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Infrastructure Project Management Problems Encountered and Solutions of Dpwh Engineers

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Abstract

This study is aimed to identify the infrastructure project management problems encountered by DPWH engineers and its solution. It was conducted at DPWH Office Aguinaldo, Ifugao comprising a total of twenty (20) participants. Three of them have finished their master's degree while the rest are still on their pursuit of it. Majority of them possess fewer years of experience in their field. The results show that the respondents agree to the given problems on infrastructure project management aspects and they strongly agree on its possible solutions. It shows that the problems encountered by the respondents have no significant relationship with their age and years of experience. However, their highest educational background has shown significant relationship with such problems. The output of this study shows that improved management techniques are a result of higher education. Hence, it is recommended to provide programs for project engineers that cater their needs for higher education and skills in their field to lessen encountered problems in infrastructure.

Keywords: infrastructure, DPWH, project management

1. Introduction

Organization and timeliness are critical for the administration of engineering projects. One of the greatest ways to ensure that a team sticks to the plan is to know how long each stage of the project should take ahead of time. With the help of expert services, project owners can effectively regulate the project's scope, budget, timing, quality, and function thanks to construction management. Most engineering project managers start out as project engineers before moving into management. For every sort of project management, the same conventional methods and techniques are employed. A person with an engineering background who wants to work in project management is probably interested in this specialization. All project delivery methods are compatible with construction management (n.a.). Whatever the situation, construction managers are in charge of making sure the owner receives a successful project. This calls for the application of sophisticated planning strategies such as the critical route method, familiarity with construction processes, and project management information systems.

Background of the Study

Engineering project management is the subset of project management that is solely focused on engineering projects. According to the study of McKinsey & Company (2017) as cited in (n.a. 2018), the construction sector is one of the main suppliers of goods and services to the global economy, contributing around $10 trillion yearly. Therefore, well-managed and closely watched projects have a big impact on the world stage. They are quite technical and have no trouble making thoughtful

selections. However, they are now dealing with a lot more when it comes to the project management job. They now need to communicate with project team members, suppliers, and stakeholders, and making logical conclusions isn't always the best course of action. Such leaders can make better decisions that result in a better project outcome by receiving training in engineering project management.

This study focuses on the "Infrastructure Project Management Problems Encountered and Solutions of DPWH Engineers". The primary goal of this study is to determine the project management problems encountered by the engineers of the Department of Public Works and Highways (DPWH), since the construction of an effective management strategy that would enhance project monitoring might be based on this knowledge. Its goal is to gauge how well and efficiently construction sites are being monitored for projects. This study also analyzes the challenges engineers face while monitoring building sites projects and suggests potential solutions that may be used to overcome these challenges and develop efficient procedures. A manager who motivates their team to achieve goals and employs the best company management techniques is a successful manager. A team is likely to succeed if successful strategies are used. If a team employs effective strategies, they have a higher chance of success (Indeed Editorial Team, 2022). Thus, in order to complete a project or build a structure for engineers, a team must have productive and well-managed members. Taking into account numerous variables, they also encounter a number of difficulties when overseeing and managing a project. Therefore, once potential solutions are offered, it is crucial to watch a managerial team's actions and projects and be aware of the issues that develop in order to prevent similar situations in the field in the future.

Research Question

This study aims to find out the infrastructure project management problems among DPWH engineers for an effective management strategy.

1. What is the profile of the respondents in terms of:
1.1 Age
1.2 Years of Experience as an Engineer
1.3 Highest Educational Attainment
2. What are the problems encountered by the respondents in infrastructure project management in terms of:
2.1 Technical Infrastructure Requirements
2.2 Manpower
2.3 Construction Site
2.4 Construction Materials
2.5 Safety Gears/Outfits
2.6 Finance
3. What are the possible solutions on project management problems encountered by the respondents in the following aspects?
3.1 Technical Infrastructure Requirements
3.2 Manpower
3.3 Construction Site
3.4 Construction Materials
3.5 Safety Gears/Outfits
3.6 Finance

4. Is there a significant difference on the problems encountered by the respondents when grouped according to their profile?
HO: There is no significant difference on the problems encountered when grouped according to profile.
5. What are the proposed measures to improve the infrastructure project management?

Research Hypothesis

There is no significant difference on the respondents' perception in infrastructure project management problems according to their age, educational attainment and years of experience as engineers.

Significance of the Study

The significance of this study is to provide engineers, workers, and nearby residents with a manual or foundation for understanding risk identification and risk reduction strategies in the context of building and monitoring construction projects. This entails seeing possible hazards at every turn in the building process and coming up with workable ways to lessen those risks. The information and assistance that the study's findings will provide will be advantageous to engineers, construction workers, and potential future researchers.

Engineers, this research provides guidelines for safer, better, and more efficient project management in terms of technical building requirements, labor force, construction site, building materials, safety equipment, and funding.

Construction Workers, the study's findings could be used as a guide to ensure safe working conditions at construction sites by adhering to protocols, donning safety gear, and exercising appropriate management and thoughtfulness. Researchers, this study may serve as a guide for those who plan to undertake relevant project management practices research or other similar studies. It can also be included in their studies' relevant literature review.

Theoretical Background

Theoretical Framework

A theoretical framework is a body of ideas and theories that outline the procedures for gathering and examining data in order to provide the needed knowledge. It provides a thorough explanation of how an investigation function. In general, it would describe the methods for gathering the data, the instruments that would be employed, their intended uses, and the anticipated methods for interpreting the data. Theories and concepts provide an explanation for the methods and procedures used to collect the necessary data. The sources and techniques of information gathering were determined by the project's overall operational structure or pattern. A scientific field's paradigm, or theoretical and philosophical underpinnings, serve as the foundation for the development of its ideas, principles, and generalizations as well as the experiments that support them. Concepts, their definitions, and any current ideas that are applied to a particular study are the components of a theoretical framework. The theoretical framework demonstrates an understanding of theories and concepts related to the research question as well as other, broader fields of study.

This study's input-process-output diagram provides a visual representation of every component used in the processes. The process, all necessary materials and data, and all products and byproducts generated during the process were all completely detailed in the diagram. All of the externally supplied data, including input components that had undergone modifications, was stored by the input element.

Processing was the act of changing or transforming input resources into output resources in order to make sure the system met its objectives. The output element would then give feedback to the input element when a modification to the system's operation was necessary.

