



Proposed Project Management Development for AMA Group

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ABSTRACT: The research aims to improve AMA Group's project management to address project delays and identify the root causes. It uses PMBOK as a problem-solving approach, utilizing expert judgment and historical data to identify root causes and assess project management aspects. The root cause of project delays is related to project scope, schedule, and resource management. Work Breakdown Structure (WBS) and Critical Path Method (CPM) are recommended tools for project scope management, scheduling, and resource management. These techniques enable effective change control, comprehensive scope planning, realistic schedule planning, streamlining workflow processes, addressing labour shortages, and regularly reviewing and improving project structures and processes. By integrating these tools, AMA Group can mitigate potential delays and enhance project efficiency.

KEYWORDS: Project Delay, PMBOK, Project Scope Management, Project Schedule Management, Project Resource Management, WBS, CPM.

INTRODUCTION

Indonesia's construction industry experienced a 4.83 percent annual growth in 2021, driven by the administration's infrastructure push. GDP from construction in Indonesia increased to IDR 292,776.20 billion in the fourth quarter of 2022, from IDR 279,993.90 billion in the third quarter.

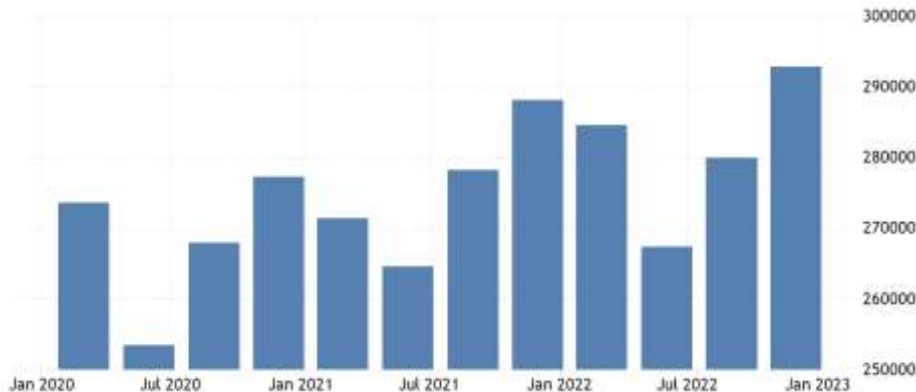


Figure 1. Indonesia GDP in Construction sector 2020-2023 (Trading Economics)

The Indonesian Chamber of Commerce and Industry (Kadin) predicts a promising infrastructure construction industry in the coming year, contributing significantly to the domestic economy. The state plans to increase infrastructure allocation by 7.75% from IDR 363.8 trillion to IDR 392 trillion in 2023. Issues such as equipment management, unreliable subcontractors, skilled employees, communication, changing regulations, and scheduling are common in the construction industry. Scheduling is crucial for project management, as it provides structure and organization to the timeline and resources, enabling timely completion of responsibilities, effective management of dependencies, and efficient resource allocation. Project management is crucial for ensuring clear direction and purpose in construction work, as ambiguity can hinder project success.

Rolling and bending techniques are used in the construction and machining industries to shape iron and steel pipes, which are used in residential buildings, factories, warehouses, and machinery. AMA Group offers pipe bending, rolling, and fabrication services for construction companies, ensuring they create components that meet their specific requirements.



BUSINESS ISSUE

The construction industry faces challenges such as delay schedules, resource constraints, and project scope constraints. Delayed schedules can result from unforeseen issues, labor shortages, or design changes, leading to unrealistic timelines and expectations. AMA Group faces project management obstacles due to schedule delays, resource constraints, and project scope constraints. Resource constraints include limited availability of skilled labor, materials, and equipment, which can lead to inefficiencies and project delays. Addressing resource constraints requires effective planning, collaboration with suppliers and subcontractors, and proactive resource management strategies.

Effective project management practices include accurate planning, proactive risk management, and strong stakeholder engagement. Scope creep, or uncontrolled expansion of project scope, can lead to delays, budget overruns, and compromised project objectives. To manage scope constraints effectively, it is crucial to define project objectives, manage stakeholder expectations, and develop effective change management processes.



Figure 2. AMA Group Revenue and Project History 2019-2022 (Data Company)

The AMA Group experienced a significant decrease in revenue over the past four years, mainly due to Covid-19-related industries impacting management performance. However, revenue and project orders increased in 2021-2022 due to recovering business and economic sectors. The hypothesis suggests project delays are the primary cause, but a root cause analysis is needed to determine the root causes.

