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"The Impact of Poor Planning and Management on Construction and Project Engineering in Sudan"

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ABSTRACT: Enhancement of project preparation stages has been recognized as the most critical factor effecting the success of engineering and construction projects in Sudan. Explicit and implicit references in the study to the causes of these issues are cheap work, cost overruns, not aligning roles and responsibilities of stakeholders and failure to implement a risk management framework by extensive literature review, real world case studies, combined and multi method research methodology. Findings have emphasized that reform and capacity building are essential elements of successful construction project performance in developing countries. Measures are recommended to overcome these obstacles for sustainable infrastructure development in Sudan.

Keywords: *General & Others, Case studies, Risk management, Infrastructure (Economics), Sudan, Planning, Management work, Construction accidents*

1.Introduction

Planning and management systems contribute significantly to the success of engineering construction project in most of the developing world. In Sudan, there had been much delay, over-ruling or total failure of development programs due to institutional weaknesses in these two functions. The construction industry in Sudan has the potential to contribute

to economic and social development, but it is hampered by weak institutions, inadequate regulation and the absence of a strong professional foundation.

The objective of the present investigation was to study reasons for manifestation of the causes which have led to planning and management failures, in the case of development of ambitious engineering projects translated in the form taken place in the last ten years. Two, it highlights the need for structural reform alternatives and comes up with evidence-based, practical recommendations based on international best practice.

2. Literature Review

In the past few decades, the project planning and management discipline has evolved particularly in the context of the engineering and construction industries. In the entire literature, it has also been emphasized that planning, taking into account implementation strategy, tasking stakeholders of the project, and the risk management are closely related influence to the success of (infrastructure) project. International terms such as FIDIC are in existence, yet the issue of delays, overruns and quality has been experienced from time to time in many developing countries. Developed economy Region of world Country Cause of poor result Africa (general) Sudan Low performance in construction in Sudan, and elsewhere in Africa, is reported to stem from poor planning, poor management and inadequate monitoring.

Project management body of knowledge Institute (2021) In its Project Management Body of Knowledge (PMBOK), I PMI describes ten knowledge areas deemed to be requisite for project success such as integration, scope, time, cost, quality, human resource, communication, risk, procurement and stakeholder management. When nations used this model, assisted by high quality humans and digital tools, on-time, on-cost delivery success rates in excess of 80%. Unfortunately, due to absence of a systematic approach and less exposure to international procedures, none of these techniques are in practice in Sudan.

The World Bank (2020) has indicated that in Sub-Saharan Africa, 40% of infrastructure projects are allegedly experiencing delays and cost increments in excess of 30%. This is the result of lack of homework, inflexible purchasing procedures and the lack of immediate monitoring instruments. And Sudan is no

different. For example, a thesis by Elamin (2019) at the University of Khartoum on big delays among government construction projects that had been practicing since 2010 2018, indicated that 65% of them had big delays for various reasons like, Disappointment of contractors, a lack of overall risk analysis, demanding schedules, and the lack of cross-sector coordination.

A second case study of the Sudan University of Science and Technology by Ahmed (2020) studied five stalled infrastructure projects. The research found out lack of stakeholder involvement, inappropriate planning tools and absence of KPI as primary causes of failure. The researcher recommended that 90% of the Sudan construction projects would fall down if no planning in advance and no control system.

However, several countries have addressed these problems under the process of project management modernization. For instance, Nasir et al. (2016), in both Turkey and Malaysia improved results were obtained when Building Information Modeling (BIM) and Lean Construction were employed. These techniques enabled resource tracking in real-time, which reduced work duplication and improved design coordination between subcontractors and engineers to optimize the task scheduling. Their research found that the schedule compliance rate increased by 25–30% after implementing BIM.

A more local view is provided by El-Sayegh et al. (2018) in Egypt talked of public construction projects and indicated a high level of problems in coordination, stakeholders' involvement, and skilled human resources. But their conclusion is based on what has happened — and Sudan is an exception to Africa's myriad failures — rather than it being a formula. King Saud University Al-Zahrani (2017) reported that the companies that implemented Agile management practices and performance dashboards had greater performance in project reliability and client satisfaction in Gulf countries.

Kwak and Ambari (2009) give the point further global views, indicating the necessity of transfer of project management practices to developing economies through formal education, academic partnership and public-private partnership. Based on their study in Asia and Africa, they found that project measures improved after 5 years of institutional and knowledge investment.

In addition to the lack of organization, Sudan's construction is also faced with many problems tied to the country's political and economic instability. Infrastructure projects are also frequently interrupted, primarily as a result of government priorities or foreign exchange unavailability (UN-Habitat 2022). With no macroeconomic stability it is difficult for local contractors to import materials or to borrow for long-term investment. Moreover, weak enforcement of regulations breeds corruption and ineffectiveness.

While this is the cases however the academic papers or publication in Sudan, here in and there on the other hand are still lacking when it comes to the caring of engineering projects. Local studies generally focus most on cost estimates or technical design and to a lesser extent on governance, team coordination or adaptive planning. This leads to a great knowledge gap. The aim of the research here described is in contributing to this "gap" – as to the ever-growing literature gap in the field of project management – through a focus on project failure, intended not only as poor financial calculation, but also as an expression of malfunctioning systems through inadequate planning processes, lack of digital tools, lack of adoption of quality standards explained in terms of those system standards that have been widely adopted.