Conceptual Framework

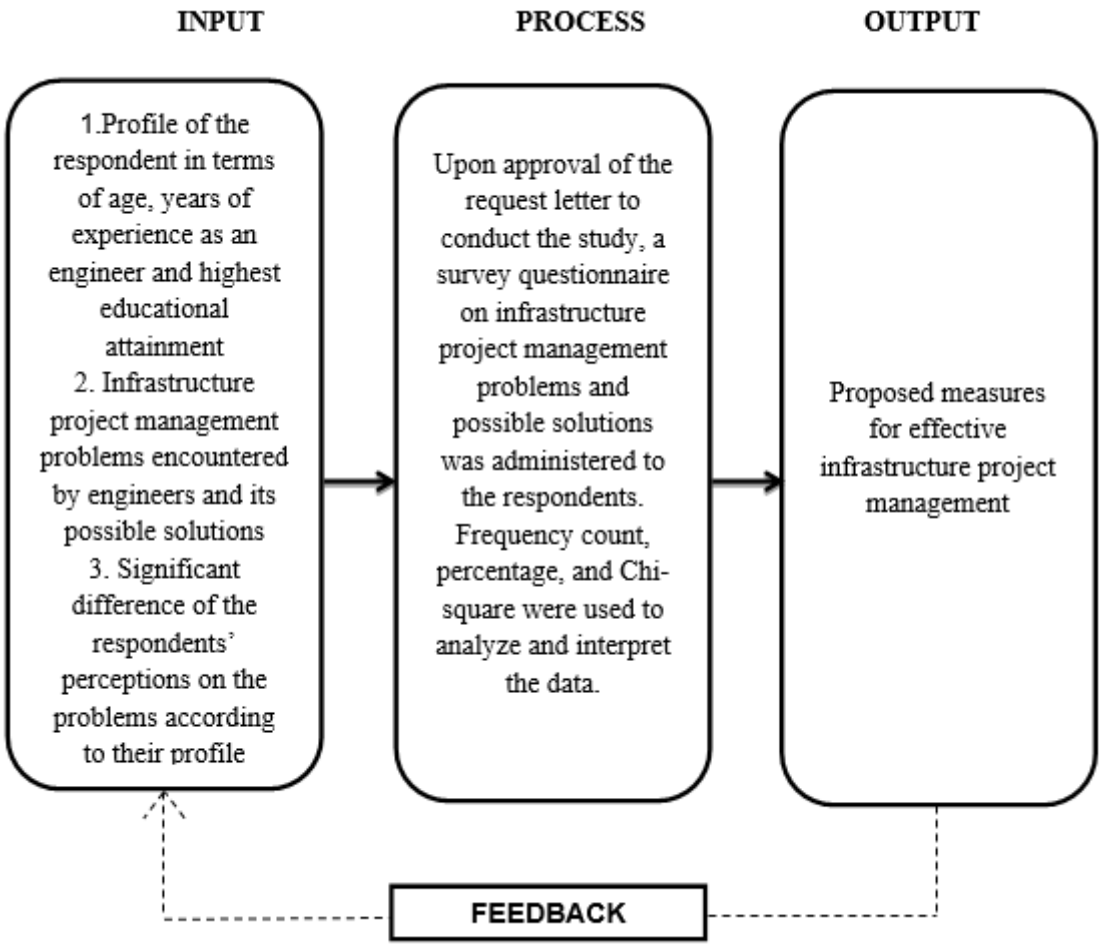

Figure 1. Paradigm of the Study

A depiction of the research or study's methodology is provided by the study's paradigm. It is composed of three boxes. The first box holds input, or information on the respondents, like their age, years of engineering experience, and highest level of schooling attained. It also covers the issues with project management that the respondents ran across and potential fixes for them. The process for collecting the study's data, which includes obtaining permission to carry out the investigation, collecting the data itself—that is, distributing questionnaires to participants—as well as the analysis and interpretation of the information obtained, is contained in the second box. The study's findings, which are based on the input or outcome and serve as the foundation for a successful management strategy, are finally contained in the third box.

Literature Review

A few pertinent studies and works of literature are cited and analyzed in order to provide further light on

the subject of this investigation. Along with local and international literature, this chapter also includes studies from both local and worldwide sources that may be found online and are relevant to the topic of this study.

Project Engineers and Managing Construction Processes

The majority of engineering project managers begin their careers as project engineers. Their technical proficiency is exceptional, and they exhibit no problems while making well-reasoned decisions. But now that they are in a project management role, they have much more to deal with. They must now communicate with project team members, vendors, and stakeholders, and making logical conclusions isn't always the best course of action in these situations. These leaders can make better judgments that result in better project outcomes by receiving training in engineering project management (Teamhood, 2019). When it comes to managing construction processes and associated activities over the course of a contract, architects, engineers, and quantity surveyors are without a doubt the most crucial project participant. Risk management is the most challenging part of building construction projects since it involves shaping workers' attitudes, which is a very important undertaking. There are engineers who would contend that building a project risk-free is far easier. As such, it is almost impossible to construct a project without running into any dangers. The most worrisome thing about building construction projects is the inherent risk, particularly for engineers who have just started working on them. Project management approaches are relatively new in the construction business. Risk management is used by construction management as part of a thorough and systematic approach to identifying, assessing, and resolving risks to meet project objectives (Banaitiene & Banaitis, 2012). The success of a development project depends on a number of factors, including the complexity of the venture, legally binding game plans, relationships between project participants, the competence of venture supervisors, and the abilities of important task personnel (Cheung, Suen & Cheung, 2004). In the study of Kissi & Ansah (2013), it says that project management techniques are becoming a standard tool used by professional businesses to achieve optimal performance (Barriere, 2003). Prior to World War II, professional project management was in fact in use. Its emergence occurred in the early 1950s when it was used to a large-scale project. The construction industry has realized that the only way to consistently improve its performance, capacity to offer services of a higher caliber, and inventive products is to have a thorough understanding of the dynamic roles that its three main resources—people, materials, and plants—play (Kissi & Ansah, 2013). One of a project's common goals is social transformation. Here, human development takes precedence over the "hard systems" emphasis found in many other project-driven industries, such as manufacturing or construction (Crawford & Bryce, 2003). Many experts and scholars have defined construction project management in the literature. These days, the term is usually used in relation to site or construction management rather than providing a whole examination of a project from the beginning to the end, including maintenance. Therefore, it makes sense that every project will provide different difficulties, especially for those in project management, in an environment characterized by a high degree of uncertainty and constant competition. Construction safety continues to be a concern for all individuals and organizations involved in construction projects. All stakeholders engaged in a construction project need to communicate their expectations on their involvement in site safety throughout the project. Becoming a competent engineering manager requires an understanding of engineering management principles. Applying engineering management concepts to your everyday work

is a great approach to hone your abilities whether you're an experienced manager looking to advance or an aspiring manager hoping to become more proficient (Ross, 2022).

Department of Public Works and Highways (DPWH)

The Department of Public Works and Highways (DPWH), a public sector entity considered the government's engineering and construction branch, is one of the three national government organizations that oversees infrastructure projects. As part of its mandate, the DPWH is in responsibility of planning public works projects, flood control measures, national highways and bridges, and water resources projects. It is also in responsible of planning, constructing, and maintaining national highways, bridges, and large flood control systems. Infrastructure management is indeed an important matter to a particular country. Improvements to public infrastructure have an impact on inflation and the external current account. It leads to a worsening current account, hence aiding external re-balancing (Komatsuzaki, 2016). It also generates greater domestic demand initially and consequently inflationary pressures. Over time, the rise in supply capacity alleviates the inflationary pressures.

It is also mentioned that the public frequently raised objections regarding the quality of the infrastructure projects, project completion delays, suspected corruption, and legal difficulties involving the acquisition of right-of-way. As a result, a variety of issues arise throughout project building. Certain components are incorporated in most projects. If the project is to be finished within a given time-frame, cost, and performance parameters, they frequently entailed significant expense and a huge number of tasks that must be meticulously planned and organized.

Engineering Management

Like any other project, managing an engineering project starts with the same set of principles. To produce successful projects, however, working with engineers necessitates a certain amount of technical understanding. They should be knowledgeable in sprint planning, user story mapping, and defining product requirements, among other things (Ahmed, 2022). Engineering management that is effective is crucial. It affects engineering facilities, major projects, clients, employees, and the general public in addition to an organization's financial results (Brown, 2022). The majority of developing nation governments lack the funding necessary to complete significant infrastructure projects (OECD, 2018), a report that identified the growing disparity between the public sector's capabilities and the necessary future infrastructure expenditure. Africa's financial imbalance has resulted in inadequate infrastructure, which has significantly impeded the continent's economic and social progress. Because of this, China is today the primary alternative source of funding for the majority of African nations. For instance, the China Development Bank has grown to be a significant investor in SSA infrastructure projects (Muchapondwa et al., 2016). Governments in developing nations also have a responsibility to supply the desperately needed infrastructure. However, under-investment by the government is the primary cause of the under-performance of sectors like water, as noted by Chan and Effah Ameyaw (2013) and using Ghana as an example, necessitating private sector involvement through funding. The notion of project management frequently minimizes development to a straightforward and easy consultation procedure that results in a mutually agreed set of needs. This is rarely the case, though, with major public infrastructure projects because significant political battles frequently impede growth.

