Getting to yes -

Excellent Project Management

PhD Research

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MESSAGE OF THANKS

I advance to my dear wife and my daughters with very much thanks, appreciation and gratitude for having created the appropriate conditions that enabled me to bring the PhD Thesis into existence. I also thank my Selinus University, which provided me with support and encouragement through the numerous of correspondences. I also thank my company Gulf Cable& Multi Industries Co., because of the experiences provided , I appriciate also the researchers and the writers who provided a very vartiy of explanation and illustraions , that made me travel with my imagination to write without adopting the opinion of someone , because I also carry deep knowledge as a result of my detailed experiences in management sciences + economics + finance + ISO + heavey duty machines , and being contenously writing research papers and studies, I hope this Thesis will benefit my country and any site in the world,

GREEN MESSAGE

The world is full of political and economic conflicts, those conflicts caused as a result of scarcity of resources, and the instinct of domination over countries that work hard to raise their economies. Through this opportunity, I called for the abandonment of sectarian, racial and regional differences, and to turn to serious work in industry, trade, agriculture and everything that is In the interest of humanity, because conflicts, no matter how long they last, will not leave victors.

Shehadeh Khalaf Al –Tubaishat
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Getting to Yes - Excellent Project Management

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Chapter (1)

Project Management Concept

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Project Management Concept

Overview

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 outcome of the project may be tangible, and may be intangible. The temporary nature of a project indicates that a project has a definite start and a definite end. The end nature is reached when a project's objectives are achieved, or when a project is terminated, or when its objectives cannot be achieved, or when the need for a project is no longer exists, or when the project's sponsor wishes to terminate the project, temporary doesn't necessarily mean the duration of the project is short, because it refers to the project's engagement and its longevity nature , temporary doesn't actually apply to the product, service, or result created by the project, the most projects are acting to create a sustainable outcome

A Guide to the Project Management Body of Knowledge - (PMBOK® Guide) – Fifth Edition

Many analysts said, a project is a series of tasks that need to be completed in order to reach a specific outcome, it can be also defined as a set of inputs and outputs required to achieve a particular goal. Projects can be ranged from simple to complex and can be managed by one manager or by team, project management can break up the tasks into many activities to determine the responsibilities, authorities and to conduct the accountability easily, product or services also can be framed by deadline to finalize deliverables on intended time,

A Project is deemed a great opportunity for an organization and for individual to achieve their business and non-business objectives efficiently may be through implementing bargaining change as market demand call , conscious management helps make desired changes in process and reduce potential failures to compete others and overcomes constraints to achieved deliverables based on :

1. Projects' Key Characteristics

Generally, and reference to the above definitions of a project, projects assumed to share common characteristics that are, but not limited to:

1.1 Temporary: This mean, every project has a finite start and a finite end, start is the time when the project initiated, and its concept is conducted and developed, while, the end is reached when the project's objectives are achieved or when the project is terminated or its objectives cannot be achieved, or when the need for the project is no longer exists, or when the project's sponsor wishes to terminate it,

1.2 Unique Deliverables: This mean, every project aims to produce some deliverables of products or services or results with a proposition values, but unlike others to convince a potential customer why a specific service or product or result will be of more value than similar offerings from other competitors. Project managers can create value added to their deliverables in content or in shape to outperform competitors, the very best proposition value added is the first thing encounter when exploring a brand of a specific project.

1.3 Progressive Elaboration: It is the process of investigation a project context to the extent of complying with stipulated standards. Every project has its own continuous investigation and improvement methodology, the successive iterations of planning processes result in developing more effective solutions to progress, and develop a

project mission, the deviated results shall be corrected as soon as appear base on the cause & effect principles, this called continues improvement in ISO 9001- 2015. Progressive elaboration is including the work on:

- Developing a new product, service, or result outperform competitors,
- Developing a product that can be either a component of another item,
- Conducting a research to enhance the respond to the market behavior
- Affecting change in the structure of the process, staffing, style, characteristics, and
- Keeping up in line with technological development,
- Developing or modified software system,
- Using sophisticated tools and techniques in process, testing, delivery, time, waste,
- Inspiring people to keep in line with management knowledge, and

