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Factors Causing the Delays of Construction Projects in the City of Mati, Davao Oriental, Philippines

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Abstract

Construction is an economic activity contributing significantly to economic development. However, construction projects are often susceptible to delays which consequently can lead to several negative impacts. Thus, the study to identify the various factors causing the delays in the construction projects in the City of Mati, Davao Oriental, Philippines. Inferential research design through Exploratory Factor Analysis (EFA) and the Analysis of Variance (ANOVA) were applied to achieve the objectives of the study. There were 289 construction stakeholders who actively participated from both public and private sectors. It was revealed that under public sector three components were clustered and were renamed as essentials and modifications, environmental conditions, and skilled labor. Meanwhile, private sectors' causes were grouped and labelled into five factors: project management, quantity of motivated skilled workers, financial constraints and modifications, eco-political instability, and environmental issues. Further, out of the 46 variables, only one variable was not found to have no significant difference when responses were grouped according to their sectors, accordingly.

CHAPTER I
INTRODUCTION

Background of the Study

Construction is an economic activity that spans across primary, secondary, and tertiary sectors, contributing significantly to economic development (Low & Lau, 2016). A country's economic growth relies on the state and extent of its infrastructure and the speed at which it is developed. The industry is the tool through which a society achieves its goals of urban and rural development (Enshassi, Al-Hallaq, & Mohammed, 2006), and is very important in the economic growth of any nation (Oladipo, Fatuki, & Aluko, 2015).

However, construction projects are often susceptible to delays, frequently resulting in schedule overruns that can extend to the original contract duration (Prasad & Vasugi, 2017). Delays in construction projects are a global issue (Sambasivan & Soon, 2007). These delays can lead to several negative impacts, such as cost overruns, loss of contractor profits, loss of business, and even insolvency of the organization. The effects of delays in construction projects extend beyond the construction industry and influence the overall economy of a country (Arditi, Akan, & Gurdamar, 1985). Almost all projects around the world experience delays (Vahid & Abbas, 2020). A significant portion of countries' capital is allocated to construction projects, many of which are completed late (Aliyeh, Eun-Seok, & Mohammad-Hossein, 2020). These

delays have far-reaching implications, including increased costs, contractual disputes, and diminished stakeholder satisfaction (Chan & Kumaraswamy, 1997; Assaf & Al-Hejji, 2006).

Over the years, both researchers and practitioners have acknowledged the significance of identifying the root causes of construction project delays. This understanding can lead to improved project management practices and the development of more effective mitigation strategies (Aibinu & Jagboro, 2002; Love et al., 1998). Local contractors and project managers have cited challenges such as difficulty in securing building permits, delays in utility connections, and insufficient availability of construction materials and skilled labor as significant hurdles to project completion (Banez & Monteclaro, 2018).

In the Philippines, the construction industry is a major driver of economic progress contributing to infrastructure development, job creation, and attracting investments (Bennegreg, 2015). Davao Region was the second fastest growing economy in the country. In 2016 to 2019, its economy grew at an average of 8.0% but had suffered contraction due to COVID 19 in 2020 which led to a fall of 7.6 percent. In 2021, there was a decline in the registered projects from worth Php4.96 billion to only PhP3.49 billion. However, due to the Build, Build, Build Program of the Duterte Administration, major infrastructure projects were approved, undergone procurement process, and are implemented or continuing its progress. All these infrastructure projects were aimed to improve transport logistics and drive rapid economic and social development among others (NEDA, 2022).

Philippine Constructors Association (2019) reported that over majority of construction projects in the country experience delays, with a considerable proportion of those attributed to administrative inefficiencies, inadequate communication, and lack of skilled labor. These delays resulted in increased project costs, diminished investor confidence, and, in some cases, abandonment of projects altogether.

Delays in implementing projects by DPWH XI have been reported, and that these are attributed to: unresolved road right-of-way issue, unworkable site condition, difficulty in securing approved permits and clearances from LGU and other NGAs, and revisions in plans due to resistance of relevant interested parties to approved project alignment (National Economic and Development Authority, 2024).

Despite existing research in other locations, the construction industry still faces delays which can suggests that studies conducted elsewhere may not be applicable to other regions. With this conjunction, there are no existing studies in Davao Oriental investigating such. Therefore, this study is significant because it addressed a common issue in the construction sector, aiming to improve stakeholder satisfaction, reduce costs, and enhance the efficient execution of infrastructure projects. It can also help policymakers and industry stakeholders develop plans to increase the construction sector's resilience and competitiveness through practical recommendations to prevent delays effectively.

Statement of the Problem

This study aimed to explore the various factors that contributed to delays in construction projects within the City of Mati, Davao Oriental. Throughout the course of this research, the following questions were specifically addressed:

1. What is the company profile of construction firms engaged in business in the City of Mati, in terms of:

a. Project Amount; and
b. Duration of the Project?

2. What are the factors that caused the delay of construction projects of public sector in the City of Mati?
3. What are the factors that caused the delay of construction projects of private sector in the City of Mati?
4. Is there a significant difference in the factors that caused the delay of construction projects in the City

of Mati, in terms of:

a. Demographic profile; and
b. Sector of the project?

Objectives of the Study

The study sought to identify the various factors causing the delays in the construction projects in the City of Mati, Davao Oriental, Philippines. Specifically, the study aimed to:

1. Determine the profile of construction firms engaged in business in the City of Mati, in terms of their:
a. Project Amount; and
b. Duration of the Project;
2. Identify the factors that caused the delay of construction projects in public sector in the City of Mati;
3. Identify the factors that caused the delay of construction projects in private sector in the City of Mati; and
4. Examine the significant difference in the factors that caused the delay of construction projects in the City of Mati, in terms of:
a. Demographic profile; and
b. Sector of the project, if there are any.

Hypotheses of the Study

The hypotheses were tested to $p \leq 0.05$.

H_{01}: There is no significant difference on the factors that caused the delay of construction projects in the City of Mati when grouped according to the demographic profile of the construction firms.

H_{02}: There is no significant difference on the factors that caused the delay of construction projects in the City of Mati when grouped according to sector: public and private.

Significance of the Study

This study holds significant value for multiple stakeholders within the construction industry, local government units (LGUs), and the broader economic development of the region. Below are the key areas of significance for this study:

Construction Industry. Professionals in the construction industry such as the contractors, developers, and project managers may adopt better planning, management, and scheduling techniques that lead to more efficient project delivery as critical factors of delays will be identified. Also, the decision-makers may have evidence-based recommendations for overcoming common delays, and that practical strategies can be derived to avoid common pitfalls and streamline construction processes which then build client satisfaction.

Additionally, as part of this industry, the proponent of the study can gain profound understanding of these delays thereby mitigating appropriately these indicators before it can occur.

Local Government Units (LGUs). Local government agencies and policy-makers may benefit from understanding how local policies and approval processes contribute to project delays. This can lead to recommendations for policy reforms which will lead to improved regulatory frameworks. Also, the study is of significance to LGUs in planning and executing projects that align with the region's growth goals. Policymakers can leverage the findings to better align regulatory processes with the actual needs of developers and contractors, helping to accelerate development.

Academic Contribution. This study contributes to the academic literature on construction management. Findings confirmed or not to the findings of previous authors, and have contributed to the existing body of knowledge. Moreover, it provides a localized perspective on the factors causing the construction delays.

Moreover, utilization of a multivariate analysis

Future Research Directions. The findings of this study may inspire future research on related topics, including how delays affect the quality of construction, or how different regions across localities mitigate the risk at stake. Thus, it opens new avenues for further exploration in construction studies.

Scope and Limitations of the Study

This study investigated the factors that contributed to construction delays in the City of Mati, with a focus on both public and private sector construction projects. Public sector projects referred to those funded, managed, and owned by local government entities, particularly those under the 2nd District Engineering Office – Department of Public Works and Highways (DPWH) Davao Oriental, as well as projects initiated by the Local Government Units of the Province of Davao Oriental and the City of Mati. On the other hand, private sector projects were those funded, managed, and owned by private individuals, companies, organizations, or other entities based in the City of Mati.

The study's respondents included individuals directly involved in construction activities from start to completion such as project managers, construction engineers, clients, and other key stakeholders. Only projects that were undertaken from 2017 up to the time of the study and had a minimum project cost of Php500,000 were considered. It was important to ensure that both the timeline and cost criteria were met before any individuals involved in a project were included as respondents.

Definition of Terms

The terms were defined based on their operational utility in the study.

Delay refers to a period of time that is longer than the deadline that was agreed upon between the client and the contractor, or that is longer than the date that the project was scheduled to be finished. In simple terms, it happens when a task or phase of a construction project is not completed as per the timeline set in the project schedule such that even for a single day of the project based on the approved duration of construction.

Private projects refer to construction projects that are funded, managed, and owned by private individuals, companies, organizations, or entities include residential developments such as construction of single-family homes, townhouses, and apartment complexes, often built for sale or lease to individual buyers or tenants; commercial developments such as office buildings, retail spaces, shopping malls, and hotels designed for business use or revenue generation; mixed-use developments like projects combining residential, commercial, and recreational spaces, and infrastructure for private use like roads, parking lots, and other facilities built for a private business.

Public projects refer to construction projects that are funded, managed, and owned by government entities at the local level. These are in a form of social buildings, bridges, roads, and the likes.