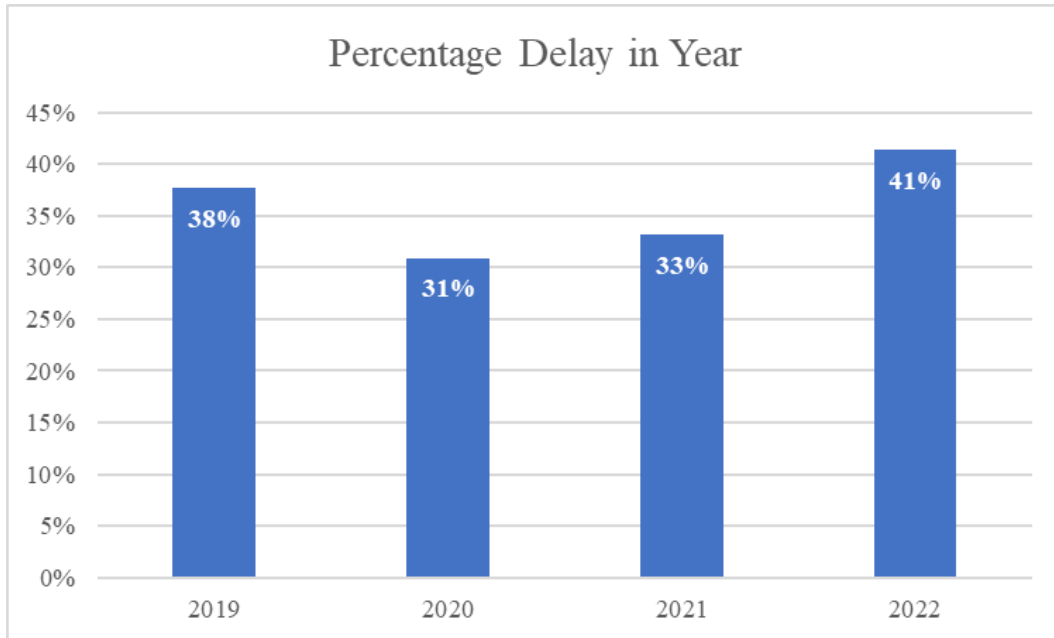


Figure 3. AMA Group Percentage Delay 2019-2022 (Data Company)

AMA Group's total delay project refers to the duration of project delays in different years, with an average annual delay of 30-40%. The graph shows a significant increase in delays in 2022, indicating a significant increase in revenue. The Covid-19 pandemic contributed to a decrease in delay in 2020, resulting in slower commercial operations. Project managers must focus on evidence-based learning, trade-off analysis, and risk assessment to mitigate the negative effects of project delays and improve outcomes. By implementing robust project management techniques, such as proactive planning, effective resource allocation, and scope control measures, construction professionals can effectively handle these challenges and enhance project success.

PROJECT MANAGEMENT

Project management is crucial for businesses to generate value and rewards in today's competitive marketplace. It involves a specific start and finish sequence of tasks, culminating in the creation of end products or deliverables. Effective project management aligns project outcomes with business objectives, improves market competitiveness, sustains the organization, and reacts to changes in the business environment. It involves applying knowledge, skills, tools, and techniques to project activities, planning, organizing, directing, and controlling resources for short-term objectives. Project management employs a systems approach, assigning functional personnel to specific projects in a vertical or horizontal hierarchy.

The three critical components of efficient project management are project scope management, project schedule management, and project resource management. By using precise techniques, project scope management makes sure that all necessary work is included in the project while removing any that are not. The processes used in project schedule management ensure that the project is finished within the allotted time limit. Finally, project resource management involves steps to locate, secure, and manage the resources needed for a project's successful execution. By ensuring that the work is clearly defined, executed according to schedule, and supported by the required resources, these management areas jointly contribute to the success of the project.

RESEARCH METHODOLOGY

Research design is the strategy or plan used by researchers to answer questions or test hypotheses. It includes methods, instruments, and procedures for data collection and analysis. For qualitative research, it involves selecting research questions, participants, data collection methods, and data analysis techniques. The research design should be rigorous, ethical, and credible, while being flexible for adjustments. Root cause identification involves examining the root causes of business issues using the "5 Whys" method and a Current Reality Tree.



Project management considerations involve establishing a Project Management Group and using the Project Management Body of Knowledge (PMBOK) framework. The PMBOK Checklist aspect ensures all necessary elements are addressed during the research design process. The Current Reality Tree and PMBOK Checklist outputs contribute to a comprehensive understanding of the business issue, its underlying causes, and project management considerations. These outputs aid in formulating problem statements and proposed solutions, providing the foundation for future research and project implementation.

ANALYSIS

Root Cause Analysis

Root cause analysis is a project management tool that identifies issues' root causes, preventing symptomatic treatment. It uses techniques like the 5 Why method and CRT to treat issues thoroughly and prevent recurrence.

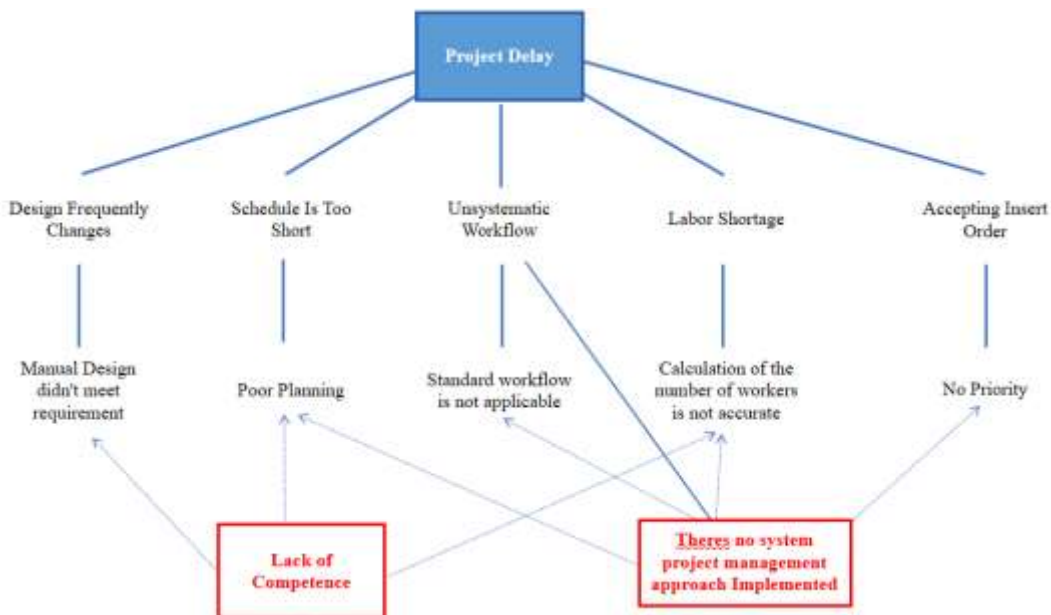


Figure 4. CRT Model Analysis

AMA Group's project delays can be attributed to various factors, including frequent design changes, short schedules, unsystematic workflow, labor shortage, and accepting insert orders. Design changes disrupt the workflow and extend the project timeline, while lack of competence among workers can lead to errors, rework, and extended timelines. A short schedule puts excessive pressure on the team, causing delays. A lack of competence among the labor force can significantly impact project timelines. A robust project management system is essential for proper training, skill development, and resource allocation.