Risk Project Analysis

Conducting a risk assessment and identifying potential threats is the first step towards successful risk management. This can be accomplished through document analysis, stakeholder interviews, and brainstorming sessions. As soon as such risks are discovered, their likelihood and impact must be evaluated. This can be achieved through a quantitative or qualitative analysis (Sofio, 2023). Risks are the last thing every project wants to deal with. Projects are made to capitalize on possibilities and resources, which also bring risk, uncertainty, and difficulties. As a result, risk management becomes a crucial component of every successful project. The risk management process is covered in the project risk management management plan, and the risk assessment meeting enables the project team to recognize, classify, rank, and take proactive measures to reduce or eliminate these risks (Simplilearn, 2023).

Risk project analysis is a strategy for implementing risk management concepts in a way that is efficient and long-lasting when project managers and workers are involved. When these parameters are met, it is possible to manage building construction wastes effectively and limit their capacity. One of the main objectives of monitoring a construction site is to identify problems and flaws both before and during the project in order to prevent errors or non-compliance with design or technical criteria. Additionally, the site manager or site monitoring team is responsible for coordinating all activities and functions amongst decision-makers, developers, contractors, and suppliers. Monitoring the building site can make the difference between a project's success and failure. Many structural and service faults in the construction sector are primarily the product of inefficient site management and monitoring, rather than flaws in the design or the materials utilized. Various project management methodologies have been employed by local government agencies to enhance their project efficacy and efficiency. Infrastructure growth in the country is limited by a bad business environment; inadequacies in planning, coordination, and finance; and a decrease in private sector involvement in infrastructure provision. In order to put the nation into a positive cycle of growth and development, the document presents a road map for promoting the improvement and expansion of infrastructure services (World Bank, 2005). For sustained infrastructure development, it is highly advised that a strict program of fiscal reform be put in place, that major sectors (power, roads, and water in particular) be further reformed to improve cost recovery, competition, and institutional credibility, and that corruption be drastically reduced; that central oversight of investment planning and coordination be strengthened; and that a small number of carefully chosen investments be made through public-private partnerships in order to swiftly improve service delivery and address significant bottlenecks.

Synthesis

The reviewed literature and studies indicate that engineering techniques influence construction projects involving risk prevention and building management. These procedures, however, include a wide range of topics, including managing building construction rules and regulations and waste material expectations. The researcher looked into studies and books that have given a deeper grasp of the details of these crucial engineering procedures so that they would be ready to tackle any hazards that might develop during the construction project.

2. METHODS

Research Design

A research design is a strategy for obtaining and analyzing data in order to provide desired knowledge. It offers a comprehensive explanation of how an inquiry operates. It would usually cover the techniques used to collect the data, the instruments that would be employed, their intended uses, and the anticipated analytic techniques. It ensures that the relevant data is precisely acquired in accordance with the current problem and outlines the protocols to be followed for data gathering and analysis. This study is quantitative in character and employs a descriptive research methodology. A descriptive study is concerned with the relationships or situations that already exist, as well as the opinions or emerging trends. It also describes and interprets the data.

Study Site and Participants

The study's locality provides information on the study's physical location. It specifies or shows the precise building sites that are being used in the study. Thus, this study was conducted at the DPWH office in Barangay Talite, Aguinaldo, Ifugao. Talite is a barangay in the municipality of Aguinaldo, in the province of Ifugao. Its population as determined by the 2020 Census was 882. This represented 4.17% of the total population of Aguinaldo. Aguinaldo is geographically located at 16°58'20" latitude and 121°20'45" longitude. It lies on the eastern part of the province, bounded on the north by Mt. Province, on the south by the Magat Dam Reservoir, on the east by the municipality of Alfonso Lista, and on the west by Mayoyao and Lagawe municipalities. The respondents of this study are the engineers of the Department of Public Works and Highways (DPWH) of Aguinaldo, Ifugao who are currently employed in DPWH Aguinaldo.

Population, Sample Size and Sampling Method

Engineers who meet the inclusion criteria pertinent to the study's goals are the study's target audience. In order to balance the demand for significant insights with real-world limitations like time, money, and accessibility, a sample size of 20 engineers was chosen. Purposive or convenience sampling techniques were used to select the study's scope, guaranteeing that the participants were appropriate for addressing the objectives of the study while preserving viability given the resources at hand.

Distribution of Respondents

Office Assignment	Total Population	Overall Total
DPWH Aguinaldo	20	20
Total	20	20

Instruments

A questionnaire was the main data gathering method for this investigation. The survey was adopted from the unapproved study of Boclog (2023) and consists of two primary sections. The first set of questions is designed to extract key information about the respondents' profile, such as age, years of engineering experience, and highest level of education attained. The items or problem statements that represent the engineers' experiences with project monitoring procedures in accordance with their degree of seriousness make up the second section of the questionnaire. The potential solution statements, which re-Present engineers' opinions on project monitoring procedures based on their respective degree of severi-

ty, make up the third section. The data gathered from the respondents were interpreted following the scale below:

Scale on Project Management Problems and its Possible Solutions

Scale	Mean Range	Description
4	3.25 - 4.00	Strongly agree
3	2.50 – 3.24	Agree
2	1.75 – 2.49	Disagree
1	1.00 – 1.74	Strongly disagree

Data Gathering Procedures

To ensure a legitimate and authentic study, the researcher wrote a request letter to Engr. Romel N. Balajo, the head of DPWH Aguinaldo's office, requesting permission to survey the engineers working there. Upon receiving permission, the researcher personally delivered the survey questionnaire to each respondent to ensure that it would be returned once they completed it. The researcher also ensured that the respondents' identities and the information collected from them would be kept private and used exclusively for this study. The information that needs to be collected were counted, tabulated, evaluated, and analyzed.

Data Analysis

A statistical analysis was performed on the information that the engineers provided in response to the issues they have with project management problems, as well as potential remedies which confers to the following statistical tools:

1. In determining the profile of the respondents, frequency and percentage count were used.
2. In analyzing results for the project management problems encountered by engineers and the possible solutions, weighted mean was used through Likert Scale.
3. Analysis of variance was used to find out if there is a significant difference on the respondents' perception on the degree of seriousness in project management problems according to their age, educational attainment and years of experience as engineers.

Ethical Considerations

An ethical study involves a number of issues that need to be resolved. The participants in this study signed a consent document guaranteeing that their participation was not coerced; instead, they completed the survey freely and without reluctance, knowing that their answers would be kept confidential as promised by the researcher. Consequently, those respondents who opt to remain anonymous were taken into account. Furthermore, it was guaranteed that no human being will be mistreated or damaged in the course of this research, or when collecting and analyzing the data.

3. RESULTS

Part 1. Profile of the Respondents in terms of the following:

Table 1. Profile of Respondents

Age	Frequency	Percentage
26-30	6	30.00
31-35	2	10.00
36-40	5	25.00
41-45	4	20.00
46-50	2	10.00
51-55	1	5.00
Total	**20**	**100**

Years of experience as an engineer	Frequency	Percentage
1-10 years	14	70.00
11-20 years	4	20.00
21-30 years	2	10.00
Total	**20**	**100**

Highest Educational Attainment	Frequency	Percentage
Bachelor's Degree	17	85.00
Master's Degree	3	15.00
Total	**20**	**100**

The profile of the respondents in term of age shows that 26 to 30 years (30%) makes up a sizable share of the sample. Given that they are usually in their early to mid-career stages of engineering, engineers in this age range may respond differently to project management challenges because of their relative inexperience with contemporary techniques and issues. 36–40 Years (25%): According to the report, this age group is the second largest. Compared to those in the 26–30 age range, these engineers might have more years of experience, which could mean they can provide more sophisticated insights into project management issues. Twenty percent of engineers are between the ages of 41 and 45, and they usually have a lot of professional experience. Their answers may indicate more mature viewpoints on the difficulties of project management.10% of those in the 31–35 age range and 10% of those in the 46–50 age range are underrepresented. With those in the 31–35 range having comparatively more experience and those in the 46–50 range approaching the end of their careers, engineers in these ranges may provide a variety of viewpoints. 51–55 Years (5%): This sample contains little representation from senior or experienced engineers who may offer in-depth, long-term views about project management problems, as there is only one engineer in this age group.