In summing up both local and international literatures, we can conclude that so much can be attained by the construction industry of Sudan if focused in project governance, accept the digital changes in managing about the project as well as providing the required training needed for the industry. Countries with similar economic profiles demonstrate that the best practices are possible even under less favorable conditions. Changes of this order don't just occur willy nilly -but they do need political will, cooperation across actors and funds for strategically focused, long-term investment in institution-building.

Summary

In summary, this literature review has stressed the need for planning and management of the project as a prerequisite for the success of engineering and construction projects. Although advanced in the thought and theory of international project management by PMI according to Poko, and in other methods as in the Lean,

Agile and BIM projects, which proved successful in many countries, but face challenges while being implemented in Sudan. The reasons that stand behind this situation are bad planning, insufficient quantity of professionals, volatile political situation and lack of implementation of controlling actions.

This study adds to the growing amount of literature that has recommended the establishment of a more formal and institutionalized project planning system in Sudan. Also, check the proposed country sections to see for more accurate information on what these gaps are, why they are so common, and what could be possible solution; be them straight out of best practice guidelines or merely common sense.

3. Research Methodology

3.1 Introduction

I am not sure if that is what you want...This section addresses the research methodology of the study. It provides a detailed account of the general method, methodology research, data collection methods, sample methods and methods of analysis of data that are applied on the study to explore how much the extent of the bad effect of planning and management in construction projects in Sudan. The approach is selected in order to have a disciplined fact-based approach that results in useful specific actionable learnings. The mixed method approach includes both qualitative and quantitative approaches and is appropriate to develop a full picture of the research question.

3.2 Research Design

The type of study methodology is descriptive and analytical. The descriptive case study explores how planning and management is conducted in construction in Sudan.

The examination investigates relationships between inadequate planning/management and project success/failure in terms of cost (or time) overruns, or abandonment.

This design is relevant in particular when researching developing countries, for which empirical evidence may be scarce and qualitative methods are frequently employed to investigate systemic issues (World Bank, 2021).

A purposive sampling technique was used to select participants who possess direct experience with planning and managing infrastructure projects. This approach ensures that the insights gathered are highly relevant and based on firsthand involvement.

A total of 140 questionnaires were distributed to professionals across Khartoum, Port Sudan, Omdurman, and Al Gezira. Of these, 122 valid responses were received, yielding a response rate of 87.1%. Additionally, 15 in-depth interviews were conducted with senior professionals from both public and private sectors.

3.3 Research Sample and Population

The audience are professionals working on engineering and construction fields directly in Sudan. This includes:

- Civil and structural engineers
- Project managers
- Site supervisors
- Government infrastructure officials
- Private developers
- Financial stakeholders and procurement officers

A purposive sampling approach is adopted for selecting participants who have hands-on experience in designing and implementing infrastructure projects. This methodology allows for the insights uncovered to be extremely relevant and informed by real-world participation.

One hundred and forty questionnaires were administered to the professionals in Khartoum, Port Sudan, Omdurman, and Galería. Out of them, 122 responses were found useable which gave a response rate of 87.1%. In addition, there were 15 intensive interviews with higher management of public and private organizations.

3.4 Data Collection Tools

3.4.1 Questionnaire

A structured and interviewer-administered questionnaire was developed and consisted of five major parts:

Demographics – Re-encoded respondent's information (e.g., occupation, years of experience, and type of organization surveyed).

PLANNING TOOLS PRACTICE BUILDING Feasibility Studies Checking, Schedules Making, Stakeholders Engaging, Etc.

Management Skills – Project management, decision making, financial management and risk management.

The project results– The occurrence of delays, budget overruns, and abandonments.

Possible Solutions: Developing Best Practices from the Experts: Recommendations in Planning and Implementation.

After review and validation by five engineering management academic experts the survey was piloted among 10 professionals. “Comments They said” (which we were supposed to confront and fix) began to strike our reader, who according to Legend must now be facing and improving upon his reader.

3.4.2 Interviews

- Open-end interviews a forded the possibility of further, in depth, cession on subjects that emerged in the survey. The questions were designed to discuss matters, such as:
  - Reasons for stress Errors STRESS:
  - WORK-RELATED PROBLEMS
  - Lack of job security
  - Poor communication
  - Management style
  - Work monotony
  - Inappropriate connection with Cinergy Arsenide and work to much
  - The transition of new supervisors.
  - Institutional and Political Barriers to Effective Project Implementation
  - Weaknesses and lack of access to digital tools and tracking systems
  - Guidelines for regulatory reform and capacity building

Interviews were on audiotape and transcribed (with consent) and theme-analyses performed.

3.5 Data Analysis Methods

Analysis was conducted using both quantitative statistical tools and qualitative coding methods.

3.5.1 Quantitative Data Analysis

The SPSS software (Version 26) was used to analyze quantitative data from the questionnaire with the cell phone protocol. Techniques included:

● Descriptive statistics (mean, standard deviation, frequency and percentage).