Unsystematic workflow can lead to confusion, duplicated efforts, and delays. Labor shortages can cause overburdening, increased workloads, and delays in project completion. Accepting insert orders without proper assessment can disrupt the project's flow and lead to delays. To address these issues, AMA should implement better project management practices, such as effective change management processes, realistic scheduling, real-time monitoring and reporting, and a thorough evaluation process for insert orders. By addressing these issues, AMA can mitigate delays and improve project completion efficiency.

INTEGRATION ROOT CAUSE WITH PROJECT MANAGEMENT

The PMBOK (Project Management Body of Knowledge) is a widely recognized standard for project management developed by the Project Management Institute (PMI). It provides a framework and best practices for managing projects across various industries and domains.



Table 1. Integration Analysis of Root cause and Project Management

No	Root Cause	Impact	Current State	Expected Future State	Proposed Solution
1	Poor Planning	The project experiences delays in completing certain stages or deliverables.	Do not have a plan schedule management and no plan schedule management	There is a clear plan from the AMA regarding schedule and resource management	Project Schedule Management
2	Standard workflow not applicable	Delay the project so that	The project has established its schedule, general scope, and deliverables requirements, but has not yet developed a WBS.	There is accessible a WBS that is both clear and well-constructed.	Project Scope Management
3	Labor shortage	Project delays caused by the absence of estimated resources to work on certain projects resulting in overwork	Does not make plan schedule management, does not estimate activity duration, does not explain activity sequences, does not develop schedule	Overwork is reduced, resource allocation for each project can be estimated and no overwork occurs	Project Schedule Management - Project Resources Management
4	No work priority	Constraints in the project work process, which causes the project work to be out of sequence so that the work that should have been completed earlier is delayed	At the completion of the project already has a settlement agreement, but often projects that come in later are done first so that project completion is not in accordance with the flow	Project work has clear work priorities based on a predetermined timeline so that delays can be avoided	Project Scope Management - Project Schedule Management
5	Manual Design didn't meet requirement	There is a possibility of design changes that occur during work which causes work to be delayed (delay).	The design often changes during execution phase because the customer's design that is submitted to AMA is still an initial sketch that is not fixed	There is a fixed design that has been agreed between the AMA and the consumer in the form of a document so that the design looks clear and the deficiencies can be understood in detail so that there are no design changes in the future	Project Scope Management

A checklist is a crucial tool in project management, ensuring important tasks and considerations are not overlooked during planning, execution, monitoring, and closing phases. The PMBOK outlines key knowledge areas, processes, and inputs/outputs for effective project management.

PROJECT SCOPE MANAGEMENT ANALYSIS

The AMA Group's Plan Scope Management lacks clarity and documentation, leading to inaccurate estimation and planning, increased uncertainty, and inefficient project management. This lack of competence in the scope area has resulted in confusion, misalignment, and missed deadlines. The absence of a structured approach and standardized workflow further exacerbates scope-related issues. The lack of a system project management approach hinders effective planning, organization, and monitoring, resulting in a lack of control over the scope. The project manager must adapt to the new process of subdividing project deliverables into manageable components (WBS) and conducting scope validation and control phases on-site.

PROJECT SCHEDULE MANAGEMENT ANALYSIS

The AMA Group's lack of a plan schedule management process and documented relationships between project activities presents significant challenges to their project management approach. This lack of clarity in activity sequence and dependencies leads to



confusion, potential delays, and miscommunication among team members. Additionally, relying on a historical approach for estimating project time periods can result in inefficient resource allocation, as historical estimates may not account for specific project circumstances or lessons learned from previous projects.

Another challenge is the difficulty in setting realistic deadlines and managing expectations. Without a documented schedule, tracking progress and identifying potential bottlenecks or deviations from the plan are difficult. Poor planning and poor prioritization of tasks contribute to confusion, conflicting priorities, and a lack of coordination among team members.

To address these challenges, the proposed solution is the critical path method (CPM). This project management technique identifies the longest sequence of dependent activities, determining the project's overall duration. By implementing the CPM, the AMA Group can gain a comprehensive understanding of the sequence of activities and their dependencies, enabling more accurate scheduling and resource allocation. This approach enhances the group's competence in managing schedules, improves coordination among team members, and increases the likelihood of successful project completion within the designated timeframe.

PROJECT RESOURCE MANAGEMENT ANALYSIS

The AMA Group has a positive project management approach, including a good supply of raw materials and equipment, well-documented records, and a well-established system for labour management. However, they struggle with accurately calculating the number of workers needed for each activity, leading to delays, inefficiencies, and compromised project outcomes. Additionally, the absence of a Work Breakdown Structure (WBS) complicates the monitoring and control process, making it difficult to track and manage labour effectively.

The lack of a system project management approach and inaccurate labour calculations due to labour shortages significantly impact the company's resource management. To address these challenges, the proposed solution is the creation of a critical path method (CPM), which identifies the longest sequence of dependent activities and determines the project's overall duration. This approach provides better visibility into the sequence of activities, their dependencies, and associated resource requirements, ultimately improving project performance.