2. Projects' Types

Projects are a set of inputs and outputs strive to reach a specific outcome, naturally the nature of the projects carried out differently managed based on projects nature and types, there are many different types of projects such as:

2.1 Construction Projects: These projects work on the installation and assembling activities for the project equipment and materials at the site in accordance with approved construction drawings, procedures and specifications, construction projects require a large number of skilled construction labors and construction equipment until the plant is mechanically completed requirement. Here are some types of construction projects but not limited to:

https://www.theprojectdefinition.com/p-construction/

- Residential Building
- Memorial
- Watchtower
- Railway
- Fast bus
- Tourist resort
- Gardens
- Skyscraper
- Airports

2.2 Research Projects: They are a creative and systematic work undertaken to increase the stock of human knowledge including culture and society, and the use of this knowledge to devise new applications, it is used to establish or confirm facts, and ensure the results of previous work, and it is a type of knowledge diversity. Here are some types of research projects, but not limited to:

- Developing a country's economic methodology of strategic planning
- Developing new systems for programming free trade works
- Developing new approaches to project management
- Publishing new curricula and apprenticeship of education
- Development of new research of renewable energy systems
- Making a change to the water networks
- Developing of hybrid fertilizers
- Upgrading management knowledge over the world

2.3 Re-engineering Projects: They are supports working on a fundamental rethinking and radical redesign of support processes to bring about significant performance improvements in an organized, coordinated, and streamlined way to achieve the desired goals. Here are some types of engineering projects, but not limited to:

- Enhancing software system
- Updating QMS of projects
- Improving OH& SMS of projects
- Developing new design on fire-fighting system
- Developing new design on machinery installations
- Developing new design on dismantling of machinery

2.4 Procurement Projects: They are the act of establishing, evaluation, and maintaining relationships with vendors of commodities and services during the project life cycle. This unique function is an essential part

of project management, which is concerned with overseeing designated sets of temporary operations. Project management for procurement purposes is an essential part of supply chain management. Here are some types of procurement projects, but not limited to:
https://www.bestvalueschools.com/faq/what-is-project-procurement-management/

- Outsourcing foe a specific construction or research project,
- Outsourcing for complete business function like commissioning of machinery.
- Developing new rules and measures to regulate industry trade-off,
- Building new relations with new suppliers,
- Supporting the diversity through trade exchange

2.5 **Implementation Projects:** Implementation is the process of executing a program or project, so a concept becomes a reality, to implement a plan properly, managers should communicate with clear goals and expectations, and provide the employees with the necessary resources that enable the project achieve its goals. Here are some types of implementation projects, but not limited to:

- Implementation of main water line
- Developing of engineering projects like railway
- Implementation of a public parks project
- Implementation of the vaccinations protect against the current epidemics
- Implementing an investment support program
- Implementing a non-formal education schemes that get supported by UNRWA
http://www.users.globalnet.co.uk/~rxv/projmgt/projtypes.htm

Example:

Project Type	Project Starts		Project Stop		Can be evaluated
	Purpose	when	Purpose	when	
Construction	With a set of ,requirements,	With a defined solution,	When the work is complete,	When the requirements are satisfied,	over the lifetime of delivery,
Research	With a hypothesis,	With a problem,	When the time runs out.,	When we feel diminishing returns,	When the knowledge is confirmed/disconfirmed,
Re-engineering	With imported solution,	With an opportunity,	when we feel a head at work ,	When some higher process changes the game,	At any time,
Procurement	With a set of requirements,	With a defined solution,	when we feel tender is completed ,	when a contract is signed with the best contractor,	Over the lifetime of the contract,
Business Implementation	With business concept,	With an opportunity,	When the process is operational,	When the process flows smoothly,	When the business benefits are starting to become visible,

3. Project Leadership style

Leadership is the action of leading a group of people or an organization. The leaders shall have the ability to build the Vision, and shall Focus on every thing happening around them, and shall be strong Communicators, and Trusted by their team, and shall take Action, they shall ensure that Perspective is being realized in different ways, so they can influence their people they lead effectively, and they can be the source of inspiration. Here are Leadership style but not limited to:

3.1 **Vision:** Leaders are defining & understanding the vision → how the vision impact organizational goals→ impact the workers' behavior → impact customers' directions → impact market behavior → impact potential audiences taste, and,

3.2 **Focus:** Leaders are inspiring people to focus on engage with everything happening around them → great leaders dig down and get focused on objectives → leading the transition of ideas to facts → focus on establish strategies that getting benefits, focus on high performance is tangible, easily defined, and monitored.