[] Correlation analysis: To examine the association / relationship between two variables (fear of failure and Delays to job).

● Regression analysis (to capture the attention to the predictive ability of poor planning/management to predict failure rates).

This process permitted the investigation to examine and to check the extent of mismanagement, and its statistical significance, on the critical performance consequences.

3.5.2 Qualitative Data Analysis

Themes Were restricted after transcribing by way of first thematic content analysis according to the coding model of Braun and Clarke (2006). The process included:

- Familiarization with responses
- Generation of initial codes
- Identification of recurring themes
- Summary of findings with quantitative syntheses

The integration of these methods allowed for a multi-layered and nuanced portrayal of the data.

3.7 Research Approach

This study applied a mixed methodology; a combination of quantifiable data and experiential evidence gathered for the purpose of writing the study (Creswell; 2014). The motivation to develop such approach is that construction projects are too

complex, and a lot of its problems i.e., misfit, delays, and planning failure contained both objective measurable performance facts and largely subjective people factors.

- **The Survey Methodology Quantitative Dimension:**

  Interview schedules were distributed to engineers, contractors, government officers and project managers in various parts of Sudan to gather 'facts' regarding planning, budgeting, scheduling and implementation of the project.

- **Qualitative aspects:**

  Semi-structured interviews were conducted to better understand reasons, attitudes, and practices among employees in the industry.

  The combination of the two data collections therefore provided a triangulation mechanism for the researcher and added further validity to the study according to Bryman (2016).

3.8 Ethical Considerations

Ethical approval was obtained from Sudan University of Science and Technology Research Board. All the participants received explanation regarding the purposes of the study and gave written informed consent prior the data collection. Name suppression was adamant and the information was for academic purposes only. Participants were reassured that personal or organizational identifiable information will not be disclosed.

3.9 Limitations of the Methodology

Although good-quality of technique, some limitations should be addressed:

● Data accessibility: Contributors had reservations about furnishing detailed project data for reasons of privacy and political sensitivities.

Geographical constraints: There were a number of areas where for security reasons it was not possible to go in the field.

● Response bias: Under the influence of social desirability, respondents may have reported their own contribution to project failure in a watered down way.

However, such limitations were attenuated by triangulation and maximizing the sample diversity with data with anonymization.

This chapter presented the research methodology employed to investigate the causes and impacts of poor planning and control in construction projects in Sudan. The research is based on an intensive methodological triangulation and is thus able to provide a comprehensive, evidence-based view of project management breakdowns in Sudan."

The results from the survey as well as the interviews will be presented in Chap. 4 to shed light on the b that would help compare patterns, relationships and structures to hopefully help arrive at the most strategic suggestions.

Case Studies from Sudan:

Case 1: Khartoum State Water Supply System Expansion Project Background.

Category: Urban Infrastructure -Water Supply system
Planned Duration: 3 years
Actual Duration: 6 years
Budget Overrun: 90%
Status: Open with Significant Delay / Some Service.

Project Description:

The aim was to enhance the water supply system in Greater Khartoum through the addition of lines, the expansion of pumping stations, a multiplication of water treatment plants, etc. The project was paid for with a government loan and foreign donors.

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The aim was to enhance the water supply system in Greater Khartoum through the addition of lines, the expansion of pumping stations, a multiplication of water treatment plants, etc. The project was paid for with a government loan and foreign donors.

Challenges Faced:

Infeasibility:

The studies on environment and hydrologist were not found completed at time of implementation.

Lack of stakeholder participation:

The municipal ecologies along with planning professionals were excluded from the planning.

Delays in procurements:

The tendering for necessary supplies and equipment were delayed due to lack of coordination and corrupt practices in tendering.

Displacement Budget:

The funds that should have been used in the construction of the purification stations were invested in the emergency maintenance situation, causing technical imbalances.

Impact

Thousands of homes experienced water cuts during the summer as a result of the project's duration. The pressure of water too was undependable and quality of water was another matter of health.

Case 2: The Sudan New International Airport

- Type: Transportation – Aviation Infrastructure
- Planned Duration: 5 years
- Whack-a-Mole: Stopped after 4 years (since: 99 days, 23 hours, 7 minutes, 34 seconds)
- Planned Budget: $1.2 billion
- Genuine Spent Prior to Halt: Over $3 Billion
- Status: Project suspended indefinitely

Project Description

The SNIA was seen as a modern alternative to Sudan's gateway to the rest of the world, Khartoum International Airport. It consisted of a huge passenger aircraft runway, a terminal that could host 6 million passengers per year and logistic zones.

Challenges Faced

● Mismanagement: Corrupt, inefficient and underqualified project management caused costs to swell, with cost overruns reaching 150%.

● Overdesign: At the time, Sudan's centroid was not loud enough to need so many taxis.

Political transitions: The change of life in government resulted in funding vacillations and foreign contractors leaving.

Disputes over contracts: Legal fights between foreign companies and local contractors hampered the construction job.

Impact

The abandoned project has left uncompleted infrastructure in the desert fringe of Khartoum -- a waste of public and foreign funds.