The profile of respondents in term of years of experience as engineers shows that 70% of respondents have between one and ten years of experience, the bulk of questioned engineers are still in their early stages. This implies that these engineers' experiences and difficulties are primarily those of younger professionals who might still be honing their craft and grasp of intricate project management settings. 20% of the respondents had between 11 and 20 years of employment, indicating a considerable amount

of work experience. This group of engineers has a good deal of field experience under their belts and has probably dealt with a range of project management challenges. The most seasoned engineers, who make up only 10% of the respondents, have between 21 and 30 years of experience. Given their level of experience, they have likely encountered a wide range of difficulties throughout their careers and may provide insightful analysis of long-term patterns in project management.

The profile of respondents in term of highest educational attainment shows that the majority of engineers holding a bachelor's degree (85%) are in their early to mid-career stages. Professionals with a few years of experience or those who have recently entered the field are probably included in this group. The comments from this group might highlight issues that are typical of people with less advanced academic training and might show a more basic awareness of project management issues. Master's degree holders in engineering (15%) have probably pursued more training or specialization. Professionals having a deeper understanding of advanced technical ideas and project management procedures may be included in this group. They may have a greater degree of theoretical and practical expertise based on their responses. They might also be more knowledgeable about cutting-edge techniques and creative fixes for project management issues.

Part 2. Problems Encountered by the Respondents in infrastructure Project Management

The problems encountered by the respondents in infrastructure project management are classified in terms of technical infrastructure requirements, manpower, construction site, construction materials, safety gears/outfits and finance.

2.1 Technical Infrastructure Requirements

Table 2 shows the problem encountered by the respondents in infrastructure project management in terms of technical infrastructure requirements.

Table 2. Problem encountered by the Respondents in Infrastructure Project Management in terms of Technical Infrastructure Requirements.

	AS TO TECHNICAL INFRASTRUCTURE REQUIREMENTS	Mean	Interpretation
1.	Starting construction without building permit	3.25	Strongly Agree
2.	Owner initiated changes in design of plans	2.95	Agree
3.	Insufficient form of works	2.80	Agree
4.	Defects that occur in an area where no one takes responsibility	2.75	Agree
5.	Lack of detail in the plans and specifications	2.35	Disagree
6.	Lack of organizational chart that jeopardize all the responsibilities towards construction	2.30	Disagree
Composite Mean		**2.73**	**Agree**

Table 2 shows the problems on technical infrastructure requirements. With the highest mean of 3.25, respondents strongly agree that starting construction without a building permit is the most critical issue. This reflects the seriousness of this concern. It is a major legal offense to begin building without a permit; this can result in fines, legal action, and project suspension. In order to guarantee that building projects adhere to safety norms and laws, permits are necessary. The mean of 2.95 indicates that

respondents see owner-initiated changes in design as a significant concern. It is the second most critical issue, reflecting its impact on project execution. The timeline, budget, and general execution of the project may all be affected by changes made by the owner. To lessen these changes' negative effects on the project's success, effective management is crucial. A mean of 2.8 indicates that respondents agree on the importance of addressing insufficient form of works. Since it is placed third, it is a serious issue but not the most urgent one. In order to meet construction criteria and guarantee that structures are constructed appropriately, forms of work are necessary. With a mean of 2.75, respondents agree that defects occurring in areas with unclear responsibility are a notable issue. This comes in at number four, showing that while it is a serious worry, it is not as urgent as other issues. Defects may go unnoticed or unaddressed when there is no assigned individual or group in charge of particular tasks, which could pose issues for the project's overall durability and quality. The mean of 2.35 suggests that while respondents disagree that the lack of detail in plans and specifications is a concern, it is less pressing compared to higher-ranked issues. To ensure that every component satisfies the project's criteria and to direct the construction process, comprehensive plans and specifications are essential. With a mean of 2.3, respondents disagree that the lack of an organizational chart is an issue, though it is the least significant of the concerns listed. Project managers need to be able to visually depict roles, responsibilities, and reporting hierarchies, which is what an organizational chart does. The composite mean of 2.73 shows that most respondents concur that the specified technological infrastructure requirements are significant issues. This average shows that there is a widespread recognition of the importance of these problems in construction management.

2.2 Manpower

Table 3 shows the problems encountered by the respondents in infrastructure project management in terms of manpower.

Table 3. Problems encountered by the Respondents in Infrastructure Project Management in terms of Manpower.

	AS TO MANPOWER	Mean	Interpretation
1.	Untrained laborers that might cause errors in their respective workplaces	3.05	Agree
2.	Lack of manpower that may lead to any untoward incidents with regards to construction	3.00	Agree
3.	Incompetent workers/laborers	2.95	Agree
	Composite Mean	**3.00**	**Agree**

Table 3 shows the problems on manpower. With a mean of 3.05 and “agree" interpretation, respondents view untrained laborers as the most critical manpower issue. This indicates that they believe untrained workers are a significant concern in ensuring the quality and success of construction projects. Construction problems, delays, and greater expenses can result from the mistakes made by unskilled workmen. A mean score of 3.00 and a agree interpretation indicate that lack of manpower is a major concern for respondents. Inadequate workforce can cause interruptions and possible cost overruns by delaying project time-frames. Inadequate workforce can also lead to hazardous working conditions, raising the possibility of mishaps and accidents at the building site. With a mean of 2.95, respondents

agree that incompetent workers/laborers are identified as a significant issue, though not as severe as untrained laborers or lack of manpower. Incompetent laborers can cause errors and delays by having a detrimental effect on the project's efficiency and construction quality. Overall, respondents agree that manpower-related difficulties are major concerns in infrastructure management, as indicated by the composite mean of 3.00. This average shows that, in order to guarantee the success of building projects, there is a general consensus about the significance of addressing certain manpower-related challenges.

2.3 Construction Site

Table 4 shows the problems encountered by the respondents in infrastructure project management in terms of construction site.

Table 4. Problems encountered by the Respondents in Infrastructure Project Management in terms of Construction Site.

	AS TO CONSTRUCTION SITE	Mean	Interpretation
1.	Bad working positions, often in confined spaces and debris caused by natural calamities	3.15	Strongly Agree
2.	Working at heights	3.00	Agree
3.	Exposure to radiation	2.80	Agree
3.	Crush injuries in excavation works	2.80	Agree
3.	Working near, in, or over water	2.80	Agree
	Composite Mean	**2.91**	**Agree**

Table 4 shows the problems on construction site. The mean score of 3.15 indicates agreement that bad working positions, including confined spaces and debris from natural calamities, is a major concern on construction sites. This is the most critical issue according to the respondents. Owing to restricted movement and inadequate ventilation, working in cramped areas might result in mishaps and health problems. Debris from natural disasters can produce dangerous conditions that put worker safety in much greater danger. With a mean score of 3.00, respondents strongly agree that working at heights is a significant safety concern. This issue is ranked second, highlighting its importance. Inadequate workforce can also lead to hazardous working conditions, raising the possibility of mishaps and accidents at the building site. With a mean score of 2.80, workers agree that crush injuries in excavation works are a significant safety concern. Because trench collapses and heavy machinery have the potential to cause serious injuries or even fatalities, crush injuries during excavation work are a significant safety concern. A mean score of 2.80 shows that workers agree that exposure to radiation is a significant issue on construction sites. Radiation exposure is a major worry since it can have long-term health repercussions like cancer. To properly manage these risks and preserve workers' health, radiation monitoring, protective equipment, and adherence to safety rules are crucial. With a mean score of 2.80, workers also agree that working near, in, or over water presents significant safety concerns on construction sites. Water dangers can result in mishaps like drowning or slips, so it's critical to have the right safety barriers, emergency procedures, and training in place to mitigate these risks. Every obstacle encountered on a building site has different dangers that could affect project results and worker safety as respondents agree upon with 2.91 composite mean.