BUSINESS SOLUTION

PROJECT SCOPE

Project scope management is the process of defining, controlling, and managing a project's boundaries and deliverables. It aims to ensure that the project is executed within the defined scope, meets stakeholder expectations, and produces desired results. The WBS is a systematic framework for breaking down the project scope into manageable tasks and subtasks, providing a comprehensive understanding of the project's objectives, deliverables, and boundaries. It serves as a roadmap for planning and executing the project, enabling effective resource management, tasks, and timelines. The WBS helps the AMA Group maintain focus on internal processes within sales, marketing, and customer support departments, while avoiding major infrastructure changes or new product development.

The WBS also facilitates communication and collaboration among team members, stakeholders, and external partners, ensuring a shared understanding of project objectives and deliverables. In 2018, Al-Hajj and Zraunig's 2018 study rated WBS 3.16 out of 4, making it a valuable tool for project management success.

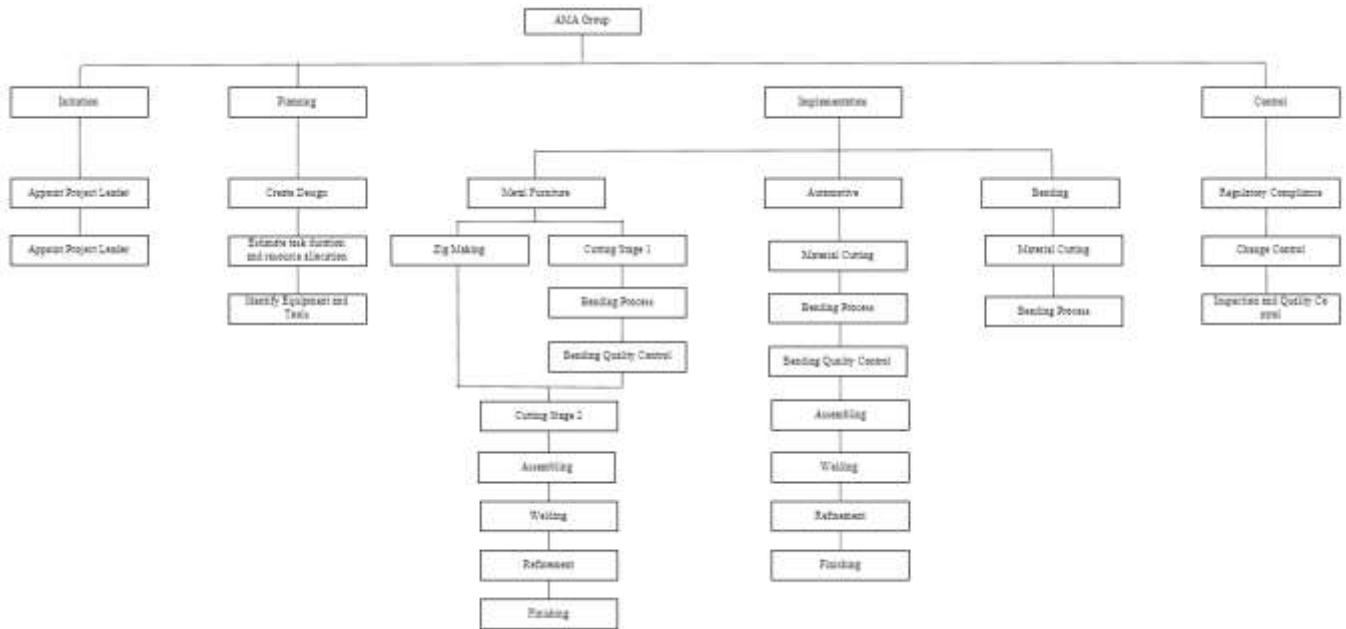


Figure 5. Work Breakdown Structure Analysis

PROJECT SCHEDULE

Project management is crucial for creating, analysing, and controlling a project schedule. It involves creating an activity schedule, identifying task dependencies, estimating durations, and allocating resources to ensure project completion within the desired timeframe. The CPM method, with a 3.76 out of 4 rating, helps determine which operations are included in the critical path and which are not. The critical path is a series of work items that are critical to the project's completion. To determine the critical path, early start, early finish, late start, late finish values must be determined, along with slack, which is the time an activity can be postponed without disrupting other projects' schedules.

AMA METAL FURNITURE

The following are the immediate, predecessor and project completion time as well as the critical path of metal furniture work which will be explained in the following sections:

Table 2. Immediate predecessor and project duration AMA Metal Furniture

Activity	Description	Immediate Predecessor	Estimated Completion Time
A	Design	-	60'
B	Zig Making	A	480'
C	Cutting stage 1	A	60'
D1	Bending Process	C	15'
D2	Bending Quality Control	D1	5'
Activity	Description	Immediate Predecessor	Estimated Completion Time
E	Cutting stage 2	B,D2	60'
F	Assembling	E	240'
G	Welding	F	480'
H	Refinement	G	240'