3.3 **Communication:** Leaders are keeping strong communicator with the internal and external interested parties → how to affect them, how affect the market behavior → how to affect competitors → how to utilize the resources → how to optimize the process how to maximize operational results, and

3.4   Trust: Leadership build understanding how employees think→ and what actually matters to them→ how to make project team trusts you as a leader → how to increase commitment to team goals → how communication improves ideas flow upward → how increasing creativity and productivity take it way for reality,

3.5   Action: Leadership acts on what the leader says, as a leader, you often have the most on your plate of anyone in your organization → how initiatives are coming from a high-level, how do they prioritize work over others action → how they able to get out of the bottlenecks → how to inspire people to promote team work,

3.6   Perspective : Leader are having the ability show perspective is being realized → how to helps the team to set a vision→ and develop a plan to realize the goal → challenge is the ability to incorporate other perspectives into the mix → how the team is thinking → to get many kinds of thinking to get many kinds of thinking → what motivates people → how to influence around different ideas and realize cognitive diversity.

4. Project Leadership Models

Leadership is an influence model among leaders and followers, and who intend real changes and reflect their mutual purpose, it is not an act or set of acts, it is a process influencing others and environment around them, it goes beyond goals, and create the organizational vision. Here are Leadership models, but not limited to**:**

4.1   Autocratic Leadership: This an aggressive leadership model is based on giving orders and control, the autocrat is rarely well-liked from others, they act as a militant model, they need to give orders and expects prompt execution with little feedback or input from the worker, the autocrat pushes employees hard, but he get no loyalty, and no long-term commitments in return, he faces high turnover and low satisfaction is expected, this model is completely unhelpful and a disgrace to the actors,

4.2   Bureaucratic Leadership: This an aggressive leadership model also, and one of the more difficult types of leadership model, because the individual must drive results under a strict set of regulations, this method reduces innovation and creativity, in a bureaucratic environment, rewards are not existing and push the workers to formulate protection layers through unions and other legal rights organizations, punishment style to workers is rarely effective and is questionably unethical. This method is also unhelpful and need to be reviewed,

4.3   Situational Leadership: This a desirable leadership model , this type of leadership depends on the situational theory of leadership suggests that no single leadership model is best because all depend on the situation at hand , and they depend on which type of leadership and strategies are best-suited to the task, it is the most effective leaders to adopt to look at cues to action, and the nature of the group, and other factors that might contribute to getting the job done, a situational leadership theory is often referred to as the Hersey-Blanchard Situational Leadership. This method is helpful and favorable to drive actions positively,

4.4 Laissez-Faire Leadership : This type of leadership is completely opposite to autocratic leadership model that mean do as you will, and economically means "opposing government intervention in economic affairs except in the minimum necessity to maintain peace and property rights" , this model has benefits in creative environments, but it also lacks discipline and structure that is often required in a business environment, , it's based heavily on talent and existing experience and creativity to drive results . Here production and bottom-line profits are not necessarily a major factor, so it is easy approach to running a shop, and it can work when the employee already has a motive to put in the effort. This method is helpful and a favorable also to drive actions positively but is lacking to disciplines,

https://blog.runrun.it/en/laissez-faire-leadership/

4.5 Transformative Leadership: This type of leadership encourage, inspire and motivate people to innovate and create change that will help grow and shape the future success of a project, as leaders motivate their workforce without micromanaging, they trust trained employees to take authority over decisions in their assigned jobs, it's a management model that's designed to give employees more room to be creative, it's look to the future and find new solutions to old problems, workers on this model track will also be prepared to become transformational leaders to themselves through mentorship and training that will create positive change, this method is helpful and a favorable to drive actions positively, but need more control on change,