2.4 Construction Materials

Table 5 shows the problems encountered by the respondents in infrastructure project management in terms of construction materials.

Table 5. Problems encountered by the Respondents in Infrastructure Project Management in terms of Construction Materials.

	AS TO CONSTRUCTION MATERIALS	Mean	Interpretation
1.	Improper testing of steel bars that may lead to danger or destruction of the building and the people near to it	3.15	Agree
2.	Misunderstandings about the performance of the product, its specifications and limitations	2.90	Agree
3.	Exposure to dangerous substances (chemical and biological)	2.85	Agree
3.	Lack of construction equipment and service vehicle	2.85	Agree
3.	Lack of knowledge about the performance of the product or system such as heavy machineries	2.85	Agree
4.	Being struck by falling objects and crushed by a workplace vehicle	2.75	Agree
	Composite Mean	**2.89**	**Agree**

Table 5 shows the problems on construction materials. With a mean of 3.15, improper testing of steel bars is viewed as the most critical issue in the context of construction materials. A building's structural integrity must be ensured by appropriate steel bar testing. Building failures that put lives in danger and cause significant damage might result from improper testing or from testing done incorrectly. With a mean score of 2.9, misunderstandings about product performance are identified as a significant issue, ranked second in terms of concern. Irrespective material selections may result from a lack of awareness of the performance characteristics of the chosen materials, thus compromising project requirements. A mean score of 2.85 indicates that exposure to dangerous substances is a notable concern, sharing the third rank. Respondents agree that handling hazardous substances is a significant issue. Workers may experience serious health consequences, such as long-term infections, skin ailments, and respiratory disorders, as a result of being exposed to hazardous chemicals and biological agents. A mean of 2.85 indicates that the lack of construction equipment and service vehicles is also a significant issue, sharing the third rank. Sufficient vehicles and equipment are necessary to finish construction projects quickly and on time. With a mean of 2.85, lack of knowledge about heavy machinery performance is identified as a significant issue, equally ranked with exposure to dangerous substances. It is crucial to comprehend the performance features of heavy machinery in order to operate it efficiently and avoid mishaps. With a mean score of 2.75, being struck by falling objects and crushed by workplace vehicles is a significant concern, though it is less critical compared to improper testing of steel bars and misunderstandings about product performance. Workplace vehicle accidents and falling object mishaps can result in serious injuries or even death. The composite mean of 2.89 suggests that respondents are generally in accord regarding the importance of matters pertaining to building materials. Regarding these topics, the overall grade indicates a moderate level of worry. There are a number of significant problems with building

materials, everyone agrees that solving these problems is essential to effective construction management (Gomes & Romão, 2016).

2.5 Safety Gears/Outfits

Table 6 shows the problems encountered by the respondents in infrastructure project management in terms of safety gears/outfits

Table 6. Problems Encountered by the Respondents in Infrastructure Project Management in terms of Safety Gears/Outfits.

	AS TO SAFETY GEARS/OUTFITS	Mean	Interpretation
1.	Improper use of harness and high visibility vest and pants	3.25	Strongly Agree
2.	Lack of safety protection (PPE) personal protective equipment, head protection, eye protection, hand and foot protection and ear protection	3.20	Strongly Agree
	Composite Mean	**3.22**	**Strongly Agree**

Table 6 shows the problems on safety gears/outfit. With a mean score of 3.25, improper use of harness and high visibility vest and pants is viewed as the most critical safety concern related to safety gears. Harnesses, high visibility vests, and pants are essential for worker safety, especially for tasks at heights and in high-traffic areas. Improper use of these items can lead to severe accidents or fatalities. A mean score of 3.20 indicates that lack of safety protection (PPE) is a major concern. PPE is necessary to protect workers from a variety of risks found on construction sites. The composite mean of 3.22 suggests that there is broad consensus among respondents on the crucial importance of safety gear and outfit issues. Safety gear on construction sites is a major source of worry (Barker & Baroud, 2018).

2.6 Finance

Table 7 shows the problems encountered by the respondents in infrastructure project management in terms of finance.

Table 7. Problems Encountered by the Respondents in Infrastructure Project Management in terms of Finance.

	AS TO FINANCE	Mean	Interpretation
1.	Sudden increase in price of construction materials	3.20	Agree
2.	Unforeseen additional/extra expenses	2.95	Agree
3.	Limited budget	2.85	Agree
	Composite Mean	**3.00**	**Agree**

Table 7 shows the problems on finance. With a mean score of 3.20, a sudden increase in the price of construction materials is identified as the most critical financial issue. Changes in the cost of materials can cause large budget overruns, which can negatively impact a project's overall financial stability. With

a mean score of 2.95, unforeseen additional or extra expenses is a significant concern, ranked second in terms of financial issues. Budgets can be strained and a building project's financial viability impacted by unforeseen costs. A mean score of 2.85 indicates that limited budget is a notable concern, ranking third among financial issues. A tight budget might limit the project's scope and have an effect on the caliber of the components and labor. There is broad consensus among respondents regarding the significance of financial difficulties in construction management, as seen by the composite mean of 3.00.

2.7 Summary of Problems Encountered

Table 8 shows the summary table of the problems encountered by the respondents in infrastructure project management

Table 8. Summary of Problems Encountered

	SUMMARY OF PROBLEMS ENCOUNTERED	Mean	Interpretation
1.	Safety Gears/Outfits	3.22	Strongly Agree
2.	Finance	3.00	Agree
2.	Manpower	3.00	Agree
3.	Construction Site	2.91	Agree
4.	Construction Materials	2.89	Agree
5.	Technical Infrastructure Requirements	2.73	Agree
	Composite Mean	**2.96**	**Agree**

Table 8 shows the summary of problems encountered in infrastructure project management, specifically from the perspective of DPWH engineers, reflects the following: Safety Gears/Outfits emerged as the most strongly agreed-upon issue, with a mean score of 3.22. This suggests that engineers are particularly concerned about the availability and quality of safety equipment. Finance and Manpower both received a mean score of 3.00, indicating a general agreement that these are significant issues. They are ranked second, showing that financial resources and workforce availability are critical concerns in project management. Construction Site (mean of 2.91) and Construction Materials (mean of 2.89) are also areas where engineers agree there are challenges, ranking third and fourth, respectively. Technical Infrastructure Requirements is ranked fifth, with a mean score of 2.73, showing a slightly lower level of concern compared to the other issues.

Part 3. Possible Solutions on Project Management Problems Encountered by the Respondents

3.1 Technical Infrastructure Requirements

Table 9 shows the possible solutions on project management problems encountered by the respondents in terms of technical infrastructure requirements.

Table 9. Solutions on Infrastructure Project Management in terms of Technical Infrastructure Requirements.

