Project Proposal

Renovation of Engineering Workspaces at XYZ Company Headquarters

Team 1 Members

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EMGT 5220: Engineering Project Management – Spring 2023

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Cover Letter

To:
Professor Andrei Guschin
College of Engineering
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Seattle, WA

April 19, 2023

Subject: Proposal to Renovate the Engineering Workspaces at XYZ Headquarters

Professor Guschin,

Please find attached the detailed proposal to renovate the engineering workspaces at XYZ company headquarters. XYZ company has experienced substantial growth in the last 10 years, increasing their global revenue from $2 billion dollars annually to $6 billion dollars annually. This significant growth has required the company to hire additional mechanical, electrical, manufacturing, and quality engineers, growing the total technical team from 30 on-site engineers to over 120 full-time engineering associates. In addition to the engineering team growth. XYZ company has had to double the size of their internal model shop team. The long-term outlook for the company anticipates continuous steady growth and will require more engineering resources to be employed at the company headquarters location. As a result of this significant growth, XYZ company has requested that a proposal be written to renovate their engineering workspaces. This proposal includes renovations to the laboratory spaces, workshops, models shops, and upgraded equipment in each area.

The following proposal lays out the details of the engineering workspaces renovation. The project is scheduled to take place over an 18-month period, and the exact start date can be moved to accommodate company resource requirements. The budget for the entire project is $3.3 million dollars. This includes renovations, labor, equipment upgrades, consulting fees, and a built-in contingency budget. The outcome of this project will be an increase in efficiency for the engineering teams' productivity and morale.

Thank you,

Team 1

Executive Summary

Introduction

XYZ Company has been headquartered at their current office for the past 10 years, and while the company has experienced significant growth during this time, the building and resources have not scaled accordingly. When the company first moved in, it was launching around 5 products per year, but in 2023 alone the company has launched over 20 new products. This growth in product offering has required the company to employ over four times as many engineers and designers as they did 10 years ago. The company is looking to use some of its cash reserves to invest in its engineering workspaces to modernize the labs, shops, and equipment that their engineers use daily.

Solution

Upon receiving the RFQ/RFP from XYZ company to renovate their engineering workspaces, Team 1- in collaboration with the faculty at XYZ company, began immediate research into the company's requirements, local building codes, local unions, and construction companies, as well as the newest technologies available to outfit the renovated shops with. The project team has developed a plan that includes a full renovation, equipment upgrades, scheduling, financing, project monitoring and control, and closeout plans.

Value Proposition

The proposed solution will result in an increase in productivity and morale for the engineering team. Determining the expected efficiency gain is a nonproductive calculation, as there are too many unquantifiable variables to make assumptions for. This project will ultimately be deemed successful if the schedule is met, the budget is used as planned, and the planned renovations are executed as detailed in this charter.

Conclusion

The necessary research and analysis have been executed to provide a best-in-class solution to XYZ Company's requests. The project has been planned out meticulously, detailing schedules, finances, and contingencies. It is the goal of Team 1 to deliver an on-time, under-budget, and fully delivered renovation as proposed, and by moving forward with this project, XYZ Company will realize tangible improvements in its company's engineering output.

Project Objectives

Project objectives have been determined for each phase of the project and are detailed below. The objectives were written in accordance with XYZ Company's requirements as well as internal research that was conducted by Team 1.

Phase 1: Analyze

- Observe and analyze the current workspaces
- Identify structural and equipment specifications
- Interview current managers, engineers, and shop floor workers to identify areas of improvement and increase efficiency
- Conduct an ABC analysis to identify optimal inventory levels
- Collaborate with the engineers and external consulting companies to identify the latest manufacturing technologies suitable for the lab

Phase 2: Plan

- Create a project charter that specifies the scopes, objectives, and participants
- Optimize shop floor layout to better promote creativity and enhances efficiency
- Estimate a total project budget including cost of future maintenance
- Figure out how to scrap and salvage money from the current equipment that is soon to be replaced
- Agile design of the new lab such that the equipment and resources can be easily changed or moved in accordance with the current needs of the company

Phase 3: Procure

- Identify potential vendors for advanced machinery (CNC equipment, rapid prototyping equipment)
- Draft and send in RFQ's to vendors
- Finalize vendor(s); Negotiate cost and maintenance expenses
- Source and procure large tools, CNC equipment, rapid prototyping equipment, raw construction materials

Phase 4: Implement & Optimize

- Combine 3 adjacent lab rooms and storage closet into a single lab space
- Complete renovation and re-organization of engineering laboratories
- Implement a lean process to optimize between JIT inventory replenishment and necessary safety stock
- Hire a lab manager to replenish stock, maintain laboratory order and enforce lab processes