4.6 Transactional Leadership: This type of leadership straightforward leadership model with a focus on work that provides a consistent results, and they reward the people accordingly, transactional leaders tends to lack the hype and charisma found in transformative leadership, they are **very much results-oriented,** which is great for business, this model is not harsh as in autocratic leadership , but transactional leaders tends to punish poor performance + provides incentive for positive performance, that is better performance means more money through bonus and commission structures , this method is helpful and a favorable to the productive people only,
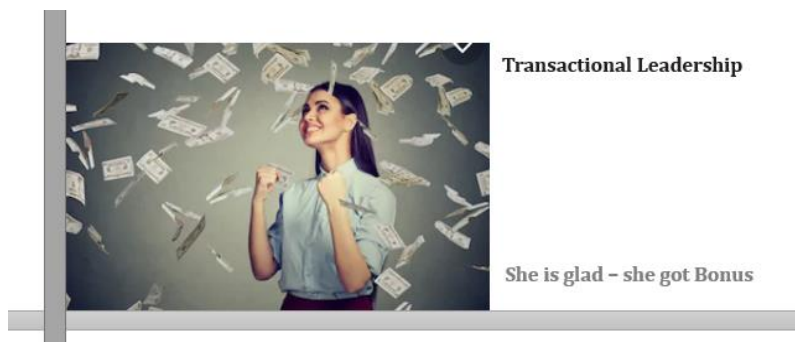
4.6 Participant Leadership: This type of leadership focuses on people participation in organizational decisions, which relies on the involvement of different culture , it includes a strong component of human motivation, the motivates to people related to performed tasks, involvement in decision-making improves the understanding of the issues involved by those who must carry out the decisions, in this assumption ,the workers are more likely to committed to actions where they have involved in, workers become less competitive and more collaborative when they are working on joint goal, when workers make decisions together the team commitment to one another is greater and thus increases their commitment to the decision. This method is helpful and a favorable, but the more the less productivity may be,
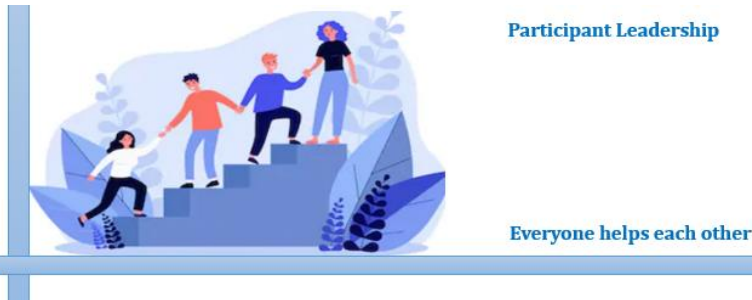
4.7 Democratic Leadership: This type of leadership allows project's subordinates involvement in decision-making, this type relies on subordinates contributions, delegation authority to other workers is active here , the unique feature of this leadership model is that communication is active upward and downward, it is one of the most preferred leadership model , and it entails the following models : Fairness $\Rightarrow$ Competence $\Rightarrow$ Creativity $\Rightarrow$ Courage $\Rightarrow$ Intelligence $\Rightarrow$ Honesty $\Rightarrow$ Productivity $\Rightarrow$ people acceptance,

4.8 Strategic Leadership: This type of leadership is not limited to those in top of the organization, it is oriented to interest parties at all levels who can creates a high performance, and the organizations shall define the context of the organization and the internal and external issues to decide what to do, this model allows to studding the factors that have positive and negative impact on the project by using the tools and techniques of analysis such as PESTLE , SWOT, 6 Sigma , this is a very great model , and it is a full model to lead the project to success, this model have little downsides such as decision delayed because formalities is so long, and,

4.9 Cross –Culture Leadership: This type of leadership normally exists where there are various cultures in the project, the diversity of culture lead to diversity of knowledge, international organizations require leaders who can effectively adjust their leadership to work in different surroundings, most of the leaderships observed in the US are cross-cultural because of the different cultures that live and work together, this model is effective because the knowledge comes from all walk, there is sharing ideas and generalizing knowledge,

4.10 Facilitative Leadership: This type of leadership is very much dependent on measurements of <u>outcomes and results, not on skills</u>, despite it takes much skill to master the project, the effectiveness of a group is directly related to the efficiency of its process, if the group is high functioning, the facilitative leader uses a light hand on the process, but if the group is low functioning, the facilitative leader will be more directives in helping the group run its process. An effective facilitative leadership involves monitoring of group, offering process suggestions and interventions to help group stay on track,