	AS TO TECHNICAL INFRASTRUCTURE REQUIRE-MENTS	Mean	Interpretation
1.	Having the construction permit before starting the building project	3.60	Strongly Agree
2.	Sufficient form of works	3.50	Strongly Agree

3.	Preventing defect that might occur in an area so that one would be forced to take the responsibility	3.45	Strongly Agree
4.	Write all the details in the plans and specifications	3.40	Strongly Agree
5.	Detailed plans and specifications	3.35	Strongly Agree
5.	Avoiding crush injuries in excavation works	3.35	Strongly Agree
	Composite Mean	**3.44**	**Strongly Agree**

Table 9 shows the solutions on technical infrastructure requirements problems. A mean score of 3.60 indicates that having the construction permit before starting the building project is viewed as the most critical technical requirement. Obtaining a construction permit guarantees that the project complies with all applicable building laws, rules, and safety requirements. With a mean score of 3.50, sufficient form of works is identified as a crucial technical requirement, with respondents strongly agreeing on its importance. For construction to have the desired structural integrity and quality, it is imperative that the formwork be sufficient. A mean score of 3.45 signifies that preventing defects is a highly regarded technical requirement. Defect prevention guarantees the built infrastructure's long-term functionality and durability. With a mean score of 3.40, writing all details in the plans and specifications is considered a critical technical requirement. Thorough plans and specifications guarantee that the project is carried out as intended by giving precise instructions for construction jobs. A mean score of 3.35 indicates that detailed plans and specifications are a significant concern. Respondents strongly agree that these elements are crucial for successful project execution. Achieving the intended results and an effective project execution require precise planning and specifications. The mean score of 3.35 signifies that avoiding crush injuries in excavation works is a significant concern for construction safety. In excavation operations, crush injuries are a major safety risk that can result in fatalities or serious injuries. There is broad consensus among respondents about the significance of solving technological infrastructure requirements, as seen by the composite mean of 3.44.

3.2 Manpower

Table 10 shows the possible solutions on project management problems encountered by the respondents in terms of manpower

Table 10. Solutions on Infrastructure Project Management in terms of Manpower.

	AS TO MANPOWER	Mean	Interpretation
1.	Competent workers/laborers	3.60	Strongly Agree
2.	Ensuring manpower to prevent any incidents with regard to the construction	3.55	Strongly Agree
3.	Proper training of laborers to do well on their respective workplac-es	3.45	Strongly Agree
	Composite Mean	**3.53**	**Strongly Agree**

Table 10 shows the solutions on manpower problems. A mean score of 3.60 indicates that having competent workers and laborers is viewed as the most critical aspect of manpower management.

Respondents strongly agree on the importance of employing skilled and knowledgeable workers for successful project execution. Skilled laborers are essential to guaranteeing superior construction projects because they possess the requisite knowledge and expertise to carry out duties efficiently. With a mean score of 3.55, ensuring adequate manpower to prevent incidents is recognized as a significant aspect of manpower management. A safe working environment and the prevention of accidents are ensured by having an adequate number of workers on the construction site. A mean score of 3.45 shows that proper training of laborers is a crucial factor for manpower management. Respondents strongly agree that providing proper training is essential for ensuring that laborers perform well in their respective roles. There is broad consensus regarding the importance of different manpower-related challenges in construction management, as evidenced by the composite mean of 3.53. The high average score suggests that respondents understand the significance of skilled labor, efficient management of the workforce, and appropriate training as necessary elements of successful construction projects.

3.3 Construction Site

Table 11 shows the possible solutions on project management problems encountered by the respondents in terms of construction site.

Table 11. Solutions on Infrastructure Project Management in terms of Construction Site.

	AS TO CONSTRUCTION SITE	Mean	Interpretation
1.	Be sure that you are wearing safety gears for unexpected matters (excavation works)	3.65	Strongly Agree
2.	Wearing anti-radiation gears to avoid exposure to radiation	3.60	Strongly Agree
3.	Special training in working at heights	3.55	Strongly Agree
3.	Be sure that you are wearing safety gears for unexpected matters (working near, in, or over water)	3.55	Strongly Agree
4.	Work at the safety positions, often in confined spaces	3.40	Strongly Agree
	Composite Mean	**3.55**	**Strongly Agree**

Table 11 shows the solutions on construction site problems. A mean score of 3.55 indicates that wearing safety gears for unexpected matters in excavation works is considered the most crucial safety measure on the construction site. Workers engaged in excavation activities run the risk of encountering dangerous materials, falling items, and cave-ins. Wearing the right safety equipment is crucial to shielding employees from these dangers. A mean score of 3.60 signifies that wearing anti-radiation gears to avoid exposure to radiation is a highly significant safety concern. Respondents strongly agree on the importance of protective gear for radiation exposure. Radiation exposure can result in both immediate and long-term health hazards, as well as major health issues. Wearing protective gear is essential to reducing these dangers. With a mean score of 3.55, special training in working at heights is recognized as a critical safety measure. Because working at heights is inherently risky, falls and accidents can be avoided with the right training. A mean score of 3.55 indicates that wearing safety gears for unexpected

matters when working near, in, or over water is a crucial safety measure. For work involving water, compliance with safety requirements is essential to avert mishaps and guarantee safety. A mean score of 3.40 shows that working at safety positions in confined spaces is a significant safety concern. There are particular concerns associated with confined places, such as restricted access for emergency response and the possibility of dangerous environments. There is broad consensus regarding the significance of several construction site safety measures, as seen by the composite mean of 3.55.

3.4 Construction Materials

Table 12 shows the possible solutions on project management problems encountered by the respondents in terms of construction materials.

Table 12. Solutions on Infrastructure Project Management in terms of Construction Materials

	AS TO CONSTRUCTION MATERIALS	Mean	Interpretation
1.	Wear safety gears to avoid being struck by falling objects and being struck or crushed by a workplace vehicle	3.65	Strongly Agree
2.	Wear mask for safety exposure to dangerous substances (chemical and biological)	3.50	Strongly Agree
3.	Proper testing of steel bars that may lead to danger or destruction of the building and to the people near it	3.40	Strongly Agree
4.	Be sure that you understand about the performance of the product, its specification and limitations	3.35	Strongly Agree
5.	Sufficient equipment and enough service vehicle for transportation	3.30	Strongly Agree
6.	Trained laborers that can cause errors on their workplac-es	3.05	Strongly Agree
	Composite Mean	**3.37**	**Strongly Agree**

Table 12 shows the solutions on construction materials problems. A mean score of 3.65 indicates that wearing safety gears to avoid being struck by falling objects and being crushed by a workplace vehicle is considered the most important safety measure related to construction materials. Respondents strongly agree on the necessity of this safety gear. A mean score of 3.50 reflects that wearing masks for safety exposure to dangerous substances is highly significant. Workers are shielded from potentially fatal biological agents, dust, and hazardous chemicals by masks and respirators. A mean score of 3.40 indicates that proper testing of steel bars is crucial. Testing steel bars guarantees that they fulfill strength and safety standards, which is crucial for the building's structural integrity. With a mean score of 3.35, understanding the performance, specifications, and limitations of products is a significant concern. Understanding the limitations and performance traits of building materials guarantees their proper and efficient use. A mean score of 3.30 shows that having sufficient equipment and service vehicles for transportation is an important issue. Equipment shortages and other transportation-related delays can be avoided with effective logistics management. A mean score of 3.05 indicates that having trained laborers is also an important concern, though it is ranked slightly lower. Respondents Strongly Agree on the importance of training to prevent errors on the construction site. Respondents strongly agree regarding

the significance of several construction material-related challenges, as seen by the composite mean of 3.37.

3.5 Safety Gears/Outfits

Table 13 shows the possible solutions on project management problems encountered by the respondents in terms of safety gears/outfits.

Table 13. Solutions on Infrastructure Project Management in terms of Safety Gears/Outfits.

	AS TO SAFETY GEARS/OUTFITS	Mean	Interpretation
1.	Proper use of harness and high visibility vest and pants	3.50	Strongly Agree
2.	Often routine inspection of PPE (if there are dents, cracks deterioration)	3.35	Strongly Agree
	Composite Mean	**3.42**	**Strongly Agree**

Table 13 shows the solutions on safety gears/outfits problems. A mean score of 3.50 indicates that the proper use of harnesses and high-visibility vests and pants is considered the most important aspect of safety gears and outfits. Respondents strongly agree on the critical role of these safety measures in preventing accidents on the construction site. By making sure that employees are clearly visible to others on the site, high-visibility vests and pants lower the possibility of accidents involving machinery and cars. A mean score of 3.35 indicates that routine inspections of PPE are also a highly important safety measure. Maintaining the effectiveness of PPE requires regular inspections to assist find any damage or wear and tear. The composite mean of 3.42 indicates a high degree of agreement regarding the significance of safety clothing and equipment.

3.6 Finance

Table 14 shows the possible solutions on project management problems encountered by the respondents in terms of finance.

Table 14. Solutions on Infrastructure Project Management in terms of Finance.

	AS TO FINANCE	Mean	Interpretation
1.	Be sure of knowing how to handle the estimated fund of the project	3.70	Strongly Agree
1.	Finished project on said due to avoid any additional cost	3.70	Strongly Agree
2.	Always update increase in price of construction ma-terials	3.60	Strongly Agree
	Composite Mean	**3.66**	**Strongly Agree**

Table 14 shows the solutions on financial problems. A mean score of 3.70 indicates that knowing how to handle the estimated fund of the project is a critical aspect of financial management. Respondents strongly agree that proper handling of project funds is essential for financial success. With a mean score of 3.70, completing the project on time to avoid additional costs is also highly valued. Maintaining client

satisfaction and creating future prospects are two benefits of meeting deadlines. A mean score of 3.60 indicates that updating for increases in the price of construction materials is an important financial consideration. Making sure the budget represents current expenses requires staying up to date with changes in material prices. There is broad consensus regarding the significance of efficient finance management in building projects, as evidenced by the composite mean of 3.66. Respondents strongly agree that being on top of material price fluctuations, finishing projects on schedule, and managing the project budget are all essential for achieving financial success.

3.7 Summary of Solutions

Table 15 shows the summary of the possible solutions on project management problems encountered by the respondents.

Table 15. Summary of Solutions.

	AS TO FINANCE	Mean	Interpretation
1.	Finance	3.66	Strongly Agree
2.	Construction Site	3.55	Strongly Agree
3.	Manpower	3.53	Strongly Agree
4.	Technical Infrastructure Requirements	3.44	Strongly Agree
5.	Safety Gears/Outfits	3.42	Strongly Agree
6.	Construction Materials	3.37	Strongly Agree
	Composite Mean	**3.50**	**Strongly Agree**

The summary of solutions agreed by DPWH engineers to address infrastructure project management problems reveals the following:

Finance is identified as the top solution, with a mean score of 3.66, indicating a strong consensus that financial strategies are critical for resolving issues in project management. Construction Site solutions rank second with a mean score of 3.55, reflecting strong agreement on the importance of effectively managing construction sites to overcome challenges. Manpower solutions are also highly agreed upon, with a mean score of 3.53, indicating that addressing workforce-related issues is seen as a vital solution. Technical Infrastructure Requirements and Safety Gears/Outfits are similarly prioritized, with mean scores of 3.44 and 3.42, respectively, showing strong agreement on the need to enhance technical requirements and safety measures. Construction Materials is ranked sixth, with a mean score of 3.37, though still within the "Strongly Agree" range, indicating that improving the availability and quality of construction materials is a recognized solution.

The composite mean of 3.50 indicates that, overall, the engineers strongly agree on the proposed solutions to address the problems in infrastructure project management.

Part 4. Significant difference on the perceptions of the respondents on the infrastructure project management problems according to their profile.

4.1 Age

Table 16. Significant difference on the problems encountered as to age

t-Statistics	Critical value (α=0.05)	Degree of Freedom	Decision	Result
1.50	24.99	15	Accept Hypothesis	Not Significant

Table 16 shows the test of significant difference of the respondents on problems they encountered when grouped according to age. There is no significant difference of respondents and their opinions on problems in infrastructure management when they are grouped according to age. Other factors beyond age may be impacting respondents' perceptions of infrastructure management problems, as their age does not appear to have a substantial impact on these perceptions. However, this result deviate the study of Chung, et. al. (2015) stating that there is a significant relationship on age and the working ability of the workers.

4.2 Years of Experience

Table 17. Significant difference of the respondents on the problems they encountered when grouped according to the years of experience.

t-Statistics	Critical value (α=0.05)	Degree of Freedom	Decision	Result
4.19	12.59	6.00	Accept Hypothesis	Not Significant

Table 17 shows the significant difference of the respondents' years of experience as engineers and the problems they encountered. The data indicates 4.19 t-statistic, 6 degree of freedom and a critical value of 12.59 which shows that there is no significant difference between the years of experience and the answers given to infrastructure management challenges, indicating that the engineers who were polled did not find their experience level to be a major factor in how they perceived these issues. This suggests that, at least in the context of the concerns addressed in the study, engineers with more and less experience share comparable opinions about the challenges encountered in infrastructure management. In the study of Ochonma, et. al (2018), it shows that there is an impact of the years of experience of workers in their job, which varies from the given result above.

4.3 Highest Educational Attainment

Table 18. Significant difference of the respondents' highest educational attainment and the problems they encountered.

t-Statistics	Critical value (α=0.05)	Degree of Freedom	Decision	Result
16.86	7.82	3	Reject Hypothesis	Significant

Table 18 shows the significant difference of the respondents' highest educational attainment and the problems they encountered. The substantial chi-square statistic 16.86, degree of freedom 3, and 7.815 critical value shows that respondents' responses to infrastructure management difficulties are influenced by their highest level of education which rejects the hypothesis. Engineers with varied educational backgrounds view these issues from different angles, and those with advanced degrees may have unique insights. This research implies that engineers' perspectives and methods for addressing infrastructure management problems may differ depending on their educational background. The result shows the same context in the study of Karimi & Taghaddos (2019) stating that the higher educational attainment a worker achieved, the lesser the problems he encounters in his field. In order to improve project management, place more value on ongoing education than expertise (Gomes & Romão, 2016).

Part 5. Proposed Measures

a. Technical Infrastructure Requirements. Implement strict protocols to guarantee that no construction begins without the necessary building permits. This will help prevent legal issues and ensure adherence to safety and regulatory standards. Establish a clear change management process that includes impact assessments, cost evaluations, and timelines to minimize disruptions caused by design alterations initiated by project owners.
b. Manpower. Provide Training Programs for Laborers. Invest in regular training and upskilling programs to ensure that all laborers are equipped with the necessary skills to perform their tasks correctly, reducing the likelihood of errors. Develop a strategic workforce plan that ensures adequate manpower is available at all stages of the project, mitigating risks associated with labor shortages.
c. Construction Site. Introduce comprehensive safety protocols for working in confined spaces, including proper ventilation, monitoring systems, and emergency procedures to protect workers. Implement stringent safety measures for working at heights, including the use of fall protection systems and thorough safety training for all personnel involved.
d. Construction Materials. Ensure that all steel bars undergo proper testing and quality checks before use to prevent structural failures and enhance building safety. Establish clear communication channels to ensure all stakeholders have a thorough understanding of material performance, specifications, and limitations, minimizing misunderstandings.
e. Safety Gears/Outfits. Conduct regular training sessions on the correct use of harnesses, high visibility gear, and other safety equipment to reduce accidents and injuries. Implement strict policies to guarantee that all workers have access to and are required to use appropriate PPE, including head, eye, hand, and foot protection.
f. Finance. Develop a financial contingency plan that accounts for potential increases in material costs, ensuring the project can adapt to market changes without compromising budgetary constraints. Establish a reserve fund within the project budget to cover unexpected costs, ensuring financial stability and continuity throughout the project lifecycle.

4. DISCUSSION

Profile of the Respondents

The respondents' profile shows a diverse range of ages, experiences, and educational backgrounds. The largest age group is 26-30 years (30%), typically in early to mid-career stages, followed by 36-40 years (25%) with more experience, and 41-45 years (20%) offering mature viewpoints. The 31-35 and 46-50

age groups each represent 10%, providing varied perspectives, while the smallest group, 51-55 years (5%), consists of senior engineers.

Regarding experience, 70% have 1-10 years, indicating most are early-career professionals. Those with 11-20 years make up 20%, and the most seasoned engineers with 21-30 years of experience constitute 10%, offering insights into long-term project management trends.

In terms of education, 85% hold a bachelor's degree, likely in early to mid-career stages, while 15% have a master's degree, suggesting advanced expertise and specialization in project management. Badewi (2016) asserted that the profile or background of project engineers is one of the important factors in the success of construction projects. Hence, the profile of the respondents in this study is included.

Problems Encountered by Respondents in Project Management

The respondents identified several key problems in project management. The most critical issue in technical infrastructure requirements is starting construction without a building permit, followed by owner-initiated changes in design plans and insufficient forms of work. Defects with unclear responsibility are also significant, while the lack of detail in plans and the absence of an organizational chart are considered less pressing. According to Sözüer & Spang (2014), every project is different and requires targeted preparation to ensure a seamless transition throughout the approval stage.

Manpower issues highlight untrained laborers and a lack of manpower as major concerns, with incompetent workers also being notable. Organizational projects must be completed on time through teamwork, and the project manager bears responsibility for the project's successful conclusion (Livesey, 2016).

Construction site problems are led by bad working positions and debris from natural calamities, followed by working at heights and risks such as exposure to radiation, crush injuries in excavation, and working near water. Construction managers may efficiently prioritize safety actions by knowing the mean scores and related hazards, allowing them to focus on the most important problems first (Radujkovic & Sjekavica, 2017).

Regarding construction materials, improper testing of steel bars is the most critical issue, with misunderstandings about product performance, exposure to dangerous substances, and lack of equipment and knowledge about heavy machinery also being significant concerns. Falling objects and workplace vehicle accidents are less critical but still important. There are a number of significant problems with building materials, everyone agrees that solving these problems is essential to effective construction management (Gomes & Romão, 2016).

Safety gear problems focus on the improper use of harnesses and high visibility gear as the most critical safety concern, followed by a lack of personal protective equipment. Safety gear on construction sites is a major source of worry (Barker & Baroud, 2018).

Financial issues are led by sudden increases in the price of construction materials, followed by unforeseen additional expenses and limited budgets. There is a lot of worry about efficiently controlling expenses during a building project which confers to the study of World Bank (2016) highlighting the importance of financial management in a firm or an institution.

Possible Solutions on Project Management Problems Encountered

The respondents proposed several solutions to address project management problems. There is a great deal of worry regarding the different technical facets of building projects (American Society of Civil Engineers, 2021).

Regarding technical infrastructure requirements, they emphasized the importance of obtaining construction permits before starting projects, ensuring sufficient formwork, preventing defects through quality assurance in procurement and rigorous planning and designing as well as continuous maintenance and supervision, and having detailed plans and specifications. These measures are seen as crucial for compliance with laws, structural integrity, and effective project execution.

For manpower issues, the focus is on employing competent workers through comprehensive safety training, ensuring adequate manpower to prevent incidents through safety protocols, and providing proper training as well as regular inspections in safety. Skilled and trained laborers are essential for quality construction and safety. Morris, et al. (2021) also discussed that the government should be responsible for the construction needs and for those who labor in it.

On construction site safety, wearing appropriate safety gear for unexpected matters, such as during excavation works and near water, is considered critical. Dewlaney & Hallowell (2012) show a great deal of care for maintaining safety in several areas of the building site setting. Additionally, anti-radiation gear, special training for working at heights, and ensuring safe working positions in confined spaces are emphasized.

In terms of construction materials, respondents highlighted the need for wearing safety gear to avoid falling objects and vehicle accidents, wearing masks to protect from hazardous substances, proper testing of steel bars, understanding material performance, and ensuring sufficient equipment and service vehicles. Training laborers is also crucial to prevent errors. For construction projects to be successful, appropriate material testing, efficient safety measures, and knowledge of material performance are essential (Dharmapalan, et al. (2015).

For safety gear and outfits, the proper use of harnesses and high-visibility clothing is vital, along with regular inspections of personal protective equipment (PPE) to maintain their effectiveness. Gambatese, et al. (2017) concur that conducting regular inspections and appropriately utilizing safety equipment are crucial to preserving worker safety on building sites.

Finally, regarding finance, managing the estimated project fund, completing projects on time to avoid additional costs, and staying updated on the prices of construction materials are critical aspects. Effective financial management ensures the project stays within budget and is completed efficiently which agrees to the study of Tymvios & Gambatese (2016) highlighting the importance of well-managed project.

Proposed Measures

The proposed measures were based on the result of the study where four problem aspects were strongly agreed upon by the respondents. Foremost, starting construction without building permit can result in fines and legal actions and could be a cause to halt the construction. It is recommended that the first step before proceeding in construction is to ensure all necessary documents are settled. Bad working positions, often in confined spaces and debris caused by natural calamities, is also one of the problems. Unsafe environment conditions may delay the progress of the project. Hence, it is recommended to conduct thorough site assessment and create safe working conditions before starting the construction in order to avoid hazards. Improper use of harness and high visibility vest and pants was mentioned as a problem in infrastructure project management. This can lead to serious accidents such as falls and collisions; thus safety measures are compromised which can increase the risk of injuries. To prevent such accidents, implementation of regular inspection that all workers are using their safety gears is highly recommended. Finally, lack of safety protection can also lead to higher rate of injuries and health

issues among workers which contributes to increased costs and delays. Safety officers must enforce strict compliance in wearing head, eye, gloves, foot and hearing protection by the workers and establish also a monitoring system to track such compliance. These safety problems are serious issues to address not only for the pursuit of the constructions projects, but most specially for the safety and wellness of the workers for the whole duration of a given project. As Barker and Baroud (2018) stated, the effectiveness of an infrastructure can be achieved through systematic and well-organized proceedings including primary considerations in safety measures in the on-going construction.

Conclusions

Based on the results of the study, the following are concluded:

1. Based from the collected data on the profile of the respondents, the study shows a large representation of early-career engineers with foundational degrees, as well as a smaller but valuable collection of opinions from more experienced and academically advanced experts. This diverse background provides a comprehensive perspective on project management challenges.
2. The absence of necessary permits and unskilled labor are the most pressing challenges in project management, according to the study's findings, which also identify important areas for improvement in legal compliance and workforce development to assure project success and safety.
3. In order to guarantee the success of construction projects, competent personnel, stringent safety regulations, appropriate material handling, and careful financial management are all essential components of effective project management solutions.
4. The study concludes that engineers' opinions of project management issues are greatly influenced by their level of education, while their age and years of experience have no relation on this.
5. The study concludes that project management techniques are greatly improved by higher education, and that in order to improve project outcomes, continuous education should be prioritized over experience alone. Comprehensive management practices, such as safety precautions and training programs, should also be emphasized.

Recommendations

Based from the results of the study, the recommendations are given for a better infrastructure project management:

1. Create and provide programs for professional development that are appropriate for a range of educational backgrounds and career phases.
2. Establish stringent safety protocols and training to ensure the proper use of safety gear and equipment, ensure that all construction projects comply with legal requirements by obtaining the necessary permits before beginning work. Invest in comprehensive training programs to improve laborer skills, develop effective financial management strategies to handle unforeseen costs and technical infrastructure by making clear project plans, specifications, and responsibilities for addressing defects.
3. Prioritize the hiring of competent personnel, enforce stringent safety regulations, manage material handling effectively, and maintain meticulous financial oversight.
4. Develop specialized training programs and solutions that take into account engineers' educational backgrounds rather than focusing on their age or years of experience in order to address project management difficulties more effectively

5. To improve project management techniques and project outcomes, construction companies and educational institutions should prioritize thorough training and safety regulations, as well as investing in the ongoing professional development of engineers.
6. For future researchers, they should investigate how well different risk management frameworks and techniques perform to recognize, evaluate, and reduce risks in infrastructure projects and the methods for enhancing stakeholder cooperation and communication in infrastructure projects in order to settle disputes and accomplish project objectives.

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