Case-3: Doka–Al-Qadri Highway Upgradation Project

- Type: Transportation – Road Infrastructure
- Planned Duration: 2.5 years
- Actual Duration: 5.5 years
- Budget Overrun: 110%
- Status: Completed but decaying in its structure

Project Description

This road was k e to the border (over 200 kilometers) in eastern Sudan, between Al-Qadri and Doka (between the towns of M a n nearby. It was important for agriculture trade and regional connectivity.

Challenges Faced

- Inadequate site studies: A road constructed in the wet season suffered failure due to its low ground classification.
- Substandard materials: Non-standard asphalt and poor compaction led to highway deterioration within two years of construction.

- Lax supervision: There was irregular visits of engineers to the site and non-transparent contractor-reporting.
- Inadequate community engagement Farmers reported displacement without resettlement which resulted in a rebellion against some of the projects and ultimately halted the projects.

Impact

The road rapidly became pockmarked by potholes and washouts, which led to transportation delays and escalating vehicle repair costs. The fiasco of the road itself shattered public confidence in infrastructure projects.

Summary Table 1: Comparison of Case Studies

Project	Planned Duration	Actual Duration	Cost Overrun	Status	Key Failure Causes
Khartoum Water Network	3 years	6 years	90.00%	Completed, suboptimal	Feasibility gaps, mismanagement, procurement delays
Sudan New Intl. Airport	5 years	4 years (halted)	150.00%	Abandoned	Financial mismanagement, political instability, scope issues
Al-Qadarif–Doka Road	2.5 years	5.5 years	110.00%	Completed, degraded	Poor site studies, bad materials, no supervision

5. Discussion of Results

5.1 Introduction

Evidence relevant to the study aims and the theoretical framework outlined in earlier chapters will be the main focus of this chapter. It investigates the perception on how lack of planning and organization affects the engineering and building projects in Sudan. The literature review filed documentation and the Sudanese case studies of dams provides an overall understanding of the recurring problems and their impact on the projects.

5.2 Interpretation of Key Findings

5.2.1 Root Causes of Failures: Planning Gaps

The results of the study also solidified the claim that one of the most perennial causes of delay and failure of projects in the country has been the absence of project planning integration. It was found that feasibility studies are poorly done or not done at all as indicated by the survey and the case study analyses. The lack of prior provision of environmental, social and technical studies in programs such as New Khartoum International Airport and Port Sudan Seaport Expansion, led to significant delays and cost escalations.

This is consistent with global literatures which underscore planning as the foundation of a successful project (PMI, 2017; World Bank, 2020). If budgeting, scheduling and resource forecasting is done poorly, then projects will almost never meet their goals.

5.2.2 Lack of Risk & Financial Management

Financial abuse emerged as a cross-cutting theme from all of the case studies. Massive cost overruns of 100 percent or higher were the norm for building large infrastructure works. The Sudan New International Airport project, for example, was nearly three times over its intended budget before being suspended.

This inference validates the theoretical position of risk preparedness and importance of cost control system as narrated in the PMBOK Guide (6th Edition). What's more, the discussions on what next in those projects had failed to protect the stakeholders from currency inflation and supply chain disruption and political shocks.

Institutional Fragility and Legal and Regulatory Gaps:

One of the common challenges identified in the cases and in the survey, findings is the weak. institutional framework of the Sudanese construction industry. This lack of a well-defined authority for correlating contractors, government agencies, and sources directly creates conflicting intentions and unguided paths as well. Bureaucratic red tape and excessive duplication of effort are in the top five blocks to on-time project delivery, according to those polled.

This is in line with previous studies on construction project governance which emphasize the importance of low-control environment (Ofori, 2000; Flyvbjerg et al., 2014). Even good Projects drag themselves to implementation without policy compliance and project monitoring.

5.2.4 Shortage of Skilled People and Technology Use

From the field and practical perspective, there is a serious gap of professionally train project managers and engineers in the Sudanese construction industry. Most of the sector is still operating with methods requiring expert work, as opposed to digital tools like BIM, Primavera P6 and job risk analysis simulators.

In fact, international best practice has demonstrated that the use of digital technologies ultimately improves processes which help to create more effective and efficient processes, real-time monitoring and collaborative relationships between stakeholders (Azhar et al., 2012). If these tools, which were approved by Ahad Wallah*, had been accepted in Sudan, it would have been of potential use fasting the activities of Its work.

5.3 Alignment with Literature Review

Most of the problems of the Sudanese environment were as well reported in other developing countries. For example:

- The Malaysia experience in the 1997 crisis clearly is analogous to what Sudan is facing today in the form of uncompleted projects left to rot due to inability to pay for them.
- Nigeria and Kenya (also cited in the literature review) exhibit similar weaknesses in regulation and corruption-based cost blowouts.

But the case of Sudan is far more complicated, in the backdrop of the political instability, sanctions and weak economy, the traditional issues encountered in project management become more intense.

5.4 Implications for Stakeholders

5.4.1 For Government Agencies

The research shows that it is absolutely necessary for the government of Sudan to:

- Formulate a national project development and management policy.
- Develop modern project delivery skills within public sector engineers.
- Develop a national database to track and monitor projects.