Private sector refers to the private company or individuals funding a construction project. The former refers to any construction companies registered under Philippine laws whichever located in its sovereignty but are engaged in business on private projects established in the City of Mati. While, the latter refers to contracted projects for household constructions.

Public sector refers to the government entities at the local and national agency particularly, LGU- City of Mati, Province of Davao Oriental, and Department of Public Works and Highways-2nd District Engineering Office of Davao Oriental. There projects are typically intended to serve the public and provide essential infrastructure or services.

CHAPTER II
REVIEW OF RELATED LITERATURE

This chapter presents the factors that caused delays in construction projects disclosed by various published studies. Theoretical bases and conceptual framework of the study are also shown.

Factors Contributing to the Delays Construction Projects

Well-structured project management practices are known to reduce the likelihood of delays by enhancing coordination, forecasting potential risks, and ensuring timely decision-making (Koushki et al., 2005).

However, for construction projects' causes of delay, Assaf and Al-Hejji's (2006) model categorized into two broad causes: the internal factors, and the external factors. Internal factors included project management issues, contractor performance, resource allocation, and labor management. On the other hand, external factors involved the supply chain disruptions, regulatory hurdles, environmental conditions, and political or economic instability.

Poor project management practices such as insufficient resource allocation, and lack of clear communication among stakeholders, significantly impact project timelines (Alsharif et al., 2020). Mistakes in scheduling consequently result to failure in recognizing the task interdependence which draw bottlenecks, and eventually waste time and resources (Khamis, et al., 2019).

Sufficient financing is another vital advancement of construction projects, and hurdles any delays to impede progress. Ogunlana, et al. (2002) highlighted financial limitations as significant factor contributing to delays in large-scale construction undertakings. When funding is not secured as planned, it stops construction activities until financial resources are obtained. Each funding stream follow its own schedule and approval protocols which, if delayed, can lead to a chain reaction of delays and issues. Effective financial planning and transparent communication with stakeholders are critical to reducing the effects of funding-related delays.

The unforeseen expenses like material price rises, personnel shortages, or unanticipated site circumstances can cause project stoppages. Project managers need to review budgets, and find additional funding as expenditures exceeds projections. In this situation of financial constraints, relationships with stakeholders and contractors can become even more difficult. Thus, comprehensive cost estimation, risk assessment, and contingency budgeting are crucially necessary tactics to help avoid and control cost overruns (Flyvbjerg, et al., 2002). These funding shortages and financial instability disrupt the cash flow necessary for timely procurement of materials and payment of labor which in effect leads to slow down work until funds are secured and available (Reyes & Pineda, 2021).

Construction projects require intensive labor. When there is an inadequate supply of qualified personnel, projects experience delays as it is difficult to uphold productivity levels. This deficiency of skilled labor affects the effectiveness and pace of construction operations. There may be huge number of labor but qualified skilled labor is at shortage worsen by issues of aging workforce, and lack of adequate training initiatives (Memon et al., 2014).

Fluctuations in labor productivity can also lead to delays in projects. Several factors affect productivity, including the motivation of workers, their skill levels, and the conditions of the workplace. Unappreciated worker or worker in unsafe or unpleasant environments may exhibit lower productivity, resulting in slower advancement. In addition, differences in their skill levels can cause inefficiencies, as less skilled labor may require supervision and take longer to finish tasks (Chan et al., 2001). Construction firms struggled to find qualified workers which tolled additional time to train new employees or dealt with absenteeism, and high turnover rates (Ocampo et al., 2019).

Design modifications also contributes to the delay of construction projects. Every change calls for reassessing project plans, modifying timetables, and possibly acquiring more resources. All of which have the potential to throw off the initial deadline. In addition, legal needs, design team updates, and detailed documentation and clear communication with stakeholders can cause adjustments and time (Hwang et al., 2013). Additionally, during construction, unforeseen site circumstances like unforeseen soil conditions, environmental concerns, or the discovery of hazardous materials might impede construction and necessitate extensive cleanup operations (Goh & Abdul-Rahman, 2013).

Environmental conditions also play a role in construction delays. Typhoons and heavy rainfall including the adverse or abrupt change in weather conditions frequently disrupt construction schedules. These environmental factors not only break worktime or schedule but also damage ongoing projects as water and other substrates fused into the mixture or introduce deterioration of construction materials, necessitating further time for repairs and adjustments (Santos et al., 2020). Further severe weather conditions can impede progress by making job sites unsafe or difficult to access. This unpredictability calls for efficient contingency planning, which involves incorporating scheduling buffers and alternative work strategies to lessen the effects of weather interruptions. Hence, these leads to modify timelines as needed to sustain project progress (Sweis et al., 2008). However, it is not only time that is wasted by financial resources.

For public sector projects, these often face unique challenges such as bureaucratic red tape, political influences, and lengthy approval processes, while private sector projects may experience different challenges related to budget constraints and project scope changes (Ramos, 2020). The regulatory environment in the Philippines poses additional challenges that can delay construction projects. The lengthy permitting processes and bureaucratic red tape often result in significant project delays where complexity of obtaining necessary permits and approvals can lead to extended waiting periods before construction can commence, impacting overall timelines (Cruz et al., 2022).

Table 1 exhibits the summary of these factors through a matrix. A compilation identifying the causes of delay were collected by Aigbavboa and Aliu (2019). In Malaysia, poor site management, improper planning, labor supply, inadequate finance of the client and payments for completed work, problems related to subcontractors, inadequate, experience of the contractor, material shortage, availability and failure of construction equipment, lack of communication between parties and errors during the construction stage (Sambasivan & Soon, 2007). In Saudi Arabia, the most significant causes of project delay were lack of finance to achieve work completion, and delay in progress payments by the client (Al-Kharashi & Skitmore, 2009).

Table 1. Matrix of Factors contributing to the delay of construction

Author	Title	Year	Factors	
Assaf, S. A., & Al-Hejji, S.	Causes of delay in large construction projects	2006	**1**	Project management issues
			2	Contractor Performance
			3	Resource Allocation
			4	Labor Management
			5	Supply chain disruptions
			6	Regulatory hurdles
			7	Environmental conditions
			8	Political instability
			9	Economic instability

Alsharif, A., et al.	Factors Affecting Construction Project Delays: A Case Study in the Philippines	2020	**10**	Insufficient resource allocation
			11	Lack of clear communication among stakeholders
Khamis, M., et al.	Impact of Mistakes in scheduling on Construction Projects	2019	**12**	Mistakes in scheduling
Ogunlana, S.O., et al.	Financial Constraints on Large Scale Construction Projects	2002	**13**	Financial limitations
Flyvbjerg, B., et al.	Underestimating Costs in Public Works Projects	2002	**14**	Material price rises
			15	Personnel shortages
			16	Unanticipated site circumstances
Reyes, M., & Pineda, J.	Financial Constraints in Construction Projects: An Analysis of the Philippine Context	2021	**17**	Financial instability
			18	Funding shortages
Memon, A.H., et al.	Labor Shortages in the Construction Industry	2014	**19**	Inadequate supply of qualified personnel
			20	Deficiency of skilled labor
			21	Aging workforce
			22	Lack of adequate training initiatives
Chan, D.W.M., et al.	Factors Affecting Construction Labor Productivity	2001	**23**	Motivation of workers
			24	Workers' skill levels
			25	Conditions of the workplace
Ocampo, R., et al.	Labor Shortages in Philippine Construction: Challenges and Solutions	2019	**26**	Absenteeism
			27	High turnover rates
Hwang, B.G., et al.	The Impact of Design Changes on Construction Delay	2013	**28**	Design modifications
			29	Modifying timetables
Goh, Y.M., & Abdul-Rahman, H.	The Impact of Site Conditions on Construction Delays	2013	**30**	Unforeseen soil conditions
			31	Environmental concerns
			32	Discovery of hazardous materials
Santos, L., et al.	Impact of Environmental Factors on Construction Delays in the Philippines	2020	**33**	Environmental conditions
Cruz, A., et al.	Regulatory Challenges Facing the Philippine Construction Industry	2022	**34**	Bureaucratic red tape
			35	Lengthy permitting processes
Sambasivan, M., & Soon, Y. W.	Causes and effects of delays in the Malaysian construction industry	2007	**36**	Poor site management
			37	Improper planning
			38	Labor supply
			39	Inadequate finance of the client and payments for completed work

			40	Problems related to subcontractors
			41	Inadequate experience of the contractor
			42	Material shortage
			43	Availability and failure of construction equipment
			44	Lack of communication between parties
			45	Errors during the construction stage
Arditi, D. *et al.*.	Reasons for delays in public projects in Turkey	1985	**46**	Frequent change orders and considerable extra work

While in Pakistan, financial and payment problems, improper planning, natural disaster, poor site management, shortage of materials and equipment, and insufficient experience of contractors. Also, in Denmark, change in work plans, dynamics of workforce, external conditions, material and construction design were found causes (Linhard & Wandahl, 2014).

On the other hand, the study of Silva (2016) emphasized delays in material supply, regulatory approvals, and the availability of skilled labor while Odeh & Battaineh, 2002 pointed out that the larger and more complex projects often experience more delays due to the challenges of managing a greater number of stakeholders, resources, and logistics.

All of these literatures disclosed that delays are caused from various factors, internally or externally influenced. However, the level of influence per factor differs from circumstance to circumstance, nation to nation, resources to resources in which this study expected to define in the City of Mati.

Theoretical Bases

The theoretical bases of this study were grounded particularly focusing on the factors that contribute to construction delays. This section also outlined the key theoretical concepts that guide the research and provide a foundation in understanding the factors influencing delays.