I	Finishing	H	120
J	Quality Control	I	5

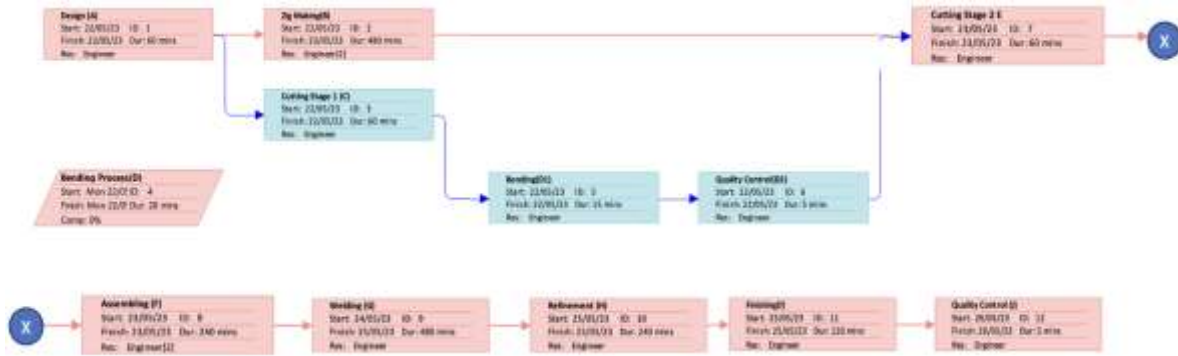


Figure 6. Project Network Diagram AMA Metal Furniture

To determine the critical path, determine project early start, early finish, late start, late finish values, and calculate slack value. The method, following Project Management Institute provisions, is used for metal furniture work.

Table 3. Project CPM Calculation AMA Metal Furniture

Node	Duration	ES	EF	LS	LF	SLACK	CRITICAL
A	60	0	60	0	60	0	Yes
B	480	60	540	60	540	0	Yes
C	60	60	120	460	520	400	No
D1	15	120	135	520	535	400	No
D2	5	135	140	535	540	400	No
E	60	540	600	540	600	0	Yes
F	240	600	840	600	840	0	Yes
G	480	840	1320	840	1320	0	Yes
H	240	1320	1560	1320	1560	0	Yes
I	120	1560	1680	1560	1680	0	Yes
J	5	1680	1685	1680	1685	0	Yes

The critical path method is from activity A, B, E, F, G, H, I, J

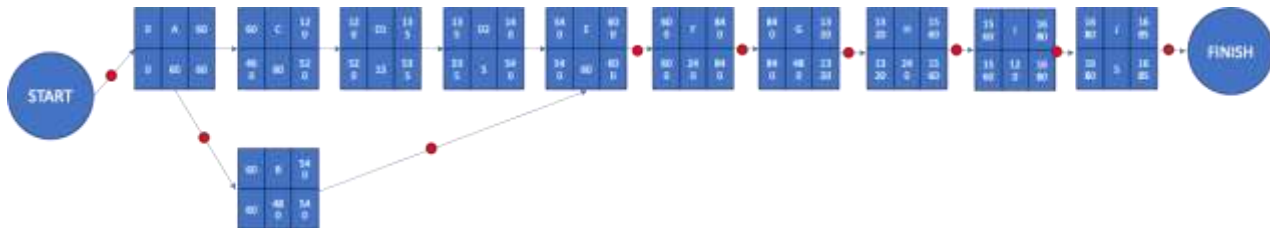


Figure 7. Project Critical Path Diagram AMA Metal Furniture

A critical path task is a crucial activity within a project that must be completed in a specific order within a defined timeframe to ensure project completion on schedule. These tasks have zero slack, meaning any delay in their completion directly impacts the project timeline. Delays in these tasks cause delays in subsequent tasks and ultimately, the project completion date.

AMA AUTOMOTIVE

The following are immediate, predecessor and project execution time as well as the critical path of automotive work which will be explained in the following sections:

Table 4. Immediate predecessor and project duration AMA Automotive

Activity	Description	Immediate Predecessor	Estimated Completion Time
A	Design	-	60'
B	Material Cutting	A	10'
C1	Bending Process	B	15'
C2	Bending Quality Control	C	5'
D	Assembling	D	120'
E	Welding	E	120'
F	Refinement	F	60'
G	Finishing	G	120'
H	Quality Control	H	5'

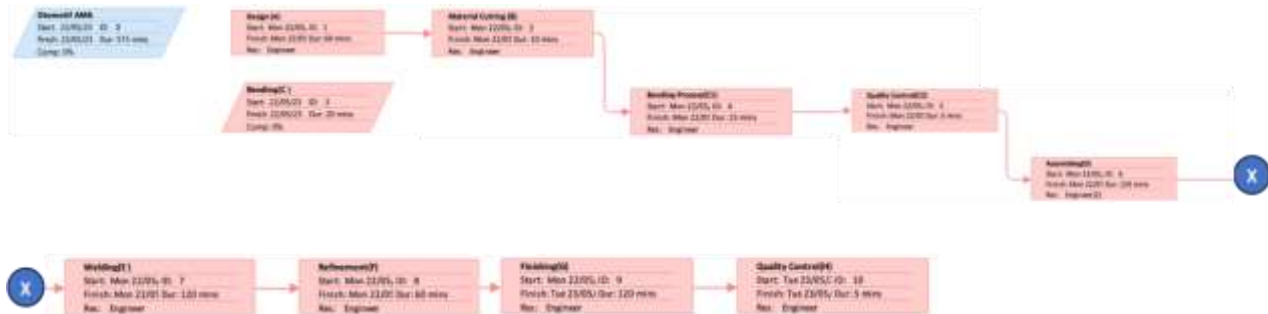


Figure 8. Project Network Diagram AMA Automotive

To determine the critical path, determine project early start, early finish, late start, late finish values, and calculate slack value. The method, following Project Management Institute provisions, is used for metal furniture work.

Table 5. Project CPM Calculation AMA Automotive

Node	Duration	ES	EF	LS	LF	SLACK	CRITICAL
A	60	0	60	0	60	0	Yes
B	10	60	70	60	70	0	Yes
C1	15	70	85	70	85	0	Yes
C2	5	85	90	85	90	0	Yes
D	120	90	210	90	210	0	Yes
E	120	210	330	210	330	0	Yes
F	60	330	390	330	390	0	Yes
G	120	390	510	390	510	0	Yes
H	5	510	515	510	515	0	Yes

The critical path method is from activity A, B, C1, C2, D, E, F, G, H.