5. Functions of Management

Management is the process of getting things done through others, or the ability to plan, organize, monitor and direct individuals to do something, management is also a set of principles related to the functions of planning, organizing, directing, and controlling, and the principles is harnessing physical application of twin *Fiscal & Human Resources* efficiently to achieve organizational goals. Functions of Management as classified by Henry Fayol, Gulick and Urwiik, R.C. Davis and Koontz and O'Donnell are:

https://www.managementstudyguide.com/management_functions.htm

5.1 Planning : Planning means setting an organizational goals and deciding the best stream to achieve them, planning is a decision making, regarding the goals and setting the future course of action from a bundle of alternatives to reach them, the plan helps to maintain managerial effectiveness as it works as a guide for the personnel for future activities, Planning means determining what the organization's position and the situation should be at some time in the future and decide how best to bring about that situation, planning helps maintain managerial effectiveness by guiding future activities. Planning includes the selection of:

- Mission statement
- Values statement
- Quality policy
- Safety policy
- Risk assessment plan
- SOWT analysis

- Quality objectives
- Knowledge management
- Fiscal policy
- Functional rules
- Quality actions
- PESTEL analysis

5.2 Organizing : Organizing means organizing <u>Human and Fiscal resource</u> that are identified as necessary by the plan to reach the organizational goal, organizing involves determining how activities and resources are to be assembled and coordinated, organizing is that part of managing which includes establishing an intentional structure of roles for people to fill in the organization, it is an intentional in the sense of making sure that all the tasks necessary to accomplish goals are assigned to people who can do the best to reach product realization whatever the product is, in short organizing is includes:

- Identification of activities
- Classification of grouping of activities
- Assignment of duties.
- Delegation of authority
- Creation of responsibilities
- Implementing of deliverables
- Conducting improving of deviations from standards
- Conduction the accountability , and

5.3 Staffing : Staffing means the determination of manpower requirements to an organization, and providing it with adequate competent people at all levels, staffing is the function by which managers build an organization through the recruitment, selection, development of individuals as capable employees, it is the key support to all other managerial functions, it helps to maintain a satisfactory workforce. The main purpose of staffing people is to put right people on right positions, <u>in other word placing square pegs in square holes and round pegs in round holes,</u> according to KOONTZ, managerial function of staffing involves manning the organization structure through proper and effective selection, appraisal and development of personnel to fill the roles designed on the structure,

5.4 Directing : Direction is the 4th part of managerial function which activate the organizational methods to work efficiently for achievement of organizational purposes, direction is the motive of a project sets things in motion , and out people also in action because the 1st three function "planning + organizing + staffing" are the mere preparations for doing the work, while direction is that inert-personnel aspect of management which deals directly with influencing, guiding, supervising, motivating sub-ordinate for the achievement of organizational goals, direction has following elements,
https://www.managementstudyguide.com/management_functions.htm

- Supervision: Inspiring, stimulating, encouraging by monetary, non-monetary used for this purpose
- Motivation: Manager guides and influences the work of subordinates in desired direction.
- Leadership: leading workers for positive direction and keep feel fun in the work
- Communication : Sharing knowledge and information and opening up to others,

5.5 Controlling : Controlling is the latest function focusing in measuring achievement against criteria and correcting deviation, if any, to ensure achievement of organizational goals, the purpose of the control is to ensure that everything is done according to standards, an effective control system helps to identify deviations that occur, and helps in anticipating new deviations, according to Theo Hayman, "Control is the process of verifying that the work that has been accomplished conforms to the goals and criteria specified for the project, according to Koontz & O'Donnell." Monitoring is the measurement and correction of subordinate performance activities in order to ensure that the organization's goals and desired plans are obtained. It is also being achieved, control area has to establishment standards to measure performance, and to take corrective action on nonconformities
https://www.managementstudyguide.com/management_functions.htm

6. Projects' Management Objectives

Project objective is a process of communicating a project's team who will run the activities to make deliverables that meet the quality standard and the expectations of stakeholders, project management objective concern in development of the project's procedures and process and measures from initiation ⟹ planning ⟹ execution ⟹ up to closer within a project scope, as clearly known , a projects is temporary and unique endeavors, it is Temporary because they only happen once and have a specific duration and Unique because they only they are not routine enterprises, but a set of procedures intended to produce a singular product, service or result, projects management common objective may include, but not limited to :
https://www.clarizen.com/objectives-of-project-management/

6.1 Maximizing Results: The main objective of management is to maximize result with minimum efforts, and resources, management is basically concerned with thinking & utilizing human, material & financial resources in such manner that would result in best combination, this combination results in reduction of various costs.