The first theoretical lens through which this study examined construction delays is the **Project Management Theory.** Project management involves planning, executing, and overseeing projects to achieve specific goals and objectives within set parameters: time, cost, scope, and quality (PMI, 2017). Furthermore, it involves coordinating resources, managing risks, and ensuring proper communication and control throughout the project lifecycle.

In the context of construction delays, Project Management Theory emphasizes the importance of: Time Management, Risk Management, and Resource Allocation. Time Management is process of planning and controlling the schedule to meet deadlines, which is critical to preventing delays. On the other hand, Risk Management is the identification and mitigation of potential risks that may impact project timelines, including delays caused by unforeseen events, labor shortages, or regulatory issues. While, Resource Allocation is the strategic distribution of materials, labor, and equipment, which can directly impact project timelines and the occurrence of delays.

In construction projects, poor project management often leads to delays, and this theory was used to understand how management inefficiencies can contribute to the delay of construction projects in the Davao Region.

The **Critical Path Method (CPM)** is another relevant theory which was applied in this study. CPM is a

project management technique used to determine the longest sequence of dependent activities and the minimum time required to complete a project (Kelly, 1961). It focuses on identifying tasks that are critical to the project's timeline and those that can cause delays if not completed on time.

By applying the CPM in the context of construction projects, this study examined how delays in critical tasks or milestones such as regulatory approvals, procurement of materials, or labor availability leading to the overall project delays. The theory suggests that any delay in the critical path directly impacts the project completion date, highlighting the importance of managing key tasks efficiently.

Another theory, the theory of **Transaction Cost Economics (TCE**), developed by Oliver Williamson (1985) explains how organizations make decisions regarding the allocation of resources and management of projects based on the costs of transacting with others. In the context of construction projects, TCE suggests that delays may occur when the costs of coordinating activities between various stakeholders including contractors, suppliers, government agencies who exceed the anticipated benefits.

In construction projects, delays may arise due to high transaction costs associated with contracting, procurement, regulatory approvals, or negotiations. TCE helps this study examine how inefficiencies in coordinating and managing transactions between multiple stakeholders mentioned which may contribute to delays in both public and private construction projects.

Lastly, **Institutional Theory** (DiMaggio & Powell, 1983) focuses on the influence of formal and informal institutions (rules, regulations, norms) on organizational behavior. In the construction industry, institutional factors such as government regulations, legal frameworks, and industry standards can either facilitate or hinder the smooth progression of projects. It helped examine how the regulatory environment in the construction industry affect the timely completion of construction projects.

Applying this theory allowed deeper understanding of how governmental processes, political factors, and compliance with legal requirements contributed to the delays, particularly in public sector projects managed by the Department of Public Works and Highways.

Consolidating these four (4) theories: Project Management Theory, Critical Path Method (CPM), Transaction Cost Economics (TCE), and Institutional Theory pulled out the reasons, and aided the root cause of these delays.

Conceptual Framework

Figure 1 illustrated the conceptual framework of the study. Factors identified from the reviewed literature were rated and analyzed through statistical treatment. These factors were then clustered based on their communality and factor loadings. This process helped reveal the underlying causes of construction delays in the City of Mati.

Construction Projects Causes of Delays
Project management issues
Contractor Performance
Resource Allocation
Labor Management
Supply chain disruptions
Regulatory hurdles
Environmental conditions
Political instability
Economic instability

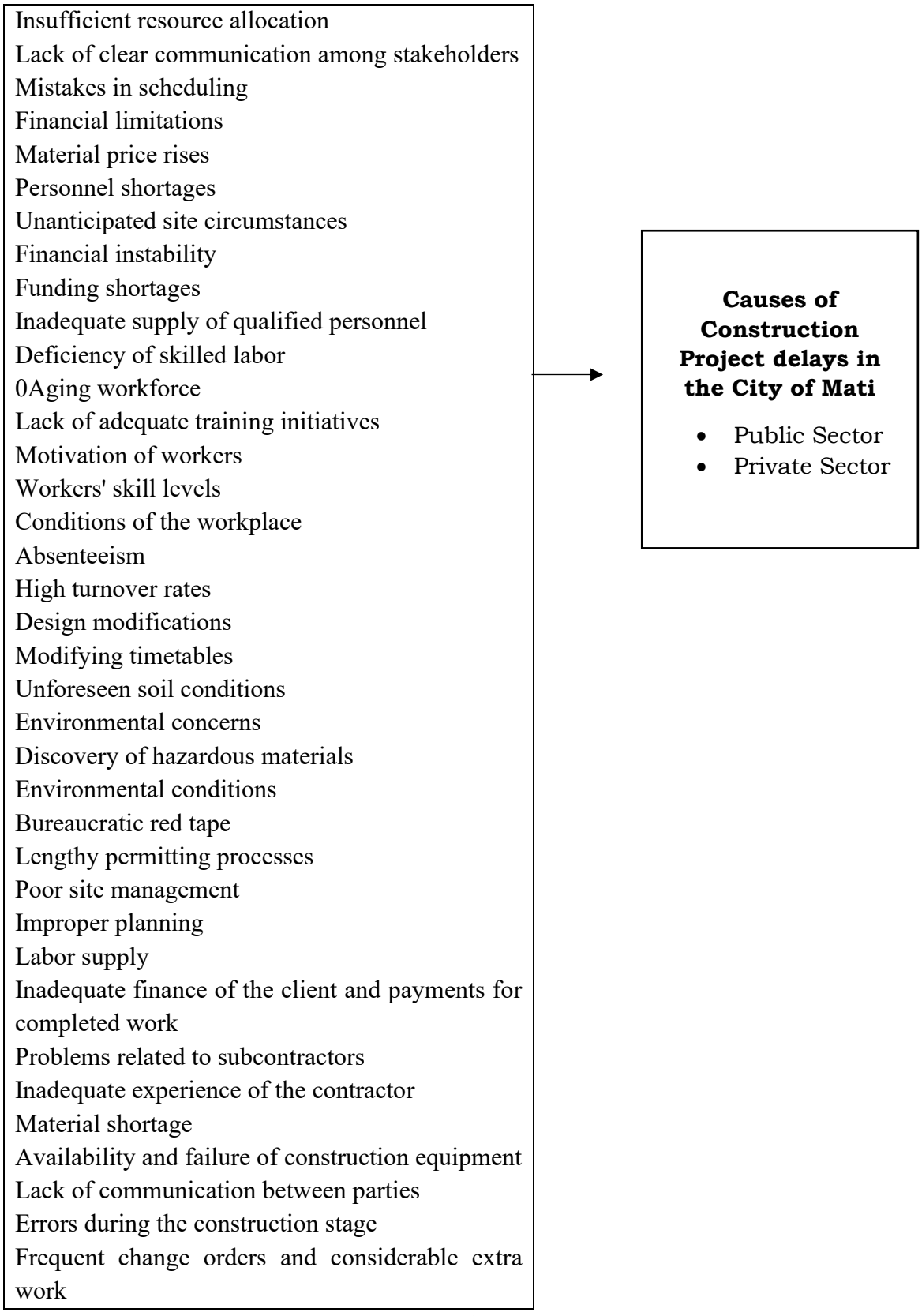

Figure 1. Conceptual Framework

CHAPTER III
METHODOLOGY

This section outlines the research design, data collection methods, sampling techniques, and data analysis procedures that will be used to investigate the factors contributing to construction delays. The methodology is designed to ensure that the study effectively addresses the research problem and provides accurate and meaningful results.

Design

The study adopted both descriptive and inferential research designs, which were deemed suitable for understanding and exploring the various factors contributing to construction delays.

Through descriptive design, the data provided a view of a situation as it occurs in its casual setting without manipulation of variables as they occur (Shinija, 2024), and that it described the characteristics of a subject as it currently exists (Sanbato, 2024). On the other hand, the inferential design was generally used in two ways: to set parameters about a group and then create hypotheses about how data performed when scaled. Inferential statistics are among the most useful tools for making educated predictions about how a set of data are scaled when applied to a larger population of subjects. These statistics help set a benchmark for hypothesis testing, as well as a general idea of where specific parameters land when scaled to a larger data set, such as the larger set's mean. (Anthony Corbo, 2022).

Thus, using descriptive design disclosed the projects' amount, and the duration it took to finished such project. Moreover, the inferential research design was used as the goal of a study was to make predictions or generalizations about a larger population based on a sample. It involves analyzing data from a sample and using statistical techniques to infer or draw conclusions about the population from which the sample was drawn.

By combining both approaches, the study was able to provide a comprehensive understanding of construction delays both in describing the current conditions and in predicting broader trends and implications.

Sampling

Stratified purposive sampling was utilized to ensure quality representation from both the public and private sectors, which served as the study's defined strata. Out of the 300 target respondents this study proposed, 289 of them were responsive (Table 2). Thus, the sample size of the study was 289, represented by 176 from public sector and 113 from private sector.

Table 2. Distribution of Respondents according to Strata

Strata	Percentage	Frequency
Public	61%	176
Private	39%	113
Total	100%	289

Respondents were deliberately selected based on their relevance to the study, ensuring that insights were drawn from individuals directly involved in construction activities from start to finish such as project managers, construction engineers, clients, and other key stakeholders.