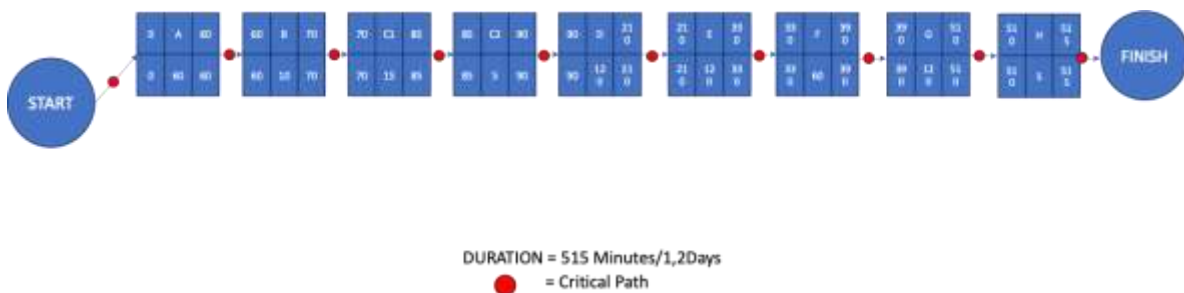


Figure 9. Project Critical Path Diagram AMA Automotive

Automotive work requires critical path processing tasks to be completed in specific order and within a defined timeframe to ensure project completion on schedule.

AMA BENDING

The following are the immediate, predecessor and project execution time as well as the critical path of the bending work which will be explained in the following sections:

Table 6. Immediate predecessor and project duration AMA Bending

Activity	Description	Immediate Predecessor	Estimated Completion Time
A	Design	-	10'
B	Material Cutting	A	5'
C	Bending Process	B	15'
D	Quality Control	C	5'

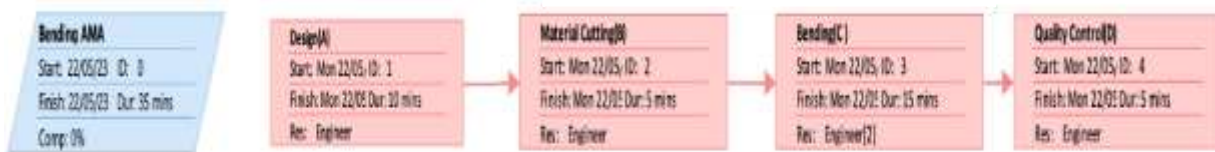


Figure 10. Project Network Diagram AMA Bending

To determine the critical path, determine project early start, early finish, late start, late finish values, and calculate slack value. The method, following Project Management Institute provisions, is used for metal furniture work.

Table 7. Project CPM Calculation AMA Bending

Node	Duration	ES	EF	LS	LF	SLACK	CRITICAL
A	10	0	10	0	10	0	Yes
B	5	10	15	10	15	0	Yes
C	15	15	30	15	30	0	Yes
D	5	30	35	30	35	0	Yes

The critical path method is from activity A, B, C, D.

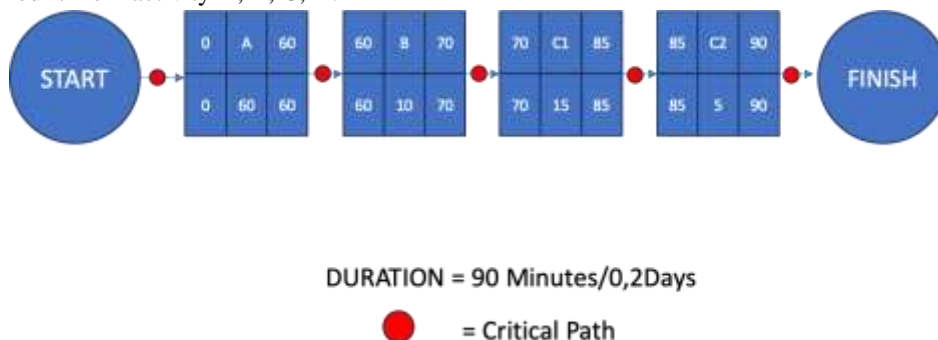


Figure 11. Project Critical Path Diagram AMA Bending

Bending work involves completing tasks on a critical path, ensuring they are completed in specific order and within a defined timeframe to complete the project on schedule.

PROJECT SCOPE

Resource allocation in project management involves scheduling activities and determining necessary resources based on availability, duration, and strategic objectives. It assigns fixed resources to all available activities, identifying the quickest critical path based on available resources. Project resources include assets, tools, materials, and personnel needed for successful completion. Workers at AMA play a vital role in executing tasks, providing necessary support and ensuring proper division of labor. Resource identification can be done using Ms. Project, identifying overallocated workers in the metal furniture project.

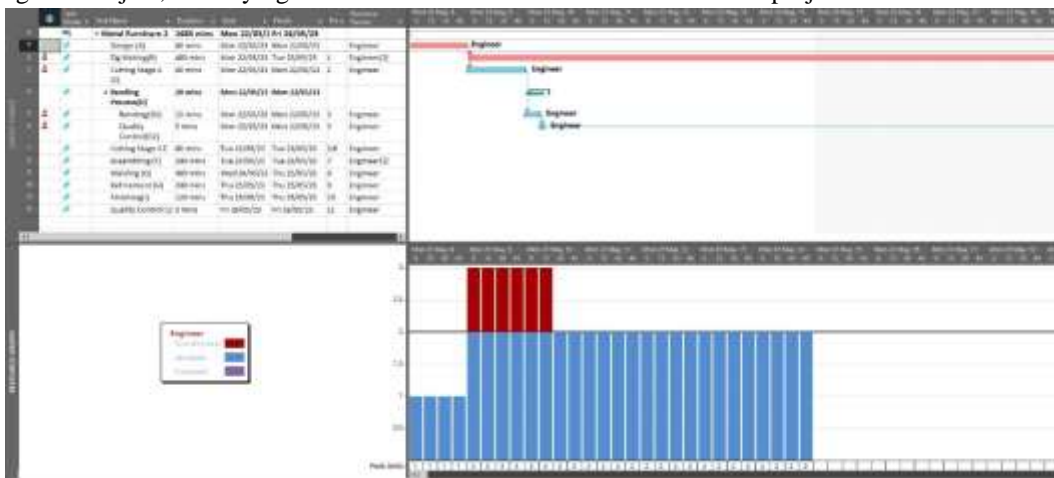


Figure 12. Identification of resource overallocated using Ms. Project

Resource leveling is a technique that optimizes resource allocation and utilization to prevent uneven distribution and overallocated projects. It helps mitigate delays by balancing workloads and availability, preventing bottlenecks, improving efficiency, and reducing delays caused by resource constraints. It should be applied in conjunction with other project management strategies to effectively manage and mitigate delays. Resource leveling helps identify and prevent resource imbalances over time, evaluating a trade-off between project completion time and efficient resource utilization.

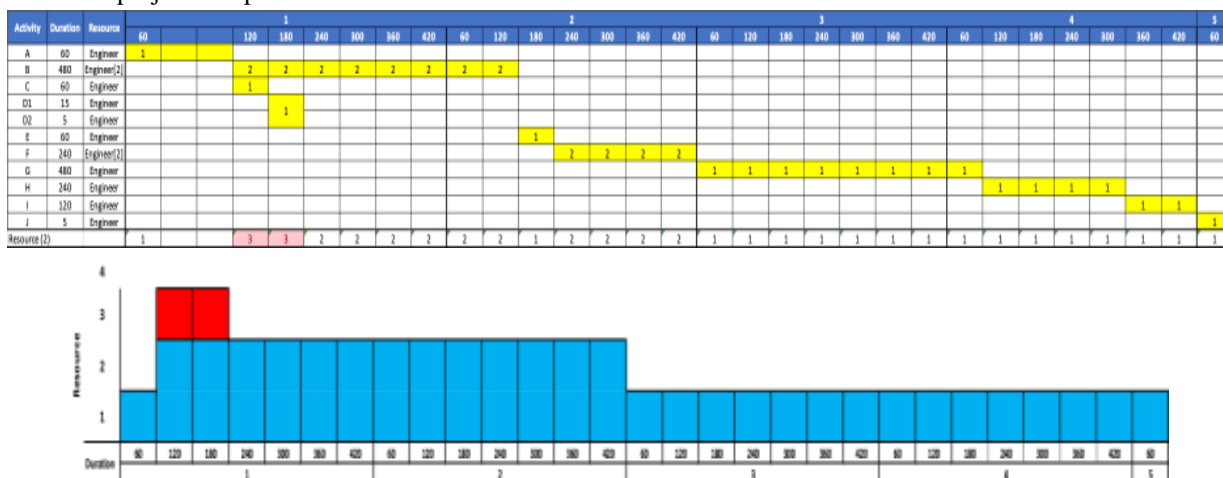


Figure 13. Current state AMA Resource Allocated Data and Graphic

A shortage of workers occurred on the first day, with 2 workers with normal working hours. This could lead to decreased work quality, increased costs, and schedule delays. Resource leveling was carried out, with results shown in tables and graphs.

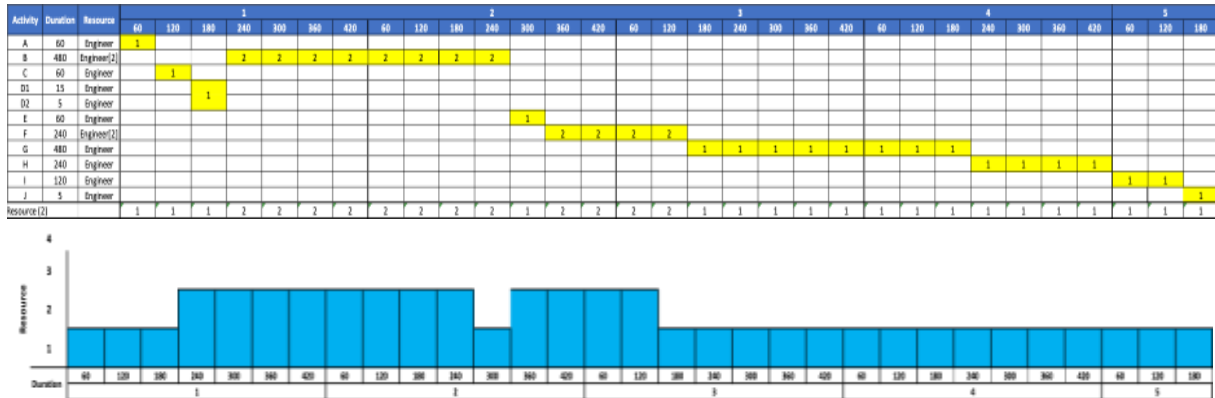


Figure 14. Resource Allocated Data and Graphic after Resource Levelling

The AMA's resource leveling has addressed overallocated resources, but a new problem arises: project completion delays. This is in line with the trade-off theory in resource project management, which emphasizes time-limited completion and resource-limited completion. The AMA must pay a price to shorten work time or add time for completion. The table compares additional costs incurred with available time.

Table 8. Additional resource scenario for AMA Metal Furniture

	Additional Resource (First Scenario)	Without Additional Resource (Second Scenario)
Additional Cost per worker	150.000	-
Total Time	1685 Minutes	1805 Minutes

The lack of resources in metal furniture production can significantly impact the AMA Group's project. Resource leveling, which aims to balance resource allocation across different tasks, may contribute to this shortage. To address this issue, the author engaged in an inquiry with the AMA Group and identified two possible scenarios: adding more resources or not adding more resources. The choice between adding more resources depends on the project's specific circumstances, such as the urgency of the deadline and the available time for completion.

In the automotive and bending projects, all tasks are on the critical path, and delays in one task directly affect the duration of the entire project. It is crucial to closely monitor tasks on the critical path and keep them running on schedule.

Highly competent employees demonstrate a better understanding of task requirements, possess the necessary skills to perform efficiently, and effectively manage their time, resulting in improved adherence to project schedules and increased project success rates. To enhance project performance and prioritize the development and management of team members, various strategies were proposed. These include providing comprehensive training programs, professional development opportunities, clear communication of roles and responsibilities, establishing effective communication channels, organizing team-building activities, implementing a robust performance management system, establishing mentorship and coaching programs, encouraging empowerment and autonomy among team members, and promoting a culture of continuous improvement.

In conclusion, enhancing the competence of the workforce within the AMA Group can effectively address issues related to lack of competence in manual design, poor planning, and inaccurate calculation of the number of workers. By investing in training and skill development, the group can improve their overall project management capabilities, resulting in improved project outcomes, increased efficiency, and overall project success.

IMPLEMENTATION PLAN

To effectively manage a project, it is essential to define the solution in three main areas: project schedule management, project scope management, and project resource management. Firstly, define the solution for each management area and ensure it aligns with the company's goals and objectives. In project scope management, identify and break down specific activities into manageable tasks,



assign responsibilities and roles to team members, and create a Work Breakdown Structure. In project schedule management, develop a timeline, allocate sufficient time, set realistic deadlines, and establish milestones to track progress. In project resource management, identify necessary resources, assess their availability and allocation, and communicate requirements and expectations with stakeholders.

Monitor and evaluate the implementation process, establish effective communication channels, encourage feedback, and develop mechanisms for monitoring progress. Regular review and evaluation of the plan enable adjustments or refinements, and periodic assessments identify areas for improvement.

The author recommends using a Gantt chart for the AMA Group to plan and communicate their problems. This chart helps in planning, communication, and resource allocation, fostering clarity, regulating expectations, and maximizing resource utilization. It also aids stakeholder communication, visualizing progress, increasing transparency, and managing expectations. The chart will be tested to ensure compatibility with the group's capabilities.

Table 9. Propose Gantt Chart

Focus Area	Description	Responsible PIC	Month 1				Month 2				
			W1	W2	W3	W4	W1	W2	W3	W4	
Proposed Business Solution	Communicate with AMA Group about proposed solution	Owner, Operation Manager									
	Integrated with the system	Owner, Operation Manager									
Project Scope Management	Break down the activities into manageable tasks and determine their dependencies	Operation Manager									
	Creating WBS	Operation Manager									
	Setting up pilot project for testing and development	Operation Manager									
Project Schedule Management	Develop a timeline for the implementation of the proposed solution activities	Operation Manager									
	Determine Sequence Activity	Operation Manager									
	Setting up pilot project for testing and development	Operation Manager									
Project Resource Management	Identify the resources (personnel, equipment, materials) required for each activity/task	Operation Manager									
	Assess the availability and allocation of resources to ensure they align with the timeline and duration of the project	Operation Manager									



Focus Area	Description	Responsible PIC	Month 1				Month 2				
			W1	W2	W3	W4	W1	W2	W3	W4	
	Creating resource allocation	Operation Manager									
	Develop a training strategy for enhanced competences	Operation Manager									
	Setting up pilot project for testing and development	Operation Manager									
Monitoring and Evaluation		Owner, Operation Manager									

CONCLUSION

AMA Group faced challenges in project management due to design changes, a compressed schedule, unsystematic workflow, labor shortages, and accepting insert orders. To address these issues, the author implemented tools and techniques such as a Work Breakdown Structure (WBS) for project scope management, the Critical Path Method (CPM) for project scheduling, and both CPM and resource histograms for resource management. These techniques help manage design changes, optimize scheduling and resource allocation, and mitigate project risks. By implementing these tools, AMA Group aims to improve project outcomes by addressing labor shortages and optimizing resource utilization.

RECOMMENDATION

AMA Group should implement several recommendations to improve project management practices and address issues related to project scope, schedule, and resource management. These include establishing a formal change control process, conducting comprehensive scope planning, conducting realistic schedule planning, streamlining workflow processes, addressing labor shortages and resource allocation, and reviewing and improving project structures and processes. Establishing a formal change control process involves submitting, evaluating, and approving design changes, involving stakeholders and assessing their impact on scope, schedule, and resources. Engaging stakeholders in a comprehensive and collaborative manner helps identify and capture project deliverables, reducing scope gaps and scope creep.

Realistic schedule planning considers factors such as task dependencies, resource availability, and potential risks when creating the project schedule. Revising the schedule to accommodate a more realistic timeframe can improve coordination and reduce pressure. Streamlining workflow processes and implementing project management software can further streamline processes. Addressing labor shortages and resource allocation using CPM and resource histograms can help manage resources effectively. Regularly communicating with stakeholders and maintaining a clear overview of resource requirements can help avoid overburdening the workforce.

In summary, AMA Group should implement these recommendations to enhance project management practices, address issues related to project scope, schedule, and resource management, leading to improved outcomes, better resource utilization, and overall project success.

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