6.2 Increasing Efficiency: The main objective of management also is to increase the efficiency of factors of Production through proper utilization of these factors of production, their efficiency can be increased to a great extent which can be obtained by preventing spoilage, wastages and breakage of all kinds, this in turn leads to saving of time, effort and money which are essential for the growth & prosperity of the enterprise.

6.3 Maximizing Benefits: The main objective of management also is to ensure smooth and coordinated functioning of the enterprise, this in turn helps in providing maximum benefits to the employee in the shape of good working condition, suitable wage system, incentive plans on the one hand and higher profits to the employer , in another word to make the interested parties better off without making workers worse off,

6.4 Corporate Social Responsibility (CSR): Social responsibility is the process of benefit the society, business strives to maximize shareholder profits, they must act in a manner that benefits society, it's become increasingly important to investors and consumers who seek investments that are not just profitable but also contribute to the welfare of society and the environment, Social responsibility of business implies the obligations of the management of a business enterprise to protect the interests of the society.
https://www.investopedia.com/terms/s/socialresponsibility.asp

- Legal Responsibility: A business must follow laws + rules of labor court + environment regulations + social security rules +
- Ethical Responsibility
- Discretionary Responsibility

7. Project's Life Cycle Description

Project Life Cycle is the processes that are followed by nearly all project managers when moving through stages of project completion, this is the standard project life cycle most organizations are familiar with. Project Life Cycle provides a framework for managing any type of project within a business. Leaders in project management have conducted researches to determine the best process by which to run a projects. It has been found that the following a project life cycle is critical and shapes the success of any project, here is the life cycle conducted in most projects:
https://www.mavenlink.com/resources/what-is-the-professional-services-project-life-cycle

7.1 Initiation: The 1st phase start-up with an idea that present the opportunity to create the project, this phase identifies the reason and the opportunity for the creation of the project , then the project is identified, developed and benefited from the opportunity is assumed to be clear in the mined of stakeholders , at the start-up phase, the business or the opportunity problem is assumed and identified to make the project plan , as the solution is identified, the project is formulated, and the project team is assigned to build base or perspective to how providing products, services, or results to the customers,   the following factors   are the formulation of the project requirements which are not limited to:
 https://www.projectmanager.com/blog/project-initiation

- Project sponsor
- Project team
- Project requirements
- Business case
- Cost and benefit analysis

- Potential risks and assumed solutions
- Future opportunities
- Future constraints
- Market analysis
- Compotators. and

7.2 Planning: The 2nd phase is planning that involves creating of a set of plans to help guide project's team through the execution and closure phases of the project, planning phase will help to manage ***time, cost, quality, change, risk,*** and other issues, and it helps to manage staff and external vendors (outsourcing), and helps the sponsor to control staff and external suppliers to ensure the delivery is implemented on the intended time, and within the planed budget,

this phase is the most challenging phase for a Project Manager because they need to make an educated guess about the staff, resources and equipment needed to complete the project, they may also need to plan their communications and procurement activities, in short, project manager need to create a comprehensive suite of project plans which set out a clear project roadmap ahead, for example:
 https://www.wrike.com/blog/foolproof-project-plan/

- Identifying stakeholders need and expectations
- Setting and prioritizing project's goals
- Defining deliverables (Goods +services + results)

- Creating the project schedule
- Performing risk assessment
- Product realization and controls

7.3 Execution and control: The 3rd phase is a project execution which is the longest phase in the project management life cycle, its consume the most energy and resources, it is very important to act smart during this phase on time, cost and quality , and the pay more attention to most constraints and potential risks, and to getting to the best communication process , the primary objective of execution is quality and controls , and to construct deliverables as per the quality assurance plan (QAP)that mostly is relying on standards accredited globally, here are some critical factors for success (CFS), but not limited to:
https://www.liquidplanner.com/blog/back-school-special-project-management-tips-successful-project-delivery/

