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OF SCIENCES AND LITERATURE

CORPORATE PROJECT MANAGEMENT

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Declaration

I hereby declare that the project work entitled "**Corporate Project Management**" submitted towards the fulfillment of the requirements for the award of Doctor of Philosophy (Ph.D.) is my original work and the dissertations has not formed the basis for award of any degree, associate ship, fellowship or any similar title to the best of my knowledge.

Signature: 

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Abstract

The current trend in most industrial or engineering companies is engineers becoming managers or leaders. Engineers or technicians may serve longer in an institution or company as opposed to their counterparts in other industries. The trend applies to the engineering industry in general. Experience is a cause for succession to senior levels in this industry.

As technology progresses, the OEM introduces advanced complexity with its equipment designs. Technical organizations have expanded in-house skills and, in turn, the responsibility of the employees broadens and becomes complex. Engineer moves into management by promotion while possessing excellent technical skills, but generally with limited financial, marketing, and people management skills. It is valuable for both the individual and the industry for an engineer to assume a leadership position. Technical expert skills are favorable when buying complex and high-tech equipment. The engineer with a deep understanding of the industry and experience contributes significantly when a company is selecting required equipment.

When an engineer's role changes to the manager, the challenges for him or her are to deal with new problems and present different solutions for the organization. These problems may range from managing teams to understanding people from work-related to human issues, to defining equipment and tools to use within the scientific organization.

The purpose of this study is to analyse Corporate Project development in its Engineering Management sector. The approach was to select some corporate organization against which conduct a benchmark study. Selinus University is the baseline for the research, against which the Project Engineering Management delivery methods and the modules offerings.

Engineering Managers are set for success when equipped with versatile knowledge. Therefore, the relationship between project management and engineering strength lies with the knowledge base of project engineering management.

List of Abbreviations

AC	Actual Cost
AON	Activity on node diagram
BAC	Budget At Completion
BCR	Benefit Cost Ratio
BEM	Business Excellence Model
BCM	Business Continuity Management
BI	Business Improvement
BOE	Basis of Estimate
CCB	Change Control Board
CEO	Chief Executive Officer
COQ	Cost of Quality
CPAF	Cost Plus Award Fee
CPFF	Cost Plus Fixed Fee Contract
CPI	Continuous process improvement
CPIF	Cost Plus Incentive Fee Contract
CPM	Critical Path Method
CPPC	Cost Plus Percentage of Cost
DFC	Discounted Cash Flow
EAC	Estimate At Completion
EEF	Enterprise Environmental Factors
ETC	Estimate To Complete
EV	Earned Value
FFP	Firm Fixed-Price Contract
FP	Fixed Price
FP-EPA	Fixed-Price with Economic Price Adjustment Contracts
FPIF	Fixed-Price Incentive Fee Contract
GUIDE	Goal-Understand-Identify-Decide-Evaluate
HRP	Human Resource Planning
IFB	Invitation for Bid
IRR	Internal Rate of Return
ISO	International Organization for Standardization

LC	Letter of Credit
LOI	Letter of Intent
LS	Lump Sum
MARR	Minimum Acceptable Rate of Return
NDA	Non-Discloser Agreement
NPV	Net Present Value
OEM	Original Equipment Manufacturer
PD	Project Director
PDCA	Plan-Do-Check-Act
PDM	Precedence Diagramming Method
PESTLE	Political-Economical-Social-Technological-legal-Environmental
Phd	Doctor of Philosophy
PM	Project Manager
PMIS	Project Management Information System
PO	Purchase Order
PV	Planned Value
QAP	Quality Assurance Plan
RACI	Responsible Accountable Consulted Inform
RAM	Responsibility Analysis Matrix
RBS	Resource Breakdown Structure
RFB	Request for Bid
RFI	Request for Information
RFP	Request for Price
RFQ	Request for Quotation
RWP	Rolling Wave Planning
SLA	Service Level Agreement
SOW	Statement of work
OPA	Organizational Process Assets
SOW	Scope of Work
TCPI	To Complete Performance Index
TQM	Total Quality Management
TTD	Technical Terms of Delivery

VAC	Variance At Completion
WBS	Work Breakdown Structure

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Chapter – 1: Introduction

According to the PMBOK (Project Management Body of Knowledge) 5th edition, a project is a temporary endeavor undertaken to create a unique product, service, or result. The project's end result may be either physical or immaterial in nature. The transient character of a project means that the project has a clearly defined beginning and an equally well defined end. When the aims of a project are completed, or when a project is ended, or when the objectives of a project cannot be fulfilled, or when the necessity for a project no longer exists, or when the project's sponsor wants to discontinue the project, we have reached the end of nature. Because it refers to the project's involvement and its lifetime nature, the term "temporary" does not always imply that the project will be completed in a short period of time. The term "temporary" does not truly apply to the product, service, or outcome that was produced as a consequence of the initiative. The majority of initiatives are taking steps to ensure a long-term outcome. (Rose, 2013). The goal of work that is done only once and has a defined beginning and conclusion is to produce something unique.

It is the application of information, tools, and procedures to project activities in order to achieve project requirements that is referred to as project management. (Rose, 2013). It is common in the business sector to have a project management job that is large in scope and includes many different stakeholders. Government and business companies are moving on with project-related work that includes a variety of features. In a nutshell, I can state that the majority of project-related activity in the business sector is a win-win situation for both the stakeholder and the OEM. It is inevitable that the after-sales service quality would suffer if the OEM does not provide adequate assistance.

Background of Study:

To allow people and groups participating in their projects to study the content of the project framework and investigate its main parts, we attempted to produce a clear description of the project framework. In accordance with project management best practices, we created a description of the PM framework, which included a list of the parts organized in hierarchical order.

With reference to the given PM framework definition, there are several basic elements:

- ✓ **Initiation:** when the project starts
- ✓ **Planning:** when all of the key decisions are made
- ✓ **Execution:** when project work actually takes place
- ✓ **Monitoring & Controlling:** When project progress is checked & adjustments are made to the plan
- ✓ **Closing:** when the project comes to an end

The project initiation phase is the initial step of the project management life cycle in which the project is initiated. A high-level overview of the project is provided, as well as the techniques that will be used to achieve the intended goals. It is during this phase that the feasibility and business worth of the project are assessed.

The project manager convenes a meeting to better understand the needs, aims, and objectives of the customer and other stakeholders. A thorough comprehension of the project necessitates the examination of minute aspects. A firm decision to proceed must be reached before a project can go to its next stage: putting together an effective project team.

The Project Charter is regarded as the most critical document in any project since it contains:

- Business vision and mission
- Project aims and gains
- Stakeholders list
- Project Scope
- Project deliverables
- Risks associated with the project
- Budget and resources for the project (Brown, Invensis Global Learning Service, 2021)

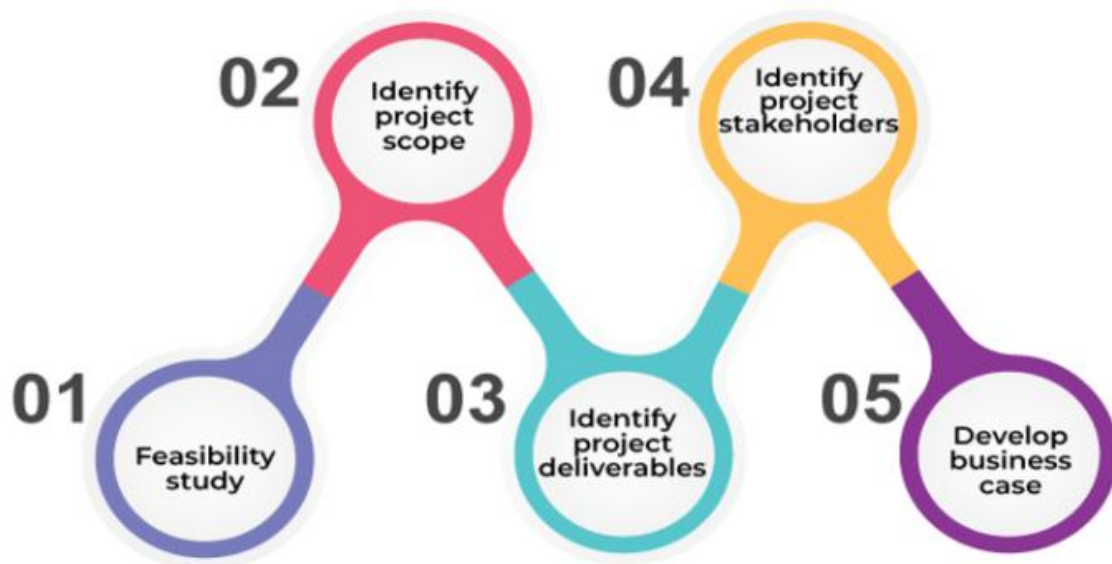


Figure 1: Project Initiation Stage

1. Undertake a Feasibility Study: In the beginning, it is critical to determine the project's viability. Analyze the project's viability in terms of its financial, legal, operational, and technological elements before moving forward with it. Finding out what's wrong can help you figure out if you can come up with a solution to the situation.

2. Identify the Project Scope: Identification of the project scope entails determining the project's length, width, and depth. The definition of roles and responsibilities as well as the timing of tasks, features and services are also essential.

3. Identify the Project Deliverable: Following the definition of the project's scope, the next stage is to define the project's deliverables. The deliverables of the project involve specifying the product or service that is required.

4. Identification of Project Stakeholders: It's critical to identify all of the project's stakeholders. To identify project stakeholders, it is preferable to arrange meetings with team members and experts. It's necessary to keep track of vital information about stakeholders and how the project's success will affect them.

5. Develop a Business Case: Make sure that the fundamental pillars of the project, such as feasibility, scope, and the identification of stakeholders, are in place before beginning to construct a business case for the project. The very next stage is to develop a full-fledged business case for the project. The development of a statement of work (SOW) and the establishment of a project team bring the project beginning phase to a close.

Project planning related to the project takes place during this phase. After defining project objectives, it is time to develop a project plan for everyone to follow.

The planning phase establishes a set of plans that will guide your team through the implementation phase and the closure phase, among other things. The program that you have developed to this point will undoubtedly assist you in managing costs, quality, risk, modifications, and time.

The project plan that is prepared should include all of the necessary elements relating to the project goals and objectives, as well as specifics on how to attain those goals and objectives. It is the most difficult phase of the project, during which project managers must consider operational needs, design limits, and functional specifications.

1. Creating a Project Plan: A plan is a diagrammatic representation of the complete project. A well-designed project plan should include the actions to be performed, the associated time period, dependencies, restrictions, and any dangers. It aides the project manager in streamlining processes in order to achieve the ultimate goal and tracking progress by making the necessary decisions at the appropriate moment.

2. Creating a Resource Plan: The resource plan contains information about the various resource levels that will be required to complete a project. A well-documented plan defines how much work and resources will be required to accomplish a project successfully. Those who will be employed should have experience in project management in the appropriate field. Priority should be given to candidates with relevant experience.

3. Budget Estimation: Creating a financial strategy can assist you in setting a budget and delivering project deliverables without going over budget. The final budget plan outlines

the costs of materials, labor, and equipment, among other things. It is important to develop a budget plan because it will assist the project management team in monitoring and controlling expenses throughout the project management life cycle.

4. Gathering Resources: Gathering of resources is a critical component of project planning since it allows for the monitoring of the project's overall quality level. A well-balanced team comprised of internal and external resources is not sufficient in and of itself. It is necessary to provide resources such as equipment, money, software solutions, and a working environment in order to fulfill the allocated responsibilities.

5. Anticipating Risks and Potential Quality Roadblocks: The risk management strategy will assist you in identifying and mitigating hazards. It will include all of the possible dangers, their severity levels, and the preventative measures that will be taken to keep track of them. Once the dangers are under control, it is possible to complete the project on schedule and with high quality standards in place.

Execution is the phase that involves the implementation of project-related activities, the assignment of tasks, and the allocation of resources. Additionally, the technique entails developing deliverables and meeting client expectations. Project managers or team leaders perform the work by allocating resources and maintaining team members' concentration.

The project team will begin developing deliverables and will work to meet the project's goals and objectives as specified in the project plan. This phase defines the success or failure of your project. The success of the project is highly dependent on the execution phase. During the project execution phase, the final project, deliverable, also takes shape. During execution, many crucial tasks are accomplished.

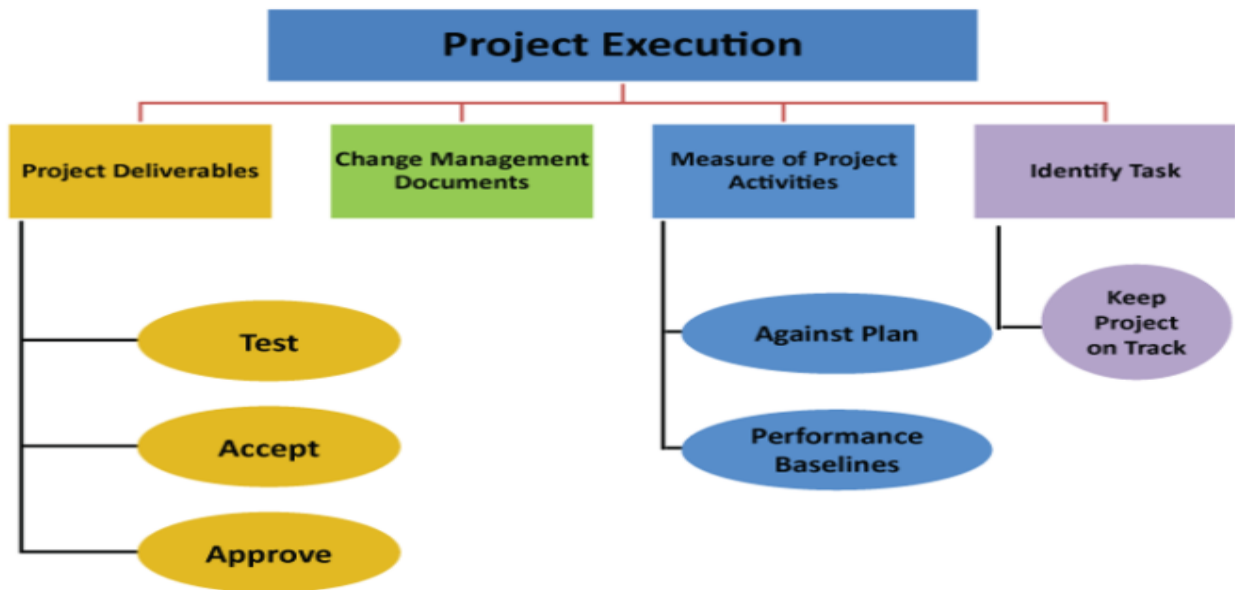


Figure 2: Project Execution Stage

Project monitoring and control is concerned with assessing the overall performance of the project and keeping track of its development. When it comes to implementation, it happens at the execution phase. The primary purpose of this phase is to ensure that everything is in accordance with the project's specifications, particularly in terms of budgetary parameters and timetables.

It is the project manager's obligation to make the required modifications in terms of resource allocation and to guarantee that everything remains on track. A project manager may organize meetings to assess progress and receive regular reports in order to assist with this.

Keeping track of project activities following the project's execution phase will help the project manager to identify and address problems as they arise. Meanwhile, taking into account the overall quality of the job will assist in making the essential modifications. Maintaining a close check on the budget will assist in avoiding wasteful expenditures on resources.

Project closure is more critical and significant for both the project manager and end users. At this point, the project will be turned over to the operations team, and someone will be assigned the responsibility for day-to-day operations. In a corporate organization, the project director (PD) transfers responsibility for the project to the operations division, along with the requisite training and paperwork. Once the product has been delivered to the clients and all paperwork, including the BCP, has been completed, the project team is disbanded and the project is considered complete.

The project closure phase, often known as the "follow-up" phase, is the final step of the project management life cycle and is the culmination of all previous phases. Approximately at this time, the finished product is complete and ready for delivery. The project manager and his or her team's primary attention should be on the release of the product and the delivery of the product. At this point, all of the activities associated with the project have been completed. The closing phase does not necessarily follow on the heels of a successful completion phase. It is possible that a project will have to be terminated owing to a project failure. Following the completion of a project and the timely delivery of results to customers, the project manager's responsibility is to emphasize the project's strengths, list the project's takeaways, identify any uncertainties, and provide recommendations on how to avoid them in future initiatives. Taking the time to identify one's own skills and shortcomings will enable one to devote more time and effort to a project, which will in turn increase the project manager's credibility. (Brown, Invesis Global Learning Services, 2021).

Statement of Problem:

For a project from the beginning to the end, scope, timing, and quality are critical. The GUIDE structure will fail if these are not included. Various types of streak holders are required for every project. These conditions must be met by PD. The project must be able to see both identified and undiscovered needs and exceptions.

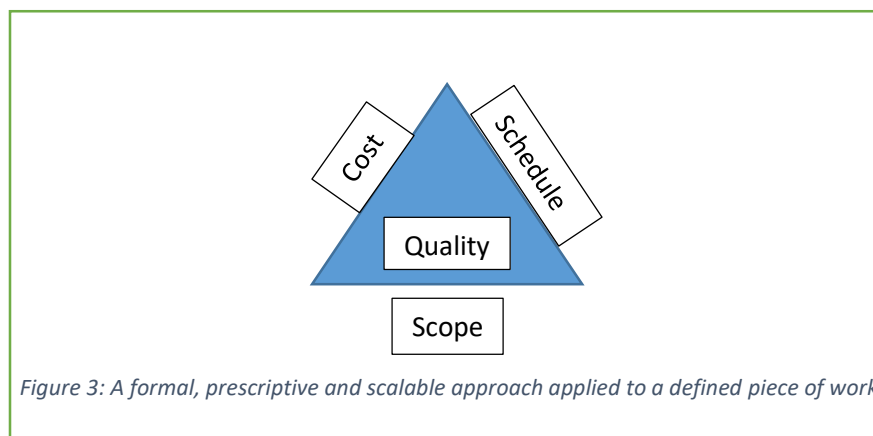


Figure 3: A formal, prescriptive and scalable approach applied to a defined piece of work

Objective of Portfolios and Programs:

Strategic corporate goals, such as increasing consumer perceptions, need the creation of portfolios. Programs and initiatives will be included here. Programs, on the other hand, deal with a collection of connected projects to achieve substantial results, such as the construction of toll roads program, which involves the construction of roads, the construction of tolling systems, the establishment of support teams and many more. Project management has a wide range of talents that may be managed by different people. Both of these requirements are carefully enforced in business initiatives.

Significance of Study:

Enterprise Environment Factors: The key parts of enterprise environment factors include organizational culture, procedures, infrastructure, government/industry norms and regulations, marketplace circumstances, politics, risk tolerances, established skill sets, and communication channels.

Organizational Process Assets: Processes and procedures, as well as a project management system and an organization's knowledge base, are critical components of corporate project administration.

Scope of Project Management to Corporate World:

Management structure that aims to standardize the project governance process as well as capabilities for sharing resources and approaches is this management structure. It's relevant to organizations that have a significant role in project implementation. There is no doubt that they serve a variety of purposes, but it's also important to recognize that they have a wide range. Corporate project management necessitates direct project management with complete documentation.

Organization related to Study:

According to the PMBOK® Guide—Fifth Edition, there are numerous sorts of organizational effects. Corporate world management picks its own path based on necessities. Some matrices are provided below for your convenience.

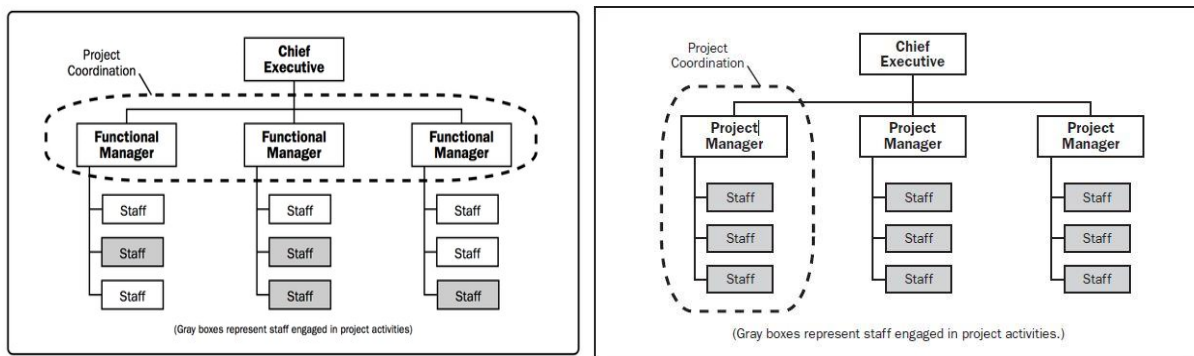


Figure 4: Functional Organization & Projected Organization

We can see from the diagram above that one organizational influence has an impact at the functional manager level, while the other has an impact on the project manager and employees. Project management and coordination tasks are quite common in the corporate office segment. In this instance, all of the members are from the same department or division, and they are all well acquainted with one another. Additionally, they are familiar with everyone's working pattern and short code for working. Again, the functional manager may make decisions quickly and without hesitation in accordance with project requirements. On the other hand, if project coordination is delegated to all functional managers, it will be difficult to find people who are just interested in working

hands. Taking our national scenario (Bangladesh) into consideration, we can observe that we are working on cross-departmental wings work in the context of corporate culture. As a result, all functional managers are occupied with their daily activity tasks and other departmental responsibilities. If they have project-related tasks put on them, they will not be able to do them in a timely manner. Furthermore, everyone is treated on an equal basis and as a functional manager. As a result, additional debate and an approval procedure are required before they can make a decision.

Now let discussed about weak, balanced and strong matrixes organizations.

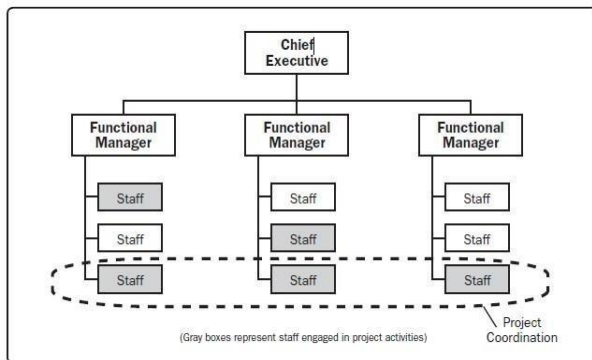


Figure 5: Weak Matrix Organization

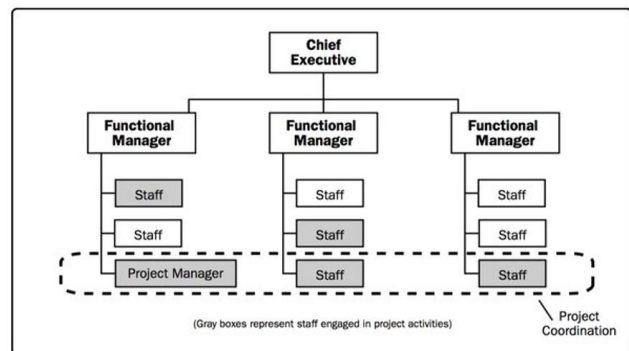


Figure 6: Balanced Matrix Organization

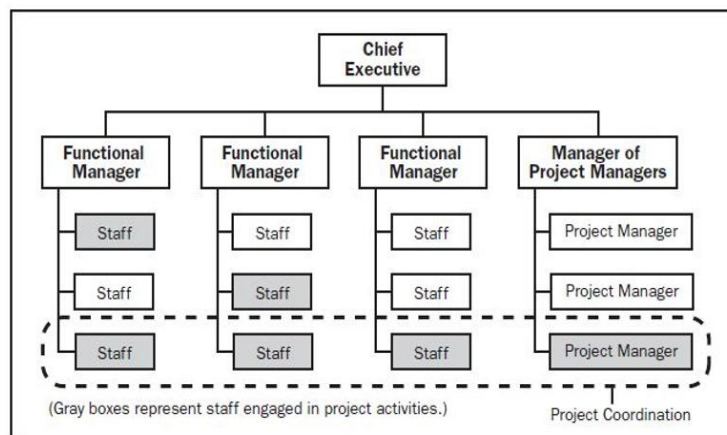


Figure 7: Strong Matrix Organization

From the above figures, we have seen that in figure 7, the project is run by only staff from the lower rank. To run a project, some experienced PM is a must. In the financial corporate sector, there is no option other than 0 or 1. So if a lower-level staff member works as a PM or PD, the FMEA impact will be higher. If we move to Figure 4, we can see that there is a PM and a few staff working on the project. This is what we call a balanced matrix. This is the most commonly used matrix in corporate institutions. Now move on to figure 05. We have seen there is a wing of a manager of project managers. They have dedicated wings

and deal with projects only. From those wings, one PM was selected and from other wings, staff were selected. We can say this is a strong matrix.

Chapter – 2: Literature Review

Corporate Project Management is a collection of interconnected actions and activities that are carried out in order to produce a specific product, service, or result. Each process is distinguished by its inputs, the tools and procedures that may be used, and the outputs that are produced as a result of the process. According to the PMBOOK® 5th edition (Rose, 2013), there are 47 project management processes that are divided into five process categories and ten knowledge domains (Rose, 2013). We already studied 05 groups in Chapter 1. We will go through the knowledge areas and the project integration method in detail.

Key Project Drivers:

There are two project drivers, according to the project management paradigm. The first is stakeholders, and the second is the governance structure. We already stated that stakeholders are the kings. Anyone who has an impact on the delivery or success of a project is considered a stakeholder. PM should be detected as soon as possible.

We've arrived to the second point of the governance structure. These give the structure, methods, decision-making models, and tools for project management to the project manager and team.

Product and Project Life Cycle:

The term "Product Life Cycle" refers to a sequence of phases that describe a product's progression from conception through delivery, growth, maturity, and retirement. On the other hand, a project life cycle refers to the sequence of phases that a project undergoes from inauguration to completion. The project lifecycle can be designed and updated to meet the organization's demands and objectives. The specific objectives, outputs, and activities vary between projects. The lifecycle lays the groundwork for all of the tasks that must be completed throughout the course of the project, regardless of the type of labor involved. The stages of a project are normally consecutive, and their names and numbers are established by the management and control requirements of the organization or organizations engaged in the project, the project's nature, and its intended use.

Characteristics of the Project Life Cycle:

Each and every project has a defined lifespan and a predetermined life cycle. After a certain amount of time has passed, the project file should be closed and sent to the operational team. All projects can be classified according to the generic life cycle structure shown below:

- ✓ Starting the project
- ✓ Organizing and preparing
- ✓ Carrying out the project
- ✓ Closing the project

This general life cycle structure is frequently referenced when talking with higher management or other stakeholders who are unfamiliar with the project's details. (Rose, 2013)

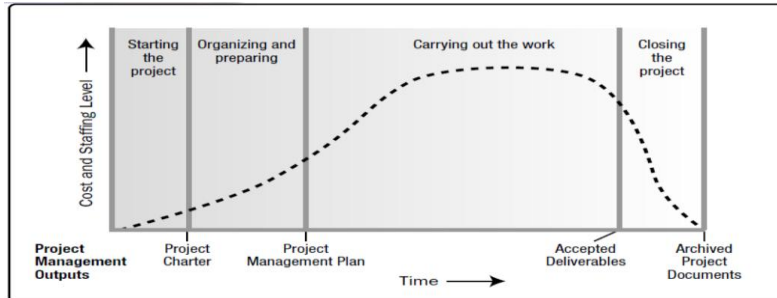


Figure 8: Typical Cost & Staffing Levels across a Generic Project Life cycle Structure

Project Phase:

Corporate project management is critical for the organization and coordination of logically connected project activities that result in the completion of one or more deliverables. Occasionally, we separate projects for business intelligence. It is utilized when the type of the work to be completed is special to a segment of the project and is often associated with the production of a key deliverable. While it may stress some Project Management Process Groups, it is expected that the majority, if not all, processes will be implemented in some way during each phase. Some project phase scenario matrix given below:

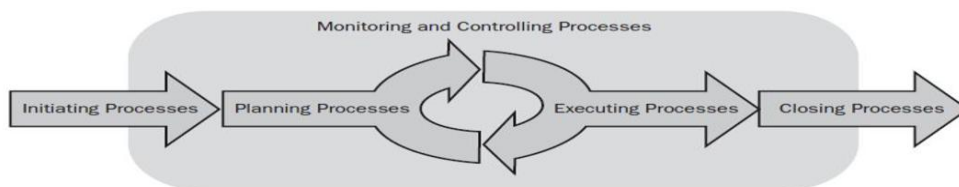


Figure 9: Single Phase Project



Figure 10: Three Phase Project

Proceed to the phase of overlapping projects. Assume that we are constructing a dream home (a second one if I already have one). My first "phase" of labor would be to complete the plan, locate vendors for constructing supplies, pick a contractor, choose wall colors, and determine the sort of flooring. However, after we have determined the plan and builder, we may proceed to the next phase of creating the foundation for your house without waiting for every detail to be finished. While the interiors of the house are being completed, we may begin landscaping the area around the house. (SHENOY, n.d.).

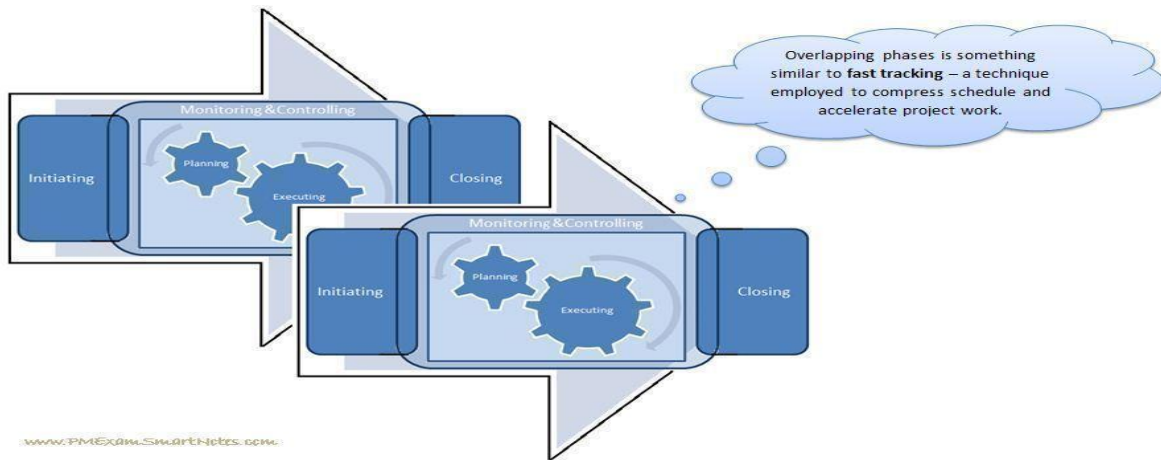


Figure 11: Overlapping Project Phase

Additionally, we have witnessed sequential project work. Only when there are clear relationships between phases are projects sequenced. We would not begin painting the walls in the above example until the covering job is complete. We would wait to install furniture and lights until the painting is complete. In these instances, we order the steps. It is very feasible that a project's stages do not correspond to one another throughout its existence. A project may consist of several consecutive phases followed by several overlapping phases - all of which are determined by variables such as technology, external dependencies, resource availability, and even the influence of political, legal, or environmental requirements. (SHENOY, n.d.).

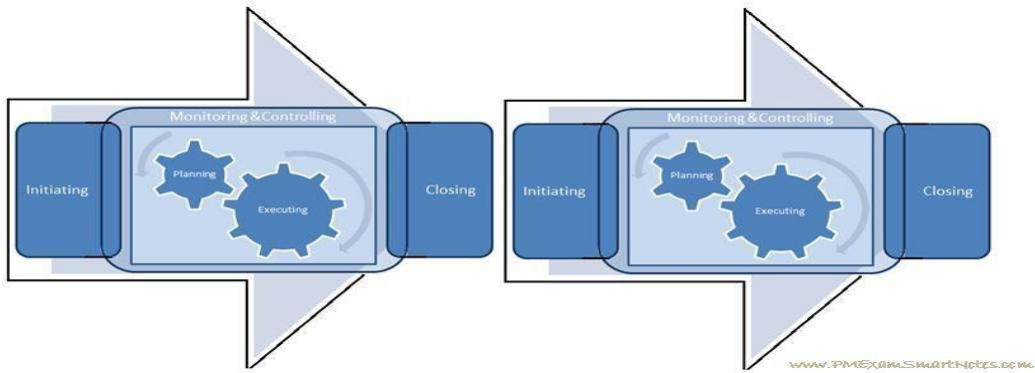


Figure 12: Sequential Project Phase

Delivery Approaches:

There are numerous modes of delivery. However, I would like a predictive strategy that is iterative and incremental, as well as an adaptable life cycle, which is commonly referred to as Agile. Different companies employ a variety of different methods for project delivery. Waterfall is a method of anticipatory delivery that is extensively employed. Interactive and progressive communication, essentially two-way. That is, it is a relationship between the client (stakeholder) and the provider (PM). This model is required for establishing corporate BEM. The phase "adaptive life cycle" refers to the notion that the project's operational plan will evolve in response to the site's demands. Certain projects are vendor-dependent. However, technical wings await their arrival till their tasks are accomplished. In this situation, the project's duration and duration will be altered, and the grant chart will not be precisely followed. This is a frequent occurrence in large-scale corporate projects.

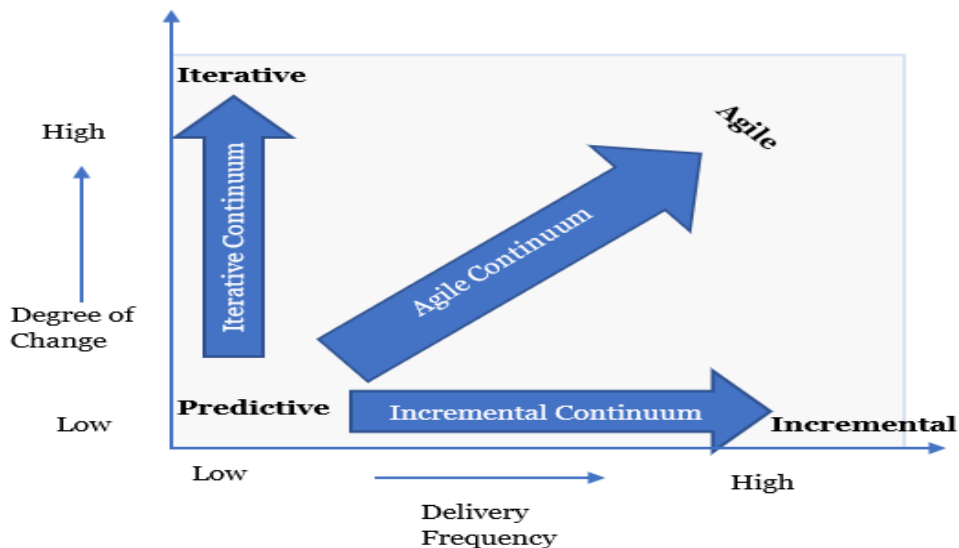


Figure 13: Project Delivery Approach

Chapter – 3: Data & Methodology

Knowledge Areas:

Integration: In order to fulfill stakeholder expectations, it is necessary to ensure that the pieces within the five process categories are appropriately coordinated, recognized, defined, merged, and harmonized.

Scope: Make sure the project contains all of the work that is necessary, and only the work that is required, in order for it to be finished effectively; pay attention to what is and is not included in the project.

Time: Processes necessary to assure the project's timely completion.

Cost: Planning and reducing expenditures to finish the project on time.

Quality: It assures that the project will meet the needs for which it was created and puts the quality management system in place.

Communications: Generation, collection, dissemination, storage, and final disposition of project information in a timely and suitable manner; establishes key relationships between people and information necessary for effective project communications.

Human Resources: Organization, management, and leadership processes for a project team.

Stakeholder: Determine project stakeholders in order to manage project expectations.

Risk: Preparation, identification, analysis, and response to project risks are all part of risk management, which aims to ensure that good occurrences occur more frequently and have a greater effect than negative events.

Procurement: Obtaining products and services from outside the team; managing contractual responsibilities.

Integration Management:

Diverse processes and activities associated with integration management activities must be defined, combined, unified, and coordinated on a consistent basis. Many suppliers and working plans will be brought into play when certain corporate organizations progress with a large project, and the project manager (PM) will be responsible for integrating all of these plans within a specified time frame. When individual processes interact, project coordination is the technique of ensuring that every aspect of the project is coordinated with the others.

	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Integration Management	Develop Project Charter	Develop Project		Monitor & Control	Close Project or Phase

		Management Plan	Direct & Manage Project Work	Integrated Change Control	
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Develop Project Charter:

As previously said, we have examined the fundamental structure of the project life cycle. Integration management is now subjected to the same cycle as the rest of the organization. The project is officially authorized and the project manager is given authority. The PM should be appointed as soon as feasible once the project is officially authorized.

The project is sponsored at the appropriate level and incorporates a significant contribution from the customer in the form of a statement of work.

Develop Project Charter		
<i>Input</i>	<i>Tools & Techniques</i>	<i>Output</i>
Statement of work	Expert Judgment	Project Charter
Business Case	PMIS	
Contact	Project Selection Methods	
Corporate Environmental Factors	Project Management Methodology	
Organizational Process Assets		

Statement of work: A statement of work is a document used in project management that contains a narrative explanation of the deliverables and their associated deadlines for a vendor supplying deliverables to clients. It is a legally binding document that must be agreed upon by all parties. The SOW must be sufficiently detailed to ensure that all stakeholders understand what work is necessary, the duration of the work, the deliverables, and what is acceptable. This section should provide a broad description of the project, as well as information on the initiative's history and objectives. Frequently, a SOW is attached to a request for proposal (RFP). A SOW must include background information about suppliers that are bidding. Typically, a SOW is established as part of a contract. Project managers should devote sufficient effort to ensuring that the SOW is understood by all stakeholders in order to minimize disagreements over deliverables, budgets, or schedules. SOW should incorporate the following fundamentals:

1. **Scope of work:** A concise narrative statement about what you plan to accomplish as a consequence of this scope of work should be included in this section. The scope of the project will establish the deliverables and the actions that will be performed in order to accomplish the deliverables. This section will outline what is and is not included in the project's scope of work, respectively.
2. **Acceptance Criteria:** This section should specify how the deliverables arising from this SOW will be accepted by the end client. Deliverables must be accepted only after they have been fully specified and understood by all stakeholders. Included in this section

should be an explanation of how both parties will know when the work is acceptable, how the work will be accepted, and who will be authorized by the client to accept and confirm it.

3. **Period of Performance:** This section should specify the time frame required to complete the project or contract in advance, based on the end date, in order to comply with certain external requirements, such as new government regulations. It is critical to determine the performance period from start to finish, as this contributes to determining the project's cost. If a project cannot be completed within the set time frame, it may be required to alter the contract, which raises the project's manufacturing costs; this is referred to as scope creep.

4. **Schedule and Milestones:** This section should specify the timeline for the project's deliveries and milestones. It is critical that all milestones, tasks, and scheduling information be as precise as possible, as suppliers or manufacturers will need to take these components into account when preparing their offers.

5. **Work Requirements:** This section should give a description of the actual tasks that will be required to complete the project. This should include a list of the tasks that must be accomplished in order for the project or contract to be completed successfully, as well as the method and resources that will be used. Every attempt should be taken to incorporate as much detail as feasible in order to bridge any gaps that may arise over the course of the contract's execution.

6. **Other requirements:** This section should state any particular needs, such as the action to be taken in the event of force majeure circumstances being raised, the insurance on delivery, the external tests that are required, the payment terms, and the most TTD, as well as the exclusions from the contract.

Business Case: It is important to have a solid business case, which can be written or spoken, that explains why a task or project should be started. The case should be well-organized and have a strong presence, and it should include information on the anticipated costs and risks as well as market behavior. It is important to have a solid business case that has a convincing conclusion and also warns of what could go wrong. It is imperative that a Business Case address the issue of whether or not the project is worth the investment of money, time, and effort. A Business Case's goal is to compare the expenses of starting the project with the advantages that will be realized once the project is done.

Contact: A contract is a legally binding agreement that establishes and controls the parties' rights and obligations. A contract is legally enforceable if it satisfies the statutory criteria and is approved by the court. Typically, an agreement entails the exchange of products, services, or money, or the promise of any of those.

Corporate Environmental Factors: Running a project environment is very important when you start a business. In order to run a project smoothly, there must be a lot of formal

corporate factors. Projects are done inside of an organization that has a certain culture, style, and structure. These things affect how these projects are done. Project managers should be aware of this fact and be able to adapt to the environment in which the project is being developed. As a point of reference, the three main environmental factors that can affect project management can be broken down into three groups: organizational, human resources, and technological systems. (ITM Platform, n.d.).

1. Environmental factors inherent in the organization:

- ✚ Shared vision, mission, values, beliefs and expectations of the organization
- ✚ Culture, structure and organizational governance
- ✚ Facilities, resources, infrastructure, and materials are available where they are needed.
- ✚ Industry or government standards that affect the organization
- ✚ Internal standards, policies, methods and procedures

2. Human Resource environmental factors:

- ✚ Existing human resources, skills and knowledge
- ✚ Personnel management, motivation systems and incentives
- ✚ Perception of leadership, hierarchy and authoritative relationships
- ✚ Organizational risk tolerance
- ✚ Project stakeholders and organizational stakeholders

3. Technological environmental factors:

- ✚ Operational environments and company authorization systems
- ✚ The formal and informal communication channels established in the organization
- ✚ Available databases
- ✚ Project management information systems

Another way to think about the environment of a project is to think of it as either internal or external factors. External factors, on the other hand, are more likely to change and require more attention from the project manager. The internal factors of each organization will stay the same regardless of the project. There are a lot of unknowns when the project is done in a country where it has never been done before, like how the law works, how the labor system works, and so on.

In project management, you can change things that are closer and more directly related to management, like resources or project management information systems. It will be more difficult to change things that are outside of the organization, like culture and the environment. Even though it may seem that organizational culture is a flexible factor that can be easily changed, it is important to think about the inertia caused by resistance to change and how such a culture is not just an idea, but is a part of the daily lives of everyone in the organization.

Changes to the environment and culture that make project management less effective can take a long time and cost more money than supporting project management with new information systems. In turn, the adoption of new information systems can be a way to change the way people act, which in turn can change the culture of the company from the ground up.

Organizational Process Assets: To support in the administration of their projects, the majority of companies have produced a variety of templates, contracts, registers, and assessment tools. Additionally, organizations have amassed information in the form of lessons learned and the organization's knowledge base, both of which may be extremely beneficial.

Thus, organizational process assets would comprise whatever the company has acquired that may be used to the project's management. They may take the shape of official or informal plans, rules, procedures, or guidelines. These are critical for the planning stage, regardless of the project's type. OPAs are required for all projects, whether long- or short-term. (Simplilearn, 2022). Here's a list of common OPAs:

- ✚ Standardized guidelines
- ✚ Proposal evaluation criteria
- ✚ Work breakdown structure templates
- ✚ Project schedule network diagram templates
- ✚ Risk templates
- ✚ Project closure guidelines
- ✚ Defect management processes
- ✚ Historical databases
- ✚ Change control procedures
- ✚ Financial control procedures
- ✚ Project files
- ✚ Organizational standard processes

Expert Judgment: Expert Value Judgment is a technique in which a judgment is provided based on a specific set of criteria and expertise that has been acquired in a specific knowledge area, such as an application area or production area, a specific discipline, an industry, trade, supply, and demand, or a specific knowledge area such as a specific knowledge area such as an application area or production area, a specific discipline, an industry, trade, supply, and demand, or a specific knowledge area This expertise may be offered by any organization or individual or entity who has received particular education, knowledge, skill, experience, or training in order to perform their duties. This knowledge base can be contributed by a single person of the project team, or it can be provided by a group of project team members. It is a very common input from individuals or groups specialized knowledge or training in:

- ✚ **Business analysis:** In terms of conducting business analysis, they know just how to accomplish it.
- ✚ **Requirements deriving:** They are able to explain both the inferred and expressed demands of the consumer.
- ✚ **Requirements analysis:** They are capable of making meaning of what they learn.
- ✚ **Requirements documentation:** They are capable of compiling a list of criteria.