Critical Success Factors

- Issues and needs clearly addressed

- 18-month time frame is maintained
    - Phase 1 – 1 month
    - Phase 2 – 2 months
    - Phase 3 – 3 months
    - Phase 4 – 12 months
- Day-to-day operations at XYZ are not interrupted by the renovation project
- Stakeholders' agreement and flexibility to frequent changes in working environment for the next 18 months
- Effective cross-functional communication
- Approval from senior management for the budget
- Detailed labor plan for phase 4
    - Construction schedule in alignment with working schedule of XYZ company
- Experienced lab manager who can work independently
- Ability to identify state of the art equipment and reliable, future-proof vendors for such equipment

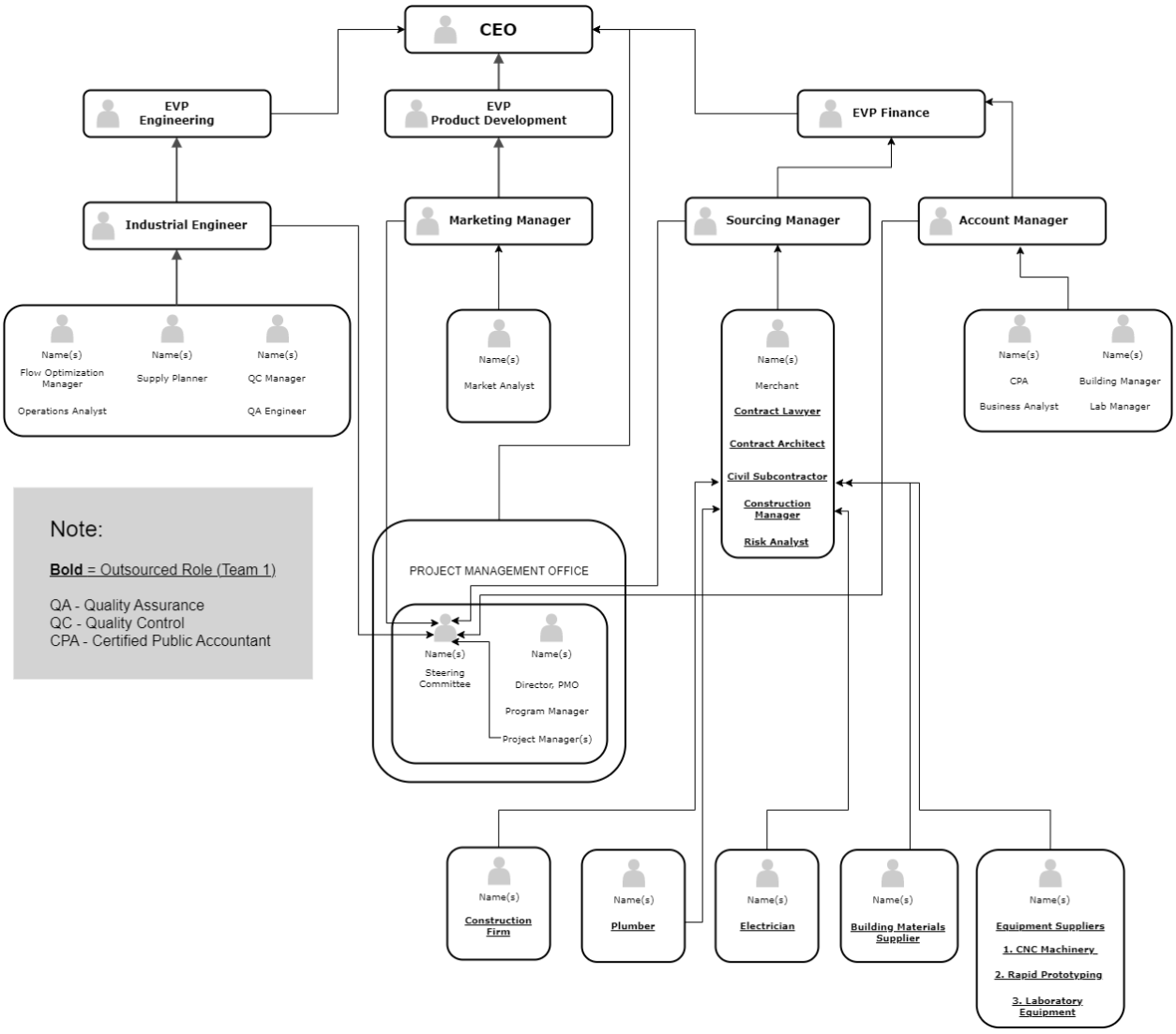
Assumptions

- Access to the process flow and resource utilization within the laboratory
- XYZ company has a high spending budget of $3.5 million for this project
- Vendors respond to the RFQ within 2 weeks
- Planned structural renovation increases productivity and efficiency
- Raw construction materials are readily available for purchase
- The old manufacturing equipment will be sold simultaneously as the new equipment arrives
- Equipment that is being moved from a prior location will be available for use to XYZ employees in the staging location during project implementation