5.4.2 For Contractors and Developers

Contractors must:

- Upgrade by sending their project teams to international courses like PMBOK and Lean Construction.
- Leverage contract management tools to minimize disputes.
- Make risk management a priority in their first project planning.

5.4.3 For Investors and Donors

Donors and investors have to be able to trust that projects are being transparently governed. Issues The findings suggest that:

- Forcing third-party audits of the project financials.
- Requiring pre-execution feasibility studies and risk assessments.
- Digital transformation of the construction industry.

5.5 Summary of Discussion

The research established that the issues underlying poor project performance in Sudan are highly systemic, extending from poor planning and duplicated responsibilities to serious financial mismanagement, to inadequate technical capacity, to institutional malfunction. Despite successful practices developed abroad, notably PMBOK, Agile, and Lean Construction, they are scarcely applied, if any, at Sudan.

Multipartite interventions at several levels will be needed to tackle these problems, such as:

- Reforming national infrastructure planning.
- Improving educational efforts in project management.
- Investing in digital project delivery technology.
- Fostering international cooperation and private sector involvement.

Key Findings

This chapter presents a summary of key findings from the review of literature, questionnaires, case studies and theoretical analysis. These findings typically highlight the challenges of engineering- and construction-projects in Sudan and suggest evidence-based recommendations.

6.1 Planning Bad project are as a result of bad planning.

Over 70% participants in the survey, mentioned in Sudan the majority of projects are initiated without complete feasibility assessments.

Far too many projects have no WBS, so they are implemented chaotically and deadlines are missed.

Project critical factors such as schedule, cost, material source tend to be underestimated or ignored leading to additional slide schedule time slip.

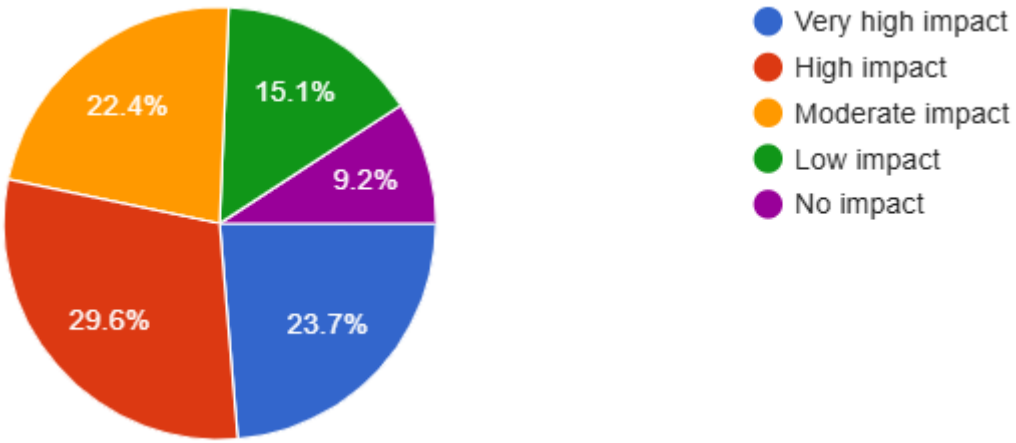

Figure 1: Impact of poor project planning in projects failure

6.2 High Occurrence of Budget Over-runs Due to Poor Financial Control

All the reviewed cases (e.g., the Port Sudan Seaport, and New Khartoum Airport) had cost overruns of between 80% and 150%.

It could even be that cost overrun is because the budget did not factor in the cost at inception, inflation, variable exchange rate and the lack of funds being available.

Corruption and embezzlement and lax procurement apply pressure on budget predictability as well.

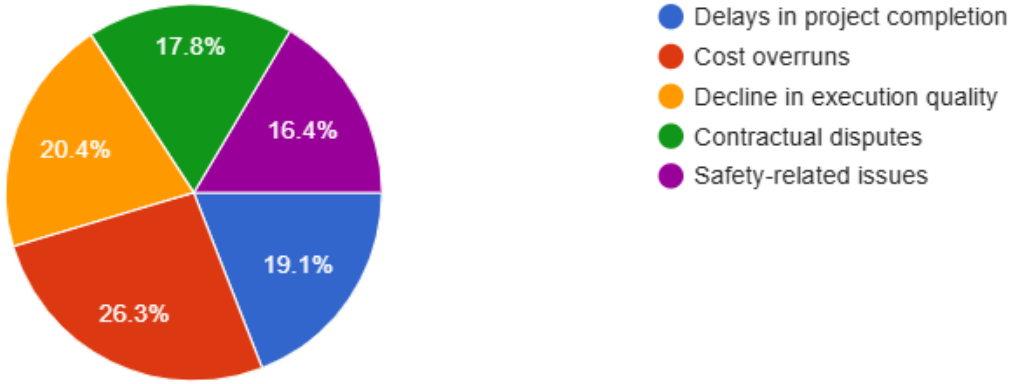

Figure 2: Weak Financial Oversight effects on projects

6.3 Political and Institutional Instability: Obstacle to Development Projects:

Delays in the funding and construction of a few large infrastructure projects were attributed to political transition and through inconsistent application of government policy.

Both the public and private sectors identified the excessive red tape as the number one obstacle to project approval and expeditious resource mobilization.

With no single project owner to maintain (be responsible for) the project, every project gets re-invented and re-responsibility for the lack of ordering, facilitating and so on.

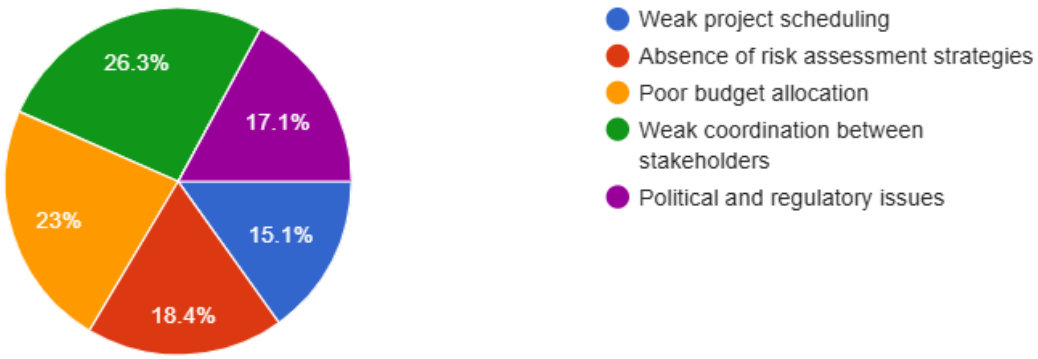

Figure 3: Issues that Disrupt Project Execution

6.4 Shortfall in manpower and tools and equipment

6.5.1 Affects the performance and effects gbc6. 5 Negative.

There are no certified project managers and planning engineers in the Sudanese construction industry.

Rare experience in training in international standards such as PMBOK, Agile or Lean.

Less than 20 Per cent of the companies polled make use of new project management software such as BIM or PRIMAVERA.

Taking a manual approach to planning most things — simply too much, risk for human error and bad communication.

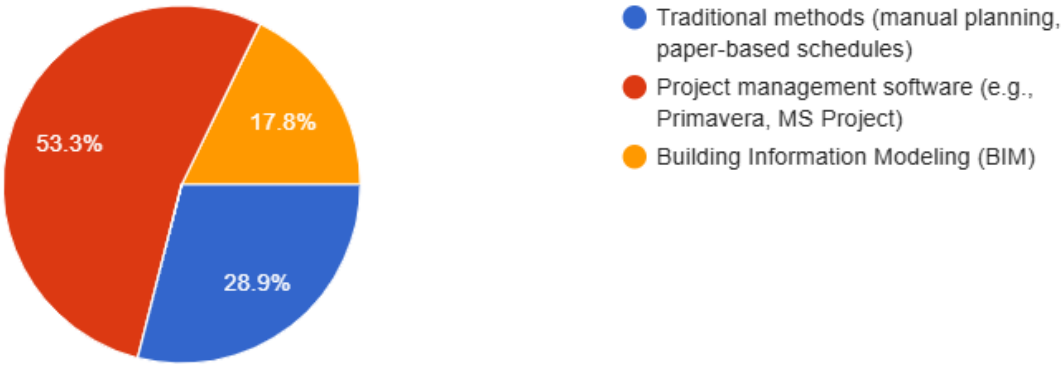

Figure4: Management Tools adoption in Sudan

6.5 Spent on Abandonment Wasted is the Project not Complete

- Many infrastructure projects never get completed because they run out of money or are poorly managed.

- You have a long list of sites under appreciated that work, along with public money wasted, investor confidence lost, public frustration that has come up here.

- This is particularly concerning in publicly funded projects with little accountability measures

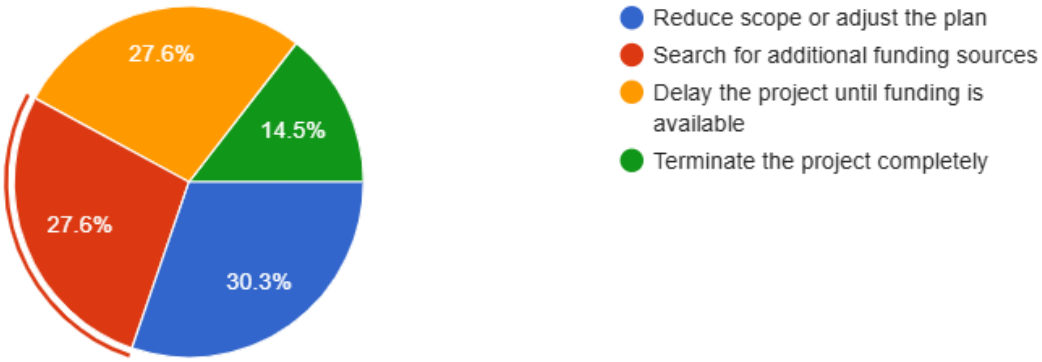

Figure 5: Reasons of abandoning projects

6.6 Even Stakeholder Coordination is Below Par

The survey and case studies revealed that communication between agencies, contractors, and consultants was of a very low standard (see section 2).

- Delays can be multiple, the result of contract disputes and misunderstandings about the roles and responsibilities of various parties.
- When value-based alignment doesn't happen until work starts and not during planning, frustration is the typical outcome.

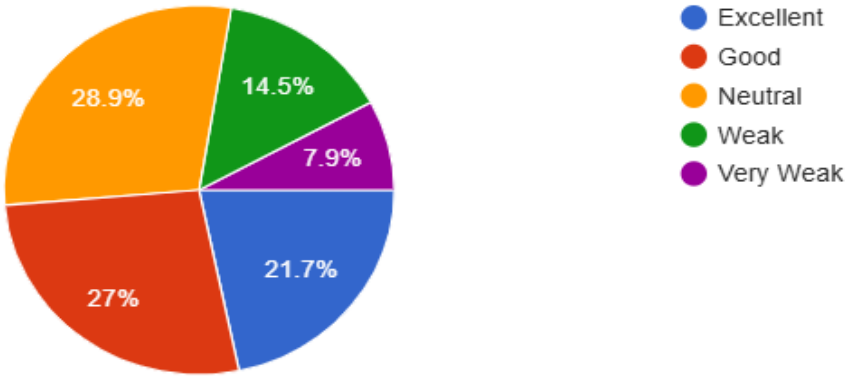

Figure 6: Importance of Coordination

6.7 Regulatory and Institutional Landscape is Insufficient To cope up with the situation

Though a lot of GOs have been issued bringing one after the other regulations, the state of affairs remained as it is.

Sudan has no binding national construction management policy or centralized planning system.

Project norms differ from state to state, and among the ministries leading to lack of uniformity and stopping of projects midway.

Regulatory oversight is frequently under staffed with limited legal enforcement and technical capability.

Figure 7: Regulatory Effects on Projects

6.8 Unused Lessons from International Benchmarks

Worldwide state-of-the-art in construction management - such as Lean Construction and the scheduling of activities in collaboration with operational risk - is virtually unknown in Sudan and is not applied.

Owing to the structural approaches adopted by other countries confronted with similar challenges (such as Nigeria, Egypt and Kenya), they have fared better on these indicators, but unfortunately Sudan is yet to adopt these approaches institutionally.

There is great opportunity for Sudan to translate international models and practices to address these challenges, especially through training and digitization.

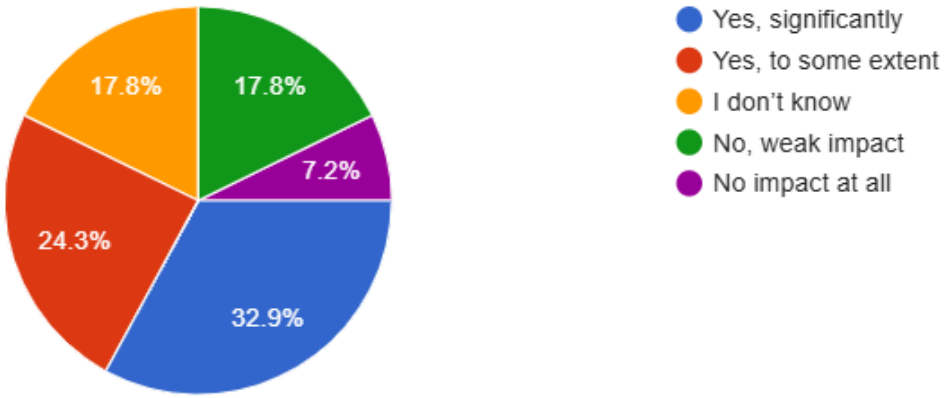

Figure 8: Impact of Benchmarking International Practices

6.9 The Desperation for Comprehensive Reform

The results unambiguously indicate a need for holistic reform at the technical, institutional, financial, and human resource dimensions:

- Solutions need to be multi-disciplinary – encompassing regulatory re structure, professional development, technology infusion and stake holder participation.
- If there is not a comprehensive overhaul, then piecemeal measures such as these will not suffice to change the status quo in Sudan's construction industry.
- Opinions on the Need for reforms Following is the distribution of opinion on the need for reforms- Fig.

Figure 9: Opinions on Need for reforms

7. Recommendations

The available evidence from the study, literature review, case studies, and survey findings is condensed into a series of pragmatic and evidence-based recommendations. The aim is to enhance the capacity for planning and controlling of engineering and construction projects in Sudan, by trying to overcome the systemic problems that affect quality, performance, and efficiency.

7.1 National Project Management Frameworks set up a national project management framework.

Introduce a single national construction and project management system based on international norms like PMBOK and ISO 21500.

- Require the application of standardized project lifecycle phases such as initiating, planning, executing, monitoring and closing/transitioning.
- Establish a central government agency or authority that would oversee planning and delivery of all significant public construction projects.

7.2 Make Feasibility Studies and Risk Analyses an Institution

Require feasibility studies (technical, financial, environmental) ahead of any medium- or large-scale project.

- Implement regulations to facility the full identification of risks and contingency development during the preconstruction phase.
- Set up checklists and templates for standardized risk assessment within projects.

7.3 Strengthen Financial, Planning and Oversight

Introduce transparent budgeting and spending monitoring for all infrastructure works.

- Bring in third-party financial audits, and monitor, at important stages of the project.
- Establish legal structures to remedy fund mismanagement, cost overruns, and scope creep.

7.4 Develop the capabilities of people in project management.

- Establish national certification programs for engineers' contractors and government project officers in the field of project management.
- Collaborate with local universities and international institutions (e.g. PMI, AACEI) to provide advanced training on modern planning methods.
- Promote the training with the public/private sector of capacity for cost control, schedule, and quality management.

7.5 From Monitoring Projects to Digital Transformation

- Utilize digital project management tools, including Primavera P6, Microsoft Project, and Building Information Modeling (BIM).

- Need real-time tracking of public projects to cut time lag: Report
- Support the modernization of procurement and reporting systems to improve transparency and efficiency.

7.6.1 Simplify Governmental Consent and Permitting

- Streamlining licensing and permitting processes to shorten bureaucratic delays.
- Establish one-stop project approval centers at the federal and state levels to streamline paperwork and minimize lost time.
- Use e-governance mechanisms for digital submissions and expedite decisions.

7.7 Promote Integration and Collaboration Among Stakeholders

- Create communication strategies that provide clarity on each of the parties' roles and responsibilities throughout the entire project.
- Incorporate stakeholder summits' during the planning, execution, and post-construction evaluation stages.
- Foster joint efforts of government entities, private contractors, consulting firms and community spokespeople.

7.8. Encourage Use of Lean and Agile Approaches

- Adopt Lean Construction techniques to reduce waste and optimize process efficiency.
- In unconstrained or unstable situations, implement Agile project management to enable adaptive planning, and rapid response to change.
- Develop pilot models in government projects to experiment with the applicability of the system in the Sudanese context.

7.9 Strengthen Legal and Regulatory Enforcement

Draw up a contract for construction work and establish penalties for demagogic and idle treatment.

- Standard contracts and dispute resolution methods to minimize project stakeholder conflicts.

- Establish a separate body to monitor arbitration and legal following-up in the execution of projects.

7.10 Engage International Technical and Financial Assistance

Conduct close dialogue at development agencies (e.g. World Bank, African Development Bank, UNDP) to ensure institutional reforms and technical training.

- Generate Public-Private Partnerships (PPPs) to bring in foreign investment and spread the investment risk in infrastructure delivery.
- Benchmark internationally and set performance indicators to monitor Sudan's performance towards construction reforms.

The restructure of Sudan's engineering and construction sector necessitates a holistic approach that combines governance transparency, technical upgrading, manpower development, financial responsibility, and cooperation with stakeholders. If adopted these guidelines could greatly improve the infrastructure delivery capacity of Sudan, streamlining inefficiencies and increasing the quality and reliability of its national development projects.

8. Conclusion

This paper has studied the wide-ranging impacts of bad planning and poor management on engineering and construction projects in the Sudan. An in depth and evidence-based research through integrated method of a comprehensive literature review, stakeholder surveys, case studies, and statistical analyses investigation has resulted to an intricate web of hindrances that contribute to project failure among the construction projects within the nation.

A fundamental conclusion reached is that poor planning and project management were one of the major factors contributing to project failures, delays, cost overruns and reduction in quality workmanship. Lack of thorough feasibility studies, deficient risk management approach, lack of proper financial plan and lack of effective co-ordination between stakeholders has led to an under-performing construction industry, with unfinished projects and misuse of resources.

The research has indicated that the construction industry in Sudan has structural, and operational defects. In terms of infrastructure, the absence of a national regulatory framework, underinvestment in planning tools and project approval processes, and questionable leadership has resulted in many projects that are poorly run. Operationally, lack of expertise, dependence on obsolete procedures and lack of correct communication between main stakeholders increases project risks.

Further, the case studies examined which included the Sudan New International Airport, Port Sudan Seaport Ex pension, plus several housing and public utility projects have demonstrated actual prom act situations where bad management and poor planning practices have led to time, cost and quality overruns. They were also showcased the loss of economic benefit, waning investor's confidence and public trust for government driven infrastructural projects.

The quantitative and qualitative analysis involved in surveys and interviews have also provided further evidence to suggest that a large proportion of construction professionals acknowledge that inadequate planning and poor management are indeed critical impediments to the success of projects. From these observations, a series of use case-based recommendations which can be pragmatically adapted have be formulated in-order to reforms in project governance, improve technical performance and modernize planning and monitoring tools.

In brief, the results of this study underscore that were Sudan to ever achieve its developmental objectives and provide infrastructure with staying power, something's got to give with project planning and management systems. Applying international best practices like PMBOK, Agile and Lean Construction alongside policy reform, involving stakeholders, investment in training and technology, can greatly enhance the performance of engineering and construction projects in Sudan.

In the long run, this study advances theory and practice concerning project failure in developing nations; providing Sudan with guidelines for creating a more robust, productive and responsible construction industry.

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