- ✚ **Diagramming techniques:** They are capable of presenting data in a comprehensible manner.
- ✚ **Facilitation:** Stakeholders will benefit from their help, as will the team.
- ✚ **Conflict management:** They can assist in resolving disputes amongst parties over requirements.
- ✚ **Requirement of similar:** They can find out what other projects need.

Project Management Information System: According to the PMBOK® Guide – 5th Edition, there are tools and strategies that assist you in collecting, integrating, and sharing the findings of your projects. According to the instructions, this is a project management information system. It is used to assist all phases of a project, from initiation to completion, and may incorporate both manual and automated technologies. (PMIS) can serve as a framework for guiding the course of a project and assisting in its success rate rise. (PMIS) provides accurate and timely information to management and assists in expediting the decision-making process and any necessary actions to guarantee that the project remains on track in terms of schedule, money, and objectives. The Project Management Information System performs the following functions:

- | | |
|------------------------------|---------------------------------------|
| ✚ Scheduling | ✚ Portals and dashboards |
| ✚ Estimating | ✚ Project control |
| ✚ Resources | ✚ Social media |
| ✚ Project documents and data | ✚ Collaborative work management tools |

Project Selection Methods: To become an effective PM, familiarize yourself with several frameworks in order to choose which one best suits your team's demands (Team Asana, 2021)

- | | |
|-------------|--|
| ✚ Agile | ✚ Six Sigma |
| ✚ Waterfall | ✚ Critical path method (CPM) |
| ✚ Scrum | ✚ Critical chain project management (CCPM) |
| ✚ Kanban | ✚ Lean |
| ✚ Scrumban | ✚ PMBOK® Guide |
| ✚ PRINCE2 | ✚ Extreme Programming (XP) |

Project Management Methodology: Specifically, a strict definition of project management methodology is a strictly defined combination of logically related practices, methods, and processes that determine the most effective way to plan, develop, control, and deliver a project throughout the continuous implementation process until it is successfully completed and terminated. It is a scientifically validated, methodical, and disciplined approach to project design, execution, and completion that is based on scientific principles.

Project Charter: A project charter is a declaration of the project's scope, objectives, and participants. It begins the process of establishing the participants' roles and duties and

specifies the project's objectives and goals. Additionally, the charter outlines the primary stakeholders and establishes the project manager's authority.

Develop Project Management Plan:

Project management plan is the collection of all subsidiary plans. It includes project baseline, cost, schedule, methodology etc.

Develop Project Management Plan		
<i>Input</i>	<i>Tools & Techniques</i>	<i>Output</i>
Preliminary Project Scope	Project Management Methodology	Project Management Plan
Project Management Processes	Project Management Information System 1. Configuration Management System 2. Change Control System	
Corporate Environmental Factors	Expert Judgment	
Organizational Process Assets		

Preliminary Project Scope: Every project requires a declaration of the project's scope. This document specifies the objectives of the project that must be met in order for it to be considered complete. The preliminary project scope statement defines the project in its infancy. This paper serves as a forerunner to the project's work and much of the project's planning. The project scope statement should always include (Rose, 2013):

- ✚ Project and product objectives
- ✚ Service requirements and characteristics
- ✚ Constraints and assumptions
- ✚ Initial work breakdown structure
- ✚ Initial project organization
- ✚ Criteria for project acceptance
- ✚ Project requirements and deliverables
- ✚ Milestones
- ✚ Order-of-magnitude cost estimate
- ✚ Project boundaries

Project Management Processes: Discussed Earlier

Corporate Environmental Factors: Discussed Earlier

Organizational Process Assets: Discussed Earlier

Project Management Methodology: Discussed Earlier

Project Management Information System:

- ❖ **Configuration Management System:** System engineers utilize configuration management (CM) to ensure that a product's performance, functional, and physical properties remain consistent with its requirements, design, and operational information throughout its life.

- ❖ **Change Control System:** Not every change in a project is equal. Certain adjustments occur naturally—for example, due to weather delays or illness—while others are requested. Regardless of the type of change, it must be handled and examined prior to acceptance or rejection. If the change is approved, it must be reacted to, requiring the establishment of a new set of change control processes to ensure you stay on schedule and under budget. Change control is the technique through which all of these variables are managed. If change occurs (which it always does), it is critical to have a framework in place to manage it.

Expert Judgment: Discussed Earlier

Project Management Plan: A Project Management Plan is an officially authorized document that is used to manage a project's execution. It includes the documentation essential for defining, preparing, integrating, and coordinating the various planning processes. The subordinate plans indicated beneath the project management plan are combined to create the scope management plan, which alters how the project scope is planned and managed.

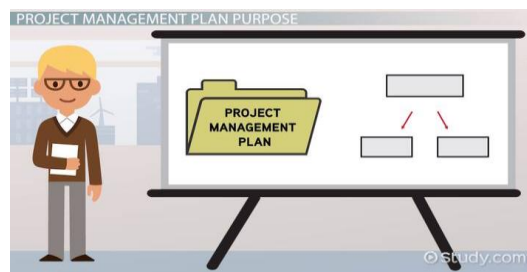


Figure 14: Project Management Plan

The project management plan is a baseline that tells you why it's important to make a scope management plan for a project. An update might be added.

- | | |
|----------------------------------|----------------------------------|
| ✚ Scope management plan | ✚ Stakeholder management plan |
| ✚ Requirements management plan | ✚ Communications management plan |
| ✚ Schedule management plan | ✚ Process improvement plan |
| ✚ Cost management plan | ✚ Risk management plan |
| ✚ Quality management plan | ✚ Project baselines |
| ✚ Human resource management plan | ✚ Procurement management plan |

Direct & Manage Project Work:

Project management deals with proper project direction & management. In corporate industry direction is must and without proper direction the operational activity and project related works will go to ashtray. If we look at the following table it will be easy for us to understand the steps.

Direct & Manage Project Work

Inputs	Tools & Techniques	Outputs
Project Management Plan	Project Management Methodology	Deliverables
Approved Corrective Actions		Requested Changes
Approved Preventive Actions	Project Management Information System	Implemented Change Requests
Approved Change Requests		Implemented Corrective Actions
Approved Defect Repairs		Implemented Defect Repair
Validated Defect Repairs		Work Performance Information
Administrative Closure Procedure		

Project Management Plan: Discussed earlier

Approved Corrective Actions: Corrective measures are conducted when a project's scope, schedule, cost, or quality requirements diverge from those that were originally anticipated. Reactive in nature, corrective measures aim to bring the project's performance back into line with the previously agreed-upon project baselines by addressing the root cause of the problem. (Master of Project Academy Blog, 2022).

Approved Preventive Actions: Preventive actions are conducted when a project's scope, timeline, cost, or quality requirements deviate from those originally made. Preventive interventions are proactive in nature and are determined by variance and trend analysis. Preventive activities are designed to guarantee that the project is completed in accordance with the project's agreed-upon baselines. (Goodrich, 2011).

Approved Change Requests: Approved change request review is a component of change control, a project management process in which all change requests within a project are examined for approval, rejection, or postponement. While projects are defined by their life cycles, change is a constant. It is critical that the improvements have a beneficial influence on the projects.

When a change request has been approved, it signifies that it has been handled through integrated change procedures. Change requests are often filed by requesters, examined by a number of different parties, and authorized by the many stakeholders involved in the project. Change requests that have been authorized can take effect at various stages over the project's duration and can be implemented immediately. It can begin at any step of the process or at a much later level, which can have an impact on several elements of project management, including budgeting and resource planning, as well as the quality of deliverables. (Alby, 2019). (What is a Change Request and How to Manage It, 2017)

- ❖ **Organizational Change Management:** It is the practice of organizational management to adapt to the changing demographics of its workforce, which includes differences in age, gender, ethnicity, race, and religion. As a result of this transformation, the company may be forced to engage in mergers, acquisitions, and restructuring in order to adapt to the changing culture. The aim is to transform opposition into good outcomes in order to create a culture that is open to change.

Phases of transformation will include anything from reorganizing employees to repositioning employees to reallocating employees.

- ❖ **Conditional Change Management:** Changing organizational management practices are prompted by a variety of factors including: new opportunities appearing in the demand, new product expansion required urgently by customers, external events related to competition, external events related to government regulations, errors or omissions discovered in the plan; new risks emerging as a threat to the plan; stakeholder requirements; and force majeure conditions such as war or natural disaster.
- ❖ **Program Change Management:** Changes in market behavior, currency rates, economic depression, economic recession, economic recovery, change in demand, change in supply, interstate change, and force majeure are all examples of project management changing owing to changing conditions. For these reasons, I purchased the Control Board (CB) in order to adjust the program's course in order to meet market demands and respond rapidly to changes.
- ❖ **Project Change Control Management:** It is project management practice to make changes in response to operational conditions, such as new technology on operation facilities, new technology on testing facilities, new tools and techniques acquire the ability to change the process, new design is superior to applied design, imperfection in intermediate materials acquires the ability to change the process, and urgent maintenance acquires the ability to change.
- ❖ **Work Change Management:** The technique of project management is changing because departments and teams dealing with a constantly changing environment typically create their own change management strategies. The goal of departmental change management may be to increase the success rate of changes and prioritize them in accordance with budget and resource constraints, or it may be to make decisions on new changes and review all change requests in order to lead them to correction. This is what is known as change disposition.

Approved Defect Repairs: The term "defect repair" is used to describe the process by which a project manager, team, or individual assigned to work on a certain project component has discovered a flaw, imperfection, or deficiency within that component and is taking steps to remedy the situation. Defect correction is a two-step technique. In order to determine whether or not the component can be fixed at all, the project team must first conduct a thorough investigation. There are times when it is more cost-effective to replace a component than to fix it. Those in charge of making the financial arrangements for the undertaking must typically review the advice in writing. (Alby, 2019).

Validated Defect Repairs: A top-notch change management method should be followed whenever anything changes in order to meet the project's specifications or to meet specific client requirements. During the course of the project, it is possible that certain products or stages may be faulty and will need to be changed or updated. After the alteration, modification, or repair has been completed, the work must be accepted by the client. First, the PM investigates the problem, and then the client investigates the problem. Following that, the phase moves on to the following level, which is the project conclusion stage.

Administrative Closure Procedure: Administrative project closing processes are also dealt with by the project's direction and management. Who will be in charge of the administrative sector? The Prime Minister must be aware of this. This is due to the fact that when the work is completed, there will be a documentation procedure for the technical and financial aspects of the project. A copy of the invoice should be given to the customer. The project overview should include information on how to close the project agreement.

Project Management Methodology: Discussed Earlier

Project Management Information System: Discussed Earlier

Deliverables: This terminology goes to the output stage. Following the completion of all input mechanisms and tooling, it should be announced that the kind of final goods/result must be given over. Every project work must have a goal and the deliverables deal with it. Project Management Body of Knowledge (Rose, 2013) as follows, and the following also shows some types of deliverables:

- ❖ **Validation:** Means the product is made and approved by a project → but still awaiting the Acceptance from the customer, it called the product is Validated
- ❖ **Verification:** Means the product is made and approved by a project, and Accepted by the customer, it called the product is Verified

Construction projects	Engineering Projects	IT Projects
<ul style="list-style-type: none"> ✓ Construction projects ✓ Design drawings ✓ Proposals ✓ Project reports ✓ Building permits ✓ building, a road section, a bridge 	<ul style="list-style-type: none"> ✓ Design drawings (electrical, mechanical) ✓ Product prototypes ✓ Finished product – a machine, a car ✓ Product manual ✓ Quality check reports ✓ Progress reports 	<ul style="list-style-type: none"> ✓ Requirement specification (document) ✓ User interface ✓ Backend development ✓ Set up of Test system ✓ Set up of Live system ✓ Data migration ✓ User training

Requested Change: It will become evident to us if we look at an example. It's possible that a vehicle manufacturer creates a basic sedan with a few extra features. However, buyers often request changes, such as the addition of leather seats, at the time of delivery. This request should originate from the user's end, and PM should work to prevent this

from happening. The management committee should repair and approve the modification requester in a business setting. An unauthorized modification request will be rejected.

Implemented Change Requests: When the project concludes that change is required, the change must be implemented in a planned and methodical way, with the goal of the change and any potential implications taken into account. The integrity of change will be reviewed with all parties involved, and the availability of resources will be considered.

Implemented Corrective Actions: It is used to fix problems and stop them from happening again.

Implemented Defect Repair: It means trying to change a product or service that doesn't meet the standards.

Work Performance Information: Performance reports are thorough statements that include the results of a given period of time's activities and work performance. Information that may be used to make decisions, actions, and/or awareness is known as a dashboard. Work A broad overview of a project's performance might show whether or not it is proceeding according to plan or has departed from it. Both project managers and stakeholders greatly benefit from performance reports. Project performance is clearly depicted in these reports. As long as the project is going according to plan, the project team and stakeholders are at ease; otherwise, they must put in extra effort to get the project back on course. Project performance reporting is critical, and we'll explore how to do that in this post. it may include (Greco, et al., 2018)

- | | |
|--|--|
| ✚ Change efficiency on application | ✚ Seller competence |
| ✚ Cost | ✚ Quality |
| ✚ Schedule | ✚ Scope creep |
| ✚ Summary of changes approved in the reporting period | ✚ Current status of risks and potential risks may be appearing |
| ✚ Work to be completed during the next reporting period | ✚ Work completed during the reporting period |
| ✚ Results of variance analysis | ✚ Forecasted project completion |
| ✚ Other relevant information consider review and asked by stakeholders | ✚ Analysis of past performance of procurements |
| ✚ Non-conformity to correct them | ✚ Impact on project process |
| ✚ Objectives | ✚ Quality |
| ✚ Cost | ✚ Schedule |

Monitor & Control:

Starting at the beginning of the project and continuing until its completion, this process helps to give the project team an insight of how well the project is doing and to identify areas that require more attention. Recommendations for adjustments include corrective actions, preventative measures, and fault repair, among others.

Monitor & Control Project Work		
Inputs	Tools & Techniques	Outputs
Project Management Plan	Project Management Methodology	Recommended Corrective Actions
	Project Management Information System	Recommended Preventive Actions
Work Performance Information	Earned Value Analysis	Forecasts
Rejected Change Requests	Expert Judgment	Recommended Defects Repair
		Requested Changes

Project Management Plan: A project management plan is a formal document that specifies how a project will be managed from beginning to finish. In it, you'll find the scope of the project, its goals, the budget, the timeframe, and the deliverables. It's critical for keeping a project on track.

Work Performance Information: Discussed earlier

Rejected Change Request: This is a critical phase in the project change control process and should not be overlooked. It serves to formally formalize the decision in response to the change request.

Project Management Methodology: Discussed Earlier

Project Management Information System: Discussed Earlier

Earned Value Technique: Project managers can use Earned Value Analysis (EVA) to see how much work has been done on a project beyond the simple assessment of cost and schedule data. EVA gives a way to measure the progress of a project based on the number of completed tasks. The project manager can then forecast the total cost and completion date of a project based on trend analysis or the application of the project's "burn rate" using the progress measured. The "earned value" of a project is an important metric in this approach. (Chance W, Reichel;, 2006).

Expert Judgment: Discussed Earlier

Recommended Corrective Actions: Discussed Earlier

Recommended Preventive Actions: Discussed Earlier

Recommended Defects Repair: Discussed Earlier

Requested Changes: Discussed Earlier

Perform Integrated Change Control:

All adjustments, no matter how little, must be authorized through an integrated change control process before they can be put into effect. When adjustments are proposed, it is the project manager's obligation to see that they are carried out properly. The PM must assess the effectiveness of the change management process in the context of the business organization. Change requests must be approved (Perform Integrated Change Control) and implemented (Direct and Manage Project Work). PM must follow:

- Evaluate change impact
- Create options for minimizing change impact
- Get approval from Change Control Board
- Get approval from customer (where required)

Perform Integrated Change Control		
Inputs	Tools & Techniques	Outputs
Project Management Plan	Project Management Methodology	Approved Change Requests
Requested Changes	Project Management Information System	Rejected Change Requests
Work Performance Information	Expert Judgment	Project Management Plan Updates
Recommended Preventive Actions		Project Scope Statement Updates
Recommended Corrective Actions		Approved Corrective Actions
Recommended Defect Repairs		Approved Preventive Actions
Deliverables		Approved Defect Repair
		Deliverables

Close Project or Phase:

Complete all tasks that are required to bring the project or phase to a successful conclusion. It is necessary to complete these tasks even if the project fails or is cancelled. Among the responsibilities it bears are the fulfillment of all open accounts and the termination of all ongoing contracts, among others.

Close Project Or Phase		
Inputs	Tools & Techniques	Outputs
Project Management Plan	Project Management Methodology	Administrative Closure Procedure
Contract Documentation		
Enterprise Environmental Factors	Project Management Information System	Contract Closure Procedure
Organizational Process Assets		
Work Performance Information	Expert Judgment	Organizational Process Updates
Deliverables		

Project Management Plan: Discussed Earlier

Contract Documentation: The contract management plan is an input-output document that specifies the way by which a certain contract will be administered and performed. It is also known as the contract management strategy. There will often be a number of topics included in the contract management plan document, such as the delivery of documents and the completion of work requirements. A contract management plan can take on a variety of shapes and sizes. Depending on how they are written, they might be official papers in which practically every detail is addressed, or they can be written quite casually, comprising simply top-level information that can be filled in with greater clarity at a later time. Contract management plans, like the majority of other components of efficient project management, should be adopted as early in the project's life cycle as is practical. The possibility of modifying a contract management plan with the approval of all parties exists in the event that circumstances change. It is important to note that the contract management plan is a subset of the overall project management plan (Rose, 2013).

Enterprise Environmental Factors: A project's Enterprise Environmental Factors (EEF) are any or all environmental factors, both inside and outside of the project that can affect how well the project does. There are a lot of things that people don't usually have a say in, like culture and weather and government regulations and the political situation and market conditions. (Khan, 2014).

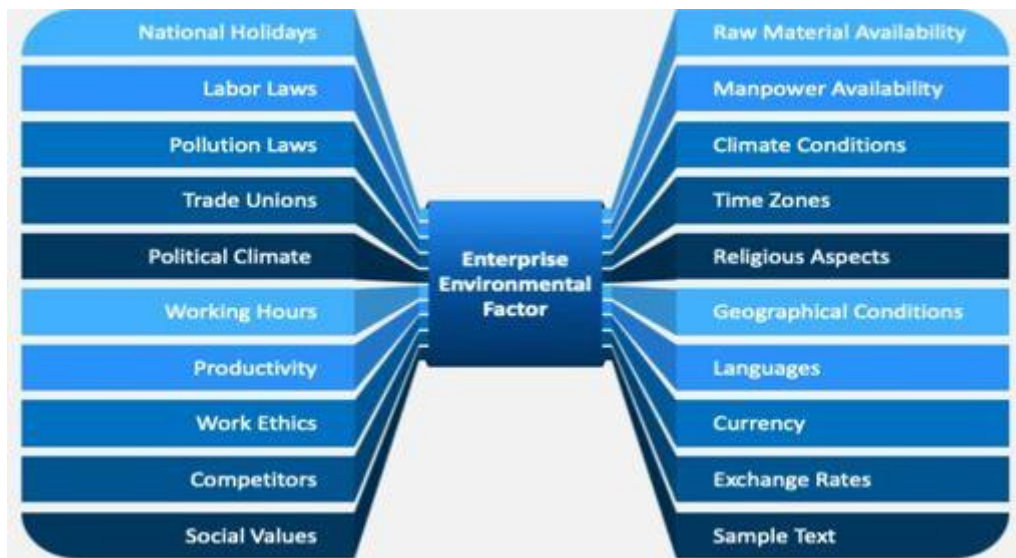


Figure 15: Enterprise Environmental Factor

Organizational Process Assets: There are a lot of tools that help people manage their projects, such as templates, contracts, registers, and evaluation tools. A lot of knowledge can also be gained by businesses through lessons learned and the knowledge base of the business itself, which can be very useful.

As a result, organizational process assets would encompass anything that the organization has acquired that may be put to use in the project's management. Plans, policies, procedures, and guidelines, both official and informal, are examples of what is included. Regardless of the type of the project, these are critical considerations throughout the planning stage. OPAs are required for every project, whether it is long-term or short-term in nature. Here's a list of common OPAs:

- ✚ Standardized guidelines
- ✚ Work breakdown structure templates
- ✚ Risk templates
- ✚ Project closure guidelines
- ✚ Change control procedures
- ✚ Proposal evaluation criteria
- ✚ Project schedule network diagram templates
- ✚ Organizational standard processes
- ✚ Defect management processes
- ✚ Financial control procedures

Work Performance Information: Discussed Earlier

Deliverables: Discussed Earlier

Project Management Methodology: Discussed Earlier

Project Management Information System: Discussed Earlier

Expert Judgment: Discussed Earlier

Administrative Closure Procedure: Administrative closure occurs at the conclusion of each phase as well as at the conclusion of the project. It is the process of finalizing the documentation of a project, and it comprises the process of arranging all essential project documents, indexing them, and archiving them in a centralized location. The preserved records should demonstrate the project's progress from the beginning through the official acceptance that signifies the project's completion.

Any documentation that is utilized throughout the project stages to illustrate project performance should be grouped into a single repository. As part of these performance measurement papers, the performance metrics established in the project plan should also be included. As the administrative closure process is completed, the project manager will be able to look back to the initial performance measurement targets and compare them to the actual performance measures that were obtained. This comparison will disclose any discrepancies as well as the overall performance of the project or phase.

Along with the performance measurement paperwork, the project manager will require all project plans, product specifications, technical documents, and drawings, as well as any other information pertinent to the end product, project, or phase. These papers will enable the project manager, the customer, and the project sponsor to check the project product and ensure that the phase's deliverables are consistent with the scope of the phase.

(Completing Administrative Closure | PMP Project Management Professional Study Guide, Third Edition (Certification Press), n.d.).

Contract Closure Procedure: Discussed Earlier

Final Product / Service / Result: The Project Management Body states that if the project is external, the product, service, or result will be transferred to another group or organization; if the project is internal, the product, service, or result will be transferred to the organization.