Project Organizational Structure

XYZ Company Reporting Structure

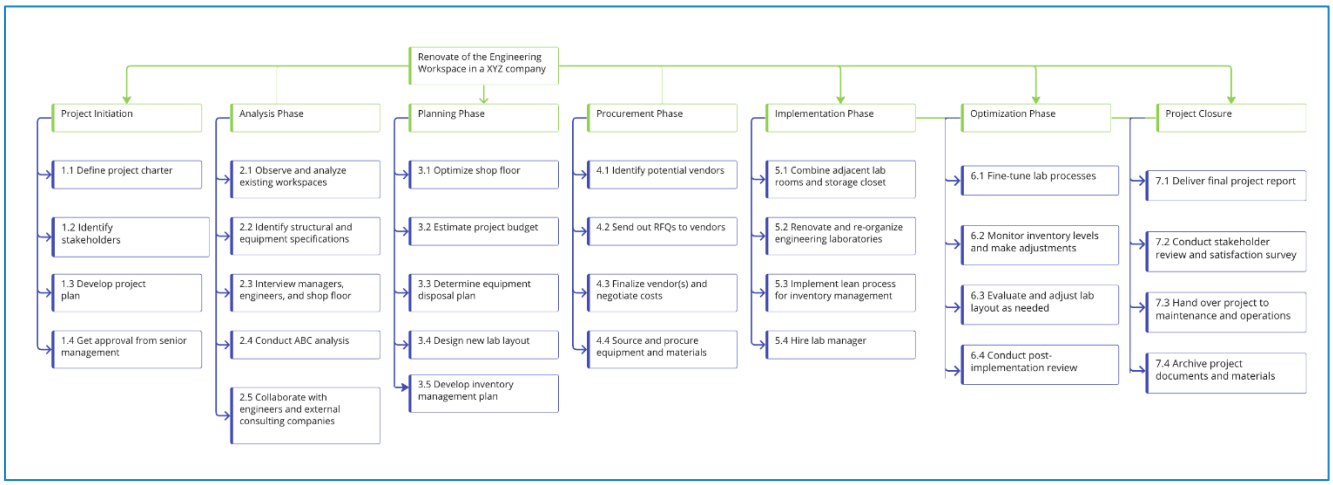
The reporting structure of XYZ company has been merged with the active organizational structure of Team 1 - which consists of the outsourced roles necessary for the execution of the renovation.



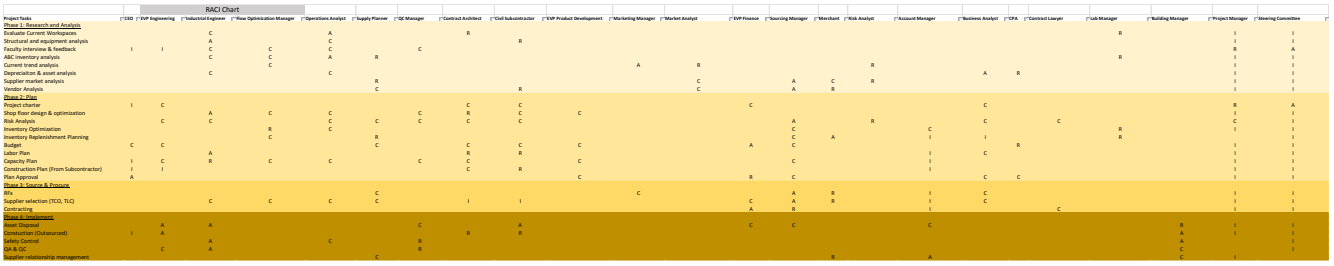
Implementation Plan

The project implementation plan includes the details regarding the work breakdown structure, responsibility chart, and schedules, broken down into a Gantt chart and PERT analysis.

Work Breakdown Structure



Responsibility Chart



Project Tasks	CEO	AVP Engineering	Industrial Engineer	Flow Optimization Manager	Operations Analyst	Supply Planner	QC Manager	Contract Architect	Civil Subcontractor	AVP Product Development	Marketing Manager	Market Analyst	AVP Finance	Sourcing Manager	Merchant	Risk Analyst	Account Manager	Business Analyst	CFA	Contract Lawyer	Lab Manager	Building Manager	Project Manager	Steering Committee
Phase 1: Research and Analysis																								
Evaluate Current Workspaces			C		A			R													R		I	I
Structural and equipment analysis			A		C				R														I	I
Faculty Interview & Feedback	I	I	C	C	C		C																R	A
ABC inventory analysis			C	C	A	R															R		I	I
Current trend analysis				C							A	R				R							I	I
Depreciation & asset analysis			C		C													A	R				I	I
Supplier market analysis						R						C		A	C	R							I	I
Vendor Analysis						C			R			C		A	R								I	I
Phase 2: Plan																								
Project charter	I	C						C	C				C					C					R	A
Shop floor design & optimization			A	C	C		C	R	C	C													I	I
Risk Analysis		C	C		C	C	C	C	C					A		R		C		C			C	I
Inventory Optimization				R	C									C			C				R		I	I
Inventory Replenishment Planning				C		R								C	A		I	I			R		I	I
Budget	C	C				C		C	C	C			A	C					R				I	I
Labor Plan			A					R	R								I	C					I	I
Capacity Plan	I	C	R	C	C		C	C	C	C				C			I						I	I
Construction Plan (From Subcontractor)	I	I						C	R								I						I	I
Plan Approval	A									C			R	C				C	C				I	I
Phase 3: Source & Procure																								
RFx						C					C			A	R		I	C					I	I
Supplier selection (TCO, TLC)			C	C	C	C		I	I				C	A	R		I	C					I	I
Contracting													A	R			I			C			I	I
Phase 4: Implement																								
Asset Disposal		A	A				C		A				C	C			C					R	I	I
Construction (Outsourced)	I	A						R	R													A	I	I
Safety Control			A		C		R															A		I
QA & QC		C	A				R															C		I
Supplier relationship management						C									R		A					C	I	

Legend:

R – Responsible

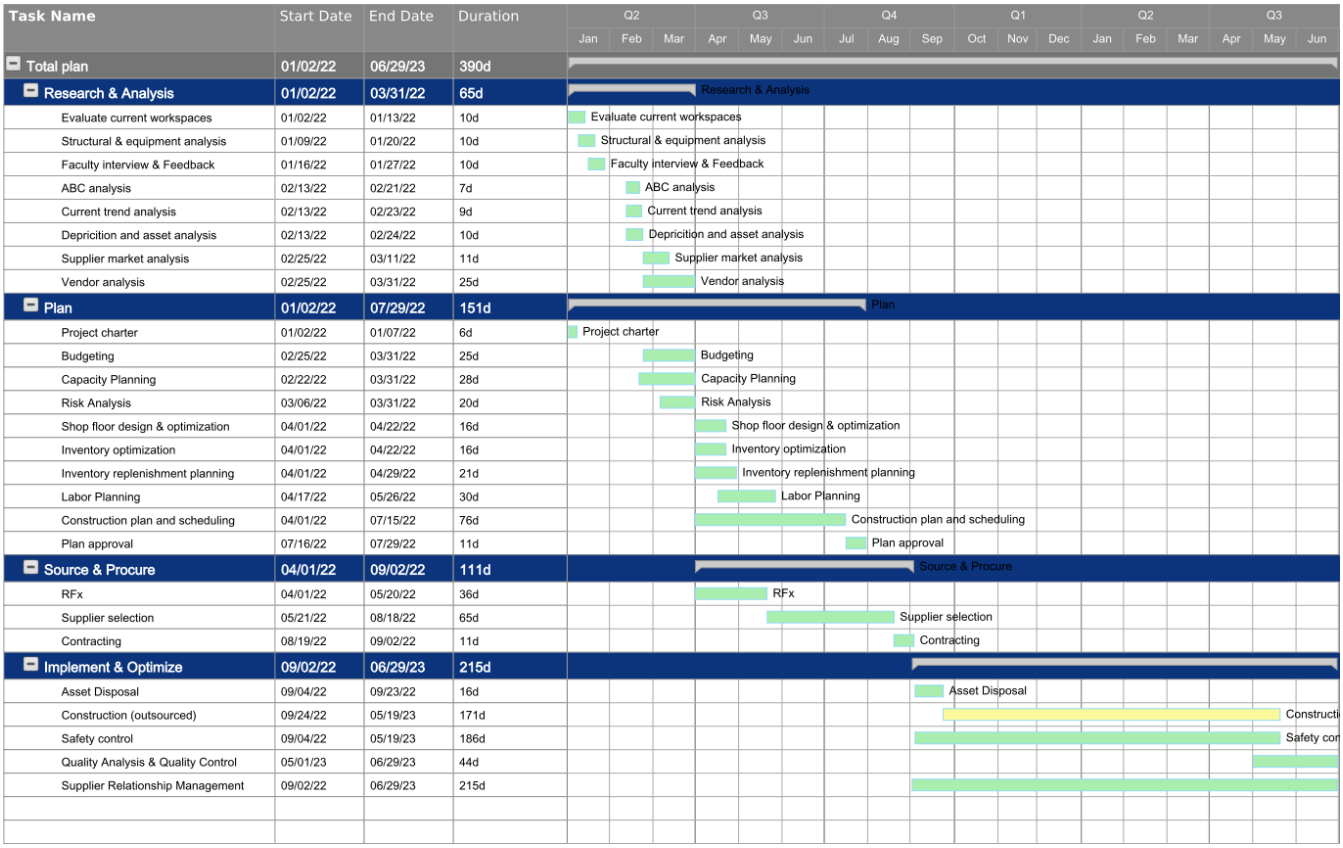
A – Accountable

C – Consult

I – Inform

Scheduling

GANTT Chart



Task Name	Start Date	End Date	Duration
Total plan	01/02/22	06/29/23	390d
Research & Analysis	01/02/22	03/31/22	65d
Evaluate current workspaces	01/02/22	01/13/22	10d
Structural & equipment analysis	01/09/22	01/20/22	10d
Faculty interview & Feedback	01/16/22	01/27/22	10d
ABC analysis	02/13/22	02/21/22	7d
Current trend analysis	02/13/22	02/23/22	9d
Depricition and asset analysis	02/13/22	02/24/22	10d
Supplier market analysis	02/25/22	03/11/22	11d
Vendor analysis	02/25/22	03/31/22	25d
Plan	01/02/22	07/29/22	151d
Project charter	01/02/22	01/07/22	6d
Budgeting	02/25/22	03/31/22	25d
Capacity Planning	02/22/22	03/31/22	28d
Risk Analysis	03/06/22	03/31/22	20d
Shop floor design & optimization	04/01/22	04/22/22	16d
Inventory optimization	04/01/22	04/22/22	16d
Inventory replenishment planning	04/01/22	04/29/22	21d
Labor Planning	04/17/22	05/26/22	30d
Construction plan and scheduling	04/01/22	07/15/22	76d
Plan approval	07/16/22	07/29/22	11d
Source & Procure	04/01/22	09/02/22	111d
RFx	04/01/22	05/20/22	36d
Supplier selection	05/21/22	08/18/22	65d
Contracting	08/19/22	09/02/22	11d
Implement & Optimize	09/02/22	06/29/23	215d
Asset Disposal	09/04/22	09/23/22	16d
Construction (outsourced)	09/24/22	05/19/23	171d
Safety control	09/04/22	05/19/23	186d
Quality Analysis & Quality Control	05/01/23	06/29/23	44d
Supplier Relationship Management	09/02/22	06/29/23	215d

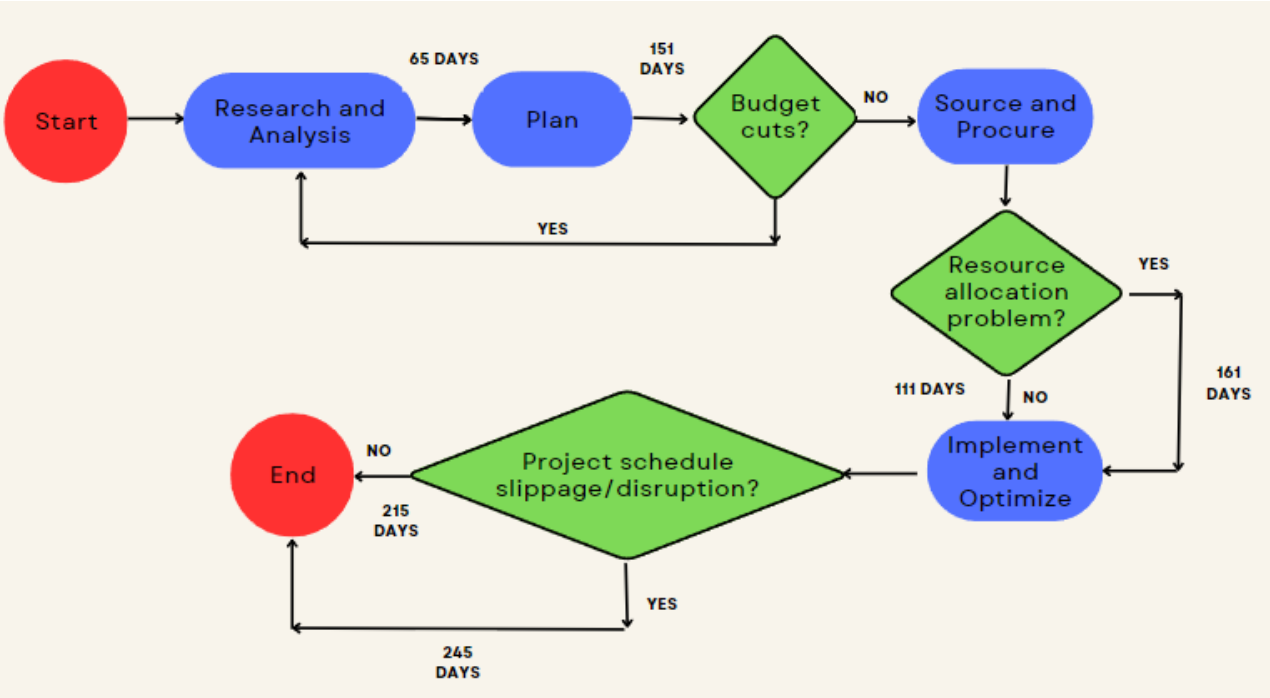
PERT Analysis

TASKS	OPTIMISTICS (O)	MOST LIKELY (M)	PESSIMISTIC (P)
Research and Analysis	65 DAYS	65 DAYS	130 DAYS
Plan	151 DAYS	151 DAYS	302 DAYS
Source and Procurement	111 DAYS	161 DAYS	161 DAYS
Implement and optimize	215 DAYS	245 DAYS	245 DAYS
COMPLETION	390 DAYS	470 DAYS	838 DAYS

PERT Formula: (P+4M+O)/6

: (390 + (4*470) + 838)/6

: 518 Days



Risk Analysis

The project team has conducted a study on all risks associated with the project and concluded that the following items pose the most risk towards the timing and finances of the project completion. The following are the top 10 risks that the team are monitoring:

1. Project schedule slippage
2. Cost creep (labor)
3. Resource allocation – workspace being renovated required sooner/earlier
4. Resource allocation – contractors' availability
5. Building requirements grandfathered into building code
6. Cost creep (raw materials)
7. Disruption to company day to day business from construction
8. Weather impact on construction
9. Scope creep – company asks for additional capabilities
10. Budget cuts – company decides to lower project scope/cost

Using the above risks as a baseline for the study, both quantitative and qualitative analysis has been performed to further understand the likelihood and impact of the top risks.

Qualitative Risk Analysis

The qualitative risk assessment can be found below. It details the risk level and likelihood of each scenario listed in the top 10 risks. As can be seen, most risks follow the line down the middle from top left to bottom right, where the most likely risks are least severe, and the most sever risks are least likely to occur. This is a good sign that if these risks do occur they will not impede the completion of the project.

Risk Matrix

		Impact				
		Negligible	Minor	Moderate	Significant	Severe
Likelihood	Very Likely	Disruption to company day to day business from construction	Cost creep (raw materials)	Weather impact on construction	Resource Allocation - workspace being renovated required sooner	
	Likely			Building requirements grandfathered into building code		
	Possible			Project Schedule Slippage	Scope creep - company asks for additional capabilities	
	Unlikely				Resource allocation - contractor availability	
	Very Unlikely			Cost Creep (Labor)		Budget cuts - company decides to lower project scope/cost

Quantitative Risk Analysis

The quantitative risk analysis can be found below. This chart gives hard number scores in order to quantify the level of risk that each scenario causes. A medium level risk would have a score of 27 (3 * 3 * 3), and most risks are around or below this value. The most concerning risks are the resource allocation (facilities being required by the company before completion), weather, and

scope creep. The resource allocation can be accounted for in scheduling, and weather can be scheduled around so that outdoors required activities are done during non-winter months. Scope creep can only be accounted for through contract negotiations early in the project.

FMEA Risk Analysis

FMEA Risk Analysis				
Threat	**Severity**	**Likelihood**	**Ability to Detect**	**RPN**
Project Schedule Slippage	3	3	4	36
Cost creep (labor)	3	1	5	15
Resource allocation - workspace being renovated required sooner/earlier	4	5	5	100
Resource allocation - contractors' availability	4	2	3	24
Building requirements grandfathered into building code	3	4	1	12
Cost creep (raw materials)	2	5	3	30
Disruption to company day to day business from construction	1	5	1	5
Weather impact on construction	3	5	5	75
Scope creep - company asks for additional capabilities	4	3	5	60
Budget cuts - company decides to lower project scope/cost	5	1	5	25
Key	*1 - lowest severity*	*1 - lowest likelihood*	*1 - able to detect*	
	5 - highest severity	*5 - highest likelihood*	*5 - unable to detect*	

Monitoring and Control

An effective monitoring and control plan is critical to the success of the Proposal to Renovate the Engineering Workspaces at XYZ Company Headquarters project. To keep the project on track and within budget, the following tools and strategies will be used:

1. Action Plans: The Project Manager will oversee developing and maintaining project action plans. Each department manager (engineering, information technology, human resources, and finance) will be responsible for monitoring work in their department and filling up action plans.
2. Milestone Reporting: Regular milestone reporting will be used to keep all project stakeholders up to date on progress.
3. Test Data Monitoring: During the development stage, the test data will be closely monitored and will be extremely valuable for controlling the project.
4. Earned Value Chart: An Earned Value Chart will be used to assess the overall success of the project. This chart will aid in tracking the project's real time and budget.
5. Gantt Chart: Tracking the real time and budget on a Gantt chart is another approach of monitoring and controlling the project. This will provide the Project Manager with a clear picture of the project's progress.
6. Budget Monitoring: It is critical to closely monitor the budget to ensure that the project stays within the authorized budget.
7. Progress Reports: The following progress reports will be necessary for effective project monitoring and control:

Progress Reports

Report	Due	Responsible
Progress Report 1	After completion of demolition and preparation work	Construction Manager
Progress Report 2	After completion of electrical and plumbing work	Electrical and plumbing contractors
Progress Report 3	After completion of painting and flooring work	Painting and flooring contractors
Interim Report	After completion of all major renovation work	Project Manager
Progress Report 4	After completion of furniture and equipment installation	Furniture and equipment installation contractors
Progress Report 5	After completion of final clean-up and inspection	Quality Control Manager

Final Report	End of the project and handover to the Engineering Department	Project Manager

Each progress report will include charts, tables, time, cost, and deviation to provide effective project monitoring and management.

8. The Control System: To keep the project on schedule, a flexible and cost-effective control system will be built. For efficient performance management, the following paperwork will be required:
    - Maintenance Procedures
    - Quality Assurance
    - Test Results
    - Engineering Change Orders
9. Information-Based Control System with Go/No-Go Status: A Go/No-Go information-based control system will be created to aid in the process of minimizing the gap between planned and actual successes. Specific preconditions for Time, Cost, and timetable will be established to satisfy the projected duration, budgeted cost, and planned timetable.
10. Critical Ratio: To identify underperformance or overperformance, critical ratios will be determined. A 5% variation from projected accomplishments will be tolerated and will not need corrective action.
11. Task Analysis: Tasks with critical ratios greater than or less than one will be prioritized. Any deviations found to be outside the tolerance will be marked for action. Before taking any specific action, a complete examination of all jobs that exceed tolerance will be undertaken.
12. Contingency strategy: To avoid unanticipated resource requirements and minimize cost overruns, a contingency strategy for acquiring resources on demand will be in place. In calculating the project cost, a sum equivalent to 10% of the resource budget has been added to the actual quantity and duration as a contingency to obtain extra resources unique to the work.
13. Marketing Plan: To support the effective introduction and acceptance of the redesigned Engineering Workspaces, a marketing plan will be established. This strategy will comprise an efficient staff and distributors with a track record of success. A qualified attorney will also be appointed to handle any legal concerns related to the launch, distribution, and sale of the product.

Financial Plan and Resource Allocation

The details of the financial plan can be found in the tables and summaries below. The total project cost will be just over $3.2 million, including the renovations, equipment, labor, and consulting fees for the PM group. A cost that is not considered here is the disruption to normal work for employees of XYZ company. Additionally, because this project is a renovation and upgrade on existing equipment, the payback period cannot be accurately calculated. This would require in-depth analysis of the employees' efficiency and morale before and after the renovation, a study which is outside the scope of this work.

Total Project Cost

The project costs are broken down into 3 major categories: labor hours, renovation, and equipment. All categories have been summed and multiplied by a 20% factor to account for overages and delays.

Total Project Cost	
Labor Hours	$ 351,000.00
Rennovation	$ 2,000,000.00
Equipment	$ 336,000.00
Allowance for Overages	1.2
Total Cost	$ 3,224,400.00

Project Group Consultant Cost

The labor hours were determined through the consulting fees to have the outsourced teams manage and organize the project. Operating at a billing rate of $90/hour, and accounting for 1.5 years of work, 5 team members, 8-hour days, 5-day weeks, the total consulting fees costs can be seen below.

Project Group Consultant Cost		
Consultants	5	
Hourly Cost	$ 90.00	
Hours / Day	8	
Days / Week	5	
Project Timeline	78	weeks
Expected Time Split on Project	25%	
Total Cost:	$ 351,000.00	

Labor Cost

Using the total consulting fees costs, the cost per project activity was broken down by line item. This can be found in the table below.

Note: It is assumed that the outsourced project team (Team 1) has active involvement in each activity of all four project phases.

Project Phase	Activities/Components	Start Date	End Date	Working Days	Responsible Person(s)	Work Hours	Cost per Task
Research and Analysis	Evaluate current workspaces	2-Jan	13-Jan	10	Contract Architect, Lab Manager	80	$ 3,679.25
	Structural and equipment analysis	9-Jan	20-Jan	10	Civil Subcontractor	80	$ 3,679.25
	Faculty interview and feedback	16-Jan	27-Jan	10	Contract Architect, Project Manager	80	$ 3,679.25
	ABC analysis	13-Feb	21-Feb	7	Supply Planner, Lab Manager	56	$ 2,575.47
	Current trend analysis	13-Feb	23-Feb	9	Risk Analyst, Market Analyst	72	$ 3,311.32
	Depriciation and asset analysis	13-Feb	24-Feb	10	CPA	80	$ 3,679.25
	Supplier market analysis	25-Feb	11-Mar	11	Risk Analyst, Supply Planner	88	$ 4,047.17
	Vendor analysis	25-Feb	31-Mar	25	Civil Subcontractor, Merchant	200	$ 9,198.11
						Sub-Total	**$ 33,849.06**
Plan	Project charter	2-Jan	7-Jan	6	Project Manager	48	$ 2,207.55
	Risk Analysis	6-Mar	31-Mar	25	Risk Analyst	200	$ 9,198.11
	Shop floor design & optimization	22-Feb	31-Mar	20	Contract Architect	160	$ 7,358.49
	Inventory optimization	1-Apr	22-Apr	16	Flow Optimization Manager, Lab Manager	128	$ 5,886.79
	Inventory replenishment planning	1-Apr	29-Apr	21	Supply Planner, Lab Manager	168	$ 7,726.42
	Budgeting	25-Feb	31-Mar	25	CPA	200	$ 9,198.11
	Labor Planning	17-Apr	26-May	30	Contract Architect, Civil Subcontractor	240	$ 11,037.74
	Capacity planning	22-Feb	31-Mar	28	Industrial Engineer	224	$ 10,301.89
	Construction plan and schedule	1-Apr	15-Jul	76	Civil Subcontractor	608	$ 27,962.26
	Plan approval	17-Jul	29-Jul	11	EVP Finance	88	$ 4,047.17
						Sub-Total	**$ 94,924.53**
Source and Procurement	RFx	1-Apr	20-May	36	Merchant	288	$ 13,245.28
	Supplier selection	21-May	18-Aug	65	Merchant	520	$ 23,915.09
	Contracting	19-Aug	2-Sep	11	Sourcing Manager	88	$ 4,047.17
						Sub-Total	**$ 41,207.55**
Implementation and Optimiziation	Asset disposal	4-Sep	23-Sep	16	Building Manager, Project Group	128	$ 5,886.79
	Construction (outsoruced)	24-Sep	19-May	171	Civil Subcontractor, Contract Architect	1368	$ 62,915.09
	Safety control	4-Sep	19-May	65	QC Manager	520	$ 23,915.09
	Quality analysis and quality control	1-May	29-Jun	25	QC Manager	200	$ 9,198.11
	Supplier relationship management	2-Sep	29-Jun	215	Merchant	1720	$ 79,103.77
						Sub-Total	**$ 181,018.87**
						Total Work Hours	7632
						Total Labor Costs	**$ 351,000.00**

Construction Cost

The renovation costs for lab space varies from $200-$450 per square foot. Given that this space is used for low stakes testing, hand manufacturing, and does not require medical or military IPX ratings, the lower estimate of $200 / square foot was used. There is 10,000 square feet of lab space to renovate, the costs of renovation can be found below.

	Lab Space Area	Cost / Square Foot	Total Cost
Rennovation Costs	10,000	$ 200.00	$2,000,000.00

Equipment Cost

Finally, the cost of the equipment has been broken out by line item and the total costs can be found below.

		Qty	Cost / Unit		Total Cost
Equipment Costs	3D Printer	4	$20,000.00		$ 80,000.00
	Laser Cutter	2	$15,000.00		$ 30,000.00
	CNC Lathe	2	$ 8,000.00		$ 16,000.00
	CNC Mill	2	$30,000.00		$ 60,000.00
	Drill Press	2	$1,000.00		$ 2,000.00
	Table Saw	2	$2,000.00		$ 4,000.00
	Band Saw	2	$1,000.00		$ 2,000.00
	Belt Sander	2	$2,000.00		$ 4,000.00
	Paint Booth	1	$40,000.00		$ 40,000.00
	Fume Hood	4	$ 4,000.00		$ 16,000.00
	Miscellaneous other tools	1	$50,000.00		$ 50,000.00
	Downdraft Tables	2	$4,000.00		$ 8,000.00
	Lab Bench	24	$ 1,000.00		$ 24,000.00
				Total	$ 336,000.00

Conclusion

Overall, the goal of this project is to increase the efficiency and productivity of the engineering laboratories at XYZ corporation through a complete remodeling and reorganization process. The project team intends to develop a cutting-edge laboratory that can adapt to the company's changing demands by examining present workspaces, designing, and acquiring new equipment and supplies, and implementing optimal lab operations.

This project is crucial for the long-term survival of XYZ corporation because it will help the company remain competitive in a constantly changing field. Each aspect of the project has been meticulously planned and performed by the project team to guarantee that it fulfills the company's unique goals and budget. The team can guarantee that the project is finished on schedule, within budget, and to the highest standard by continuously monitoring and regulating it.

XYZ corporation hopes to develop a laboratory that not only improves efficiency and production but also encourages creativity and innovation among its employees through this initiative. The project team intends to establish a laboratory that really fulfills the needs of the organization and its workers by incorporating key stakeholders in the design and execution process.

This project's success is dependent on excellent communication, cooperation, and flexibility among all stakeholders. The project team can guarantee that the project is finished smoothly and to the satisfaction of all parties involved by working together to identify concerns and resolve them in a timely way. XYZ corporation may create a cutting-edge laboratory that satisfies the demands of its customers with rigorous planning, monitoring, and management.