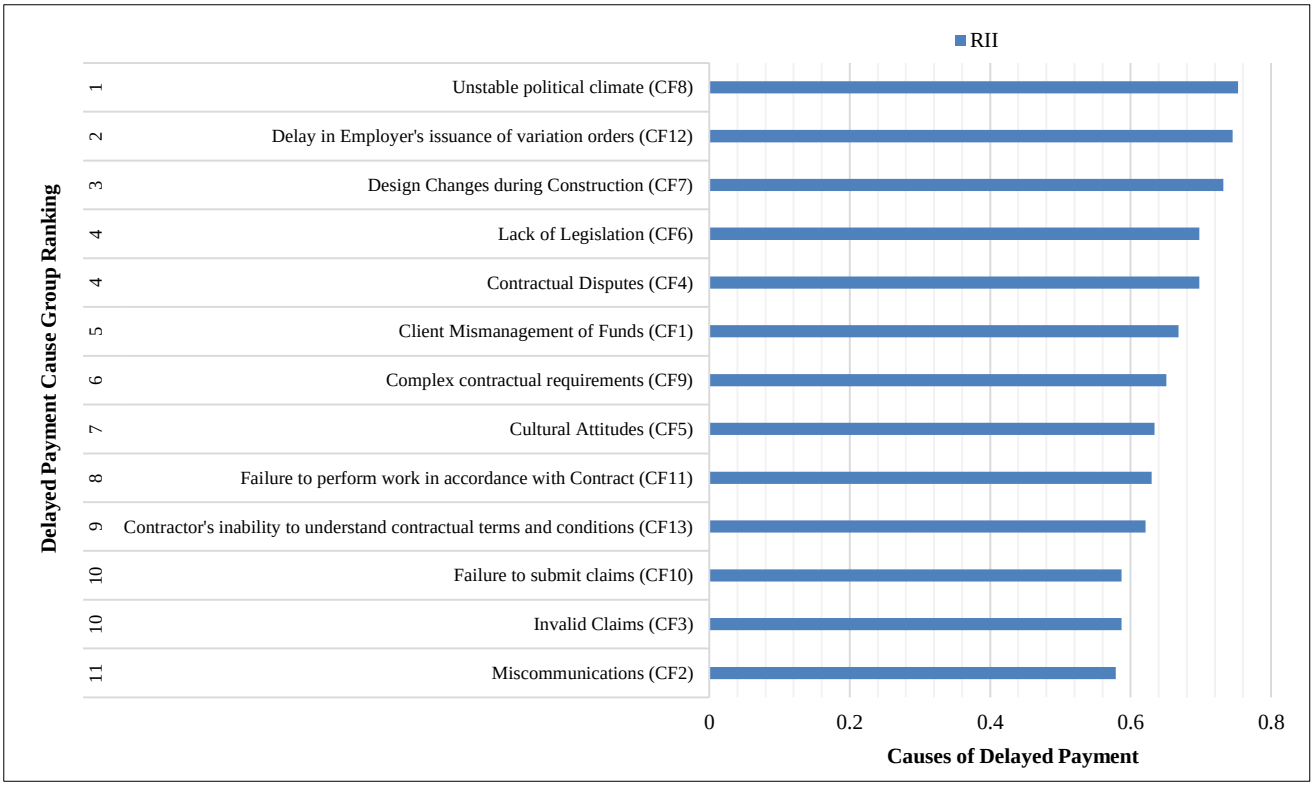

Figure 6. Ranking of Critical Factors for the Causes of Delayed Payments

Table 8. Ranking of critical factors for the effects of delayed payments

Grouping Rank	Rank (Overall)	Effects of Delayed Payments	RII
4	4	Project suspension (EF1)	0.809
2	2	Delays in paying financial institutions (EF2)	0.838
1	1	Delay in supplier payments (EF3)	0.855
1	1	Delay in sub-contractor payments (EF4)	0.855
9	16	Social Unrest, e.g., Protests (EF5)	0.621
3	3	Sub-Contractors or Suppliers refusal to continue providing services (EF6)	0.821
7	7	Project abandonment/termination (EF7)	0.770
1	1	Increase in Contractor's debt (EF8)	0.855
6	6	Bankruptcy (EF9)	0.774
5	5	Contractor downsizing labour force (EF10)	0.796
8	12	Sub-standard material usage (EF11)	0.668

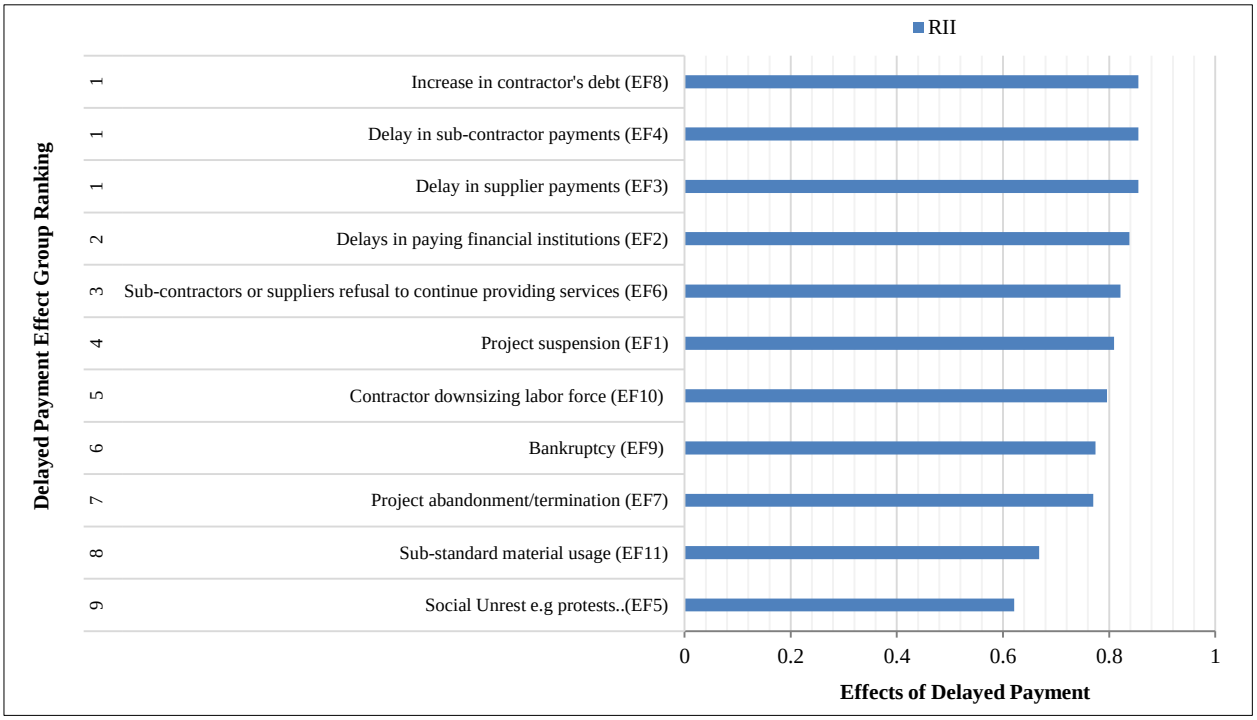

Figure 7. Ranking of Critical Factors for the Effects from Delayed Payments

The reported findings was compared with similar scholarship in varying geographical context to determine both theoretical and practical implications. Table 9 presents the factors found from the previous studies and the present study. Within the causation grouping, the top ranked factor for delayed payment in T&T was "unstable political climate" (RII = 0.753). This cause relates mainly to bureaucracy, partisanship and incompetence of the political directorate in the execution of projects [2]. Bureaucracy is defined by Rahman [54] as a system of official regulations or governmental infrastructure that is essential for policy formation, execution and the delivery of public services to citizens. This finding was similarly reported [13], where it was stated that bureaucratic procedures, and bureaucratic culture within the construction industry, can be a main cause of delayed payments due to a lack of knowledgeable employees involved within said payment system. The second ranked factor for delayed payment within the causation grouping in T&T was "Delay in Employer's issuance of variation orders" (RII = 0.745). This finding also relates to the causal issue of "slow process of variation approval" as a key contributor to delayed payments to contractors [13]. Variations are typically quick to be executed but slow to be contractually awarded. Contractors' views variations works as a mechanism to improve the profitability on a project. Before awaiting the official award of the variation works, contractors use 'unofficial instructions' to execute variation works, and to submit interim payment claims to include the executed variation works. Paradoxically, while in the haste to complete works to acquire timely payments, these works are now subjected to more scrutiny. Similarly, this cause is also linked to the political climate and bureaucratic culture within the construction industry of Trinidad.

Table 9. Comparison of critical factors for the causes of the delayed payment

Critical factors for the causes of the delayed payment	Reference
Contractors' failure to submit corrected claims	[55]
Submission of claims with errors	[55, 56], Present Study
Client's failure to cultivate a good payment attitude among their employees by wrongfully withholding the payment	[25, 55, 56], Present Study
The use of 'pay-when-paid' clauses	[25, 55]
Contracts used are not comprehensive enough in terms of payment aspects	[55]
Contracts used are too complicated to be understood by both parties	[55], Present Study
Clients' poor financial management	[25, 55], Present Study
Clients' poor financial condition	[55]
Bureaucratic procedures	[57, 13]
Slow process of approving variations	[56, 57, 13], Present Study
Ripple effects of an economic downturn	[57, 13]
Poor Process Implementation	[13, 57]
Acceptability of Late Payment	[13, 57]
Client's disagreeing on the valuation of project executed	[25, 56]
Delay in certification by the consultants	[25, [56]
Poor quality of work	[56]
Design changes during construction	Present Study
Contractual Disputes	[25], Present Study
Cultural Attitudes	[25], Present Study
Failure to perform work in accordance with the Contract	Present Study

The nature of these top two causation of delayed payments consequently further correlate to an underlying root cause, namely political influences, which has been shown to be the leading contributor of cost overruns on projects [9]. The political directorate is considered to be the significant players of power and are directly responsible for the implementation of these organized systems. Government officials however are constantly strategically manipulating official channels and regulations to maximise personal agencies for the political directorate from public sector projects. To date in T&T, no legal punishment has been decided for causes of these unscrupulous actions. The main restraint to prevent agency behaviour and further misappropriation of taxpayers' funds is the loss of employment. This is a limited and weak deterrent to which public officials are willing to chance. Also, during the end of a political cycle, multiple contracts are awarded to partisan contractors without consideration to budgetary requirements. Thus, changes in the political climate leads to a lack of familiarity with payment processes, further leading to political calls for transparency, accountability and public scrutiny in the contract award processes. Therefore, the reliance of external parties for guidance, accountability and independent reviews can cause prolongation delays to the payment process.

In other developing nations, similar findings were found to be in relation to other ranked causes of delayed payments. In Ghana, complicated contractual processes and the client's poor financial management are critical delayed payments causative factors [41]. The neighbouring region of Nigeria, Odenigbo et al. [56] found that submission of claims with errors and slow variation approval processes occur frequently In Malaysia, numerous significant causes of delayed payments to contractors were identified and mirror issues occurring in T&T, such as the client's poor financial management, contractual disputes and cultural attitudes [32]. These similar causations experienced amongst all these countries all contributes to the deliberate withholding of payments to contractors.

Within the effects of delayed payment subgroup, "Delay in supplier payments", "Delays in paying financial institutions", and "Increase in Contractor's debt" were all perceived to be of top factors with similar relative importance weights (RII = 0.855). These effects align with the ideology that small to medium contractors experience more drastic financial effects owing to increased financial burden to the contractor, fund acquisition difficulty, as well as the inability to fund overhead expenses [13]. Similar critical effects of delayed payments can be seen on small to medium contractors that exist within other developing nations [58]. The financial responsibilities of funding a public sector construction project are often placed on the contracting companies' capabilities to secure a constant cash flow through various debt overdraft facilities. For subcontractors however, the ability to acquire debt financing may be prohibitive because of the lack of assets to act as collateral or the high interest rates assigned to these knowing risky ventures. Subcontractors refuse to continue work on a project, in turn stalling project progress (RII = 0.821, rank 3rd) [41], which often lead to the suspension of works (RII =0.809, rank 4th). These extensive delays often results in the Contractor downsizing labour force (RII =0.796, rank 5th) as a mitigation strategy to curb the project overheads while awaiting payment. Prolong delays in payments can severely affect contractors' overall business model and output. This can result in bankruptcy (RII =0.774, rank 6th), and lengthy, often costly, legal disputes. Unfortunately, project abandonment (RII =0.77, rank 7th) is the resultant effect [58] that could have been mitigated if proper financial, ethical and sustainable controls were enforced [2]. Further findings from the previous studies and the present study on critical factors for the effects of the delayed payments were tabulated in the Table 10.

Table 10. Comparison of critical factors for the effects of the delayed payment

Critical factors for the effects of the delayed payment	Reference
Delay in project's progress	[51, 53, 55]
Subcontractors refuse to continue works on the project	[55], Present Study
Low quality works due to contractor's uncertain financial condition	[55]
Extension of time for project	[55, 59]
Creates negative relationship among parties	[55, 58]
Creates financial hardship for the company	[25, 55, 13, 57, 58], Present Study
Abandonment of the project	[55], Present Study
Difficulties in Procuring Materials and Equipment	[13, 57]
Problems Acquiring Funds from Financial Institutions, and Inability to Pay Wages	[57, 13], Present study
Tarnishing the Image of Contractors	[13, 57, [58]
Slow in company growth	[58]
Profitability of the project	[58]
Loss of productivity & efficiency	[59]
Increase in time-related costs	[59]
Re-scheduling and re-sequencing of works	[59]
Create stress on contractor	[25]
Increase in Contractor's debt	Present Study
Delay in supplier and sub-contractor payments	Present Study
Project suspension	Present Study
Contractor downsizing labour force	Present Study
Bankruptcy	Present Study

The study model was then created to establish connections between the causes and consequences of late payments. Figure 3 displayed the primary structural model for the primary variables related to payments, which was derived from the literature review. This research approach is recommended since it assesses several interdependent relationships in a single examination. This approach employs two types of variables: endogenous variables and exogenous variables. Endogenous variables have the same value as the independent variable and are identical to dependent variables. Consequently, the construction of the model serves as a framework for examining the relationship between factors and groups. The original fit resulted in a "bad" output; hence, the modification indices were analyzed and the appropriate modifications were performed to get the figure path diagram depicted in Figure 8 below. The first list of payment delay variables includes 13 causes and 11 consequences. This list was reduced to six causes and nine effects using the normalizing technique.

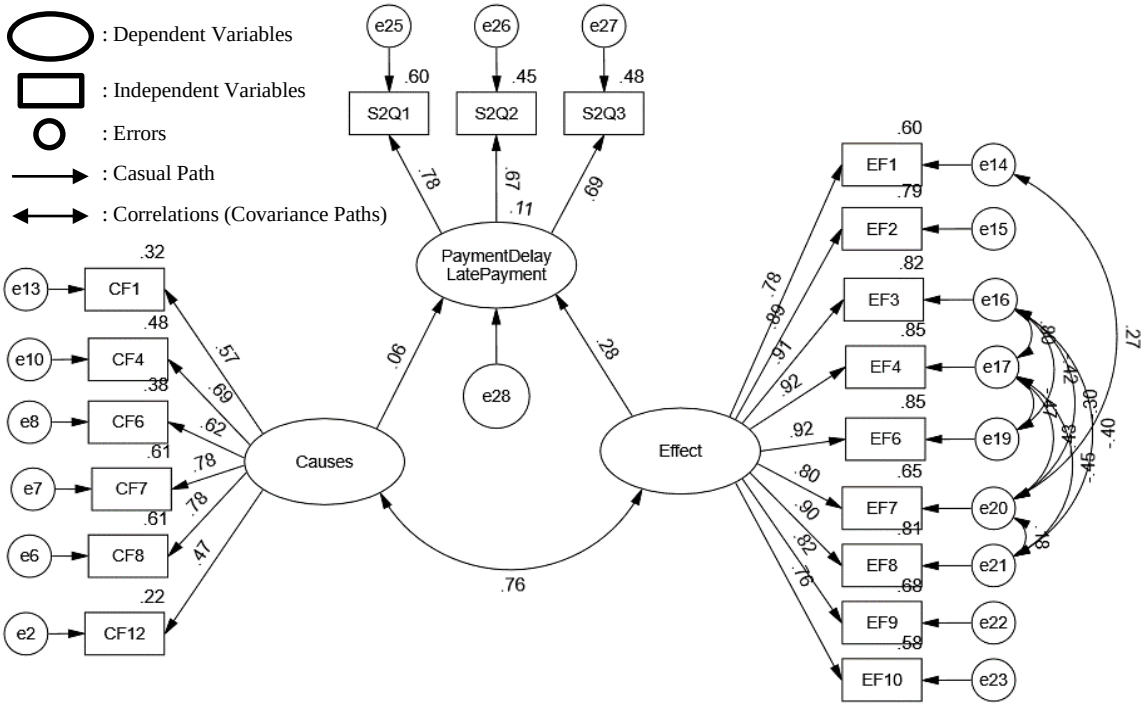

Figure 8. Figure path diagram: confirmatory factor analysis (CFA)

When participants were questioned about the most often utilized contract for construction projects, 53.3% of respondents mentioned the FIDIC Red Book. When asked if any contract type offers the Contractor legal recourse for delayed payments, 42.2% of respondents responded that the Red Book contract grants the Contractor legal recourse for delayed payments. According to the study conducted on delayed payment conditions in the red book, which was previously studied in the literature review, this is consistent with the results obtained. It has been shown that the FIDIC Yellow and Red Book is utilized the most by both public and private contractors. When asked the typical waiting duration for payment certificates after presenting valid supporting papers to the Client/Employer, 41.3% of respondents indicated less than two months, 32.6% stated between three and six months, and 26.1% stated between six and twelve months.

It may be asserted with confidence that respondents believed that delayed payments are more common in the public sector. The second question inquired about the implications of the pandemic on the payment delay period. 89% of respondents concurred with this statement, while 10.9% disagreed. A closer examination of these data reveals that the respondents who disagreed with this assertion were employed in the private sector of the industry.

Frequently, private finance for a project is arranged, and the payment procedure runs smoothly. A query with an open-ended format designed to elicit more precise explanations for the payment delay. These replies may be classified as social, political, or economic in nature. Clients, Engineers, and Contractors reported that payments needed a longer processing time by the government, understaffing within agencies to handle claims because of work-from-home or status coordination concerns, and a lengthier processing time by the banks. Political motives cited by respondents include the reallocation of funds to other government areas in need of financing.

When questioned, one Client responded:

"Increase in cost due to global resource and shipping issues has made the Client project budgets become escalated and as a result the reduction in original budgeted capital has a negative effect on refinancing, overall cost and cash flow."

These findings correspond with those in [60] indicating that unanticipated cost overruns create significant delays in payments to contractors. When discussing this topic, it became apparent that the Client and the Contractor held similar perspectives. One Client defended the payment delays by using the status of the economy as a justification; however, a Contractor stated that Employers are using the pandemic as an excuse for their own mismanagement and ineptitude.

The last questions provided respondents with the opportunity to share their views on the primary causes of delayed payments in the Public and Private Sectors. Most respondents cited inadequate financial management, insufficient financing, political influences, redirected funds, long claim processes, and deficiencies in contract administration and creation as the primary causes within the public sector. These might be categorized as political and economic causes of delay. This corresponds to the link between Public Sector labour and the political and economic atmosphere of a nation as explained by Mohamed et al. [33]. When asked if late payments might negatively affect the Client/Employer, 84.8 percent of respondents agreed. They found that delayed payments significantly strain the contractor-client relationship. Additionally, project quality declines, affecting both productivity and craftsmanship. According to the Red Book Contract, severe interest charges and project suspension would be incurred (Clause 16.) In construction, time lost is equivalent to money lost, and significant delays would result in substantial costs for all parties involved.

5. Qualitative Risk Response Framework Development

The establishment of the risk response framework would entail the identification of methods to manage or eliminate any risk associated with delayed payments to the Contractor. Using delayed payments as a threat would be ineffective for the contractor, since this issue cannot be avoided due to the interdependence of the construction industry with other sectors of a country, such as the social, economic, and political controls.

Figure 9 depicts typical responses to unfavourable risks or dangers. The developed risk responses emphasize risk minimization and acceptance. Here, construction managers of small to medium-sized contracting firms would be able to identify and mitigate crucial high-impact elements from the viewpoints of the four primary stakeholders: political, economic, legal, and social.

Figure 9. Typical qualitative risk response to negative risks (threats)

Based on questionnaire responses and semi-structured interviews with project managers, the following political risks were identified: bureaucracy, corruption, and the possibility of project suspension. Intriguingly, these findings were also consistent with those of Le (2020) [24], who examined political risks in Vietnam. When asked if a project has ever been suspended owing to political concerns, A1 said that project B1 was completed and ready for handover but had been stalled for over three years because newly elected administrators refused to support the project due to its ties to the opposition. Additionally, Trinidad's high Corruption index accounts for systemic flaws. As the construction industry is utilized for political benefit, project cancellations based on political connections are also commonplace. Political in character are government-funded or public sector projects in developing nations, such as Trinidad [61].

Respondents answered that insufficient laws and inadequate contract management, and formulation are legal concerns linked with late payments. It was mentioned that there is no proper legislation for delayed payments in the construction industry; hence, contractors are left without protection and are at a greater risk of encountering the dangers of delayed payments. When asked about the legal system in Trinidad, A2 responded that many contractors hesitate to take problems to court due to the lengthy and ineffectual nature of the legal procedures. A2 indicated that many public-sector-focused contractors would not go to court due to the societal dangers that would result. This contractor's image would be tarnished, and public-sector clients would be hesitant to grant them future contracts.

Among the highlighted economic concerns were the Client's mishandling of cash and a lack of project budget funding. Due to the pandemic's impact on import taxes, the price of materials surged dramatically. A2 said that cost overruns occurred for project B2 because the client failed to account for an increase in material costs within variations. A2 additionally indicated that project B2 required certain materials due to the infrastructure's adherence to specified design criteria. Doors and windows were needed to be of a specified grade that cannot be manufactured locally, hence importation fees were necessary.

Social liabilities linked with late payments included the possibility of provoking social unrest, garnering unfavourable national attention, and the reduction of labour force, as well as miscommunications with Clients leading to strained working relationships.

Table 11. Developed risk response framework

Risks Identified with Delayed Payment	Risk Response Technique
Political Risks	
Project suspension Political Influences Corruption Project abandonment/termination Unstable political climate	• Bid for short term projects (Public Sector) • Request that Clients demonstrate that funding is available prior to project to meet projected cash flow needs. • Implement proper financial management and planning. • Engage in Private Sector projects vs Public Sector. • Maintain positive relationships with government officials.
Legal Risks	
Lack of legislation Contractual Disputes Complex contractual requirements Submission of invalid/incorrect claims	• Competency in construction contract is a mandatory requirement. Training of Contractors and staff in contract administration recommended. • Settle contractual disputes through negotiation. • Ensure claims are submitted in accordance with the contract and encourage follow up. • Ensure a standard format is used for payment claims • Have current cash flow projections as well as a procurement department allowing for easy financial record access.
Financial Risks	
Delays in paying financial institutions Sub-contractors or Suppliers refusal to provide services Delay in supplier payments Delay in sub-contractor payments Increased Debt Bankruptcy	• Maintain collaborative relationships with sub-contractors and suppliers. • Ensure initial cash flow of the project adequate to cover suppliers' costs. • Develop financial contingencies to treat with depleted cash flows. • Create multiple streams of income by altering business models to include non-construction related sources of income.
Social Risks	
Social Unrest, e.g., Protests Contractor downsizing labour force Miscommunications	• Ensure documents submitted are correctly written and submitted in a timely manner. • Ensure proper lines of formal communication between the Contractor and the Client. • Keep the morale of workers high by establishing a good relationship with them. • Reduce activity on site when project payment delays start, as to not end up in greater financial difficulty.

6. Conclusion

The global phenomenon of late payments poses significant obstacles to contractors. While comprehensive political and social transformation is firstly ascribed to and desired for the construction industry, short- and medium-term solutions are warranted. For SIDS, effective solutions require recognition of the leading causes of payment delays and the potential effects on contractors in order to develop potent measures to overcome the obstacles of delayed payments. Unstable political climate (RII = 0.753) and the delay in employers' issuance of variation orders (RII = 0.745) were found to be the main causes of delayed payments within the industry. "Delay in supplier payments", "Delays in paying financial institutions", and "Increase in Contractor's debt" (RII = 0.855) are the leading effects of delayed payments to contractor's cash flows. A structural equation model depicting the relationships between the impacts of late payments was proposed to show a strong linear relation between the cause-effect covariance paths. This method was hindered by a limited sample size and sensitive data, as many financial documents cannot be made public. As the issue of late payments continues to plague the industry, a qualitative risk response framework was established to inform stakeholders of potential mitigating strategies to limit the negative impacts of political, legal, financial, and social risks. These findings are specific to the context of SIDS, and further research is warranted to develop the generalizability of the results. Finally, this research continues the dialogue to better inform construction praxis and policies to mitigate the negative effects on contractors' cash flows when payment delays arise.

7. Declarations

7.1. Author Contributions

Conceptualization, A.C. and H.A.; methodology, H.A.; software, H.A.; validation, H.A., A.C., and S.G.; formal analysis, H.A.; investigation, H.A.; resources, A.C.; data curation, H.A.; writing—original draft preparation, S.G.; writing—review and editing, S.G. and U.R.; visualization, A.C.; supervision, U.R.; project administration, A.C. All authors have read and agreed to the published version of the manuscript.

7.2. Data Availability Statement

The data presented in this study are available on request from the corresponding author.

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7.5. Conflicts of Interest

The authors declare no conflict of interest.

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