- Prepare the scope statement,
- Implement stakeholder analysis,
- Develop a communication plan,
- Review the work breakdown structure (WBS,)
- Keep track with processes on act ,

- Impose control on deliverables,
- Develop risk management check list,
- Manage meeting minutes,
- Issue the operational plan regularly specially on WO's
- Use the statistical methodology like 6 Sigma + KPI's,

7.4 Monitoring and controlling: The 4th phase is a project monitoring and controlling phase allows all to track the entire function and takes place at all stages of a project works, tracking allow to trace process, and reviewing, and reporting the deviations and allow reporting the progress to meet the performance objectives that defined in the project management plan, it is also will enable the interested parties understand the current state and the future direction of the project., Tracking can be implemented from project initiation until project closing for each step, and each action, expected results of monitoring and controlling project work process are differ from one project to another, all deviations or nonconformities (NC's) shall be corrected early ,the integrated system will help to find out the deviation faster, the benefits of monitoring and controlling a project wok is not limited to:
https://erau.instructure.com/eportfolios/8804/Monitoring_and_Controlling_Process_Group

- Control project scope
- Validation of scope
- Update project plan
- Control project work
- Control project resources
- Control Schedule
- Control project cost

- Control project sunk cost (Waste)
- Control project quality
- Control project time management
- Control project communications
- Control project risk management
- Control project procurement Management
- Control Stakeholder engagement

7.5 Closure: The 5th phase is a project closure phase which the latest phase in the project life cycle, all process results shall be closed , and to be reported overall level of process, this phase involves handing over the deliverables to the customer after passing and documentation, closing customers' contracts, releasing staff and equipment, and informing stakeholders of the closure of the project, a project closure means , a post implementation review is completed to determine the project's success and identify the lessons learned, and future enhancement will conducted, closing have major activities, but not limited to:

- Close all pending nonconformities (NC,s)
- Close all open claims
- Close all open work orders
- Close all open contracts
- Close open accounts with vendors and customers
- Close all open stock with customers
- Handover all deliverables to the customers

- Close all open reports
- Close all project controlling tools
- Getting recognition letters from customers + vendors
- Getting alarm from X- lessons about risk management
- Getting alarm from X- lessons from market behavior
- Understanding the e-trade as they witness the lessons
- Closed Procurements

8. Relations among Portfolio, Program, and Project

According to PMBOK® 5th Edition Guide, despite of that portfolio, program, and project they may be seem similar sound, but their meaning and their activities are quite different. The portfolio is more comprehensive than the program and the program is more comprehensive than the project, get little explanation here under:

8.1 Portfolio: A Portfolio is a collection of programs and projects, they are managed as a group, they manage by the organization of the portfolio to achieve strategic goals of a portfolio, the said collection is not necessary to be dependent or interdependent, it based on the portfolio strategy, the hierarchical arrangement of the portfolio starts with the portfolio at the top of the pyramid, then the programs, and then the projects. Portfolio mastered the role of administrator who cares of providing, developing, reviewing and implementing the strategy to the programs and the projects. Portfolio is responsible for choosing programs and projects and responsible for providing them necessary resources. Portfolio owns the global strategy to maximize the return on investment (ROI).

According to PMBOK Guide, Portfolio management aligns with organizational strategies by selecting the right programs or projects, and prioritizing the work, and providing the needed resources, Portfolio management represents the big picture of the organization projects and programs; it supports the managers to analyses and make the right decisions on investment. Portfolio management focuses on financing, selecting the optimum mix of projects and programs that the organization should undertake to act accordingly.
akes%20care%20of%20developing%20the%20strategy%20and%20reviewing%20and%20implementing%20it%20in%20the%20form%20of%20programs%20and %20then%20in%20the%20form%20of%20projects. %20The%20portfolio%20is%20responsible%20for%20choosing%20programs%20and%20projects%20and%

8.2 Program: A program is an integral part within a portfolio , and is composed of sub-programs, projects, or other work that are intended and coordinated by portfolio, