
**PROPOSED PROJECT MANAGEMENT SYSTEM FOR PT. GTU:
A CASE STUDY OF PIPING SYSTEM CONSTRUCTION PROJECT**



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Abstract

Engineering, procurement, and construction (EPC) projects place a single contractor in charge of design, materials, and construction under tight time and cost targets. In Indonesia many projects also rely on subcontractor labor and owner supplied materials, which increases coordination risk. PT GTU experienced a failure on a piping project for a paper mill in Riau, known as BM4. This thesis examines why the project moved away from its plan and what kind of project management system could have reduced the likelihood of failure. BM4 is analysed as a single case. The study assumes that complex projects usually fail because of an accumulation of management choices rather than one event. It aims to identify the key factors behind the failure using the six project constraints as a frame, to explain how they affected schedule, site readiness, subcontractors and cash flow, and to develop a project management system tailored to GTU. A qualitative design is used. Data comes from semi structured interviews with seven internal stakeholders and from supporting project documents. The material is coded by project constraints, analyzed using Current Reality Trees to link visible symptoms to root causes, and compared with selected PMBOK Guide Sixth Edition processes as a benchmark for expected practice. The results indicate three main root causes: lack of project leadership and discipline, absence of formal change control and unrealistic schedule and resource baselines. Together they explain the difficulties in BM4, including unstable subcontractor manpower, coordination problems and repeated quality issues. The thesis concludes by proposing a practical project management system for GTU that clarifies governance routines, introduces an integrated change control procedure and strengthens rules for setting and updating baselines to support future EPC projects.

Keywords: EPC, PMBOK, Project Failure, Project Management System, Change Control

INTRODUCTION

The engineering, procurement, and construction (EPC) industry has a significant influence on Indonesia's economy. Many of the country's large industrial facilities, including pulp and paper mills, refineries, petrochemical plants, and power stations, depend on EPC work (Ahmad et al., 2023). These projects place design, procurement, and construction under a single contractor, which ideally creates efficiency. At the same time, this arrangement puts most of the risks and responsibilities on one party. Since EPC contracts often involve multi-billion rupiah investments, the outcome of just one project can affect not only company performance but also wider economic indicators. This is why EPC performance matters for this study.

The construction industry has also consistently been a contributor to Indonesia's growth. It accounts for 10 percent of GDP and supports job creation for millions across various levels of labour skill (BPS, 2024b). The sector operates and has ties to a few supporting sectors, including materials, heavy equipment and consulting businesses. Based on BPS data there were 190,677 construction places operating in 2023. Small companies accounted for most of them at 82.51 percent, medium firms stood only 16.47 percent, and large companies at 1.02 percent (BPS, 2024a). The total number of permanent and contract workers rose 2.46 percent to about 1.19 million based on the same time in 2022. Completed construction work amounted to 1,626.33 trillion rupiahs in 2023, up to 8.54 percent from 2022, with civil engineering as the leading contributor. Productivity also improved to 1.37 billion rupiahs per worker, up 5.94 percent from a year earlier. Such information shows the extent to which the sector is feeding the national economy and explains why EPC companies have pressure to perform well.

This trend is backed up by market projections. In 2023, the estimated market size of Indonesia in construction Industry was IDR 332.95 trillion which were mainly composed of civil works, 47.29% and building works, 52.71% (CRIF Indonesia, 2023). There is still an ongoing interest from the state in infrastructure investment, with an increase of budget in 2023, by 7.75% in IDR 392 trillion, mainly to carry on the existing projects. The recovery of the sector following the pandemic should also benefit from the reopening of delayed activities and new projects, especially from state and private developers alike. On the other side of the contrast, the EPC industry is still struggling to combat rising raw material prices, fierce competition, uncertainties from the 2024 elections, and the likely effect of policy interest rate changes to property demand. These are all things that prompt companies to bolster efficiency and have better project management systems.

Project management, derived from Project Management Institute, denotes the process of gathering and organizing knowledge, skills, tools to achieve project objectives (PMI, 2017). This methodology aims at integrating project and organisational success in accordance with stakeholder needs. However, EPC projects in practice might be hindered by delays and cost overruns or even poor performance. These issues tend to be related to shortcomings in management, more so than technical barriers. Some of the most common ones are an ambiguous concept of scope, unrealistic schedule plans, poor communication methods, lack of risk planning and poor communication skills (Coccia, 2023). Previous works also indicate that repeated failures frequently result from weak planning, ambiguity of scope, ineffective communication, and low resources. It is more difficult to identify problems earlier given leadership gaps and weak monitoring systems (Shabbir et al., 2023).

The PMBOK Guide (PMI, 2017) outlines ten knowledge areas. These include integration, scope, schedule, cost, quality, resource, communications, risk, procurement, and stakeholder management. These areas relate closely to the six major project constraints, which are scope, schedule, cost, quality, resources, and risk. Managing these constraints together is essential for achieving successful project outcomes (PMI, 2013). This relationship is illustrated in figure 1.



Figure 1.

Project Management Constraints

Source: Adapted from A guide to the Project Management Body of Knowledge (5th ed.).

The six fundamental project constraints identified in PMBOK (PMI, 2013) play a pivotal role in explaining the reasons EPC projects fail or succeed.

- a. **Scope:** Outlines what is to be achieved by the project, specifying its goals, deliverables, and requirements. Misaligned priorities and reworking with unclear scope are always a big trouble as there will be some confusion.
- b. **Time:** It refers to the planned timeline for the completion of activities on the project. One task in particular delaying the other will interrupt work and result in both a delayed or missed delivery date.
- c. **Cost:** The budget assigned for delivering the project. Excess cost: Poor underestimating, inefficient expenditures, or insufficient timeframes can lead to expenditure that is above the approved level which impacts profitability at a time when we have less funding to cover it.
- d. **Quality:** The extent to which deliverables are of a satisfactory quality and meet the agreed on standards and specifications of the project. Quality of the workmanship, reduced workmanship level, defects, reduced quality is reduced in forlorn workmanship, defects, and increased rework.
- e. **Resources:** The potential for events or circumstances that might impede the realization of project goals. If risks are unmanaged, the effects can turn into significant disruptions, causing delays, cost overruns, or poor quality.
- f. **Risk:** The potential for events or circumstances that might impede the realization of project goals. If risks are unmanaged, the effects can turn into significant disruptions, causing delays, cost overruns, or poor quality.

Among these constraints, a lot of EPC projects take special consideration of risk since it frequently causes issues in the other domains. Typically, risks within EPC projects originate from identifiable risks such as contractor performance problems, procurement delays, incomplete designs, or lack of skilled labor and crucial materials (Khairullah et al.,

2022). These risks can limit the owner's ability to deliver on any contract that an EPC project may not be meeting its contractual objectives. Delays attributed to contractor underperformance due to delays in procurement process, scope changes, and coordination failures among project have been identified as critical concerns in earlier studies (Nurdiana & Susanti, 2020).

In Indonesian context, EPC projects delays are commonly due to weaknesses in internal project management more than external uncontrollable conditions. Sarwani et al. (2024) highlights a number of recurring issues: delays in the procurement of materials and equipment, problems in cash flows of contractors and unrealistic timing, awarding contracts to the lowest bidder when it is not possible to price, construction mistakes that result in rework, poor coordination, design subcontractors delivering late outputs, contract term conflicts, change order slowdowns for owners.

Another recurring challenge in EPC work is subcontracting. Poor subcontractor prequalification, payment delays that lead to cash flow difficulties, misunderstanding of technical specifications, and unfamiliarity with the project's technology can create delays throughout the engineering, procurement, and construction stages. Tamin et al. (2015) show that in a major Indonesian EPC project, weak subcontractor management caused procurement delays, increased rework, and even affected commissioning activities. This illustrates how subcontractor-related risks can appear at every phase of the project.

Besides risk identification, Improving construction productivity is the key to avoiding delays and cost overruns. Other factors that can affect productivity include management of the workforce, the quality of supervision, site conditions, and availability of resources, etc. Active project monitoring of these aspects, particularly manpower based, are associated with better scheduling and cost performance (Alzubi et al., 2023).

The use of an integrated project platform, in addition to productivity monitoring, has been found to be very insightful in aligning planning, execution and reporting. Centralized IT project information enables teams to use the same information, coordinate better, and reach decisions quicker. Research demonstrates similar systems improve cost control, schedules, and project results (Althoey et al., 2024).

In practice, these six project constraints are rarely isolated from each other. For example, worker shortages can have an immediate impact on the schedule, raise costs and put strain on quality. Such interlinked nature necessitates that EPC project teams can catch possible issues early and handle them before they become a reality. These are not in isolation theoretical challenges. Most EPC companies in Indonesia are confronted with them on their real projects, in which numerous have been hit by delays, subcontractor problems and inadequate coordination.

This study examines one such case: the failure of a piping system EPC project handled by PT. GTU for a pulp and paper facility in Riau. In this project, weaknesses in internal management, disruptions caused by subcontractors, and poor coordination combined to cause a complete failure to finish the work, despite the project's large budget and national significance.

REVIEW OF LITERATURE

Engineering, Procurement, and Construction (EPC)

Projects EPC is a delivery method where one contractor handles the engineering, procurement, and construction and then hands over a working facility. In Indonesia, EPC is often seen as a driver of industrialization and the energy transition because it pulls together technical capability, supply networks, and construction capacity. This helps technology transfer, import substitution, and higher TKDN (local content) (Ahmad et al., 2023).

Major Risks in EPC Projects

Projects involving Engineering, Procurement, and Construction (EPC) also present the most diverse and potentially high risk potential as they are large scale as well as high technology with many stakeholders in the supply chain. Project risk is defined by the PMBOK as an uncertain event or condition that, if it occurs, can have either a positive or negative effect on one or more project objectives such as scope, schedule, cost, and quality (PMI, 2017). This definition emphasizes the need for rigorous risk management as identification, analysis, response planning, and monitoring are crucial to the success of EPC projects.

Subcontracting in EPC Projects

Specialist subcontractors are crucial to EPC delivery, and associated risks are grouped along the four major risks that are included in this classification (Khairullah et al., 2022). It is helpful to clarify where these risks exist and how to put subcontracting in the larger EPC framework. As shown in Figure II.2, subcontractors operate beneath the EPC contractor who is responsible for engineering, procurement, and construction.

Project Manager Competence

Project managers in EPC projects also assume the role of risk management of failure and coordination of various parties, thus competence is important at both the technical and leadership level in EPC projects. Coccia (2023) defines failure as the inability to achieve project goals and characterizes its causes as planning and design errors, execution errors, and market-orientation errors. Patterns of practice-based work show similarity, as shown by Giri et al. (2020), and gaps like: unclear objectives; weak leadership; limited skills; underfunding; poor prioritization; communication breakdowns; weakness in performance tracking, which associated with PMBOK Process groups.

Project Management Body of Knowledge

The Project Management Body of Knowledge (PMBOK), published by the Project Management Institute (PMI), is a globally recognized standard that provides a common framework for project management processes, terminology, and best practices. The PMBOK Guide (PMI, 2017) organizes project work into a structured life cycle so that project objectives can be defined, planned, executed, and completed in a controlled manner.

RESEARCH METHOD

The formulation of the research design is illustrated in Figure III.1. The design provides a structured pathway for the research to move from problem identification toward the formulation of a project management system framework.

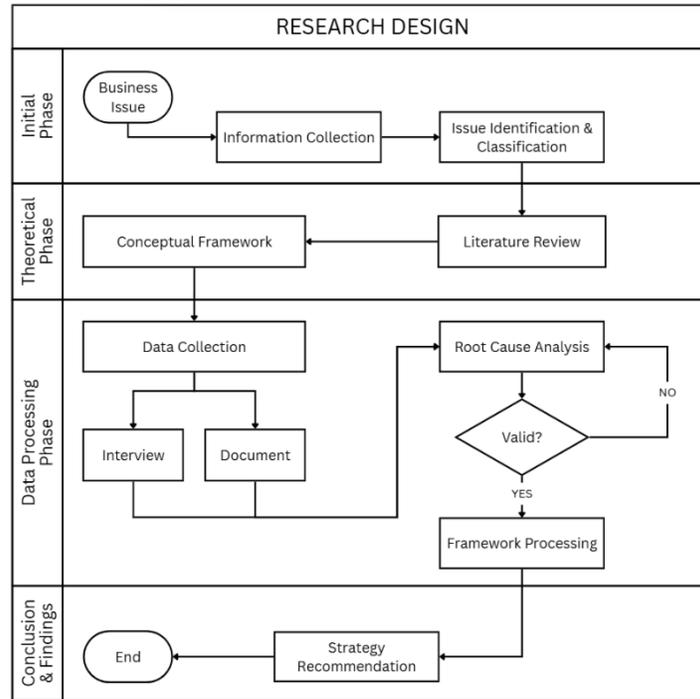


Figure 2.
Research Design

The process is divided into four interconnected phases:

a. Initial Phase

The study starts by stating the business issue observed in. We then conduct information collection from verifiable sources: contracts, schedules, S-curves, weekly progress, and minutes of meetings, with brief field notes to retain context. Using this data, we perform simple issue identification and classification. This register is the hand-off to the theoretical work.

b. Theoretical Phase

A focused literature review is carried out on EPC execution, delay/failure drivers, subcontractor governance, monitoring & controlling (scope, schedule, resources), and quality gates. Concepts, roles, interfaces, control points, and indicators from the literature are organized into a conceptual framework tailored to the case. Drafts of the framework are iterated against the literature until constructs and relationships are clear, observable, and testable. The resulting framework becomes the operational guide for evidence collection and analysis.

c. Data Processing Phase

Guided by the framework, data collection runs in two streams: (i) interviews with role holders (President Director, Project Director, Construction Manager, Project Control, HR, Field Engineer, QA/QC), and (ii) a structured document review. The integrated evidence is analyzed through root cause analysis, using event timelines, standardized constraint codes, and cause-effect (Ishikawa) mapping to move from symptoms to underlying process failures. Findings are then tested at a validity gate:

- 1) If NO: we loop back to root-cause work (and, if needed, collect targeted documents/interviews) until the causal chain is consistent and evidenced.
 - 2) If YES: we proceed to framework processing, overlaying confirmed causes onto the conceptual framework to localize breakdowns (roles, steps, controls) and to specify the control points where monitoring and response failed.
- d. Framework Implementation and Strategy Phase
Validated gaps are translated into a strategy recommendation that stages Improvements, with ownership and review cadence defined. This set of actions and the implementation roadmap constitute the documented findings, closing the study.

RESULTS AND DISCUSSION

Analytical Summary

Cross-Source Aggregation

Table 1 brings together the interview and secondary data codes at the parent-theme level and groups them by project constraint. Each count reflects one unique coded passage per source. The aim is to see which issues consistently surface across sources and to establish a clear focus for the next analysis.

Table 1.
Interviews and Secondary Data Aggregation

Project Constraint	Theme	Interview Frequency	Secondary Data Frequency	Total
Resources	Limited Manpower Capability and Availability	51	20	71
	Ineffective Material Management	21	14	35
	Weak Project Leadership	24	-	24
	Administrative Bottlenecks	4	3	7
	Subcontractor Performance	7	-	7
	Equipment Readiness	-	3	3
Time	Project Schedule Slip	13	26	39
Scope	Site Unreadiness	15	17	32
	Delayed Engineering Information Flow	17	8	25
Quality	Weak Document and Inspection Control	7	6	13
	Quality Nonconformities	7	4	11
Cost	Cost Overrun	6	-	6
	Payment Delayed	1	3	4

Note: Frequency indicates the number of coded references to the sub-theme in the Dataset.

The data shows a clear hierarchy of project constraints. The most serious problems are concentrated under the Resource constraint, which contains the highest cluster of coded themes. This is followed by Scope and Time, while Quality and Cost mainly appear as downstream effects of these earlier failures.

Within Resources, two of the most common themes are Limited Manpower Capability and Availability (Total 71; 51 interview, 20 secondary data) and Ineffective Material Management (Total 35; 21 interview, 14 secondary data). These numbers indicate structural deficiencies in both manpower and material preparedness, which are consistently confirmed across sources. Weak Project Leadership (Total 24) is evident only in interview data, indicating that leaders and planning gaps were highly rated, especially by senior management

but never reflected in regular project documentation. Other resource themes like Subcontractor Performance (Total 7), Administrative Bottlenecks (Total 7), Equipment Readiness (Total 3) are present, but minor.

The Scope limitation demonstrates how resources were frequently obstructed by constraints of access and information. Work areas were repeatedly not ready; hence Site Unreadiness (Total 32; 15 interview, 17 secondary data). Delayed Engineering Information Flow (Total 25; 17 interview, 8 secondary data) suggests drawing delays can be felt on site, even if not entirely reflected in formal reports.

The Time constraint is represented by a single theme, Project Schedule Slip (Total 39; 13 interview, 26 secondary data). This captures the high-level outcome of the problems in resources and scope: the project was significantly behind plan, while respondents tended to focus more on upstream causes such as manpower, materials, and site readiness. the project was seriously behind schedule, and the respondents in general had a stronger emphasis on manpower, materials, and site readiness.

Quality and Cost have the lowest theme totals and act as lagging indicators. In Quality, Weak Document and Inspection Control (Total 13) and Quality Nonconformities (Total 11) show that both process bottlenecks and nonconforming work existed but were not the initial trigger. In Cost, Cost Overrun (Total 6) appears only in interviews, mainly from senior leaders, while Payment Delayed (Total 4; 1 interview, 3 secondary data) is a smaller issue, reinforcing that cost impacts are consequences rather than independent drivers.

Prioritization

Table 2.
Prioritizing Table

Project Constraint	Theme	Total Freq.	Total Cumm.	%	% Cumm.
Resources	Limited Manpower Capability and Availability	71	71	25,63	25,63
Time	Project Schedule Slip	39	110	14,08	39,71
Resources	Ineffective Material Management	35	145	12,64	52,35
Scope	Site Unreadiness	32	177	11,55	63,90
Scope	Delayed Engineering Information Flow	25	202	9,03	72,92
Resources	Weak Project Leadership	24	226	8,66	81,59
Quality	Weak Document and Inspection Control	13	239	4,69	86,28
Quality	Quality Nonconformities	11	250	3,97	90,25
Resources	Administrative Bottlenecks	7	257	2,53	92,78
Resources	Subcontractor Performance	7	264	2,53	95,31
Cost	Cost Overrun	6	270	2,17	97,47
Cost	Payment Delayed	4	274	1,44	98,92
Resources	Equipment Readiness	3	277	1,08	100,00

Note: Frequency indicates the number of coded references to the theme in this interview.

Based on the prioritization in Table 2 and discussion with GTU top management, this study focuses only on the themes that fall within the 90 percent cumulative frequency band. This, including Limited Manpower Capability and Availability, Project Schedule Slip, Ineffective Material Management, Site Unreadiness, Delayed Engineering Information Flow, Weak Project Leadership, Weak Document and Inspection Control, and Quality

Nonconformities is treated as the core problem set for the subsequent root cause analysis and design of the proposed Project Management System. Themes beyond the 90 percent line are still acknowledged but are not analyzed in this study.

The Proposed Project Management System (PMS)

The analysis shows that the BM4 project failed because three fundamental root causes were not controlled: Lack of Project Leadership and Discipline, Absence of Change Control, and an Unrealistic Resources and Schedule Baseline. To prevent similar failures in future projects, this study proposes an integrated PMS. The PMS is designed to be practical. It consists of three main modules that operate together across the project life cycle.

PMS-1: Governance and Discipline Module

PMS-1 is the foundation of the Project Management System. It is designed to close the root cause Lack of Project Leadership & Discipline by creating formal standards for who may lead projects and how leadership is exercised in daily work. This module has two main design elements: a Project Manager Competency standard and a Team Integration process.

a. Recommendation 1: Formalize PM Competency

This recommendation addresses the systemic failure in leadership and technical discipline by setting a clear standard for future Project Managers. GTU’s Human Resource Department (HRD), in partnership with the Project Director, will establish and manage a Project Manager Competency and Training Program so that project governance capabilities are owned by the organization, not tied to individual personalities.

HRD will own this program, and the Project Director will be required to use it for all Project Manager assignments. HRD will develop and maintain a formal Project Manager Competency Matrix (see Table 3), which will serve as the new minimum standard for all Project Managers at GTU.

Table 3.
Proposed Project Manager Competency Matrix

PMI Talent Triangle	Competency	Reference
1. Technical Project Management	Integrated Project Planning	PMBOK 4.2
	Project Monitoring & Control	PMBOK 4.5
	Resource Planning	PMBOK 9.1 & 9.2
	Resource Acquisition	PMBOK 9.3
2. Leadership	Leadership Skills & Styles	PMBOK 3.4.4 & 3.4.5
	Project Alignment	PMBOK 3.5
	Team Development	PMBOK 9.4
	Team Management	PMBOK 9.5
3. Strategic & Business Management	Stakeholder Management	PMBOK 13
	Contract Management	PMBOK 12
	Cost Controlling	PMBOK 7.4

Based on this matrix, HRD will implement a mandatory Training Program (See Table 4) to ensure all Project Managers possess the specific skills required to prevent the recurrence of RC-01.

Table 4.
Proposed Project Manager Training Program

PMI Talent Triangle	Key Module	Sub-Module	Reference
1. Technical Project Management	Module 1: Integrated Project Planning	How to create Integrated Project Management Plan	PMBOK 4.2
		How to create the Quality Management Plan and a Document Control Plan	PMBOK 8.1
		How to create a Resource Management Plan	PMBOK 9.1
	Module 2: Project Execution	How to Direct and Manage Project Work	PMBOK 4.3
		How to Manage Quality proactively	PMBOK 8.2
		How to execute Resources Plan	PMBOK 9.3
	Module 3: Project Monitoring & Controlling	How to Monitor & Control Project Work	PMBOK 4.5
How to Control Quality		PMBOK 8.3	
2. Leadership	Module 1: Leadership Skills & Styles	Understanding several type of Leadership Skills and style	PMBOK 3.4.4 & 3.4.5
		Understanding the alignment of project objective and result	PMBOK 3.5
	Module 2: Team Development & Management	How to Develop team and build loyalty to the Project	PMBOK 9.4
		How to Manage team and create high performance team	PMBOK 9.5
3. Strategic & Business Management	Module 1: Stakeholder & Contract Management	How to use the contract as a tool to manage the client	PMBOK 12 & 13
	Module 2: Cost Controlling	How to use Earned Value analysis to understand the financial impact of Productivity shortfall	PMBOK 7.4

Through this competency matrix and training program, GTU formally requires that every assigned Project Manager be capable of developing a Project Management Plan that follows the standards of PMBOK 4.2. This plan will become the foundational planning document that guides subsequent project processes and serves as a required input for both the Project Team Integration Process and the Project Readiness Framework.

b. Recommendation 2: Mandate a Formal Team Integration Process

This recommendation responds to the core people issue, where GTU lacked a mechanism to align the team with project objectives instead of a single individual. The proposed solution is a new internal SOP, “GTU-HR-01:

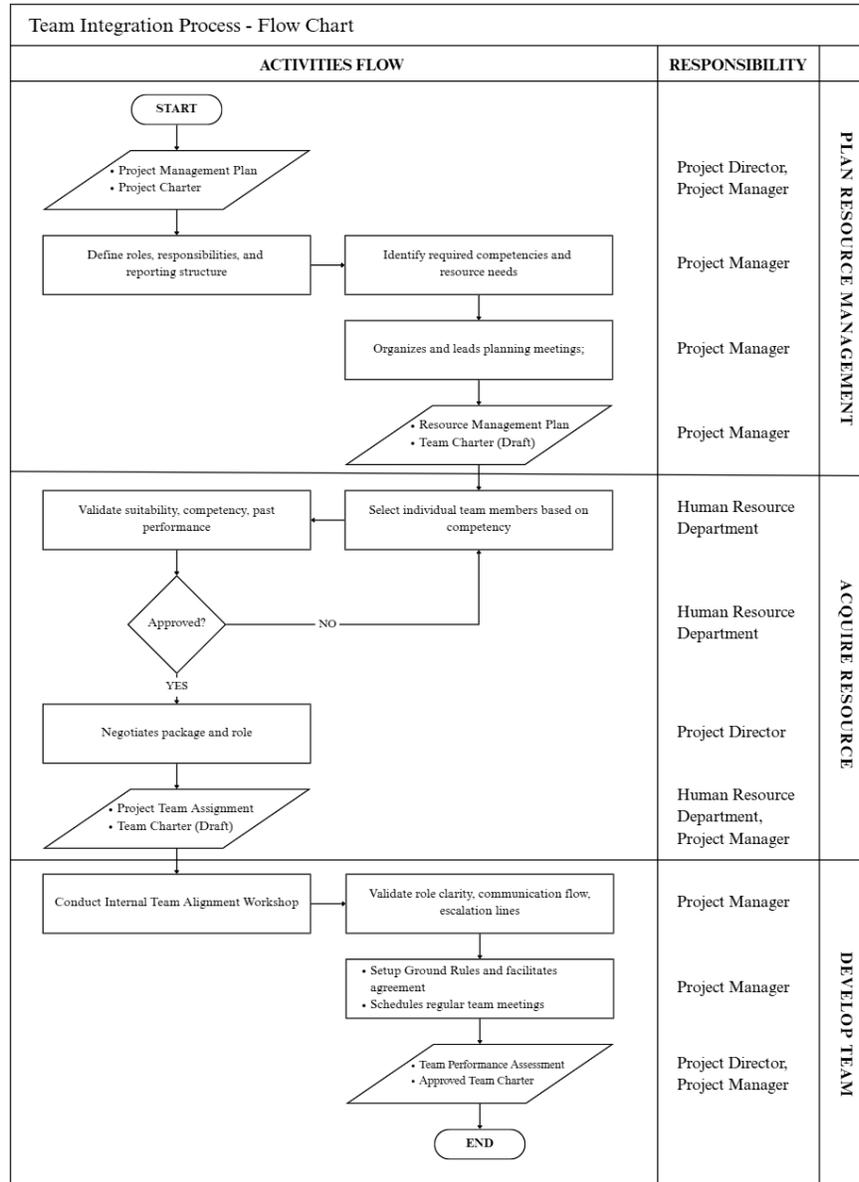


Figure 3.
Proposed GTU-HR-01 Process Flowchart

This SOP defines how team members are selected, briefed, and aligned with the Project Management Plan, key risks, roles, and expected behaviours, and produces a Team Integration Package to ensure the team is competent, cohesive, and committed to the project.

PMS-2: Integrated Change Control (ICC) Module

This module designed to address the root cause Absence of Change Control by establishing a single, mandatory process for managing all project changes. PMS-2 operationalizes integrated change control in a simple way so that scope, schedule, cost, and drawing changes are no longer handled informally.

Recommendation 3: Implement a Formal Integrated Change Control (ICC) System.

This recommendation addresses change issues that were not properly managed during the project. PT GTU needs to implement a new internal SOP, “GTU-P-ICC-01: Integrated Change Control”, Figure IV.15 shows the only valid workflow for any changes in project.

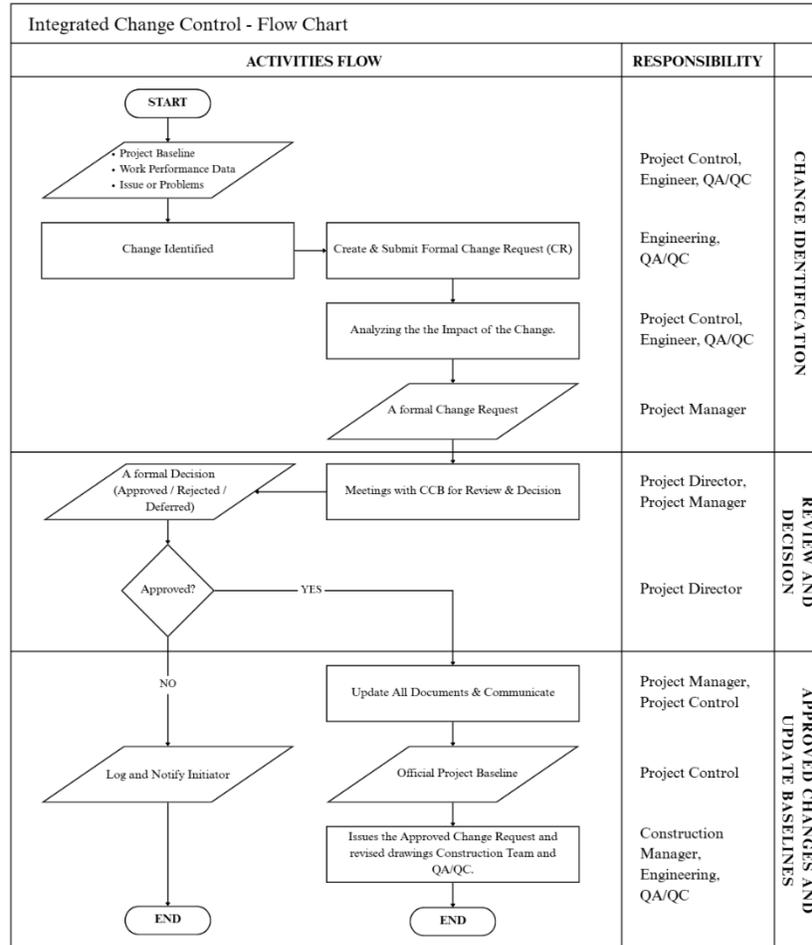


Figure 4.
Proposed GTU-P-ICC-01 Process Flowchart

Within GTU-P-ICC-01, a Change Control Board (CCB) and a Change Request Form are established to support this flow. The CCB consists of the Project Director, Project Manager, Project Control, and QA/QC, and reviews each change request, considers its impact on technical integrity, schedule, cost, and risk, and decides whether the change is approved, modified, or rejected. A Change Request template, illustrated in Figure 4, formalizes the minimum information required for CCB review.

GTU - Change Request Form		CR-ID: _____
Project:		_____
Originator:		_____
1. Description of Change:		
(What is the proposed change?)		
2. Justification for Change:		
(Why is this change necessary?)		
3. Impact Analysis		
Scope:	<input type="checkbox"/> High <input type="checkbox"/> Med <input type="checkbox"/> Low	
Schedule:	<input type="checkbox"/> High <input type="checkbox"/> Med <input type="checkbox"/> Low	
Cost	<input type="checkbox"/> High <input type="checkbox"/> Med <input type="checkbox"/> Low	
Quality	<input type="checkbox"/> High <input type="checkbox"/> Med <input type="checkbox"/> Low	
Risk	<input type="checkbox"/> High <input type="checkbox"/> Med <input type="checkbox"/> Low	
4. CCB Decision		
<input type="checkbox"/> Approved	<input type="checkbox"/> Rejected	
Sign-off by Project Manager:		
_____		Date:

Figure 5.
Change Request Template

This reduces unrecorded changes, inconsistent drawings, and scope creep, and keeps technical decisions visible to planning, construction, and quality control.

PMS-3: Baseline Governance and Project Readiness Module

PMS-3 is the project’s Go / No Go quality gate. It is designed to close the root cause Unrealistic Resources and Schedule Baseline by forcing realistic planning before execution and keeping the baseline under review once the work starts.

Recommendation 4: Implement GTU-P-PR-01 Baseline Governance and Project Readiness Review

PMS-3 is implemented through a standard procedure “GTU-P-PR-01: Baseline Governance and Project Readiness Review.” The procedure works in three linked stages as shown in Figure 6.

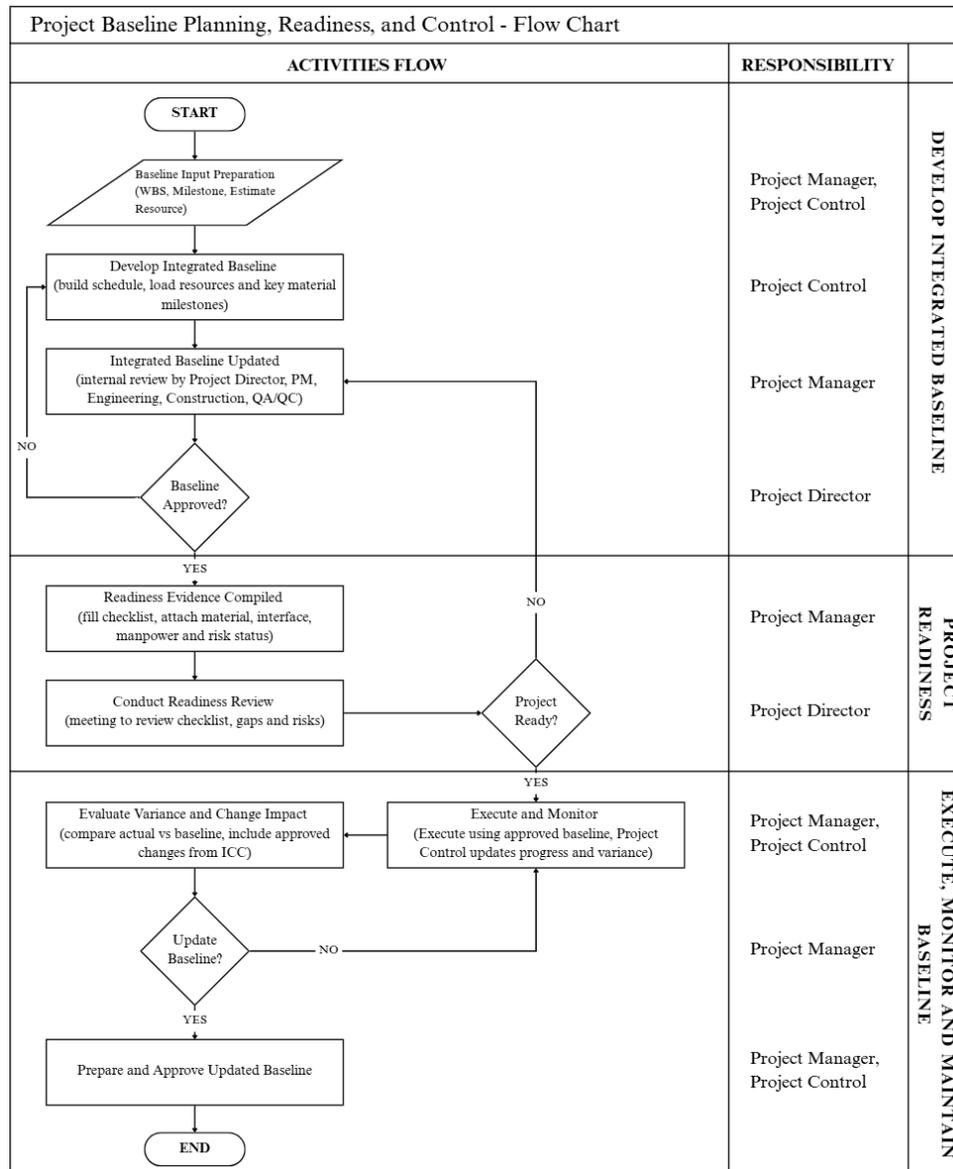


Figure 6.

Proposed GTU-P-PR-01 Process Flowchart

- a. Integrated baseline development.
 Planning & Control, Engineering, and the Project Manager combine contract scope, WBS, client milestones, productivity and resource data, material plans, and interface information to build one integrated schedule and resource baseline. The team reviews and adjusts this baseline until it is considered realistic. This step reflects PMBOK processes 4.2 Develop Project Management Plan, 6.5 Develop Schedule, and 9.2 Estimate Activity Resources.
- b. Project Readiness Review (Go / No Go).
 Before mobilisation, the team needs to complete the Project Readiness Review: Go/No-Go Checklist (Figure 7) and holds a short readiness meeting.

Project Readiness Review: Go/No-Go Checklist	
Governance & Team	
Criteria	Status (YES/NO)
Has a qualified Project Manager been formally assigned in line with the Project Manager Competency Matrix?	[]
Is the Project Management Plan, including the Schedule Management and Resource Management Plan, approved and signed off?	[]
Has the Team Integration Process been completed and documented (Team Integration Package issued)?	[]
Change Control Preparedness	
Criteria	Status (YES/NO)
Is SOP GTU-P-ICC-01: Integrated Change Control approved for this project?	[]
Has the Change Control Board (CCB) for this project been appointed and communicated to the project team?	[]
Are the Change Request Form and Change Register prepared and available to the project team?	[]
Schedule and Resource Baseline	
Criteria	Status (YES/NO)
Has the integrated schedule and resource baseline been approved?	[]
Has the Resource availability of materials has been verified?	[]
Have all major Interface conflicts been identified in the Risk Register?	[]
Does the Schedule Baseline reflect the actual resource availability and interface constraints?	[]
Authorization to Proceed (GO / NO-GO) Remarks: Sign-off by Project Director: _____ Date: _____	

Figure 7.

Project Readiness Review

c. Project Readiness Review (Go / No Go).

Once in execution, the project uses the approved baseline as the reference plan. Planning & Control update actual progress and then review the progress gap and change impact at regular intervals. If the gap is still within an acceptable control range, the team continues with the current baseline. If the gap shows that the plan no longer reflects reality, they prepare an updated baseline that includes actual performance and approved changes from PMS-2 and seek approval from the Project Director. This stage is consistent with PMBOK Control Schedule (6.6) and Control Costs (7.4).

With these three steps, PMS-3 prevents projects from starting with an unrealistic resource and baseline, which gives GTU a simple way to keep the plan realistic as conditions change.

CONCLUSION

This study analysed the failure of the BM4 piping project carried out by PT Gearindo Tiga Utama (GTU). Using interviews, project documents, coding under project constraints, Current Reality Trees, and PMBOK 6th Edition as a benchmark, the research found that the project failed not because of one technical issue, but because of deeper management problems. This section answers the three research questions.

a. What were the main factors that caused the BM4 project to fail?

The study found that the main factors behind the BM4 failure were three fundamental root causes, not just isolated day-to-day problems:

1) Lack of Project Leadership and Discipline.

The Project Manager was perceived as under-qualified in field management. Management presence at toolbox meetings and critical inspections was inconsistent. The team worked without strong daily and weekly routines, supervision was weak, and a resignation cascade happened when the Project Manager and his core group left together. This leadership gap sat behind many other issues such as weak planning, poor supervision, and slow decision making.

2) Absence of Change Control.

Drawing changes, client instructions, and site clarifications were not handled through a formal integrated change control process. Different parties sometimes used different drawing revisions, AFIs were delayed, and quality control worked on information that was not always current. As a result, the project faced drawing to actual mismatches, rework, disputes on acceptance, and unstable scope.

3) Unrealistic Resources and Schedule Baseline.

The initial baseline for schedule and resources did not match real conditions in the field. Workfronts were opened even when materials were not ready, manpower was mobilised without stable work, and interfaces with other contractors were not fully cleared. The project did not apply a disciplined process to estimate resources and build a realistic schedule. This made the original baseline impossible to follow and forced the team into constant firefighting.

These three root causes appeared repeatedly in the analysis and explained most of the Undesirable Effects identified under the resource, scope, time, and quality constraints.

b. How did these factors impact project performance, leading to the project's termination?

The three root causes above translated into clear performance problems in BM4

Under the resource constraint, weak leadership and an unrealistic baseline led to serious manpower issues. Capacity allocation was poor, recruitment was rushed, and qualification checks were weak. This produced both manpower shortage and low capability. Supervisors had difficulty in controlling crews, and welding output rarely achieved the Dia-inch plan. The productivity shortfall was a persistent issue and made it very hard to recover once the project fell behind.

Under the scope constraints, the absence of change control and poor planning created site unreadiness. Crews arrived at work areas that were still occupied by other contractors, or

where handover was not yet clear. Interfaces were not systematically managed, which caused congestion and frequent stop and start work. This decreased productivity and led to frustration in the field.

Under the time constraint, these resource and scope problems grew into a major schedule slip. Since the baseline was unrealistic, early delays in drawings, AFIs, materials, and access quickly used up any float. There was no strong mechanism to re-baseline or enforce recovery plans. As a result, the gap between planned and actual progress increased month by month.

Under the quality constraint, missing change control and weak leadership also caused quality failures. AFI approvals were slow, documentation was incomplete or out of date, and QC had difficulty checking work against the correct drawings. This caused nonconformities, rework, and disputes between claim and acceptance.

Financially and relationally, these issues damaged trust. Costs increased due to low productivity and rework, while payment was delayed due to schedule slip and quality disputes. Tension between GTU and the client increased. In the end, the project could not present a credible recovery plan, and the client decided to terminate the contract. In other words, the three root causes led to persistent problems in productivity, schedule, quality, and commercial relations that made continuation of the project no longer acceptable.

- c. What solution can be proposed to ensure this type of failure does not happen in future projects?

To reduce the risk of similar failures, the study proposes a Project Management System (PMS) for GTU that directly targets the three root causes.

1) PMS-1: Leadership and Discipline Module

This framework defines specific competency requirements for Project Managers and sets minimum leadership routines. It includes a Project Manager competency matrix based on PMI's talent triangle and relevant PMBOK processes, structured team formation and onboarding, mandatory management presence in toolbox meetings and key inspections, and clear escalation lines. The goal is to ensure that future projects are led by Project Managers who can maintain planning discipline, supervise crews effectively, and manage team risks such as resignation cascades.

2) PMS-2: Integrated Change Control (ICC) Module

This framework introduces a simple but formal control system aligned with PMBOK integrated change control. It specifies how drawing revisions, field changes, and client instructions are to be requested, reviewed, approved, and circulated. These include a change register, standard forms, a small Change Control Board, and specific connections between change decisions, drawing updates, AFIs, and document control. This is done in order to mitigate uncontrolled drawing changes, AFI backlogs, and scope confusion the likes of BM4.

3) PMS-3: Baseline Governance and Readiness Module

This framework improves how GTU develops and uses its resource and schedule baselines. It mandates baselines based on realistic assumptions of resources and productivity, availability of materials, and site access.. It introduces simple readiness gates and Go or No-Go criteria before major mobilizations, such as minimum material readiness, interface clearance, and AFI status. It also sets rules for monitoring

deviations and deciding when to re-baseline. The objective is to avoid starting work with plans and baselines that do not match field reality.

Together, these three pillars form an integrated solution that is directly linked to the root causes identified in BM4 and that is consistent with PMBOK guidance. They provide a practical way for GTU to improve its project governance in future projects.

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