The inclusion criteria required that all selected construction projects were located in the City of Mati, initiated between 2017 and the present, and had a minimum project cost of Php500,000. Public sector projects referred to those funded, managed, and owned by local government entities particularly the 2nd

District Engineering Office of the Department of Public Works and Highways (DPWH) Davao Oriental, the Provincial Government of Davao Oriental, and the City Government of Mati. Meanwhile, private sector projects involved those funded, managed, and owned by private individuals, companies, organizations, or other established entities operating in the City of Mati.

Based on field observations, public construction projects outnumbered private ones. As a result, the total number of respondents was set higher on the public sector then the private sector (see Table 2).

The size of the sample was aligned with established research guidelines. Bujang et al. (2012) recommended a sample of 100 to 200 participants for exploratory factor analysis. Additionally, Kline (1994), as cited by Hatcher (1994), noted that a minimum of 100 participants is generally acceptable, with at least 150 recommended when the number of items reaches 30. In addition, Lakens (2022) remarked that sample size of 300 could be justifiable depending on factors such as the effect size, statistical power, and research goals. If the study requires detecting small effect sizes, a larger sample may be necessary. Therefore, 300 is generally considered acceptable.

Collection

To gather the necessary data, a survey questionnaire (Appendix A) was used to address the research problems. The questionnaire consisted of two main parts: (1) Project details and (2) Factors contributing to construction delays in the City of Mati.

Before the actual data collection, the questionnaire was validated by subject matter experts. Following validation, a pilot test was conducted by administering 40 questionnaires to test the reliability of the listed items. A Cronbach's alpha value of .967 was acquire by the 46 items/variables. It further means that the data set is 96.70%at consistent and dependable.

The final round of data collection commenced after successful pilot testing. Each respondent was allowed to answer for only one sector, either public or private, even if they had experience in both. Once a sector was chosen, the respondent was not allowed to answer for the other to avoid data duplication.

To measure the respondents' views on the factors contributing to construction delays, a 4-point Likert scale was used. The scale was as follows: 4 – Major Cause; 3 – Moderate Cause; 2 – Minor Cause; and 1 – Not at All a Cause.

The data collection process included one-on-one interviews conducted by trained enumerators appointed by the researcher. These enumerators introduced themselves, explained the purpose of the study, and informed respondents of their voluntary participation. Privacy and confidentiality were emphasized, and respondents were assured that they could withdraw at any point without penalty, pressure, or negative consequences.

The pilot testing phase was conducted over three (3) days, while the actual data collection spanned a maximum of two (2) weeks. Completed questionnaires were then encoded using KoboCollect Toolbox, an offline/online data collection platform that facilitated efficient data entry. Once all responses were encoded, the data were exported into spreadsheet format for statistical treatment, which was conducted by a professional statistician.

Data

The primary source of data served as the foundation for answering the key research questions, particularly those concerning the sector of the construction project, the project cost, and its duration.

While the factors listed in the questionnaire were derived from secondary sources such as published journal articles, official reports, and documents from authorized agencies, these sources played a crucial role in shaping the study. They provided a basis for identifying commonly cited causes of construction

delays. By validating these factors against primary data gathered from projects in the City of Mati, the study was able to determine which of them were truly applicable in the local context.

Presentation

The summary of the company profile was presented separately for the public and private sectors, as well as in total, using tables for visual clarity. In addition, the identified factors contributing to construction delays, along with their corresponding values and significant differences, were presented in tabular form. These presentations were designed to provide a clear and immediate understanding of the results, making it easier to interpret the findings at a glance.

Analyses

To analyze the data, the study employed frequency counts and percentages, Exploratory Factor Analysis (EFA), and Analysis of Variance (ANOVA).

Frequency count and percentage. These statistical tools were used to identify and summarize the profile details of construction projects undertaken by both public and private sectors in the City of Mati. This included categorizing projects based on sector, amount, and duration.

Exploratory Factor Analysis (EFA). Among the two major classes of factor analysis: Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA), this study utilized EFA. As explained by Pett, et. al (2003), EFA is appropriate when the goal is to explore and generate a theoretical model from a large set of latent constructs or underlying factors.

In this study, the threshold for communalities and factor loadings were set at 0.60. Additionally, the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy have met or have exceeded 0.70, and Bartlett's Test of Sphericity was at significant value at $p \leq .000$ to validate the suitability of the dataset for factor analysis.

Analysis of Variance (ANOVA). To determine whether there were significant differences in the contributing factors to construction delays between public and private sector projects, and based on the demographic profile, ANOVA was applied. This allowed the study to statistically assess and compare sector-based variations, along with the project amount and the duration of the project in the identified delay factors.

Ethical Consideration

The purpose and process of the study, as well as the rights and responsibilities of the respondents, were clearly explained prior to participation. Respondents were given the freedom to decide based on their willingness, without any form of coercion or intimidation. They underwent an informed consent process, during which they signed a consent form confirming their voluntary agreement to participate in the study. Their participation was entirely voluntary.

Respondents were also accommodated at their most convenient time and place for answering the questionnaire. At any point during the process, if a respondent chose not to continue, the researcher fully respected that decision. Respondents were reminded of their right to withdraw from the study at any time, without facing any negative consequences, penalties, or pressure.

To protect privacy and confidentiality, respondents were not required to disclose their real names. Instead, they were allowed to use pseudonyms or codes to maintain anonymity. This eliminated any identifying information and further secured their privacy. A Non-Disclosure Agreement (NDA) was also provided to both the researcher and the respondents to reinforce the confidentiality of all shared and obtained information.

To assure respondents that the study was conducted in good faith and solely for academic purposes, they were informed about the mechanisms for handling and safeguarding their data. For transparency,

respondents were briefed on both the advantages and potential risks of participation. This fostered mutual trust and confidence, and reaffirmed that the study prioritized the welfare of participants, the validity of findings, and the ethical standards of academic research, without expectation of reward, recognition, or financial gain.

The researcher held a strong commitment to academic honesty and integrity. A plagiarism checker was used to ensure originality and proper attribution of scholarly sources. All cited authors' ideas and discussions were paraphrased respectfully, without distortion or misrepresentation. Only accurate, reliable data were used for analysis to ensure honest interpretation aligned with the study's objectives. No data were manipulated to serve personal or organizational interests.

Overall, the study was carried out in good faith, free from conflicts of interest, falsification, or inconsistencies, upholding the highest ethical standards in research.

CHAPTER IV
RESULTS AND DISCUSSION

This chapter presents the results of the study with interpretation and discussion. Results are shown chronologically based on the problems provided for in Chapter I.

Profile of Construction Firms engaged in business in the City of Mati

Project Amount. Table 3 provides the project amount participated by construction firms. It presents that public contractors' project amount were mostly more than Php5,000,000, that is 32.39% for more than Php5,000,000 to 10,000,000, and 32.39% for more than Php10,000,000. On the other hand, private contractors' project amounts were mostly (f=45, %=39.82%). This emphasize further that the projects held in the City of Mati were mostly (f=102, %35.29) more than Php10,000,000. On the other hand, few contractors for both public (f=28, %=15.91) and private (f=17, 15.04%) with project amount ranges from Php500,000 to 3,000,000.

Table 3. Project Amount of Constructions in the City of Mati

	Public		Private		Total	
Project Amount	**F**	**%**	**f**	**%**	**f**	**%**
Php500,000 to 3,000,000	28	15.91	17	15.04	45	15.57
>Php3,000,000 to 5,000,000	34	19.32	25	22.12	59	20.42
>Php5,000,000 to 10,000,000	57	32.39	26	23.01	83	28.72
>Php10,000,000	57	32.39	45	39.82	102	35.29
Total	**176**	**100.00**	**113**	**100.00**	**289**	**100.00**

This finding may suggest that the project amount lean towards higher amount due to high cost of materials and labor in current time, and that contractors may tend to participate more on higher budget allocation for construction giving them more opportunity to increase their earnings.

Duration of the Project. Construction for both public and private sector mostly took more than six (6) months to one year, f=64, %=36.36 and f=44; %38.94, respectively. There were very few under less than three (3) months construction for both sectors: 18 contractors or 10.23% for public and six (6) contractors or 5.31% for private. Overall, there were only 8.31% or 24 contractors who engaged in less than three (3) months duration of project. Table 4 present the project amount of constructions in the City.

Table 4. Project Amount of Constructions in the City of Mati

Duration of the Project	Public		Private		Total	
<3 months	18	10.23	6	5.31	24	8.31
3 to 6 months	45	25.57	26	23.01	71	24.57
>6months to one year	64	36.36	44	38.94	108	37.37
>one year	49	27.84	37	32.74	86	29.75
Total	**176**	**100.00**	**113**	**100.00**	**289**	**100.00**

The result may suggest that most contractors were confident to finish projects in more than six (6) months to one year. This further suggest that this time frame sufficiently provide time for contractors to finish their construction, and serve their clients.

Factors that Caused Delay of Construction Projects in Public Sector in the City of Mati

There were four runs before the intended criteria were satisfied. These criteria included that factors with communalities and factor loading of .600. Hence, the process of extraction had only stopped as this was achieved. At this point, there were ten (10) out of 46 variables remained for analysis.

Before discussing the output of this objective, it pays to present that the KMO Measure of Sampling Adequacy is .823 with Bartlett's Test of Sphericity Sig .000. This indicate that the data set is excellent for factor analysis. Table 5 presents this result.

Table 5. KMO Measure of Sampling Adequacy and Bartlett's Test of Sphericity – Public Sector Data Set

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.823
Bartlett's Test of Sphericity	Approx. Chi-Square	778.897
	Df	45
	Sig.	.000

Communality emphasizes the variance of the variables, which is explained by all factors. Thus, of the variable aging workforce, 76.50% of the variance can be explained by all of the factors, of the variable lack of adequate training initiatives, 71.90% of the variance can be described by all of the factors, and so on. This further means that each of the variable in Table 6 with its individual extraction value, can be explained accordingly by all of the factors.

Table 6. Communalities of Public Sector Cause of Delay

	Variables	Extraction
1	Aging workforce	.765
2	Lack of adequate training initiatives	.719
3	Environmental concerns	.815
4	Discovery of hazardous materials	.641
5	Environmental conditions	.793
6	Inadequate experience of the contractor	.678
7	Availability and failure of construction equipment	.702
8	Lack of communication between parties	.721

9	Errors during the construction stage	.727
10	Frequent change orders and considerable extra work	.698

Extraction Method: Principal Component Analysis.

Table 7 further shows that the cause of delay in public sector is comprised of ten (10) components. However, only three (3) components with eigenvalue of 1.0 and higher. The first component can explain 42.268% of the cause of delay in public sector construction, second component can explain 17.426%, and the third can explain 12.886%.

The Rotated Component Matrix for public sector is shown in Table 8. This matrix detailed the variables' cluster comprising to explain a component. Component 1 is comprised of inadequate experience of the contractor (.790), availability and failure of construction equipment (.782), lack of communication between parties (.816), errors during the construction stage (.816), frequent change orders and considerable extra work (.791).

Table 7. Total Variance Explained Matrix for Public Sector

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.227	42.268	42.268	4.227	42.268	42.268	3.365	33.648	33.648
2	1.743	17.426	59.694	1.743	17.426	59.694	2.207	22.071	55.719
3	1.289	12.886	72.580	1.289	12.886	72.580	1.686	16.861	72.580
4	.593	5.930	78.510						
5	.456	4.560	83.070						
6	.407	4.066	87.136						
7	.383	3.828	90.964						
8	.358	3.582	94.547						
9	.307	3.074	97.621						
10	.238	2.379	100.000						

Extraction Method: Principal Component Analysis.

Table 8. Rotated Component Matrix for Public Sector

Variables	**Component**		
	1	**2**	**3**
Aging workforce			.847
Lack of adequate training initiatives			.828
Environmental concerns		.888	
Discovery of hazardous materials		.638	
Environmental conditions		.882	

Inadequate experience of the contractor	.790
Availability and failure of construction equipment	.782
Lack of communication between parties	.816
Errors during the construction stage	.816
Frequent change orders and considerable extra work	.791

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 5 iterations.

This component is renamed as 'Essentials and Modifications'. The clustered variables were renamed as such as experience of contractor, construction equipment, communication between parties are essential to perform the construction projects, and that errors and change are modifications needed to complete these projects.

Essentials were of the same output, but not all, with Sambasivan and Soon (2007) and Haseeb, et al. (2011) findings. This suggests that the inadequate experience of the contractor, availability and failure of construction equipment, lack of communication between parties are also present in the performance of construction projects in the City of Mati that has caused delays in construction. Alsharif, et al. (2020) defined the inadequate experience of contractor and inaccessible or under repair construction equipment as poor project management practices including the lack of clear communication among stakeholders. Khamis, et al. (2019) reinforced such poor construction practices to significantly impact project timelines making mistakes in scheduling which consequently result to failure, and eventually waste time and resources. Moreover, Ogunlana, et al. (2002) expressed that transparent communication with stakeholders are critical in reducing the effects of financial-related delays, and that Koushki et al. (2005) recommended an enhanced coordination among them to reduced the likelihood of delays.

Modifications, on the other hand, entail additional time and resources. Hwang, et al. (2013) expounded that modifications call for reassessment of project plans, adjustments of timetables, and most often require additional resources. Subsequently, all of these are subjected to legal needs, design team updates, and detailed documentation and clear communication with stakeholders. Thus, all of these potentially cause adjustments and time throwing off the initial deadline.

Component 2 consists of environmental concerns (.888), discovery of hazardous materials (.638), and environmental conditions (.882). This component was renamed as 'Environmental Conditions'. The environmental-related unforeseen site circumstances mentioned by Goh and Abdul-Rahman (2013) were also present in the cause of delays of construction projects in the City of Mati.

Although the City of Mati is very seldom visited or affected by typhoon, it has been experiencing heavy rainfall including adverse or abrupt change in weather conditions. Santos, et al. (2020) discussed that this environmental condition frequently disrupt construction schedules leading to break worktime or schedule, and damage ongoing projects as water and other substrates may fused into the mixture or introduce deterioration of construction materials, necessitating further time for repairs and adjustments.

Sweis, et al. (2008) added that it impedes progress by making job sites unsafe or difficult to access making unpredictable calls for efficient contingency plan for scheduling buffers and alternative work strategies to lessen the effects of weather interruptions. Hence, environmental conditions lead modifying timelines as needed to sustain project progress.

Component 3 includes aging workforce (.847), and lack of adequate training initiatives (.828). This component can also be renamed as 'Skilled Labor'. This label was utilized by numerous authors in this paper (Chan et al., 2001; Memon et al., 2014; Silva, 2016; Banez & Monteclaro, 2018; Philippine Constructors Association, 2019).

Skilled labor is considered as one of the significant factors that hurdles the completion of a construction project (Banez & Monteclaro, 2018), as it requires intensive labor. The Philippine Constructors Association (2019) added that over majority of construction projects in the country experience delays due to lack of skilled labor. Despite the fact that there is a huge number of labor force, Memon et al. (2014) highlighted that qualified skilled labor is at shortage worsen by issues of aging workforce, and lack of adequate training initiatives.

The result suggest that labor of older generation has better foundation in construction in terms of knowledge and/or skills but has now eroded in number. Public sectors contractors perceived that current generation of labor have not possessed what aging labor have, in knowledge and/or skills. Older generation may have also used much of their ingenuity at work as there were no computer-aided devices or high-technology equipment at their aid but pure resourcefulness and hardwork. Memon et al. (2014) further emphasized that inadequate supply of qualified personnel delays projects as it affects the effectiveness and pace of construction operations which made difficult to uphold productivity levels.

In addition, without adequate training initiatives from the labor themselves or from the construction companies they served, work will most likely turn inefficient. The lack of knowledge and skill of know how to do it in a construction may cause hard. Construction materials or equipment are expensive which must be taken seriously by doing exactly what it should. When errors occur, great loss may be incurred by the construction firm.

Subjecting labor to training may aid this challenge as it affects their productivity. It motivates workers, increase labor skill levels, and provides positive condition of the workplace. Appreciated worker or worker exhibit higher productivity, resulting in speedy advancement. Chan et al. (2001) explained that differences in labor skill levels can cause inefficiencies such that a less skilled labor may require supervision and take longer to finish tasks. Additionally, Ocampo et al. (2019) opined that qualified workers are difficult to find which tolled construction companies an additional time to train new employees or dealt with absenteeism, and high turnover rates.

Factors that caused the delay of construction projects in private sector in the City of Mati

The data set of private sector construction projects is excellent for factor analysis as its KMO Measure of Sampling Adequacy is .847 with Bartlett's Test of Sphericity Sig .000. Table 9 exhibits the result.

Table 9. KMO Measure of Sampling Adequacy and Bartlett's Test of Sphericity – Private Sector Data Set

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.847
Bartlett's Test of Sphericity	Approx. Chi-Square	1251.139
	Df	45
	Sig.	.000

On the communalities of variables under private sector cause of delay, it is revealed in Table 10 that there are 18 variables with variance of .60 and above. With such, of the variable political instability, 75.0% of

the variance can be explained by all of the factors, of the variable economic instability, 72.90% of the variance can be described by all of the factors, of the variable financial limitations, 73.70% of the variance can be described by all of the factors, and so on. This further means that each of the variable with its individual extraction value, can be explained accordingly by all of the factors.

Table 10. Communalities of Private Sector Cause of Delay

	Variables	Extraction
1	Political instability	.750
2	Economic instability	.729
3	Financial limitations	.737
4	Financial instability	.656
5	Deficiency of skilled labor	.733
6	Lack of adequate training initiatives	.822
7	Motivation of workers	.778
8	Workers' skill levels	.745
9	Design modifications	.777
10	Modifying timetables	.715
11	Environmental concerns	.810
12	Environmental conditions	.815
13	Poor site management	.749
14	Improper planning	.694
15	Problems related to subcontractors	.791
16	Lack of communication between parties	.767
17	Errors during the construction stage	.703
18	Frequent change orders and considerable extra work	.740

Extraction Method: Principal Component Analysis.

There were 18 total components provided by Table 11, the Total Variance Explained under private sector construction sector. However, only five (5) remained to have more than 1.0 eigenvalues. The five components are accounted for a total of 7.389 with 41.049% of variance, 2.0687 with 11.486% of variance, 1.737 with 9.652% of variance, 1.039 with 7.275% of variance, and 1.009 with 5.604% of variance, respectively. Thus, the total cumulative variance is accounted for 75.067%.

Table 11. Total Variance Explained Matrix for Private Sector

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.389	41.049	41.049	7.389	41.049	41.049	4.038	22.431	22.431

2	2.068	11.486	52.535	2.068	11.486	52.535	3.410	18.944	41.375
3	1.737	9.652	62.188	1.737	9.652	62.188	2.701	15.006	56.381
4	1.309	7.275	69.462	1.309	7.275	69.462	1.682	9.347	65.728
5	1.009	5.604	75.067	1.009	5.604	75.067	1.681	9.339	75.067
6	.703	3.907	78.974						
7	.579	3.215	82.188						
8	.566	3.147	85.335						
9	.470	2.611	87.946						
10	.347	1.929	89.876						
11	.333	1.849	91.724						
12	.291	1.618	93.342						
13	.263	1.459	94.801						
14	.242	1.342	96.143						
15	.223	1.240	97.383						
16	.183	1.014	98.397						
17	.158	.878	99.275						
18	.131	.725	100.000						

Extraction Method: Principal Component Analysis.

Table 12 presents the Rotated Component Matrix for private sector. It uncovers the detailed clustered variables under a component/factor. There are six (6) variables in Component 1, four (4) variables in Component 2 and Component 3, respectively, and two (2) variables in Component 4 and Component 5, accordingly.

Table 12. Rotated Component Matrix for Private Sector

	Component				
	1	2	3	4	5
Political instability				.847	
Economic instability				.817	
Financial limitations			.710		
Financial instability			.686		
Deficiency of skilled labor		.689			
Lack of adequate training initiatives		.877			
Motivation of workers		.853			
Workers' skill levels		.787			
Design modifications			.749		
Modifying timetables			.704		
Environmental concerns					.877
Environmental conditions					.895

Poor site management	.675
Improper planning	.629
Problems related to subcontractors	.829
Lack of communication between parties	.826
Errors during the construction stage	.701
Frequent change orders and considerable extra work	.790

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 6 iterations.

The composition of Component 1 includes: poor site management (.675), improper planning (.629), problems related to subcontractors (.829), lack of communication between parties (.826), errors during the construction stage (.701), and frequent change orders and considerable extra work (.790). This component is renamed as 'Project Management'.

In addition, all of the variables under this component are controlled by management. Thus, this is equated to Assaf and Al-Hejji's (2006) model as internal factors. Sambasivan and Soon (2007) and Alsharif, et al. (2020) expressed that poor project management practices such as the lack of clear communication among stakeholders significantly impact project timelines. Also, Sambasivan and Soon (2007) and (Haseeb, et al, 2011) have the same results stressed by the poor site management, improper planning, problems related to subcontractors, lack of communication between parties and errors during the construction stage (Sambasivan & Soon, 2007).

Thus, this study agrees to Koushki et al. (2005) on having a well-structured project management practices to ensure timely and efficient decision-making. As Project Management is controlled by the construction firms, they can fully assess and forecast potential risks, thereby crafting measures to eliminate, avoid or reduce risks. These actions suggest direct influence in minimizing costs while maximizing utility of resources. Leaving these concerns unattended can lead to several negative impacts including cost overruns, loss of contractor profits, loss of business, and even insolvency of the organization.

Component 2 comprises deficiency of skilled labor (.689), lack of adequate training initiatives (.877), motivation of workers (.853), and workers' skill levels (.787). This cluster component is relabeled as 'Quantity of Motivated Skilled Workers'.

It is an undeniable fact that labor in construction is plenty, and have greatly contributed to job creation (Bennegreg, 2015). However, the deficiency of skilled labor may be attributed and defined further not only in terms of its quantity but also with labor who have adequate trainings attended, motivated workers, and highly skilled labor. In addition, this study agrees to Banez and Monteclaro (2018) that local contractors and project managers have significantly hurdles insufficient availability of skilled labor to project completion.

These evidences point out that motivated skilled workers are indispensable and significantly vital in the performance of construction industry thereby, no kind or amount of technology or equipment can replace human participation. Moreover, providing opportunities for workers to enhance their skills, may it be through trainings, can motivate them in their work which can transcend in their productivity causing on time completion of projects. Otherwise, delays are inevitable.

Component 3 is renamed as 'Financial Constraints and Modifications' as it comprised financial limitations

(.710), financial instability (.686), design modifications (.749), and modifying timetables (.704).

This study confirms with the findings of Ogunlana, et al. (2002) and Reyes and Pineda (2021) that financial limitations and instability significantly contribute in construction undertakings. The instability of financial resources as planned can lead the project to stop or that funding shortages and financial instability ultimately disrupt timely procurement of materials and payments. These circumstances of delay funding stream cause chain reaction of delays and issues until financial resources are obtained, secured and available.

With these financial constraints, construction firms and their clients necessitate to source sufficient budget with decent margin for price increase and other changes in financial requirement. Thus, comprehensive cost estimation, and contingency budgeting are crucially necessary strategies to help avoid and control cost overruns. In addition, effective financial planning accompanied by appropriate financing is critical to reduce the effects of funding-related delays which can impede progress.

On the other hand, modification needs reassessment, legal review, team updates, and detailed dissemination with stakeholders. Consequently, all these transactions adjust timetable.

Component 4 comes with political instability (.847) and economic instability (.817). This component is renamed as 'Eco-Political Instability'. Construction firms serving private sector felt political and economic instability are causes of delay. These are external factors as described by Assaf and Al-Hejji's (2006). In management, external factors are those that are uncontrollable by any of the stakeholders in the organization, in this case, in the construction.

These results validate the Philippine Constructors Association (2019) with its report that construction projects in the country experience delays with a considerable proportion attributed to administrative inefficiencies. These results also acknowledge the findings of Ramos (2020) and Cruz et al. (2022) that, indeed, the regulatory environment in the Philippines poses additional challenges that can delay construction projects including the political influences, lengthy permitting processes and bureaucratic red tape where complexity of obtaining necessary permits and approvals can lead to extended waiting periods before construction can commence, impacting overall timelines. However, contrary to the subject of Ramos (2020) which pertained to public sectors' cause of delay, the results of the study were for construction firm engaged in private sectors. Nevertheless, political instability is one that cause delay in the construction.

Economic instability can pertain to the unforeseen increase in material price rises mentioned by Flyvbjerg, et al. (2002). As this industry necessitate intensive capitalization in every activity it takes, price is a considerable determinant as it affects financial resource. The higher price of procured goods and services, the lesser they can have in terms of quantity. However, the lower the price, the higher quantity they can produce, and can even secure saving margin for unforeseen expenses.

Component 5 comprised environmental concerns (.877), environmental conditions (.895). Thus, this component is renamed as 'Environmental Issues'. Environmental issues are apparently evident for construction engaged by private sectors might impede construction and necessitate extensive cleanup operations. Thus, this study confirms Goh and Abdul-Rahman (2013) findings.

Moreover, these environmental issues can make construction activities stop which can lead to timetable disruptions, damage ongoing projects through debris and rainwater fused into concrete mixture, or for wooden materials to absorb too much moisture, or in anyway deteriorate construction materials as Santos, et al (2020) discussed. More to the materials and impeding time is the wasted financial resources that is always considered limited.

Significant Difference of Cause of Delay of Construction Projects in the City of Mati when grouped according to Demographic Profile

This section examines whether there is a significant difference in the responses of respondents when these are grouped according to their demographic profile specifically the project amount and the duration of the project, and the sectors of the project.

Project Amount. There are 24 out of the 46 variables which respondents responded differently when grouped according to the amount of the project. These are: Project management issues (F=3.126, Sig.= .026), Contractor performance (F=6.895, Sig.= .000), Mistakes in scheduling (F=4.774, Sig.=.003), Financial limitations (F=4.504, Sig.=.004), Unanticipated site circumstances (F=3.273, Sig.=.022), Financial instability (F=3.109; Sig.=.027), Funding shortages (F=4.104, Sig.=.007), Deficiency of skilled labor (F3.646, Sig.=.013), Aging workforce (F=5.984, Sig.=.001), Lack of adequate training initiatives (F=4.341, Sig.=.005), Workers' skill levels (F=4.213, Sig.=.006), Absenteeism (F=7.623, Sig.=.000), High turnover rates (F=4.121, Sig.=.007), Design modifications (F=3.042, Sig.=.029), Discovery of hazardous material (F=2.968, Sig.=.032), Poor site management (F=6.702, Sig.=.000), Improper planning (F=2.763, Sig.=.042), Labor supply (F=2.773, Sig.=.042), Inadequate finance of the client and payments for completed work (F=8.430, Sig.=.000), Problems related to subcontractors (F=4.473, Sig.=.004), Inadequate experience of the contractor (F=4.872, Sig.=.003), Material shortage (F=8.043, Sig.=.000), Availability and failure of construction equipment (F=7.589, Sig.=.000), Lack of communication between parties (F=4.335, Sig.=.005), and Errors during the construction stage (F=2.752, Sig.=.001). All of these significant differences including those that there not are exhibited in Table 13.

This further proves evidence that there is a significant difference on the responses of the respondents on these variables to cause delay in the construction projects in the City of Mati with regards to the project amount. Hence, on these variables, the H_{01} is rejected.

Table 13. Significant Difference on the Cause of Delay in terms of the Project Amount

No	Variables	F	Sig.	No	Variables	F	Sig.
1	Project management issues	3.126	.026	27	High turnover rates	4.121	.007
2	Contractor Performance	6.895	.000	28	Design modifications	3.042	.029
3	Resource Allocation	1.830	.142	29	Modifying timetables	1.174	.320
4	Labor Management	2.558	.055	30	Unforeseen soil conditions	1.426	.235
5	Supply chain disruptions	2.311	.076	31	Environmental concerns	.824	.481
6	Regulatory hurdles	.306	.821	32	Discovery of hazardous material	2.968	.032
7	Environmental conditions	2.486	.061				
8	Political instability	.332	.802	33	Environmental conditions	.623	.601
9	Economic instability	.877	.453	34	Bureaucratic red tape	2.033	.109

10	Insufficient resource allocation	1.685	.170	35	Lengthy permitting processes	.724	.538
11	Lack of clear communication among stakeholders	.685	.562	36	Poor site management	6.702	.000
				37	Improper planning	2.763	.042
12	Mistakes in scheduling	4.774	.003	38	Labor supply	2.773	.042
13	Financial limitations	4.504	.004	39	Inadequate finance of the client and payments for completed work	8.430	.000
14	Material price rises	1.305	.273				
15	Personnel shortages	1.265	.287				
16	Unanticipated site Circumstances	3.273	.022	40	Problems related to subcontractors	4.473	.004
17	Financial instability	3.109	.027	41	Inadequate experience of the contractor	4.872	.003
18	Funding shortages	4.104	.007				
19	Inadequate supply of qualified Personnel	.967	.409	42	Material shortage	8.043	.000
				43	Availability and failure of construction equipment	7.589	.000
20	Deficiency of skilled labor	3.646	.013				
21	Aging workforce	5.984	.001	44	Lack of communication between Parties	4.335	.005
22	Lack of adequate training Initiatives	4.341	.005				
				45	Errors during the construction stage	5.752	.001
23	Motivation of workers	2.057	.106				
24	Workers' skill levels	4.213	.006	46	Frequent change orders and considerable extra work	1.742	.159
25	Conditions of the workplace	.606	.612				
26	Absenteeism	7.623	.000				

These variables may suggest that higher project amount tolerates modifications, adjustments on unanticipated circumstances, labor salary, wages, and/or benefits, additional materials, and other

necessities for the completion of the project. While, lower project amount may face financial constraints or very limited margin or allowance for modifications, and other adjustment to carry out the construction. Moreover, project and site management including scheduling, planning and good communication, and the performance and experience of contractor and subcontractors with the available of construction equipment are expected more for those with higher project amount than lower amount. It can also be presented that higher project amount requires higher quality of management, performance, and assets to support and finish the project. This means that higher amount equates the higher expectations.

Duration of the Project. Three variables are reflected in Table 14 as having significant difference on the cause of delay in terms of the duration of the project. These are: Unanticipated site circumstances (F=5.059, Sig.=.002), Bureaucratic red tape (F=3.804, Sig.=.011), and Errors during the construction stage (F=3.487, Sig.=.016). Thus, on these variables, H_{01} is rejected.

Table 14. Significant Difference on the Cause of Delay in terms of the Duration of the Project

No	Variables	F	Sig.	No	Variables	F	Sig.
1	Project management issues	.998	.394	27	High turnover rates	1.295	.276
2	Contractor Performance	1.497	.216	28	Design modifications	.578	.630
3	Resource Allocation	.165	.920	29	Modifying timetables	.829	.479
4	Labor Management	.794	.498	30	Unforeseen soil conditions	2.043	.108
5	Supply chain disruptions	.957	.413	31	Environmental concerns	2.253	.082
6	Regulatory hurdles	1.051	.370	32	Discovery of hazardous material	2.460	.063
7	Environmental conditions	.226	.878				
8	Political instability	1.159	.326	33	Environmental conditions	1.559	.200
9	Economic instability	.596	.618	34	Bureaucratic red tape	3.804	.011
10	Insufficient resource allocation	1.063	.365	35	Lengthy permitting processes	.797	.496
11	Lack of clear communication among stakeholders	.667	.573	36	Poor site management	1.709	.165
				37	Improper planning	1.082	.357
12	Mistakes in scheduling	.239	.869	38	Labor supply	.629	.597
13	Financial limitations	1.718	.163	39	Inadequate finance of the client and payments for completed work	1.081	.357
14	Material price rises	1.463	.225				
15	Personnel shortages	1.198	.311				

16	Unanticipated site circumstances	5.059	.002	40	Problems related to subcontractors	1.448	.229
17	Financial instability	2.360	.072	41	Inadequate experience of the contractor	1.160	.325
18	Funding shortages	1.965	.119				
19	Inadequate supply of qualified personnel	1.223	.301	42	Material shortage	1.753	.156
				43	Availability and failure of construction equipment	2.057	.106
20	Deficiency of skilled labor	.913	.435				
21	Aging workforce	.416	.742	44	Lack of communication between Parties	1.000	.393
22	Lack of adequate training initiatives	.108	.955				
				45	Errors during the construction stage	3.487	.016
23	Motivation of workers	1.873	.134				
24	Workers' skill levels	1.654	.177	46	Frequent change orders and considerable extra work	1.990	.116
25	Conditions of the workplace	1.408	.241				
26	Absenteeism	2.206	.088				

Unanticipated site circumstances, and errors during the construction stage may be taken immediately for decision-making with subsequent speedy action to resolve shorter duration projects, or otherwise, delay occurs. Conversely, there is enough time to resolve issues and concerns on a longer duration projects for decisions and actions are warranted by time.

Bureaucratic red tape obviously prolongs projects. It comes with the step to step process of actions undertaken. The longer the process, the longer time is needed to see accomplishments. The worst scenario for this variable is the non-responsive action of the sector holding the decision. One office after another, delays can occur. This usually can occur in longer duration projects. On the other hand, eliminating bureaucratic system can produce more direct and more prompt response on matters at hand from among parties. Delays are reduced, or even eliminated. Thus, shorter duration projects most often eliminate this challenge.

Sector of the Project. Table 14 shows the significant difference of the cause of delay construction projects in the City of Mati when responses are grouped to private and public sectors.

Based on Table 15, only one variable satisfied H_{02}, Unanticipated site circumstances. Stakeholders of construction industry must have anticipated site circumstances, and that they knew anything can happen on an ongoing project.

Table 15. Significant Difference on the Cause of Delay in terms of the Duration of the Project

No	Variables	F	Sig.	No	Variables	F	Sig.
1	Project management issues	47.603	.000	26	Absenteeism	14.498	.000
2	Contractor Performance	56.411	.000	27	High turnover rates	17.237	.000
3	Resource Allocation	20.277	.000	28	Design modifications	44.445	.000
4	Labor Management	23.583	.000	29	Modifying timetables	34.346	.000
5	Supply chain disruptions	26.101	.000	30	Unforeseen soil conditions	10.637	.001
6	Regulatory hurdles	18.523	.000	31	Environmental concerns	12.182	.001
7	Environmental conditions	8.364	.004	32	Discovery of hazardous material	17.911	.000
8	Political instability	873.833	.000				
9	Economic instability	84.610	.000	33	Environmental conditions	21.609	.000
10	Insufficient resource allocation	8.232	.004	34	Bureaucratic red tape	52.210	.000
				35	Lengthy permitting processes	27.935	.000
11	Lack of clear communication among stakeholders	43.075	.000	36	Poor site management	21.775	.000
				37	Improper planning	20.594	.000
12	Mistakes in scheduling	12.897	.000	38	Labor supply	12.405	.000
13	Financial limitations	18.592	.000	39	Inadequate finance of the client and payments for completed work	12.869	.000
14	Material price rises	16.105	.000				
15	Personnel shortages	13.028	.000				
16	Unanticipated site circumstances	.690	.407	40	Problems related to subcontractors	35.807	.000
17	Financial instability	33.540	.000	41	Inadequate experience of the contractor	25.576	.000
18	Funding shortages	19.921	.000				
19	Inadequate supply of	18.344	.000	42	Material shortage	15.660	.000

	qualified personnel		
20	Deficiency of skilled labor	19.374	.000
21	Aging workforce	22.277	.000
22	Lack of adequate training initiatives	18.699	.000
23	Motivation of workers	20.303	.000
24	Workers' skill levels	24.654	.000
25	Conditions of the workplace	10.581	.001
43	Availability and failure of construction equipment	40.199	.000
44	Lack of communication between Parties	38.654	.000
45	Errors during the construction stage	44.647	.000
46	Frequent change orders and considerable extra work	34.714	.000

The rest of the variables reject H_{02}, and that there is a significant difference on the factors that caused the delay of construction projects in the City of Mati when grouped according to sector: public and private. This may be attributed on the experience of the respondents on how these sectors differently face processed before the implementation, during implementation, and after the implementation of the project.

For public sectors, republic acts were promulgated regulating government procurement. Those acts stated precise procedure on budget allocation pre-processes, implementation phase, and post- phase. Thus, public projects have budgetary allotment from national or local budget but projects are subjected to public bidding. The plan presented by the winning bidder or the plan for bidding need to be accurately performed. Periodic monitoring and evaluation are conducted before payment is released. At the time the project is complete, post-evaluation of the engineers, end-user, the HOPE, and the Commission on Audit review or evaluate the project before it can be accepted and properly turned over to the agency.

In addition, provisions for inflation and other modifications if needed, justified, and approved by the Head of Procuring Entity (HOPE), can also be provided. This may appear that public sector is confident to accomplish projects based on the provisions under the general appropriations. Furthermore, the line of communication between the agency of the public sector and the contractor firm are mostly on those supervising engineers of the project and less from the end-user and the HOPE. Thus, this point out the access of communication.

However, due to the bureaucratic system of public sector, different personnel such as the end-user, the supervising personnel, the HOPE, and other sections of the agency, perform different task. Hence, communication has can hardly be expressed to one personnel to the other, or from the end-user to the contractor, or otherwise. This experience may have led to the significant difference in the lack of communication between parties especially when significant amount is at hand. In contrary, public sector needs to consult the end-user, other sections in the procurement process, and the HOPE for appropriate actions. Thus, as to the duration of the project, decision-making of these sectors may be executed differently.

On the other hand, private sectors may have limited financial resources but fairly enough to accomplish the project. When inflation strikes hard, private sector may hardly cope with the additional expenses.

Private sector relied on their equity, and many others may have incurred debt from financing institutions to support construction projects. Moreover, any modification on design, equipment, supplies, labor or management that lead to budget adjustments may make it difficult for private sector, as financial resource is limited. Thus, the elasticity of financial resources is very tight in private sector.

However, communication in private sector can be assumed to be more directly from the owner of the project to the professionals handling the project, and vice versa. Whichever the case maybe, decisions and actions can be made sooner as decisions can only rely on one or two decision maker/s. This communication is rather more frequent and direct than public sector.

CHAPTER V
SUMMARY, CONCLUSION AND RECOMMENDATION

This chapter presents the summary and conclusion of the study. These were the bases for the recommendation.

Summary

The study sought to identify the various factors causing the delays in the construction projects in the City of Mati, Davao Oriental, Philippines. Specifically, the study aimed to: determine the profile of construction firms engaged in business in the City of Mati, in terms of the project amount and duration of the project; to identify the factors that caused the delay of construction projects in public sector; to identify the factors that caused the delay of construction projects in private sector; and to examine the significant difference in the factors that caused the delay of construction projects, in terms of their demographic profile and the sector of the project.

Descriptive and inferential research designs were applied to supply results accordingly to the objectives at hand. Descriptive design revealed the demographic profile of the projects in terms of project amount and duration of the project. Meanwhile, inferential design uncovered the causes of delay in public and private sectors, and determined whether there were significant differences on their responses.

Out of 300 proposed respondents, there were 289 who actively participated, of which 61% or 176 from public, and 39% or 113 from private.

It was revealed that public sectors' project amounts were mostly (64.78%) start of from more than Php5,000,000 while private sector mostly (39.82%) started from more than Php10,000,000. Hence, combining public and private sector, there were 35.29% projects with more than Php10,000,000 projects amount.

In general, most (37.37%) of the projects are completed within more than six (6) months to one (1) year. Both public and private sectors ranged on this duration with 36.36% and 39.94% representation, accordingly.

Out of 46 variables, ten (10) variables were found to cause delay under public sector. These are the aging workforce, lack of adequate training initiatives, environmental concerns, discovery of hazardous materials, environmental conditions, inadequate experience of the contractor, availability and failure of construction equipment, lack of communication between parties, errors during the construction stage, and frequent change orders and considerable extra work.

These variables were further extracted, and had formed three (3) components which were renamed accordingly to the variables. Component 1 was renamed 'Essentials and Modifications' which was composed of variables: inadequate experience of the contractor (.790), availability and failure of

construction equipment (.782), lack of communication between parties (.816), errors during the construction stage (.816), frequent change orders and considerable extra work (.791).

Component 2 under public sector was renamed 'Environmental Conditions' as it included environmental concerns (.888), discovery of hazardous materials (.638), and environmental conditions (.882). Meanwhile, Component 3 included aging workforce (.847), and lack of adequate training initiatives (.828). This component was labelled as 'Skilled Labor'.

For private sector, there were 18 variables that causes delay. These included political instability, economic stability, financial limitations, financial instability, deficiency of skilled labor, lack of adequate training initiatives, motivation of workers, workers' skill levels, design modifications, modifying timetables, environmental concerns, environmental conditions, poor site management, improper planning, problems related to subcontractors, lack of communication between parties, errors during the construction stage, and frequent change orders and considerable extra work.

These variables extracted five components. The composition of Component 1 included: poor site management (.675), improper planning (.629), problems related to subcontractors (.829), lack of communication between parties (.826), errors during the construction stage (.701), and frequent change orders and considerable extra work (.790). This component was renamed as 'Project Management'.

Component 2 comprised deficiency of skilled labor (.689), lack of adequate training initiatives (.877), motivation of workers (.853), and workers' skill levels (.787). This cluster component was relabeled as 'Quantity of Motivated Skilled Workers'. Moreover, Component 3 is renamed as 'Financial Constraints and Modifications' as it comprised financial limitations (.710), financial instability (.686), design modifications (.749), and modifying timetables (.704).

While Component 4 came with political instability (.847) and economic instability (.817). This component was renamed as 'Eco-Political Instability'. Component 5 comprised environmental concerns (.877), environmental conditions (.895). Thus, this component was renamed as 'Environmental Issues'.

On the matter of significant difference, as to project amount, there are 24 out of the 46 variables which respondents responded differently when grouped according to the amount of the project. These are: Project management issues (F=3.126, Sig.= .026), Contractor performance (F=6.895, Sig.= .000), Mistakes in scheduling (F=4.774, Sig.=.003), Financial limitations (F=4.504, Sig.=.004), Unanticipated site circumstances (F=3.273, Sig.=.022), Financial instability (F=3.109; Sig.=.027), Funding shortages (F=4.104, Sig.=.007), Deficiency of skilled labor (F3.646, Sig.=.013), Aging workforce (F=5.984, Sig.=.001), Lack of adequate training initiatives (F=4.341, Sig.=.005), Workers' skill levels (F=4.213, Sig.=.006), Absenteeism (F=7.623, Sig.=.000), High turnover rates (F=4.121, Sig.=.007), Design modifications (F=3.042, Sig.=.029), Discovery of hazardous material (F=2.968, Sig.=.032), Poor site management (F=6.702, Sig.=.000), Improper planning (F=2.763, Sig.=.042), Labor supply (F=2.773, Sig.=.042), Inadequate finance of the client and payments for completed work (F=8.430, Sig.=.000), Problems related to subcontractors (F=4.473, Sig.=.004), Inadequate experience of the contractor (F=4.872, Sig.=.003), Material shortage (F=8.043, Sig.=.000), Availability and failure of construction equipment (F=7.589, Sig.=.000), Lack of communication between parties (F=4.335, Sig.=.005), and Errors during the construction stage (F=2.752, Sig.=.001).

On these variable H_{01} was rejected since there exists a significant difference on the cause of delay when responses are grouped according to project amount.

On the other hand, when responses were grouped according to the duration of the project, three (3) variables are reflected to have significant difference on the cause of delay. These are: Unanticipated site

circumstances (F=5.059, Sig.=.002), Bureaucratic red tape (F=3.804, Sig.=.011), and Errors during the construction stage (F=3.487, Sig.=.016). Thus, on these variables, H_{01} is rejected.

Lastly, on the significant difference with respect to the sectors of the projects, all have significant difference except for the unanticipated site circumstances. On this note, only under this variable H_{02} was accepted. In the contrary, there have been significant difference in most of the variables mentioned as cause of delay of construction projects when responses were grouped according to sectors.

Conclusion

Based on the findings, it is concluded that construction projects in the City of Mati mostly amounted to more than Php10,000,000 with more than six (6) months to one (1) year duration.

Three clustered factors were found out that caused delays under public sector: essentials and modifications, environmental conditions, and skilled labor. On the other hand, private sectors' causes were grouped into five factors: project management, quantity of motivated skilled workers, financial constraints and modifications, eco-political instability, and environmental issues. .

It was also discovered that when grouped according to project amount, a significant difference exists in 24 out of 46 variables. Meanwhile, only three variables were found with significant difference when grouped according to the duration of the project. However, as to grouping the responses with regards to the sector, 45 out of 46 were found to have significant difference.

Recommendation

Based on the findings and conclusion, the following recommendations were crafted:

Three clustered factors were found out that caused delays under public sector: essentials and modifications, environmental conditions, and skilled labor. On the other hand, private sectors' causes were grouped into five factors: project management, quantity of motivated skilled workers, financial constraints and modifications, eco-political instability, and environmental issues. .

Construction Industry. For the professionals, and technical and skilled labor serving in the construction industry to join forums, conferences, seminars, and other professional gatherings related to enhancing their construction knowledge and skills. Thus, making themselves competent in their profession.

This may also improve their planning, management, and scheduling techniques that can lead to more efficient project delivery, and that decision-makers can have evidence-based strategies to avoid common pitfalls and streamline construction processes which then build client satisfaction.

In addition, labor was a critical factor in the delay of construction from both sectors. Hence, motivating these labor by monetary or non-monetary benefits can boost their productivity.

Regulatory Government Agencies. These sector needs to understanding how local policies and approval processes contribute to project delays. Thus, better re-alignment of regulatory processes may be taken to address the actual needs of developers and contractors thereby helping accelerate development.

Academic Contribution. The utility of EFA disclosed the causes of delay in construction activities in the City of Mati. This treatment can also be used in other areas similar to the study at hand.

Moreover, the findings of the study contribute to the existing knowledge on the cause of delay of construction such that environmental concerns and issues, essential project management, financial constraints, modifications, motivated skilled labor, and eco-political instability caused delays on the construction projects in the City of Mati.

Future Research. This study can be duplicated in other setting. Moreover, this may inspire others to investigate how delays affect the quality of construction, or how different regions across localities mitigate the risk at stake, and many more. Hence, it opens new avenues for other researches.

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