Figure 16: Result Leads to Direction

Deliverables are created as an integral part of the project operations, and shall be

- ✓ Record as a product, or service or result in operation area
- ✓ Inspect throughout the manufacturing process to avoid flaws.
- ✓ During the final process, check to make sure they passed. This is called the phase of verification.
- ✓ Record in testing area
- ✓ People should send things for packing and storage
- ✓ Export or local delivery as agreed by customers; partial or complete delivery as accepted by customers
- ✓ Prepare an invoice and deposit it into a bank account for payment.
- ✓ To complete the payment, you must also complete the work order.
- ✓ Measurement of the return on investment is a critical step in determining the current status of the project. (J, 2019)

Organizational Process Updates: Discussed Earlier

Create Work Breakdown Structure:

- ✚ **Gather Critical Documents:** To begin, we'll need to establish an appropriate task breakdown structure based on the project charter and scope description.
- ✚ **Put a Team Together:** The project's stakeholders, particularly subject matter experts, must be involved in defining the sub-deliverables.

- ✦ **Define Level 1 Components:** Level 1 components are short descriptions of deliverables that must encompass the total of the project scope.
- ✦ **Start “decomposing” deliverables:** The lower WBS parts give necessary detail and emphasis to aid in the execution of project management procedures such as schedule preparation, cost estimation, resource allocation, and risk assessment.
- ✦ **Decide upon Work Packages:** These will be the hierarchy's lowest levels. They must include definitions of the tasks to be completed and tracked.
- ✦ **Create Optional WBS Dictionary:** This is an extension of the typical work breakdown structure as defined by the PMBOK. If you wish to develop a WBS Dictionary, include work package-level descriptions. These descriptions should include details on the project's limits, milestones, risks, owner, and expenses.

Requirements and expectations of stakeholders: Individuals, groups, businesses, or organizations who may be impacted by a decision, conclusion, or even a minor activity relating to a certain project are referred to as stakeholders. Generally, a stakeholder register is considered to be a project management document since it identifies, evaluates, and categorizes the stakeholders involved in a project. As an input, a stakeholder register is used to create the various project management processes, such as the Plan Stakeholder Management, the Plan Procurement management, the Plans Risk and Communications management and the Plans Quality Management, as well as the Collect Requirements and Identify Risks processes. This is one of their contributions, which is the stakeholder registration. It is required that the stakeholder registry have at least the following information about the stakeholder:

Stakeholder Register								
Project Name								
Reference No								
Project Sponsor Name								
Project Manager Name								
Project Location								
Prepared By								
Date Prepared								
ID	Name	Org	Role	Title	Contact Number	Communication Type	Stake in Project	Influence
01	Mr. Nazim	LET	Sponsor	Director	nazim@leadingedge.net.bd	Mail	Funding	Strong

Solution Requirement: To address the demands of stakeholders as well as the goals of the company, solution requirements define certain features that a product must have. They may be divided into two main categories.

- ✚ **Functional requirements** tell you what a product must do and how it should look and work.
- ✚ **Nonfunctional requirements** describe how a system should look and work. Those things, which are also called quality qualities.

Functional Vs Non-Functional Requirements		
	Functional Requirements	Non-Functional Requirements
Object	Describe what the product does	Describe how product works
End Result	Define product feature	Define product properties
Focus	User requirement	User expectations
Documentation	Capture in use case	Capture as quality
Essentiality	Mandatory	Not mandatory
Origin Type	Defined by user	Defined by vendor
Testing	Component, API, UI Etc	Performance, Usability etc
Types	Authentication, Authorization, rules	Usability, reliability, scalability

Transition Requirement: Another set of requirements shows what an organization needs to do to move from where it is now to where it wants to be with the new product. Only for a short time while the transition is taking place. Example: Training, Data Conversions, Prototype etc.

Stakeholder Requirements: It's an unavoidable fact that stakeholders place demands on your project (else they are not stakeholders). A number of different specifications may be necessary at any given moment. For example, a landowner near a new oil pipeline site may be both an antagonist and a supporter of the project. Another option is for stakeholders to create papers outlining the criteria themselves. These should be included in the project management plan's requirements section.

Quality Requirements: Almost every project has a set of requirements for product designs. Standards for a wide range of everyday items and services are developed by the ISO.

1. International Standards Association (ISO)
2. American Society for Testing and Materials (ASTM)
3. Institute of Electrical and Electronics Engineers (IEEE)
4. Project owner (sponsor) design requirements
5. Stakeholder or regulatory design requirements

There are certain projects, like a user interface design or a building project, where the needs aren't entirely defined and become apparent as the project progresses. The use of focus groups and workshops to help fine-tune project specifications is thus planned at

several points throughout the course of the project. It is common in the manufacturing business to deploy quality functions to clarify product specifications.

It's critical that a project account for the fact that its needs aren't yet understood in full. This can be done in two ways:

- ✚ **Contingencies:** To guarantee that the project's schedule, cost, or quality are not threatened, an additional sum is added to the project schedule, cost, or quality.
- ✚ **Warn Stakeholders:** Wherever feasible, stakeholders should be open to project revisions if the needs exceed those stated in the project plan. This must be decided upon throughout the project planning stage.

Collection of Requirement Must Be:

Based-Lined, Unambiguous, Measureable, Testable, Traceable, Complete, Consistent, Linked to Business Objective and acceptable to key stakeholder.

Requirement Gathering Techniques: (Upgrad Knowledge Hut, 2019)



Figure 17: Methods for Requirement Collection

- ✚ **Brainstorming:** A group of interested parties can be asked for their input, and they should be encouraged to contribute any and all comments and ideas they may have

for the final product. This produces a lot of thoughts. In a brainstorming session, there are no rules to follow.

- ✚ **Interview:** To better understand the needs and expectations of some of the company's most important stakeholders, interviews might be arranged.

- ✚ **Focus groups:** Moderated conversation with stakeholders from a certain group or function to finalize needs.

- ✚ **Facilitated Workshops:** Finalize some of the standards that will apply to all participants in a conversation led by a facilitator with a cross-functional group of stakeholders.

- ✚ **Questionnaires & Surveys:** Designed to get input from a wide range of stakeholders.

- ✚ **Benchmarking:** As a starting point for a new product, we may frequently draw inspiration from existing goods or concepts, and then establish new criteria based on the comparison.

- ✚ **Observation and Conversation:** Stakeholders are frequently unable to clearly communicate their expectations because they lack the necessary skills and expertise. There are times when it's necessary to observe what's already in place in order to have a clearer picture of what's needed. Often used to gain a better understanding of the current manual operations that need to be automated.

- ✚ **Nominal Group Technique:** Requirements should be prioritized by including the many parties who are involved. Making a list of the things you absolutely must have, should have, and perhaps could have.

- ✚ **Facilitation techniques:** The project team must motivate and assist the various stakeholders in order to gather specific needs.

- ✚ **Affinity diagrams:** Organization of needs into logical categories to facilitate comprehension and comprehension.

- ✚ **Decision Making:** When it comes time to make final decisions on requirements, the group of stakeholders is brought into the process via vote.

- ✚ **Prototyping:** There is always a risk of misunderstanding of requirements gathered via interactions. Prototypes are frequently created in order to avoid this kind of misconception. A prototype is a great way to ensure that all stakeholders are on the same page about the project's requirements.

Output Traceability Matrix (Simplilearn, 2022):

In order to verify the completeness of the many-to-many link between two baseline documents, a traceability matrix (TM) is used.

Traceability matrix is the primary tool for this purpose.

- ✓ Keep tabs on requirements
- ✓ Ensure fulfillment of the project requirements

Traceability Matrix Benefits:

- ✚ As a project manager, it's not unusual for the project's needs to change at one time or another. These alterations may be tracked with RTM, which has an influence on the entire project.
- ✚ When it comes to ensuring that your team has accurate and consistent documentation, a traceability matrix may be an invaluable tool. A TM can tell you if a need has been well documented, from test cases to wireframes to user stories. Even if a need isn't present, a traceability matrix can help find it.
- ✚ Assume you're a test manager on a large software development project. When you're dealing with a large backlog of faults, it's critical to start with the most pressing ones. Traceability matrices can help you identify and prioritize issues associated to critical requirements, as well as their severity, priority, and other attributes. As a last step, RTM ensures that all tests are covered.

Traceability Matrix Template										
ID	Ass. ID	Requirements	BJ	Objective	Requested By	Dept	WBS	Spec	Design	Test Case
1	1.1	Network Node	IP Phone	Created Extra Node	Mr. Fakhru	IT Infra	7	Done	Done	5001
2	1.2	Login Page	Security	Viable Program	Mr. Ashfaq	Server	3	Finish	In Progress	5002
3	2.1	Welcome Mail	Confirmation	Viable Program	Mr. Ekram	Domain	2	In Progress	In Progress	5003

Work Performance Measurements:

Work Performance Measurements, also referred to as Key Performance Indicators (KPIs), assist teams in determining the efficacy of various activities and processes critical to

accomplishing corporate objectives. Businesses utilize key performance indicators (KPIs) at many levels to determine their effectiveness in meeting objectives. While high-level KPIs may be concerned with the overall performance of the business, low-level KPIs may be concerned with the activities of individual departments such as purchasing, sales, production, planning, staff, calibration, stores, quality control, and planning.

Operation Area Metrics:

- ✚ **Effectiveness Metric:** It is the link between Results attained and Capacity (as measured by Ratio), and the most effective approach to achieve so is by attaining the projected Results at a larger profit margin.
- ✚ **Efficiency Metric:** It is the link between the results gained and the resources utilized (using the Ratio), and the most cost-effective approach to do so is to utilize the fewest possible resources.
- ✚ **Capacity Metric:** It is the link between the Maximum Amount That Can Be Produced and the Time Required to Produce That Amount.
- ✚ **Productivity Metric:** It is the connection between the quantity that can be produced by (A) machine and the quantity that can be produced by (B) machine given a particular time and resource constraint.
- ✚ **Quality Metric:** It is the relationship between the total output and the outputs that are suitable (the degree of acceptance) and suitable for use (using Ratio), as well as the relationship between the desired non-conformity and the frequency with which non-conformity occurs for each machine or cable meter.
- ✚ **Waste Volume Rating:** The closer the time is closed, the more accurate the result is, allowing the company to take corrective action when discrepancies arise. It is the relationship between total production and scrap created by each machine during a particular period.

Quality control Metrics:

- ✚ **Product deviated from Design:** To put it another way, this is one of the most important metrics in businesses where regulations are strict and capital expenditures are high. It measures the proportion of items that were manufactured according to the design estimate. When it comes to raw resources, it's about the link between what was estimated and what was used.
- ✚ **Passed Tests:** In some cases, you need to look beyond the requirements level and into the execution of every test configuration within a test, KPI is a complimentary to your Passed Requirements and measuring how much effective your test configurations, check the relationship between quantity exposed to test and the quantity passes within a certain period.

- ✦ **Equilibrium Test with third Party:** Some organizations may see too many clients get hung up on the severity degree of flaws as a consequence of faultier tests because of how much your physical test diverged from international authorities like KEMA. You may use this KPI to keep an eye on the quality of your product, but make sure that you use proper testing and balances when determining the severity of a fault. You can establish a threshold for this KPI once you've made sure all of the checks and balances are in place.
- ✦ **Rejected Defects:** If your team is rejecting a significant number of defects with a comment like "works as planned," perhaps you might walk your team through the design documentation of the application under test, such that no more than 5% of the defects filed are ever rejected.
- ✦ **Waste Volume Measure:** The waste value metric is the link between total production and scrap created by each machine during a certain time period (by using Ratio). The closer the time, the more precise the outcome, allowing the company to take remedial action if variances are detected.

Time Management Strategies:

- ✦ **Follow Seven Stage Above:** This is critical for task organization and scheduling. You must be aware of how you spend your time. This includes tracking your own and your team's hours.
- ✦ **Each Task Time:** Contrast this to the time estimate you made. If there is a disparity, determine why and make necessary adjustments to your plan. Perhaps that work should be completed while your team is fresh, whether it is first thing in the morning or first thing in the week.
- ✦ **Focus on task:** Maintain an orderly task list. Whether you use a basic to-do list or project management software, prioritize your tasks according to their due dates to determine when they must be finished.
- ✦ **Don't over-commit:** Occasionally, it's advisable to abandon an activity that is taking an excessive amount of time and go on to the next one. While this may seem counter-intuitive, efficiency is the goal of project time management.
- ✦ **80/20 Rule:** According to the 80/20 rule, 80% of your outcomes come from 20% of your labor. This entails developing an understanding of how to optimize your burden through task and time prioritization.
- ✦ **Time Project Management Tool:** Project management software can help you save time by simplifying and automating repetitive tasks throughout the day.

Sequence Activities

The practice of finding and establishing linkages between project tasks is called sequencing. The primary advantage of this form of process connection is that it establishes the logical order of tasks necessary to maximize efficiency within the restrictions. The sequence activities are classified as planning process activities and project time management knowledge in the project management process groups and knowledge area mapping. The schedule model is created by combining the outputs from the procedures to identify activities, sequence them, estimate resources, and estimate activity durations with a scheduling tool to create the schedule model, which is a representation of how the project will appear when completed.

Precedence Diagramming Method (PDM): The Precedence Diagramming Method is a graphical representation tool for arranging activities in a project plan. It shows the interdependence of activities and is utilized in the creation of schedules. The method is used to create a project schedule network diagram that uses nodes to represent tasks and connects them to projectiles to show the dependencies. This technique is also known as the activity-on-the-fly technique. This method is used to construct critical path network diagrams, critical chain network diagrams, and other project schedule network diagrams. This diagramming style depicts activity linkages. It is a vital tool for stakeholders to communicate with one another. On the node diagram, there is activity on node diagram (AON)

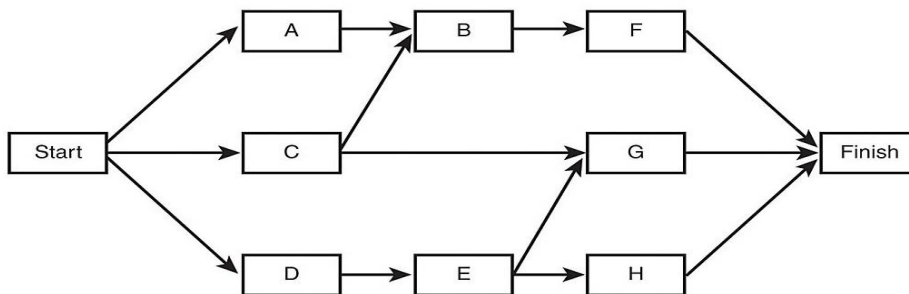


Figure 18: AON (Activity of Node Diagram)

- ✓ **Finish to Start (FS):** This is used when one task cannot begin until another has finished.
- ✓ **Start to Start (SS):** This is used to indicate when two activities can begin concurrently.
- ✓ **Finish to Finish (FF):** This is applied when two jobs must be completed concurrently.
- ✓ **Start to finish (SF):** You can only finish your previous task if the subsequent task has been started

Sequence Activities – Key Concepts:

Lead time: The term "lead time" refers to the acceleration of a subsequent activity. In other words, the second activity can begin (and be carried out concurrently with) the first. Leads are only discovered in activities that have a finish-to-start relationship: A must be completed before B may begin. To leverage a lead and so reduce the overall length of both tasks, the reliance must be discretionary, which means that there is no physical constraint on completing (A) before beginning (B). Lead time is the amount of time required to advance a successor activity relative to a predecessor activity. Lead occurs when the first activity is still operating when the second action begins. Lead Time is the time period during which primary and secondary activities overlap.

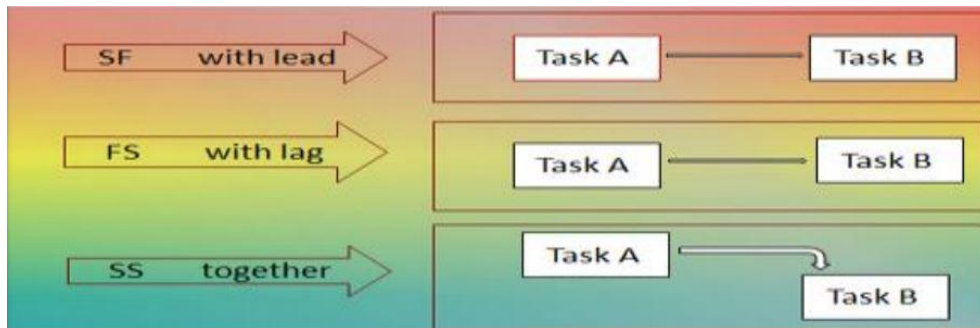


Figure 19: Lead Time & Lag Time

Lag Time: "Lag Time" refers to the amount of time required for a successor activity to be delayed in relation to a predecessor activity. When the first action is completed but the second activity does not begin immediately, this is referred to as "lag." The delay is referred to as "lag time." The term "Lag Time" refers to the time interval between the first and second activities. In short, both lead time and lag time contribute significantly to the establishment of the timetable baseline. In a network diagram, lead and lag can be used to represent any form of dependency. They are quite beneficial and give project managers greater freedom in developing schedules.

Dependencies:

- ✚ **Mandatory:** It's legal and necessary for them to be a part of the job. Physical barriers are often a part of the project team's process of figuring out which tasks need to be done in order. This is called "hard logic," and it should not be confused with relegating tasks in the scheduling tool. As an example:
 - ✓ Two things must be done at the same time (starting and/or ending at the same time)
 - ✓ When one thing has been done, the next thing can't start.

- ✚ **Discretionary :** They are referred to be preferable logic, as they are based on best practices or lessons learnt from earlier experiences, or Soft Logic application areas of the project that require a specific sequence, even if other sequences are suitable.

Discretionary Because there are multiple ways to define a sequence between two activities, the project team will choose their preferred sequence and may use random float values that restrict advanced scheduling options; thus, the project dependencies must be documented. They must also be audited and considered for modification when optimizing systems are in use, and the project team determines which dependencies are optional along the way toward completing the project. As an example:

- ✓ This activity will take place concurrently with another group of activities.
- ✓ This activity will begin a few days after the conclusion of another.

Estimate Activity Durations:

This is the process of calculating the number of work hours required to execute various tasks given projected resources. After determining the activity resources, these resources estimate the activity durations. How long it will take someone to accomplish a task. The entire project length will be decided based on their estimates.

Durations – Tools and Techniques:

- + **Expert Judgment:** Discussed Earlier
- + **Analogous:** A top-down estimate is another name for this method. It uses past data to determine the current length of the activity. It is just based on a little quantity of data. This is a quick estimate, but it may not be particularly accurate because you are not checking the job.

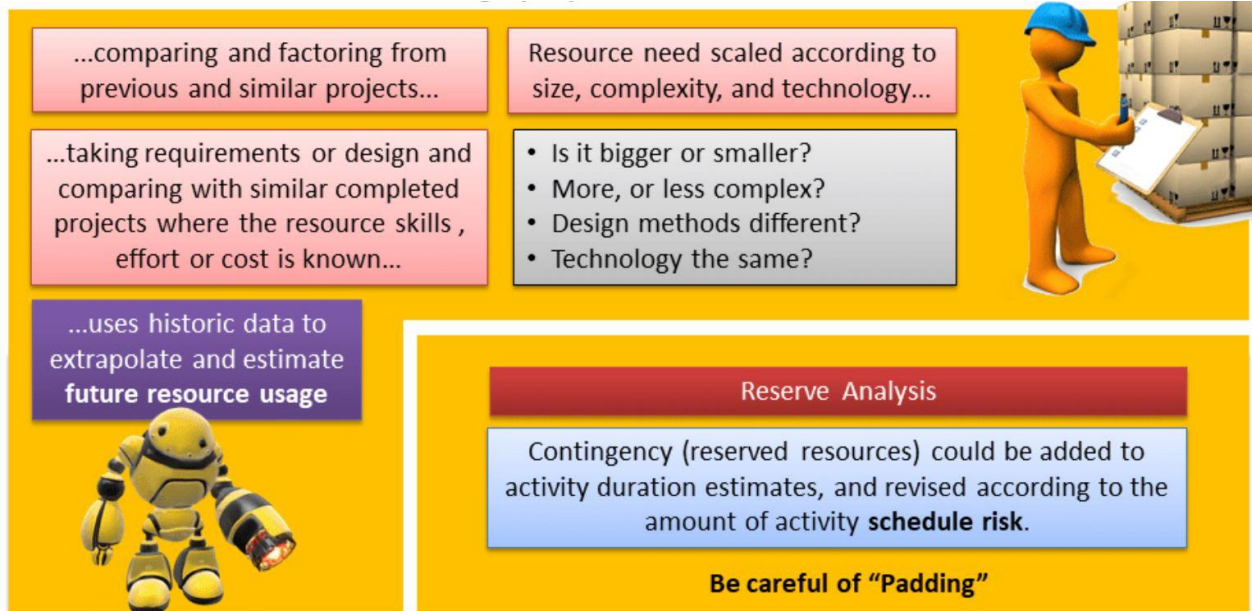


Figure 20: Estimating By Experience

- Parametric Estimating:** This calculates the cost or duration of an operation using a mathematical procedure. Calculations are performed using historical data and variables. For instance, if one programmer is required to develop one module, then ten programmers will be required to write ten modules. This method of estimating may or may not be correct, depending on the precision of the data utilized to generate it.

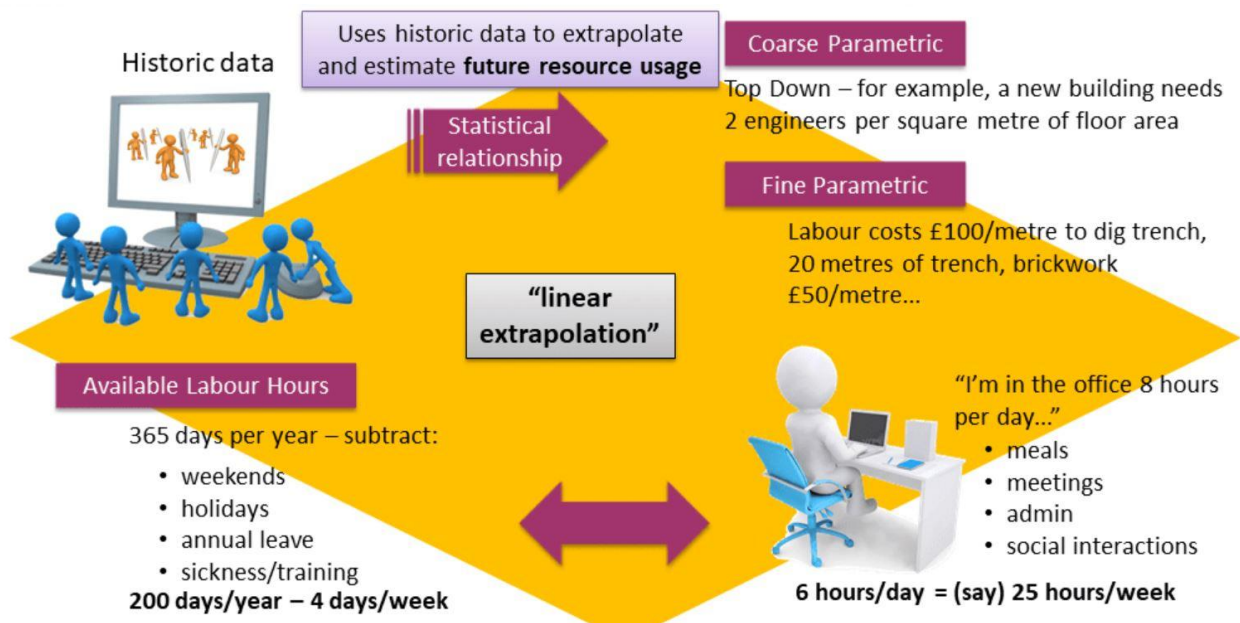


Figure 21: Parametric Estimating

- Three Points Estimate:** The majority of projects fail due to inadequate estimations. Although many project managers consider estimating projects to be one of their most difficult duties, using a three-point estimation method can make the process easier and more accurate. Due to the fact that this technique considers three distinct possibilities, your estimate will be more accurate.

When utilizing the three-point estimating approach for your project, each member of the project team should record their optimistic, realistic, and pessimistic predictions for the work they will be performing and the time necessary to complete it. From there, you can use this method to determine the weighted average of the three points.

$$\text{Three-point } T = (O+4M+P)/6$$

Where,
 T = Estimated Costing
 O = Optimistic Value

M = Most Likely Value/Realistic Value

P = Pessimistic Value

- ✚ **Group Decision Making Techniques:** Estimate the length of each activity using group decision-making processes. This strategy involves consulting your team members or subject matter experts to obtain the most accurate estimations for project activities.

- ✚ **Reserve Analysis :** Reserve analysis is used to establish budgets and takes both contingency and management reserves into account. Reserve analysis is an analytical approach used to maintain enough reserves in the event that anything falls between the cracks. A project manager must develop a system for mitigating risks via the use of a sort of reserve analysis in order to keep ahead of possible hazards on a yearly basis and while calculating the annual expected budget. A reserve fund is established to cover any hazards that the project's management may encounter.
 - ✓ **Management Reserve:** It is a sum of money set aside from retained profits to cover unexpected losses or prospective risks; this reserve can be in the form of cash or time; this reserve is not random; rather, it is an estimate reserve based on various risk management approaches budgeted on an annual basis.
 - ✓ **Contingency Reserve:** Annual budget allocations are made for anticipated events such as risks and threats or force majeure conditions. The project may utilize all or a portion of this money to cover some immediate costs necessary to mitigate possible risks such as losses, waste, or force majeure situations.

Critical Chain Method:

The critical chain approach is a schedule network analysis tool that alters the project schedule in response to constraints and places an emphasis on managing the duration buffer and resources, in addition to activities and resources. It solves issues using both statistical approaches. The terms "critical chain" and "critical route" are found in the text. Nevertheless, there is a significant difference. The two methods are totally opposite. The critical chain technique (derived from constraint theory) is resource-oriented, whereas the critical route method is task-oriented. Critical chain introduces the concept of buffers and buffer management

- ✚ **Buffer Management:** Three Kinds of Buffers management.
 - ✓ Project Buffer (PB) – at the end of project to absorb delays and protect the end date
 - ✓ Feeder Buffer (FB) – where noncritical paths merge with the critical chain to protect critical chain from delays

- ✓ Resource Buffer (RB) – where uncommon resources are needed to keep them available and to ensure resources are forewarned of changing schedules

Forecasting Method:

Forecasting is a method that estimates the value of a variable or combination of variables at some point in the future. Typically, a forecasting exercise is conducted in order to facilitate decision-making and future planning.

Forecasting may include:

- ✓ Forecasting the growth and tendencies of the economy
- ✓ Forecasting financial information and budget allocation
- ✓ Forecasting inflation and its developments in the economy
- ✓ Expecting manufacturing preparation
- ✓ Forecasting the behavior and developments of the market
- ✓ Forecasting estimates the quantity of raw materials and finished goods in inventory
- ✓ Forecasting demand and supply in the market
- ✓ Forecasting international relations and exchange rate
- ✓ Guessing the tastes of customers

Qualitative Method:

Subjective in nature, these sorts of forecasting approaches are based on value judgments, views, intuition concerns, emotions, or personal experiences. They do not conform to any strict criteria.

- ✓ **Common Opinion:** In meetings or sessions, collectively formed projections are possible.
- ✓ **Market Survey:** Questionnaire-based forecasting to assess market demand and supply
- ✓ **Sales Force Analysis:** Forecasting based on salesperson projections of sales in their respective territories
- ✓ **Delphi Method:** It is the process through which a group of experts establish an agreement by compromise.

Quantitative Method:

These forecasting approaches rely on mathematical analysis to predict the future. They are largely dependent on mathematical computations.

- ✓ **Time-Series Models:** This model explains historical data to forecast future movement.
- ✓ **Associative or casual Models:** This model assumes that the variables under consideration are connected to one another.

Calculation Methods:

- ✓ **Naïve:** The method of forecasting in which the sales from the previous period are used without making any projections or modifying the components.
- ✓ **Simple Mean:** The approach forecasts using the average of all historical data.
- ✓ **Simple Moving Average:** Uses an average of a certain number of recent observations, with each observation getting the **same** weight.
- ✓ **Weighted Moving Average:** Uses an average of a certain number of recent observations, with each observation getting the **different** weight.
- ✓ **Exponential Smoothing:** A weighted average process in which the weights decrease exponentially as the data becomes older.
- ✓ **Trend Projection:** A technique that use the least squares method to fit a straight line to a set of data.
- ✓ **Seasonal Indexes:** A way to change the forecast to take into account any seasonal patterns in the data.

Continuous improvement:

Shewhart and Deming's Plan-Do-Act-Check (PDCA):

The (PDCA) Cycle is a four-step, continuous problem-solving method used to enhance business operations. Developed in the 1920s by American physicist Walter A. Shewhart. Dr. W. Edwards Deming pioneered the approach in the 1950s. The strategy involves condensing the following factors: (Tague, The Quality Toolbox, Second Edition, 2022)

- ✓ **Plan:** Determine the resources, identify internal and external concerns, determine the requirements of interested parties, and identify threats and opportunities.
- ✓ **Do:** Put the strategy into action
- ✓ **Check:** Measure the processes and performance in terms of the needs and goals
- ✓ **Act:** Utilize the information you gathered during the research phase to take action

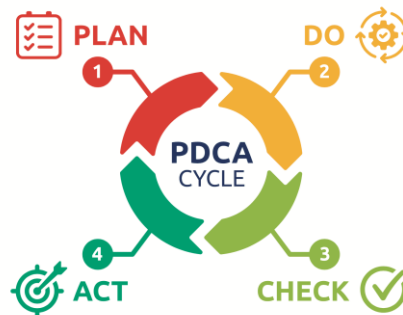


Figure 22: PDCA

Total Quality Management (TQM):

TQM is a management concept that aims to integrate all organizational activities (marketing, finance, design, engineering, manufacturing, customer service, etc.) to fulfill customer wants and corporate goals.

TQM considers a company to be a collection of processes. It asserts that firms must seek to continually enhance these processes by utilizing the workers' expertise and experience. The fundamental goal of Total Quality Management is to "Do the right things, correctly the first time, every time." TQM is varied and flexible indefinitely. Although initially applied to manufacturing operations and for a period of years employed exclusively in that sector, TQM is increasingly being recognized as a general management strategy applicable to service and public sector businesses as well. There are several evolutionary threads, with each sectors developing their own copies of the common ancestor. TQM is the basis for the following activities:

- Commitment from senior management and all staff
- satisfying consumer needs
- minimizing development cycle durations
- Just-in-time/demand flow production
- Enhancement groups
- Cost reduction for products and services
- Systems that facilitate progress
- Line management responsibility
- Employee engagement and autonomy
- Recognition and festivity
- Challenging measurable objectives and benchmarking
- Focus on processes / improvement plans
- Detailed inclusion in strategic planning

Six Sigma:

Six Sigma is utilized to precisely minimize variability and faults. It employs two methods, DMAIC (define, measure, analyze, improve & control) and DMADV (define, measure, analyze, design & verify), to accomplish the intended results: minimizing mistakes and maximizing value across industries. There are 6 steps of protocol:

1. Determine desired product characteristics
2. Criticality classification of elements
3. Determine if a characteristic is regulated by an element or a process
4. Determine acceptable deviation
5. Determine process variation
6. Change design to achieve 6 Sigma performance

Lean Six Sigma:

Lean Six Sigma is the combination of two well-known business principles—lean and Six Sigma—into a single strategy for enhancing organizational performance and eliminating waste processes. Lean Six Sigma acknowledges the relevance of stakeholders to the success of every project, as well as the significance of collecting and analyzing data to assist stakeholders understand the efficiency or inefficiency of the workflow. It is a realistic

strategy that allows a company to choose which aspects of each discipline will assist it achieve its objectives (Yasar, 2022).

Six Sigma vs. Lean Six Sigma:

Lean management and Six Sigma both aim to reduce waste and enhance company operations. A significant difference, though, is that lean management depends on individuals to detect waste-causing problems. Six Sigma, on the other hand, uses data to detect business process issues. The management philosophy was called after the Greek letter, which is used in statistics to represent deviation from the norm.

Malcolm Baldrige Framework:

By supporting continuous development, the Baldrige Excellence Framework offers organizations with a systematic approach to improving the whole quality management system and organizational efficiency. The Malcolm Baldrige National Quality Award (MBNQA), a Presidential Award, was established to promote the benefits of following the Baldrige Excellence Framework.

Many organizations have been able to deploy and use the framework as a process management tool while maintaining high levels of performance and quality in all areas. Every organization, regardless of size or industry, can use the Excellence Framework and apply for the MBNQA. Organizations that excel in performance are recognized and encouraged to share their best practices with others by acquiring the MBNQA.

The return on investment of implementing the Baldrige Excellence Framework and achieving the MBNQA brings significant value to the organization and fosters a learning and development environment (Lopez, 2018).

The quality management framework is divided into **seven critical categories**:

1. Leadership
2. Strategy
3. Customers
4. Knowledge Management
5. Workforce
6. Operations
7. Performance measure or result

Quality Management & Control Tool:

- ✚ **Affinity diagram:** Used to produce concepts that can be connected to construct structured patterns.
- ✚ **Inter-relationship diagraph:** A method for solving creative problems involving up to fifty interconnected relationships.

- ✚ **Tree diagram:** Used to show decomposition hierarchies, such as the WBS.
- ✚ **Matrix diagram:** Utilized for data analysis inside the organizational framework produced by the matrix.
- ✚ **Prioritization Matrices:** Identify the critical concerns and the ranking of suitable alternatives.
- ✚ **Process decision program chart (PDPC):** Utilized to comprehend a goal in relation to the procedures required to achieve it.
- ✚ **Activity Network Diagrams:** A visual representation of a sequence of events.

RACI Matrix: The RACI chart has been a popular tool among project managers worldwide for a very long time. It's also known as the RACI matrix, and it's used to define employee roles and responsibilities for each project job, milestone, and decision. The chart is intended to facilitate clear communication and efficient processes among all team members. RACI diagrams can prevent the sinking feeling that occurs when a big decision-maker arrives at the conclusion of a project and complicates matters with a huge number of changes since they were not consulted throughout the project. RACI Stands for:

- ✚ Responsible
- ✚ Accountable
- ✚ Consulted
- ✚ Informed

RAM Matrix: The responsibility assignment matrix (RAM) is a method of project management that encourages everyone to understand each project stage. Examining the chart engages all stakeholders and promotes an end-to-end perspective of any large task in the workplace; everyone on the team has a better understanding of what they are responsible for and where their portion of the project sits on the calendar.

Basic Difference RACI vs RAM: This may be somewhat puzzling. RAM refers, in its simplest form, to the structure in place for delegating duties to persons. Different team members are assigned one of the RACI designations. Briefly, a RACI may be viewed as a subset of the larger RAM architecture.

Plan Risk Management:

Plan risk management is looking at what could go wrong, because you can't plan for everything. Getting a handle on the biggest ones, like how likely they are to happen and how bad they could be, can help a project succeed. It involves looking at the schedule, figuring out the scope, making a budget, and finding problems.

Inputs:

- **Scope Statement:** Discussed Earlier

- **Plans for Cost:** A cost management plan is a plan for estimating, allocating, and keeping track of the costs of the resources needed to finish all project tasks. One of the most important parts of a project is how the cost plan is set up. It acts as a safety net during the planning phase of a project, making sure that the costs of the project stay within the budget. In general, the cost management plan looks at how the costs of the project will be planned, paid for, and controlled.
- **Time and communications:** Include a section defining the risk management activities' timetable.
- **Roles and responsibilities from staffing plan:** The members of the risk management team are accountable as risk owners. They must keep an eye on project hazards and oversee risk response measures.
- **Templates from Organizational Process Assets (OPA):** The organizational process assets consist of the plans, processes, policies, and procedures, and knowledge bases are utilized to execute processes to ensure the initial success of the project. These procedures include assets like as information, documentation, historical data, risk data, operational data, testing data, and instruments. In the project execution phase, approaches for controlling the project may be physical or intangible. Asset processing is an input to the majority of planning procedures. The project team members may modify and add to organizational process assets as required.

Tools & Techniques:

- **Analytical Techniques:** Discussed earlier
- **Expert Judgment:** Discussed earlier

Output – Risk Management Plan – Includes:

Risk management is a procedure that enables the understanding and management of both individual risk occurrences and total risk. Proactively maximizing success by eliminating dangers and capitalizing on opportunities. All projects, programs, and portfolios are inherently dangerous because they are one-of-a-kind, restricted, founded on assumptions, and conducted by people who are susceptible to external pressures.

In addition to the above description, a risk management plan is a document that a project manager creates in order to anticipate risks, quantify their potential implications, and specify appropriate solutions. A risk assessment matrix is also included. The risk management strategy incorporates an analysis of potential risks with both high and low effect, as well as mitigation techniques to prevent the project from being derailed in the event that typical issues materialize. Risk management plans should be evaluated frequently by the project team in order to prevent the analysis from becoming stale and no longer representative of the real possible hazards of the project. There are four possible reactions to risk, with several variants on the names used to refer to these responses

(Roseke, 2015). Regarding how to react and manage risk, please refer to the following diagram.

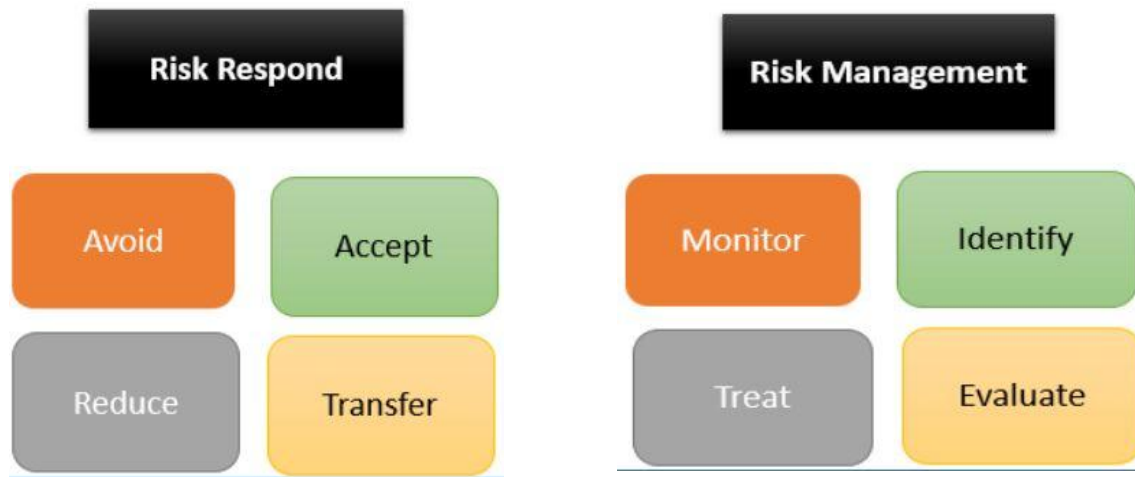


Figure 23: Risk Respond

Figure 24 Risk Management

There are many different techniques that can be used to identify project risks such as:

- ✚ Methodology
- ✚ Budget
- ✚ Categories scoring
- ✚ Probability & Impact Matrix
- ✚ Roles & Responsibilities
- ✚ Timing
- ✚ Definition of risk probability & impact

Identify Risks:

Risk is any unpredictable occurrence or circumstance that might have an effect on a project. Not all risks are bad. For instance, the discovery of an easier method to do a task, the discovery of new, cheaper pricing in the market, or the modification of a project's technology may include risks, but may be referred to as an opportunity. However, they are still treated as risks. Bad occurrences are classified as dangers (threats) with negative consequences, and good events are categorized as opportunities with positive outcomes. Numerous risk categories may have negative effects on the company, while risk solutions can have beneficial effects on the organization.

Risk Register												
No	Description	Probability	Impact	Significance	Score	Strategy	Resolution	Owner	Resolution Date	Reference	Comments	Status

Finding Risk:

- **Documentation Review:** For risk's history or context, documentation is most useful. Numerous project hazards may be found by evaluating the project's technical aspects, the team's history, and other information.
- **Information Gathering Technique:**
 - ✚ Brainstorming (Ask Everyone)
 - ✚ Delphi (Ask the expert- consensus)
 - ✚ Interview (Ask relevant stakeholder)
 - ✚ Root cause analysis
- **Checklist Analysis:** A method for collecting on a check list the typical hazards that might have a negative influence on the project. The checklist will help you to rapidly identify the most significant hazards and the conditions in which they apply. In addition, it offers a ranking of replies.
- **Assumption analysis:** Each business case for a project is based on a set of underlying assumptions. Identifying these assumptions and evaluating their dependability might lead to the discovery of new risks.
- **SWOT:** Strengths-Weaknesses-Opportunities- Threats analysis will help figure out what the project's risks are. It lets the project look at the project from the point of view of how it will compete with other projects in the same industry.
- **Diagram Techniques:**
 - ✚ Cause & Effect
 - ✚ Flow Charts
 - ✚ Influence Diagrams

Cause & Effect:

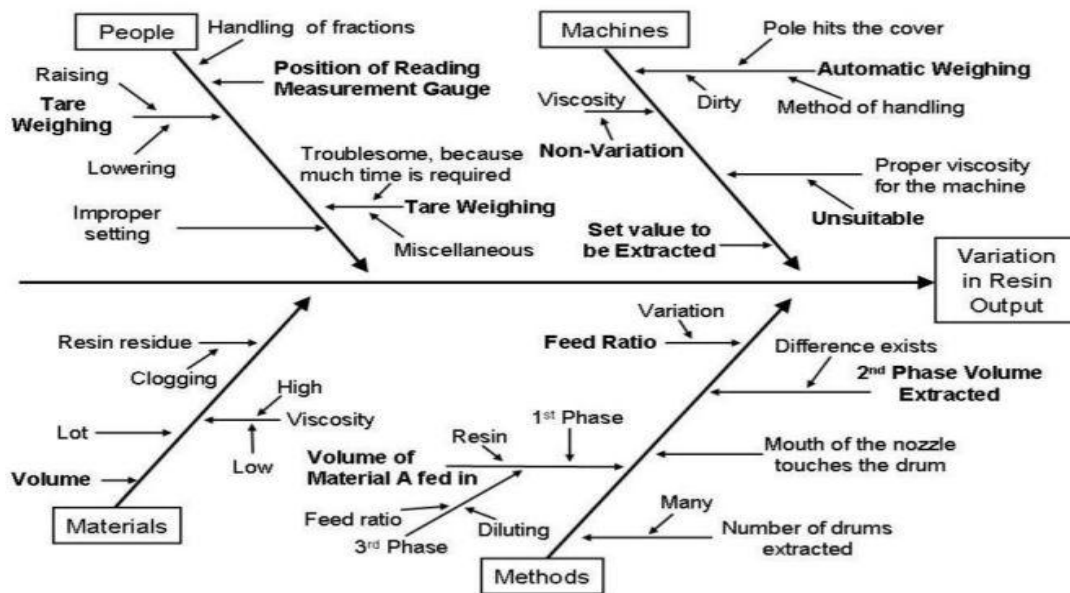


Figure 25: Cause & Effect Diagram

Flow Chart:

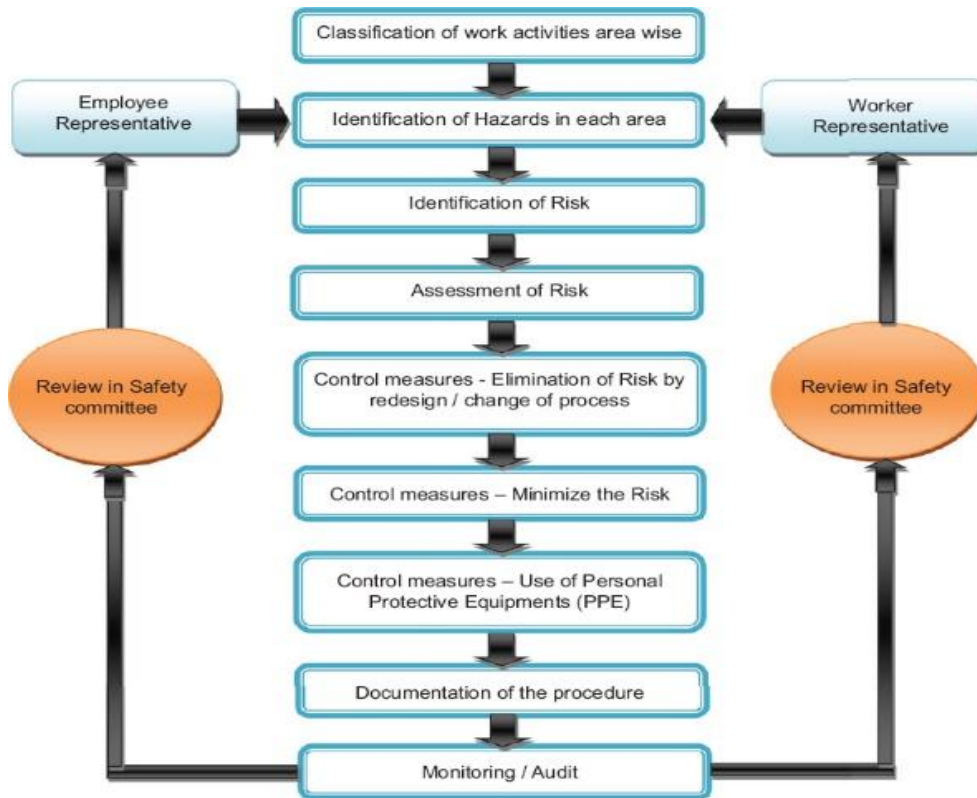


Figure 26: Flow chart of methodology of risk identification, risk assessment, and control measures

Influence Diagram:

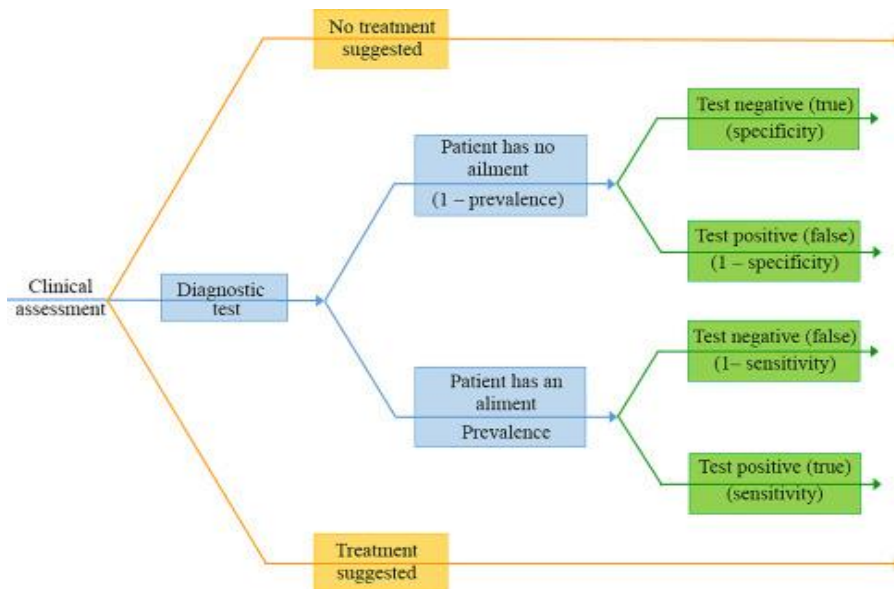


Figure 27: Finding Risk Influence Diagram

Procurement Documents: Procurement is a formal process with legal implications, and the information shared between the buyer and seller needs to be stated, written down, and shared in a formal way.

- ✚ **Request for Information (RFI):** A Request for Information, or RFI, is both a business process and a document that is sent out early to survey the market and look into options or opportunities. The goal of an RFI is to find out what potential contractors can do and what benchmarks or standards are used in the industry. Responses to an RFI can help the party doing the contracting or the potential client change its needs and scope of work before making a request for proposal (Pineda, 2018).
- ✚ **Request for Proposal (RFP):** A Request for Proposal, or RFP, is a document that is made and sent out to find possible contractors and get their bids. In a typical RFP, the potential client says what they want. It also tells interested contractors or bidders what is expected of them by setting criteria for judging their proposals. So, an RFP may also include a Statement of Work, a Request for Quotation, and Terms and Agreements.
- ✚ **Request for Quotation (RFQ):** RFPs are official documents that are used to explicitly outline the specifications for certain purchases and solicit price quotes. For routine purchases like hardware, off-the-shelf software, laptops, or any other equipment, an RFQ is employed. In comparison to an RFP, an RFQ is a much shorter document that merely specifies the goods to be acquired and asks for a quote. In response to an RFQ, the seller will provide a price quote and other parameters.
- ✚ **Invitation for Bid (IFB):** An official document known as an invitation to bid invites those who might be interested in bidding on a project to attend the bidding process.
- ✚ **Request for Bid (RFB):** A Request for Bid is used to request financial bids for certain items from a pool of preselected vendors.
- ✚ **Purchase Order (PO):** A purchase order is a business document and the first official offer for goods or services to be delivered in the future. It is sent by a buyer to a seller. The benefit for the buyer is that they can place an order without having to pay right away. Each PO comes with a unique number that both the buyer and the seller can use to keep track of delivery and payment. A blanket order is a promise to buy a certain number of goods or services over and over again.

- ✚ **Letter of Intent (LOI):** A Letter of Intent (LOI) is a short, non-binding contract that comes before a binding agreement, like a share purchase agreement or asset purchase agreement (definitive agreements).
- ✚ **Statement of Work (SOW):** A Statement of Work is a document that explains in detail what the potential customers want and what the contractor's roles and responsibilities are. It does this by listing and describing the activities, deliverables, and timelines involved. The said document can be used as a back-up for the contract or agreement because it has a lot of information about the contract's terms and conditions.
- ✚ **Contract or Agreement:** A contract or agreement is something that both the buyer and seller agree to. A contract that is legally binding will have an offer, an acceptance, and enough money for both parties.

Contract Types:

- ✓ **Fixed Price Contract (FP) Or Lump Sum (LS):** When the scope of the project is fixed, a fixed-price contract (lump-sum contract) is utilized. Once the contract has been signed, the seller is contractually obligated to do the work within the agreed-upon price and timeframe, and no price adjustments are allowed. Because there is no negotiation of the price, the seller will carry the most risk. **FP** are three categories:
 1. **Firm Fixed-Price Contract (FFP):** This is a legally binding contract for the seller; the seller must accomplish the project within the agreed-upon terms and conditions, including price, time, quality, and quantity; the seller is liable for any risks, increases in production costs, or increases in sunk costs on his side.
 2. **Fixed-Price Incentive Fee Contract (FPIF):** This is a contract that the seller has to follow, but it can be changed depending on how well the seller does. In this case, if the seller does a good job, they might get a bonus.
 3. **Fixed-Price with Economic Price Adjustment Contracts (FP-EPA):** This kind of contract is adaptable to changes in the economy. A project can use a fixed-price contract with economic price adjustments if the agreement will last for a long time. The seller is protected from inflation by a special clause in this contract.
- ✓ **Cost Reimbursable Contract:** A Cost Reimbursable Contract (Cost Disbursable Contract) typically has incentive provisions indicating that if the seller meets or exceeds certain project objectives, such as schedule targets or total cost, the seller would receive an incentive or bonus payment from the buyer. **Cost Reimbursement** are four categories:
 1. **Cost Plus Fixed Fee Contract (CPFF):** This type of contract is a specific type of contract in which the contractor is paid for the normal costs of a project plus an extra fixed fee for their services.

2. **Cost Plus Incentive Fee Contract (CPIF):** A cost-plus-incentive fee (CPIF) contract is a cost-reimbursement contract with a fee that can be changed later by a formula based on how the total allowable costs compare to the total target costs.
3. **Cost Plus Award Fee (CPAF):** This kind of contract allows the seller get paid back for the costs of doing the work and earn extra money for doing a great job.
4. **Cost Plus Percentage of Cost (CPPC):** This sort of contract is structured to pay the contractor his real expenses plus a predetermined percentage for profit or overhead (that is not audited or adjusted)
5. **Time and Materials Contract:** This form of contract is a combination of Fixed-Price and Cost-Reimbursement arrangements. Here, the risk is shared by both parties. This form of contract can be used when the deliverable is "labor hours."

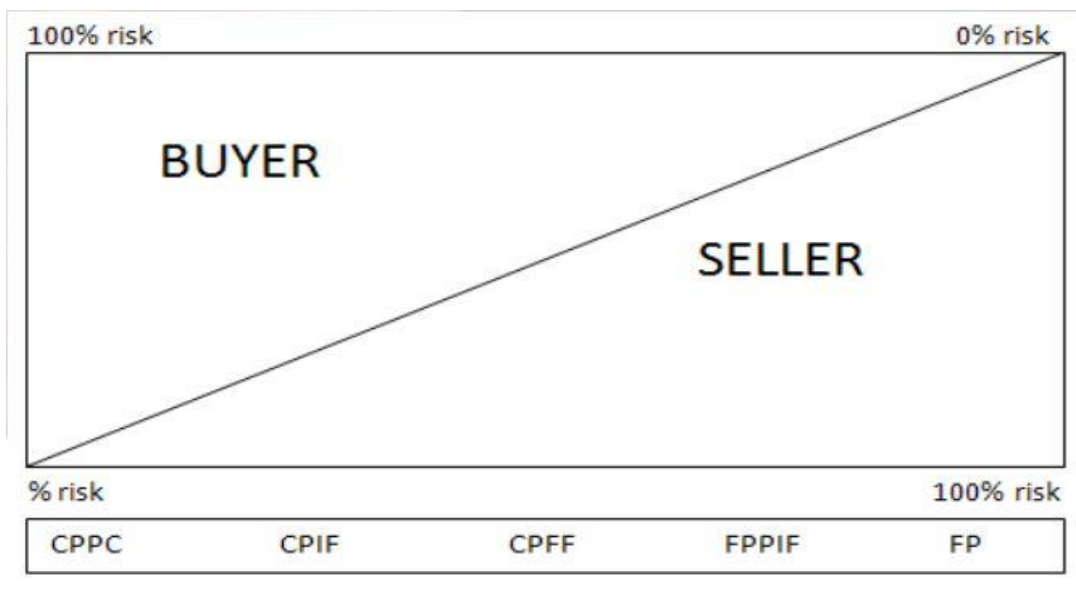


Figure 28: Cost Reimbursable Chart

Conduct Procurement:

Conducting procurements means getting responses from sellers, choosing a seller (who will provide or deliver the goods or services to the buyer), and giving a contract to that seller. During this step, the team will get bids or proposals and, if necessary, use previously set evaluation criteria to choose one or more sellers who are qualified to do the work and good as sellers. Selecting sellers is the process of choosing sellers based on how they responded to requests from buyers. The buyer chooses the evaluation criteria, which are used to sort the responses from the sellers. The final award may go to one or more sellers. The main benefit of this process is that it aligns the expectations of both internal and external stakeholders through the agreements that are made.

Inputs Include:

- **Procurement Management Plan:** Discussed earlier
- **Procurement Documents:** Discussed Earlier
- **Statement of Work:** Discussed Earlier
- **Selection Criteria:** Source selection criteria are a list of things that a buyer wants that a seller must meet or beat in order to get a contract. In project management, the criteria for choosing a source are often written down in the procurement documents. You can find and write down selection criteria to help you evaluate products, services, or results that are more complicated. Some possible ways to choose a source are:
 - ✚ Getting what you need. How well does the seller's proposal answer the statement of work for the procurement?
 - ✚ Total or "life-cycle" cost. Will the chosen seller have the lowest total cost of ownership (the cost of buying plus the cost of running it)?
 - ✚ Risk. How much risk is in the statement of work, how much risk will be given to the chosen seller, and how does the seller reduce risk?
 - ✚ Management approach. Does the seller have management processes and procedures, or is it reasonable to expect the seller to create them?
 - ✚ Technical strategy. Do the seller's suggested technical approaches, techniques, solutions, and services fulfill the requirements outlined in the procurement papers, or are they more or less likely to provide the intended outcomes?

Tools and Techniques include:

- **Bidder Conference:** A bidder conference, also called a vendor conference, seller conference, contractor conference, etc., is a meeting between a buyer and multiple potential suppliers to talk about a possible purchase. The bidder conference gives sellers a chance to ask questions and get information they can use to put together a bid. It also helps make sure that all bidders have the same information before submitting proposals or bids.
- **Proposal Evaluation Techniques:** A proposal evaluation technique is the process of reviewing the seller's proposals to help the buyer decide who should get the contract. It is also the process of getting answers from the seller, including the buyer's choice of who should get the contract. These methods can be used for big projects with a lot of capital, but they aren't necessary for small projects.
- **Independent Estimate:** Independent estimating is a project management method in which a third-party external estimator or an internal estimator from the same company gathers and analyzes information from the bidder (the seller). To estimate the cost and schedule of buying something for the project, you need to look at the information. Significant differences in cost estimates can be a sign that the procurement statement of work (SOW) was incomplete or unclear, or that the potential seller either didn't understand the SOW or didn't respond to it.

- **Procurement Negotiation:** Communication between two or more parties with the goal of obtaining a mutually suitable agreement is negotiation. In procurement, individuals negotiate advantageous terms for a new supplier contract through negotiation. This may involve negotiating alternative terms with an existing supplier or beginning from scratch with a new vendor when a contract is renewed.

Outputs Include:

- **Selected Sellers:** The chosen sellers are those who have been determined to be in a competitive range based on the results of the proposal or bid evaluation, those who have negotiated a draft contract that will become the final contract after award, and those who have been chosen to deliver a contracted mix of items, services, or results. You can use a variety of criteria, including price, quality, and delivery ratings, to choose one or more sellers who are both qualified and acceptable as sellers. However, keep in mind that the lowest price does not always equate to the lowest cost because a seller may offer a lower price but be unable to timely deliver or maintain continuity of supply.
- **Agreement:** When we discussed the different types of contract, we talked about how the contract is also known as an agreement, undertaking or purchase order (PO). So agreements or contracts are definitely an output of conduct procurement process since you have selected the sellers you want to award the work to. Once all relevant stakeholder (relevant) sign the contract you are pretty much done with this process
- **Resource Calendar:** Resource calendars show when team members are available and can be used to schedule project tasks based on what's possible and who's available. They can also be used to keep track of when resources are available and how much time they have to work on a task (Lockhart, n.d.).

Control Procurement:

Controlled procurement is the process of managing relationships with people who buy things, keeping an eye on how well contracts are working, making changes and corrections as needed, and then ending contracts. The main benefit of this process is that it makes sure that both the seller and the buyer meet the legal requirements of the project. This process is done as needed throughout the project.

Inputs Include:

- **Procurement Management Plan:**
 - a. **Requirements management plan:** The requirements management strategy outlines the analysis, documentation, and administration of contractor needs.
 - b. **Risk management plan:** The risk management strategy specifies how seller-generated risk actions will be designed and carried out for the project.
 - c. **Procurement management plan:** The activities that need to be done during the Control Procurement process are listed in the procurement management plan.

- d. **Change management plan:** The change management plan tells how changes made by the seller will be handled.
 - e. **Schedule baseline:** If sellers produce delays that negatively impact the project's overall performance, the schedule may need to be revised and authorized to reflect the current expectations.
- **Project Documents:**
 - a. **Assumption log:** The assumption log keeps track of the assumptions that were made during the procurement process.
 - b. **Lessons learned register:** Lessons learnt early on in the project can be applied later to enhance contractor performance and the procurement process.
 - c. **Milestone list:** This list of significant milestones indicates when sellers are anticipated to provide results.
 - d. **Quality reports:** The quality reports can identify seller processes, methods, or items that do not comply with standards.
 - e. **Risk register:** Depending on the seller's organization, the length of the contract, the external environment, the project delivery technique, the kind of contracting vehicle used, and the final agreed-upon price, each approved vendor has its own set of hazards.
 - f. **Stakeholder register:** The stakeholder register has information about identified stakeholders, such as contracted team members, selected sellers, contracting officers, and other people who have a role in procurements.
 - g. **Requirements documentation:** It include some key points.
 - ❖ Technical requirement
 - ❖ Legal implications that include that health, safety, security, performance, environmental, insurance, intellectual property rights, equal employment opportunity, licenses, permits, and other nontechnical requirements
 - **Enterprise Environmental Factors:**
 - ❖ Contract change control system
 - ❖ Marketplace conditions
 - ❖ Financial management & accounts payable system
 - ❖ Buying organization's code of ethics
 - **Agreement:**
Discussed earlier
 - **Work Performance Data:**
Work performance data comprises information from the seller regarding the project's status, such as technical performance, activities that have begun, are in progress, or have been completed, and expenses that have been expended or

committed. Work performance data can also include information about paid seller invoices.

Tools and Techniques include:

- **Contract Change Control System:** A contract change control system is the way that a request for a change can be looked at, approved, or turned down. If the change request is approved, the contract can be changed to reflect the change. It includes the paperwork, tracking systems, ways to solve disagreements, and levels of approval that are needed to make changes.
- **Procurement Performance Reviews:** The seller's documents and the buyer's inspections are looked at during procurement performance reviews. It also includes doing quality audits and inspections on the seller's work as he does it to boost his confidence.
- **Inspections:** An inspection is a planned look at the work being done by the contractor. This could just mean going over the deliverables or looking at the work itself. On a construction, engineering, or infrastructure project, both the buyer and the contractor walk through the site to make sure they both know how the work is going.
- **Audit:** Audits are a systematic examination of the procurement procedure. In the procurement contract, rights and duties pertaining to audits should be specified. The findings of the audit should be communicated to the buyer's and seller's project managers so that the project may be modified as necessary.
- **Payment System:** Payment is a system that pays the seller for the goods and services they've provided according to the contract. This is usually done by the accounts payable system of the buyer after an authorized member of the project team has confirmed that the work was done well. Most of the time, payment is done according to the terms and conditions of the procurement contract. Before making a payment, the change must be carefully looked over. The support document will make sure that payment is made. Before payment, all of the documents must be approved. Payment must be made on time, and the buyer must keep the seller's account up to date. There will be a review of the bank reconciliation accounts. Let's talk about payment types.
 - ✚ Payment in Advance
 - ✚ Documentary Collection
 - ✚ Open Accounts
 - ✚ Letter of credit

Now have a look on different types of L/C (Letter of credit)

- ✚ Revocable/Irrevocable L/C
- ✚ Confirmed L/C
- ✚ Partial Shipment L/C
- ✚ Redeveloped L/C
- ✚ Advance Payment L/C
- ✚ Transferable L/C
- ✚ Back to Back L/C

- **Claims Administration:** Contracts have a list of technical terms of delivery (TTD) that the seller and buyer must follow. Contracts set the rules for how the seller and buyer work together. Contracts are protected by the law. There may be some differences in the manufacturing, shipping, quality, and "scope creep" of the product.

Outputs include:

- **Work performance Indicator:** Discussed earlier

Close Procurement:

The buyer tells the seller in writing that the contract is over, usually through an authorized procurement administrator. Usually, the terms and conditions of the contract and the procurement management plan list the requirements for a formal procurement closure. Usually, all deliverables should have been done on time and meet technical and quality requirements. There shouldn't be any outstanding claims or invoices, and all final payments should have been made. Before the project ended, all deliverables should have been approved by the project management team.

Inputs Include:

- **Procurement Management Plan:** The completion of all project procurement in order to support the conclusion of the project or the completion of a particular phase procedure is referred to as closed procurement. The recording of all documentation and agreements is one of the benefits of close procurement, which may be used for reference in the future.
- **Procurement Documents:** Changeable documents connected to procurement include the contract with all of its schedules, requests for modifications to the contract that have not been approved, and approved requests for changes to the contract. In addition to technical documents created by the seller, procurement documentation also includes deliverables, seller performance reports and warranties, SLA (Service Level Agreement), NDA (Non-Disclosure Agreement), financial documents such as invoices and payment records, and the results of inspections related to the contracts.

Tools and Techniques include:

- **Procurement Audit:** Procurement audits are the process of examining contracts and contracting processes for completeness, correctness, and efficiency using the most appropriate tools and methods for their procedures, papers, properties, budgets, expenses, and level of completion. Procurement Audits are a component of a quality audit, which is an external process created to verify whether project activities adhere to organizational and project rules, processes, and procedures. A purchase checklist is a useful tool for ensuring a streamlined, comprehensive procurement process. Due to the neglect of certain factors during the procedure, unexpected complications can result in excessive expenses, legal complications, and delivery delays.
Some steps considered to prior audits:

- ✚ Holding Meetings
- ✚ Prioritized procurement system
- ✚ Review Procedures
- ✚ Purchasing Forms

- **Procurement Negotiation:** Negotiation is usually thought of as talking or bargaining to reach an agreement in a business deal. People think that negotiating is one of the most important and interesting things that buyers do. To negotiate between a buyer and a seller, you need to know how the market works and be able to find the best deals with suppliers. Negotiation is the difference between success and failure, and for it to work in procurement, it needs to be used in a broader sense as knowledge, interest, analysis, review, planning, and a way for the seller and the buyer to decide whether they agree or disagree.

Focus on following point for Negotiation:

Supply		
Order Lead Time	Supplier Safety Stock	Delivery Frequency
Supply Flexibility	Shipping Terms	Insurance

Quality		
Specification Compliances	Inspection Criteria	Rejection criteria
Rejection Procedures	Functionality Compliances	Change Request

Price		
Purchase order Price	Volume Discount	Price Breakdown
Pricing Review Period	Purchase Currency	Payment of Taxes

Transaction		
Delivery Terms	Shipping Documents	Loading & Unloading
Requirement & Guideline	Damage In Transit	Third party Inspection

Support		
Technical Support	Information Sharing	Spare Parts
Training	Contact points	Warranty

(Al Tubaishat, 2020)

Benefits of good negotiation:

- ✓ Lowering lead time period
- ✓ Increasing continuity supply
- ✓ Lowering cost of supply and snuck cost
- ✓ Improving supplier reliability and service
- ✓ Increasing opportunities for change request acceptance
- ✓ Lowering dispute
- ✓ Improving quality supply

Different Types of Negotiation:

- ✓ Principal Negotiation
- ✓ Positional Negotiation
- ✓ BATNA (Best Alternative To Negotiate Agreement) Negotiation
- ✓ Negotiator position
- ✓ Interest Focus
- ✓ Needs
- ✓ Wants

Output include:

- **Completion or Termination:** The process of concluding all project purchases in order to support the close project phase is known as close procurement.
- **Written Notice:** A written notice is usually provided from the buyer to the seller once contact is complete. Most of the time, the terms and conditions of the contract and the procurement management plan are written down.

Chapter – 4: Result & Discussion

Quantitative Risk Analysis & Modeling Techniques:

A quantitative risk analysis and modeling approach is utilized to evaluate which hazards provide the greatest potential impact on the project. For example: Sensitivity analysis, Expected Monetary Value (EMV) and modeling/Simulation

EMV-Decision Tree Example: Analysis of Expected Monetary Value (EMV), a statistical approach that determines the average outcome when the future contains both possible and unlikely situations. Suppose I am going to visit “**Padma Bridge**”

Dhaka Car Rental

Car cost = BDT 5000, Premio Car 2014 Model, Customer Satisfaction 90%

Honolulu Rental

Car cost = BDT 4200, X corolla Car 2003 Model, Customer Satisfaction 70%

Trip late free on terminal = BDT 5000 for Both Car (For Whole Trip)

Dhaka Car Rental = $(10\% \times 5000) + 5000 = 500 + 5000 = 5500$

Honolulu Car Rental = $(30\% \times 5000) + 4200 = 1500 + 4200 = 5700$

Develop Schedule:

The Develop Schedule method is a strategy for analyzing the sequences of activities, their durations, and the associated resource needs. To develop the project schedule model, a project schedule will be created. This schedule will include the start and finish dates of the project. The project's activities include the relationships between them, the resources available for them, and the project's overall length. A well-planned timetable enables the project's stakeholders to manage their time effectively and produce results. Additionally, it assures that the project's life cycle will fulfill the required deadline.

Tools and Techniques

Schedule Network Analysis: Schedule Network Analysis is a technique for establishing a project schedule that makes use of a graphical depiction of all the tasks in the project. This strategy entails identifying the project's early and late tasks and establishing logical linkages between them (project schedule slack and possible float time of tasks must be defined). To create this graphical presentation, you must first create what is known as a schedule network diagram, which visually represents a certain schedule. All tasks on a project schedule will occur in the order in which they are linked. A schedule network diagram can illustrate the interdependence of activities; in other words, it is a thorough report outlining how and when the next stage of a project will be executed.

Critical Path Method (CPM): The Critical Path Method is a network analysis methodology that is considered one of various project planning methodologies. It determines which sequence of operations has the least scheduling flexibility and uses that information to forecast the duration of the project. It is predicated on an assessment of the normal time required to complete operations. The strategy effectively manages both the duration and expense of a project. The critical route of

the project is determined by identifying the project's critical activities. The term "critical activities" refers to those with a total float value of zero. For each activity, Critical Path Method determines four dates, and a number.

- ✓ Early Start (ES)
- ✓ Early Finish (EF)
- ✓ Late Start (LS)
- ✓ Late Finish (LF)
- ✓ Float or Slack

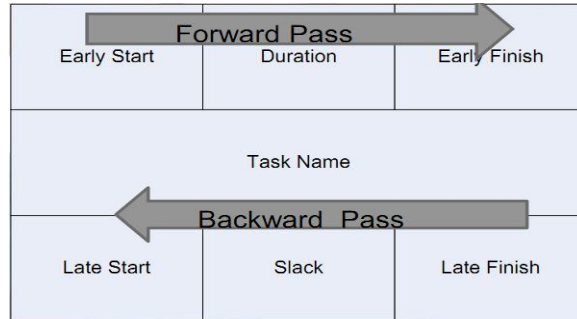


Figure 29: Network Diagram – CPM

- ✓ Add Start + Duration + Finish
- ✓ Higher number wins (when multiple inputs)

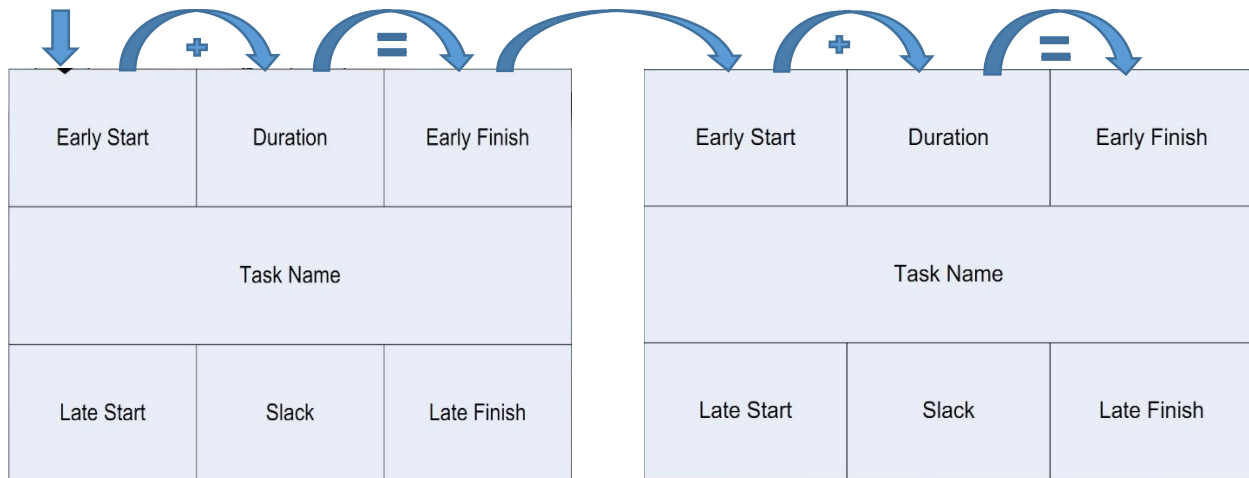


Figure 30: Critical Path Forward Pass

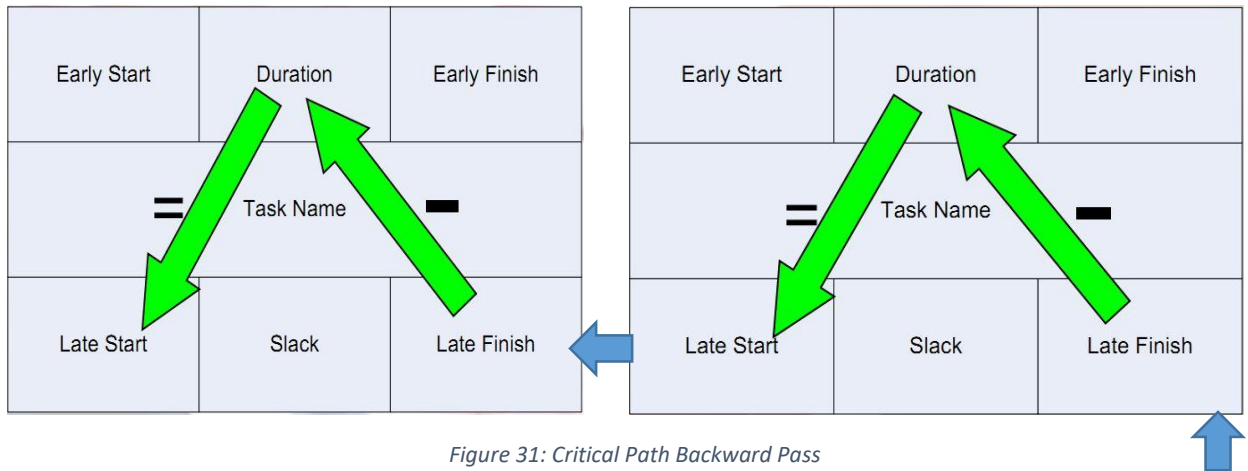


Figure 31: Critical Path Backward Pass

- ✓ Add finish + Duration + Start
- ✓ Lower number wins (when multiple inputs)

Critical Path Data		
Task Name	Predecessor	Duration
A	Start	4
B	Start	6
C	A	8
D	B	7
E	C, D	5
F	D	5
G	E	7
H	G	8

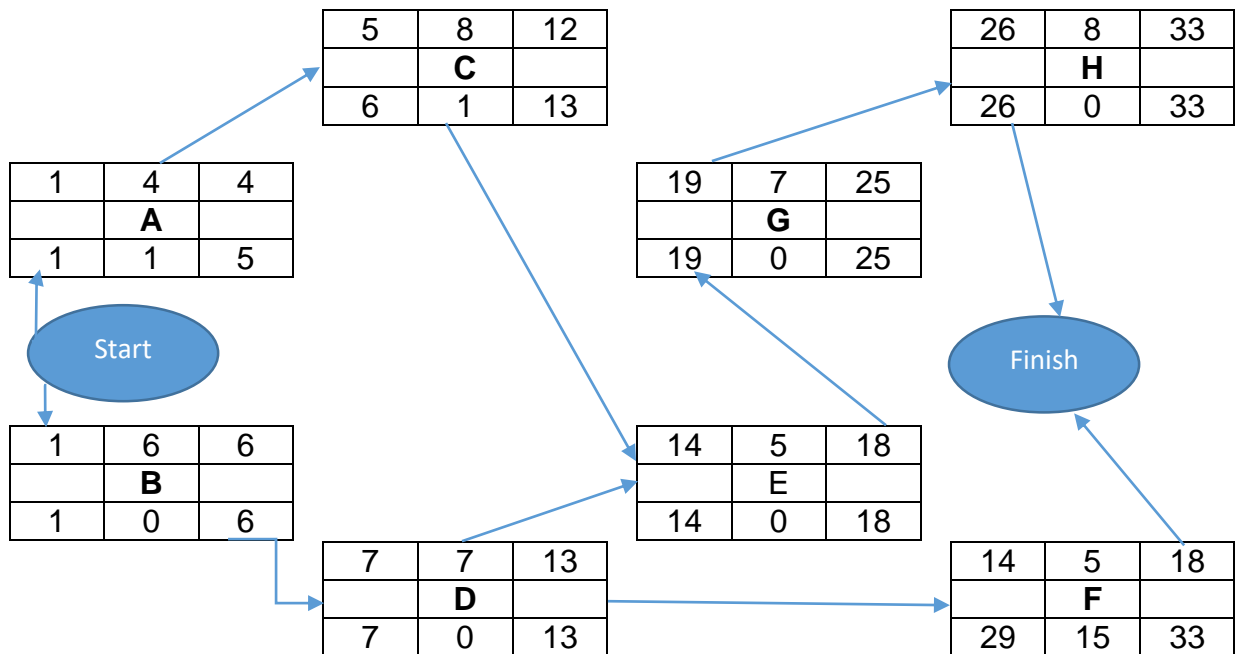


Figure 32: Critical Path Result

Formulae:

1. $EF = ES + \text{Duration} - 1$ (EF = Early Finish, ES= Early Start)
2. $LS = LF - \text{Duration} + 1$ (LS = Late Start, LF = Late Finish)
3. $\text{Stack} = LF - EF = LS - ES$

Basic Quality Tools:

- + **Cause and effect diagram (fishbone/Ishikawa):** The fishbone diagram assists users in identifying the various factors (or causes) contributing to an impact, which is typically represented as a problem to be addressed.

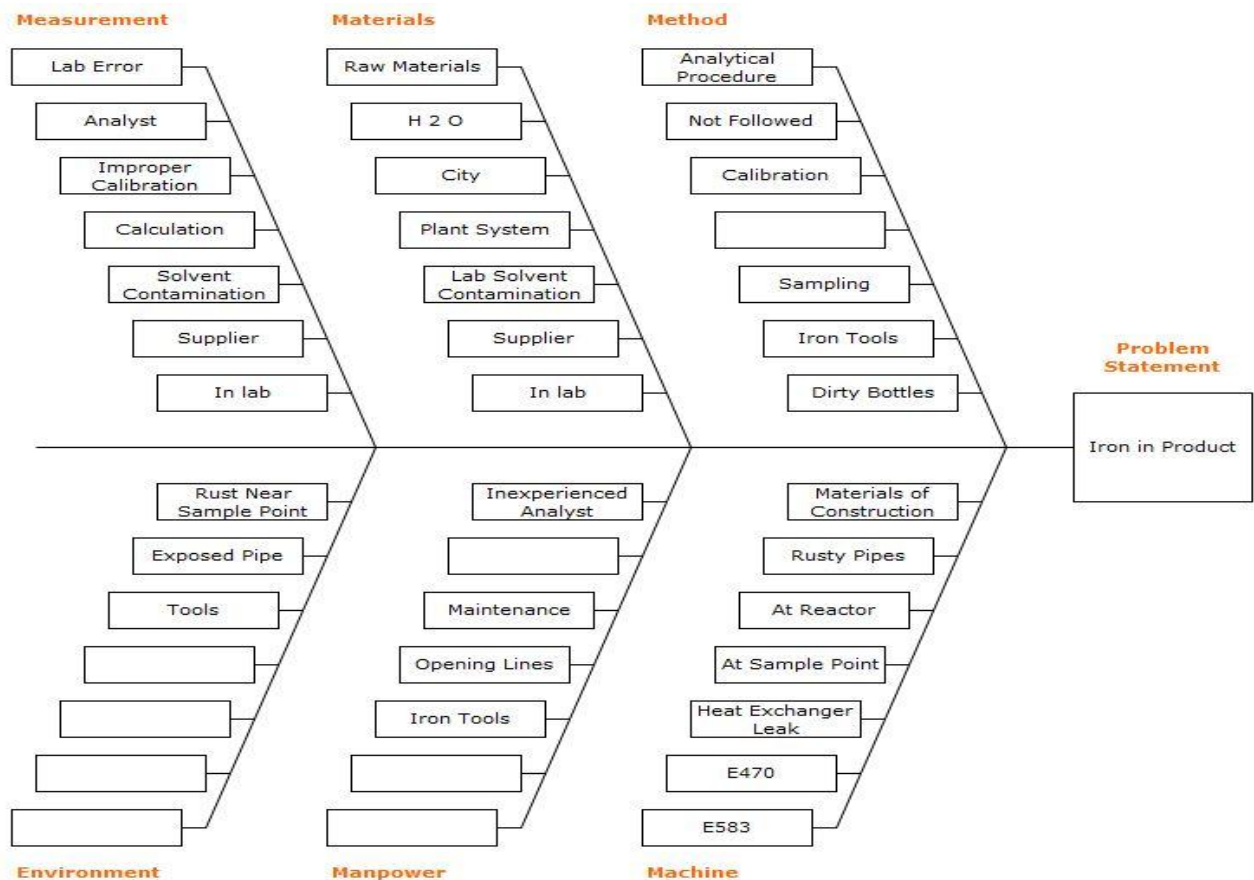


Figure 33: Cause and Effect Diagram

- + **Control charts (Shewhart Chart):** This quality improvement tool can assist quality assurance experts in determining whether or not a process is stable and predictable, making it simple to discover variables that could contribute to faults.

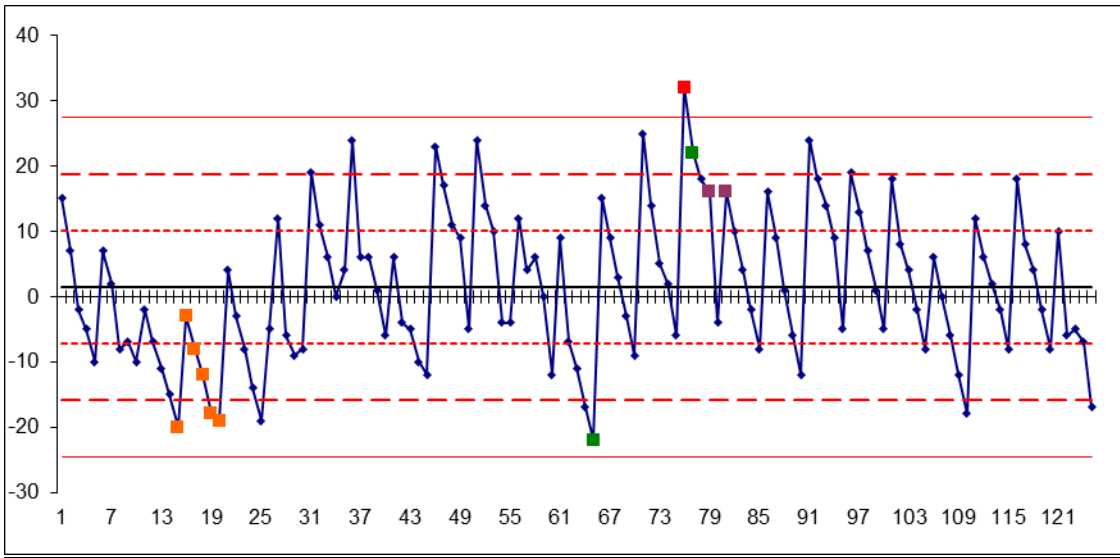


Figure 34: Individual Control Chart

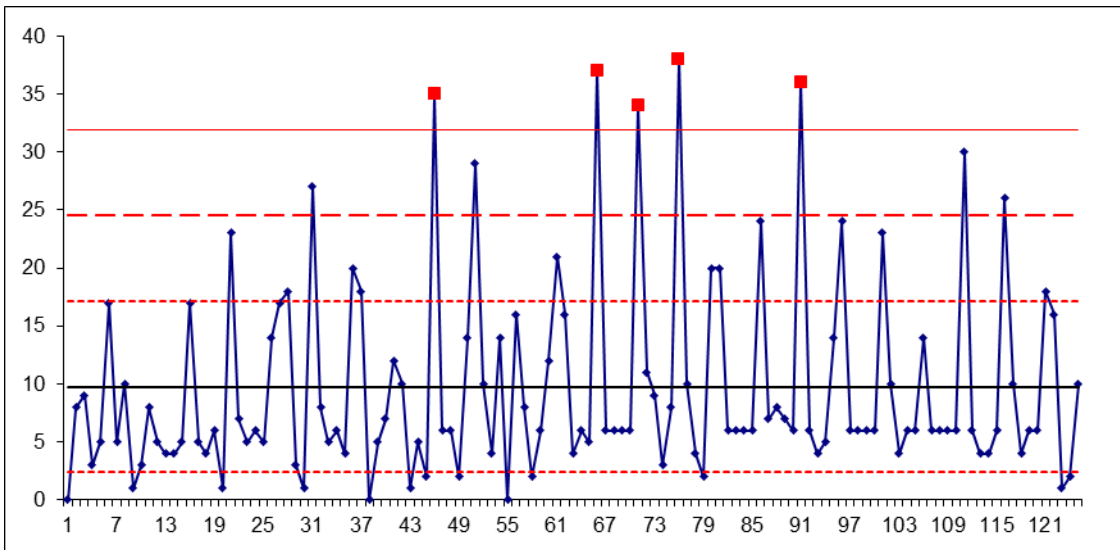


Figure 35: Moving Range Control Chart

- | | |
|---|---|
| — Three Sigma Unit | ■ A single point outside the control limit |
| - - - Two Sigma Unit | ■ Two of Three pts outside the two point sigma limit |
| . . . One Sigma Unit | ■ Four of five pts outside the one sigma limit |
| — Average | ■ Eight in a row in the same side of centerline |

Flowcharting: Flowcharting the phases of a process gives a visual representation of the process and might identify problems within the process.

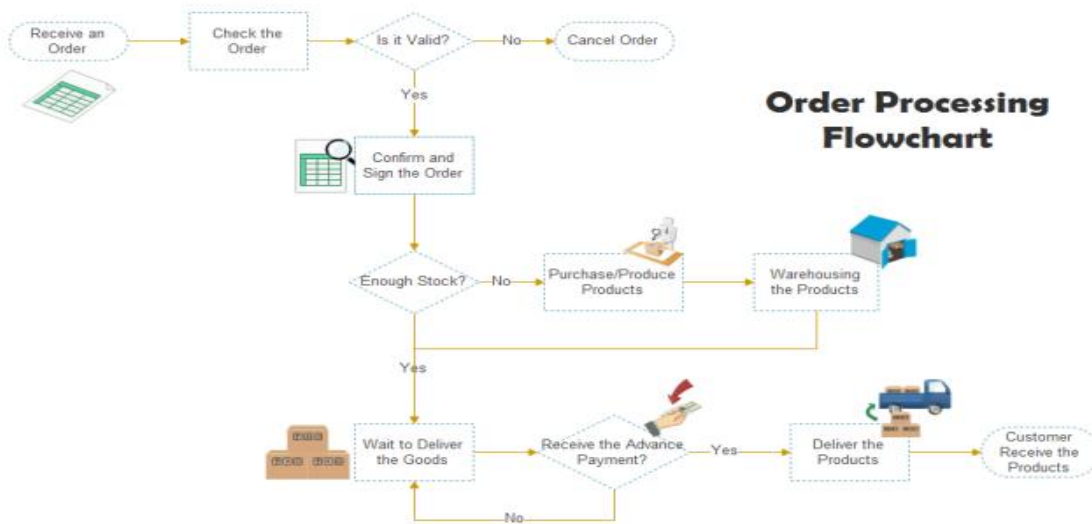


Figure 36: Flowcharting

✚ **Histogram:** In order to manage quality, quality specialists are frequently charged with evaluating and understanding the behavior of various data groupings.

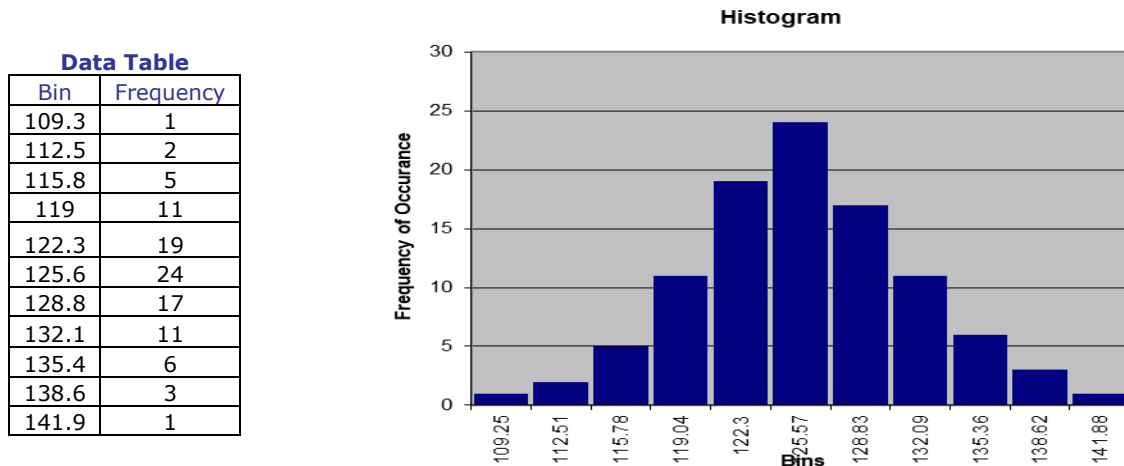


Figure 37: Histogram

✚ **Pareto Chart (80-20 Rules):** The 80/20 rule applies to the Pareto chart when used as a quality assurance tool. This rule states that the "essential few," or the top 20% of a process or system, are responsible for 80% of the issues that arise from that process or system. 80 percent of the remaining 20% of difficulties are caused by small issues.

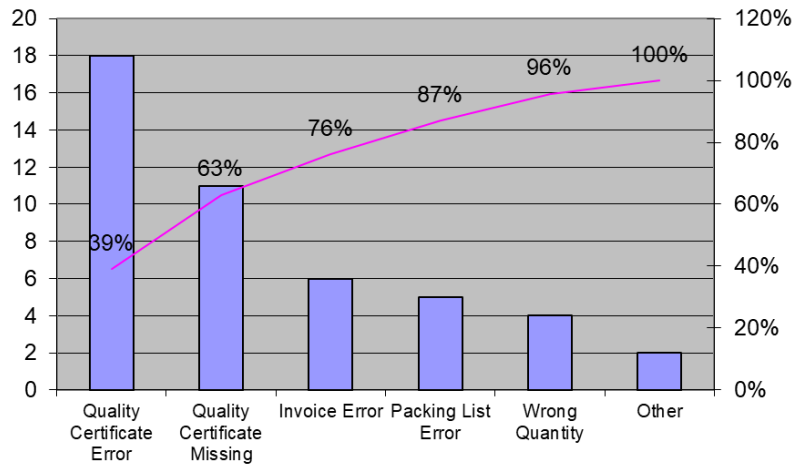


Figure 38: Petro Chart

- + **Check Sheet:** Quantitative and qualitative data can be collected via check sheets. A tally sheet is a type of data collection sheet that's used to keep track of numbers. Defect or error patterns may be rapidly identified by using a check sheet.

Human Resource Questions						
	Monday	Tuesday	Wednesday	Thursday	Friday	Total
Health Insurance	### //	### ###	////	### /	### ///	35
Disability Insurance	///	////	/	### /	//	16
Sick Time	###	### ///	///	////	###	25
Paid Time Off	### ###	### ###	### ////	### ////	### ///	47
Tuition Reimbursement	///	//	////	///	////	16
Payroll Error	//	/	///	/	//	9
Total	30	35	25	29	29	148

Figure 39: Human Resource Questions Check Sheet

- + **Scatter Diagram:** The scatter diagram is the most helpful of the seven quality tools for illustrating the link between two variables, making it perfect for quality assurance workers attempting to establish cause and effect correlations.

	I/P (x)	O/P (y)		I/P (x)	O/P (y)
1	63	98.9	19	40	99.55
2	60	98.8	20	34	99.5
3	49	98.53	21	30	99.5
4	40	98.35	22	24	99.75
5	45	98.55	23	23	99.65
6	45	98.95	24	13	98.85
7	30	98.75	25		
8	34	98.65	26		
9	32	98.8	27		
10	21	98.75	28		
11	22	98.8	29		
12	29	99.05	30		
13	27	99.35	31		
14	13	99.85	32		
15	10	99.05	33		
16	9	99.3	34		
17	21	99.55	35		
18	24	99.4	36		

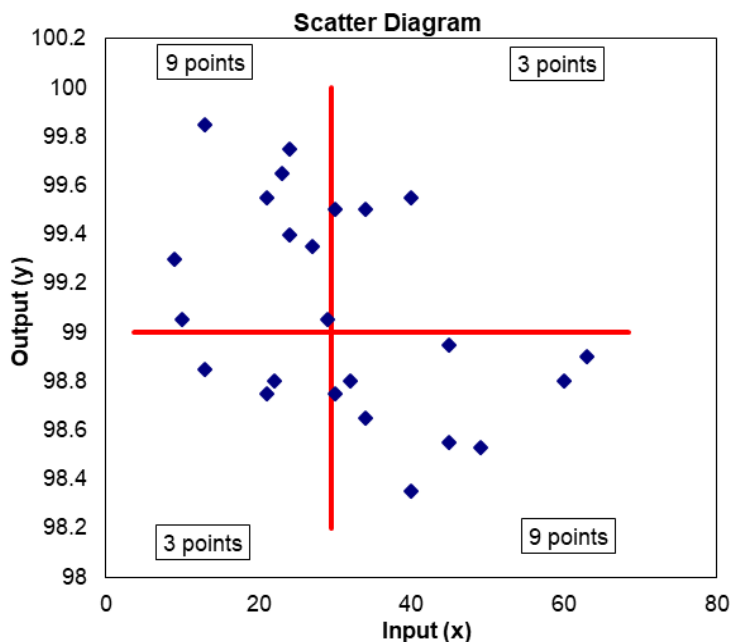


Figure 40: Scatter Diagram Result

Each dot represents a common crossing point, with dependent values on the Y-axis and independent values on the X-axis. These dots, when connected, can illustrate the link between the two variables. The relationship between variables is stronger if the correlation in the diagram is stronger (Tague, The Quality Toolbox, Second Edition, 2005).

Cost Ratio: The Cost Ratio measures the cost ratio incurred by the project during its lifecycle. The benefit of a project decreases as the cost ratio increases, but the benefit increases as the cost ratio decreases. In other words, only tangible advantages are included in the benefit cost ratio (BCR).

Project	Initial Investment	Expected cash flow	Benefits
A	70,000.00	77,000.00	1.1
B	35,000.00	42,000.00	1.2
C	20,000.00	17,000.00	0.85
D	68,000.00	92,000.00	1.35
E	56,000.00	45,000.00	0.80

- ✓ Project A is favorable (Ration is > 1)
- ✓ Project B is favorable (Ration is > 1)
- ✓ Project C is not favorable (Ration is < 1)
- ✓ Project D is favorable (Ration is > 1)
- ✓ Project E is not favorable (Ration is < 1)

Weighted Scoring Model: The weighted scoring model is a graphical depiction of project scores based on a set of criteria used to identify the winning project.

Criteria	Details	Weight	P-A	P-B	P-C	P-D
Technical	Raw Materials	10	7	8	7	7
	Machinery	10	6	5	8	6
	Technical Wings	10	4	6	8	8
Costing	Waste	10	8	5	5	5
	Profit Rate	10	9	8	8	6
	Investment Cost	10	7	6	7	8
Market	Present Demand	10	9	7	8	6
	Promotion Ability	10	6	8	6	6
Total Weight		80	56	53	57	52

Payback Period: The payback period is the time required for an investment to return or pay for itself. This is a crucial time-based evaluation since it shows the profitability and risk level of an investment.

Payback Period = Initial Investment Made / Net Annual Cash Inflow

Details	P-A	P-B	P-C	P-D
Initial Investment	70,000.00	35,000.00	20,000.00	68,000.00
Expected Cash Flow	77,000.00	42,000.00	17,000.00	92,000.00

Net Present Value (NPV): The net present value measures the degree to which a project is acceptable or unacceptable to the people involved. It is the gap between the present value of future cash flows and the amount invested in an asset.

$$NPV = CF_0/(1+r)^0 + CF_1/(1+r)^1 + CF_2/(1+r)^2 + CF_3/(1+r)^3$$

CF: The cash flow within a period 0, 1, 2, 3

r: Discount rate %

Discounted Cash Flow (DCF): It shows how the time value of money principle is used. The idea is that money that will be received or paid in the future is worth less now than the same amount of money that will be received or paid today.

Internal Rate of Return (IRR): It is the interest rate at which the net present value of all cash flows (positive and negative) is equal to zero. It is used to evaluate the investment's attractiveness. If the internal rate of return (IRR) of a new project exceeds the needed rate of return, the project is desired. In contrast, if the IRR falls below the necessary rate of return, the project must be aborted.

Opportunity Cost: The profit lost when one alternative is chosen over another is referred to as an opportunity cost. For example, suppose you have \$1,000,000 and decide to invest it in a product line that would provide a 5% return. If you might have spent the money on another investment that would have provided a 7% return, the 2% difference between the two options is the opportunity cost.

Change Request: A change request is a formal proposal to modify the project scope. It might be corrective action, preventative action, or defect correction. In turn, defect repair is the deliberate modification of a nonconforming product or product component. Depending on your corporate organization's rules and processes, you may be required to obtain approval for change requests from a change control board (CCB).

DHAKABANK LIMITED Information Technology Division		[Change Request Form]	
		[Form No: DBL/HO/IT/2022/001]	[Version- 1.0.1]
PART 1: Initiator Information		Change Request ID # 20220219 ✓	
Subject of Change	Plug in 5*1.8TB HDD in new backup servers.		
Change Type	Hardware		
Initiator Name	Md Shafiqul Islam	Employee ID	180162
Email Address	Shafiqul.islam5@dhakabank.com.bd	Initiation Date	04/04/2022
Department	IT		
Server Name	ICT-276-016	IP	192.168. [redacted]
Priority	<input type="checkbox"/> High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low		
Impact	<input type="checkbox"/> High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low		
Requester Signature & Date	[Signature] 4.4.22		
PART 2: Change Preview			
Purpose for changing : 1. For increasing storage capacity.			
Pre Implementation Plan: 1. Shut down the server.			
Implementation Plan: 1. Plugging in five HDD and create 400 Raid Group RG01 = 3 x 1.8TB = RAID 5 RG02 = 2 x 1.8TB = RAID 1			
Roll Back Plan:	N/A	Down Time Required?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Please mention time 4 April, 2022 12:01PM to 02:00PM
Implementation Window: 4 April, 2022 12:01PM to 02:00PM			
Change Impact (High/Medium/Low)	Application :	Database :	Network: Others: Server - 2 ✓
Initiator Supervisor/ Team Leader Approval			
Name	Mohammad Ashfaqur Rahman	Signature & Date	[Signature] 04/04/22
IT Security & Compliance Team Review			
PART 3: Change Assessment [Technical Risk & Impact : High/Medium/Low]			
Application	Low	Do you ensure Backup/Restore ?	Yes/At/A. ✓
Database	Low	Do you test in Test Environment/UAT? (if yes, please attached/evidence.)	✓
Networks	Low		
Remarks	Impact level is Low.		
Name	Saqib Islam.	Signature & Date	[Signature]
PART 4: Executor Information (Only if applicable for initiator and executor that are not same)			
Execute By:		Downtime	
Signature & Date		Completion Date & Time	
PART 5: Final Approval			
S/L	Name	Designation	Signature Date
01.	Mirza Faysal	FVP,IT	[Signature] 04/04/2022

Figure 41: Change Request form of Dhaka Bank PLC IT Division

Continuous Process Improvement (CPI): Quality improvement is a methodical strategy to evaluate the performance of systems and processes, then identifying functional and operational areas that require improvement. The collecting and analysis of data is essential to successful operations.

RACI Matrix Calculation:

Inventory Migration Project	Support Team	Inventory Team	Procurement Team	Application Team	Data Base Team	Core Management	F & AD	Management	Senior Management
Develop strategy & communicate vision		A	A		R	A		I	
Oversee Financial System Governance body			A		C		C	C	
Define & monitor performance metrics (KPIs)		A	A		R				
Schedule and conduct group meetings			R						
Establish priorities for ongoing support, maintenance, critical issues and enhancement of the application	A	A			R				
Consolidate list of proposed enhancements			R		R			I	
Define and document business requirements for system enhancements					R				
Provide technical estimates and plan for enhancement requests		I	I	I	R				
Develop charter for all enhancements for each cycle			A		C				
Review and approve enhancement charter					R				C
Approve enhancement charter budget							C		R

KEY	R = Responsible	Responsible for performing the task (ie. the actual person doing the work to complete the task).
	A = Accountable	Ultimately accountable for the task being done in a satisfactory manner. The accountable person must sign-off the work that the Responsible person produces.
	C = Consulted	Team members whose input is used to complete the task. Communication with these members will be 2-way in nature.
	I = Informed	Team members who are informed as to the status of the task. Communication with these members will be 1-way in nature.

Risk Probability and Impact Assessment:

The Risk Likelihood and Effect Assessment supplies the project with the initial risk, rating, sources, probability, impact, severity, and estimated monetary value (EMV) for each detected risk.

Event	Probability (%)	Impact (Value)	EMV (Value)	Risk Type
A	10	500	50	Opportunity
C	15	2300	- 345	Threat
B	5	8000	400	Opportunity
D	30	6200	1860	Opportunity
E	70	9700	-6790	Threat

- ❖ Risk probability is the estimation of a risk's occurrence likelihood. This probability may be determined using past project data. Does the danger normally exist? Or, the probability of hazards can be determined through interviews or discussions with persons who are knowledgeable about the chance of risks occurring. When estimating the likelihood of a risk occurring, it is common to assign it a score, as shown in the risk checklist provided below.
- ❖ Impact assessment is the appraisal of a risk's potential consequences. Would the risk's occurrence be disastrous for the project or a slight inconvenience? Generally, an impact assessment is undertaken via meetings or interviews with persons who have the necessary information to evaluate a risk's impact.

Probability and Impact Matrix (Risk Management Plan):

The Probability and Impact Matrix is a tool utilized by the project team to prioritize risks. Individual hazards are ranked or prioritized by the Likelihood and Impact Matrix based on the combination of their probability and impact values. In other words, the probability and effect matrix assists in identifying which hazards require elaborate risk response strategies. Knowing the priority of each risk informs the project team of the relative significance of each risk (Just Get PMP, 2012).

		Impact				
		Trivial	Minor	Moderate	Major	Extreme
Probability	Rare	Low	Low	Low	Medium	Medium
	Unlikely	Low	Low	Medium	Medium	Medium
	Moderate	Low	Medium	Medium	Medium	High
	Likely	Medium	Medium	Medium	High	High
	Very Likely	Medium	Medium	High	High	High

Importance of Stakeholder Management Plan: It is essential for a project's success that stakeholders are well managed. Many times, project resources that are critical to its success are in the possession of key stakeholders. These resources include project cash and personnel, as well as materials and knowledge.

Your stakeholders' interests and expectations may be managed more effectively when you have a written plan of action for stakeholder management. Planned communication helps project teams understand how and when information will be disseminated.

Creating a plan helps you assess your stakeholders and gain a better understanding of them along the process. As a result, you can better anticipate their requirements and respond to any problems they may have before they arise.

If no Stakeholder Plan: It's far more likely that your project will fail if important stakeholders aren't involved, or worse, actively working against it. In order to deal with challenging stakeholders successfully, one must understand what drives them. If you don't have a stakeholder management strategy in place, you won't know what motivates your stakeholders and hence won't be able to enlist their support.

It's also possible to waste a lot of time dealing with stakeholders who have little influence while disregarding those that have the capacity to sabotage your project if you don't examine and prioritize your stakeholders.

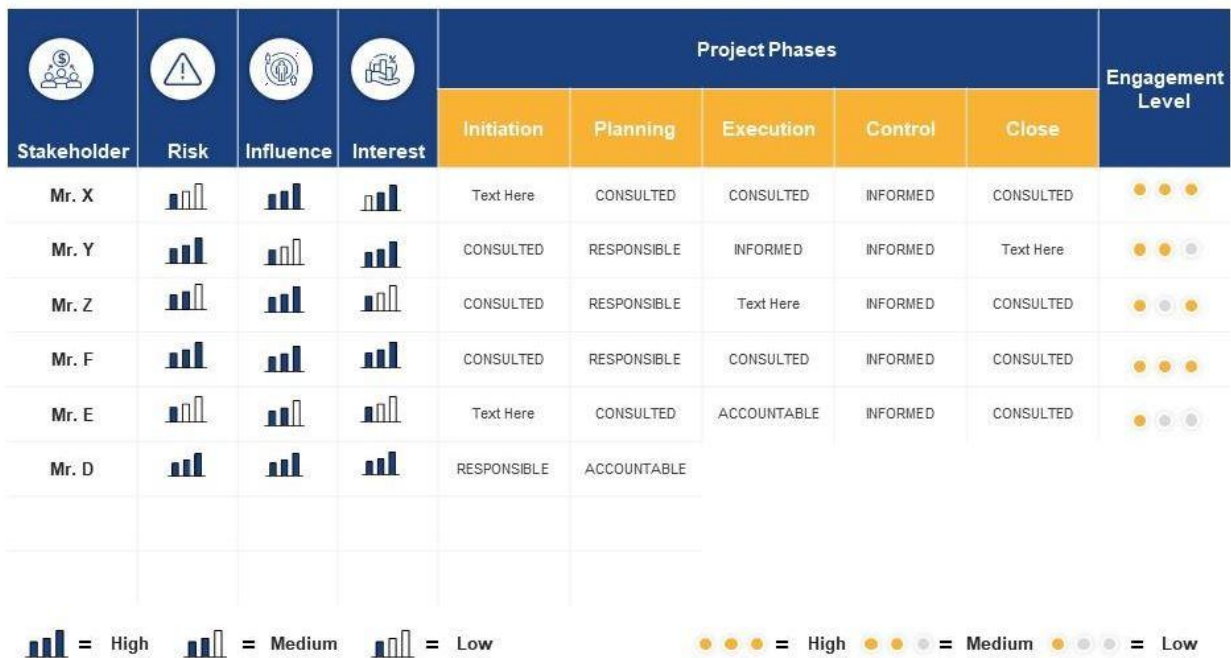


Figure 42: Stakeholder Management Plan Including Risk & Influence

Discussion:

The goal of this study was to look at the link between project management capacity and overall corporate organizational success. It was also interested in using market and customer satisfaction as success elements in project management. A project that meets the needs of its clients will have a big market share, and as a result, total organizational success will be attained through revenue and profit. As a result, recognizing success determinants from both short- and long-term views is critical. This study takes into account the following dimensions of success variables.

The first dimension was fulfilling time, budget, and requirements goals, and the first question examined respondents' attitudes on reaching time, budget, and other project criteria. Unsurprisingly, this characteristic appeared to be crucial to all of them. Furthermore, most project managers were believed that this was their primary

responsibility, and that their performance was measured by how effectively they accomplished their project's immediate goals, as well as their adherence to timetables and budgets. However, as the following conversation demonstrates, while everyone considered time and budget as crucial, the focus on reaching these objectives differed depending on the project type. (Interestingly, meeting performance was almost non-existent for all responders.

The second dimension is client satisfaction. The results show that achieving performance metrics, functional criteria, and technical standards are all part of this second dimension.

The third dimension, commercial success, is often achieved when initiatives assure client happiness, resulting in word-of-mouth and market loyalty, as well as revenue, profit, and other business-related outcomes. Achieving organizational success However, it varies depending on the project kind.

The fourth dimension, Leadership is an impact paradigm shared by leaders and followers who seek to effect positive change and represent their common goal. It is not a single act or series of acts; it is a process that affects others and the environment in which they live.

Chapter – 05: Conclusion

Introduction:

Project managers have to do their jobs in a way that makes people act in a moral way. This is done through expert service. The goal should be to set a standard of professionalism that can be used in an environment of trust and loyalty. So, the project manager should try to get the help of his or her peers, employers, clients, and the general public to reach this goal, with the goal of coordinating the efforts of the profession to improve people's lives.

Underlying Principals:

When engaging with customers, project owners, and other stakeholders, the PM demonstrates honesty, responsibility, and openness. Managers of projects are aware that working in project, program, or project portfolio management may bring a variety of ethical problems.

- ✓ Code of ethics & Professional Conduct
- ✓ Mandatory and Aspirational standard
- ✓ To Whom the code applies
 - ✚ All PMI members
 - ✚ Non-members who hold a PMI certification
 - ✚ Non-members who apply commence a PMI certification process
 - ✚ Non-members who serve in a volunteer capacity

Anchors of Ethics code:

- ✓ Responsibility
- ✓ Respect
- ✓ Fairness
- ✓ Honesty

Recommendation:

It is critical to recognize that project management is not about finishing tasks. It is about generating organizational success by effectively delivering projects that are aligned with the organization's strategic goals, respond to market demands, and satisfy customers. Customer satisfaction is an important aspect of corporate success since it not only helps organizations retain customers but also attract new ones, resulting in greater revenue and profitability. Understanding what customer satisfaction is, what variables drive it, and how to enhance it is critical for any organization seeking to expand and prosper in today's competitive market.

Key Points for improvement:

Providing an amazing roadmap is an important method for increasing project satisfaction. To create an outstanding flowchart, firms must spend in educating their personnel to be informed, sensitive, and attentive to client demands. They should also build clear contact routes so that clients may reach out to them quickly and easily.

Furthermore, businesses must guarantee that their products and services meet or exceed customers' expectations. This necessitates an emphasis on quality assurance, timely delivery, and consistent performance.

Actively seeking and reacting to feedback is another key method for increasing satisfaction. Customers love being heard, and it is critical to take their input seriously in order to improve the entire customer experience. One approach to accomplish this is to conduct surveys or feedback forms to gain thoughts and views on the services or products offered. Companies may also utilize social media platforms to track and respond to client feedback fast. It is critical to accept both good and negative comments and take the appropriate steps to fix any concerns presented swiftly.

In addition to obtaining suggestions, it is critical to reply to stakeholders swiftly. Stakeholders value organizations who take their complaints seriously and reply within a fair timeframe. Companies should have a designated team of persons responsible for handling client feedback and ensuring that all input is addressed. Consumers should be informed of any modifications or improvements made in response to their comments. Actively soliciting and reacting to client feedback may help foster trust and loyalty, and consumers are more likely to suggest a company that values their thoughts.

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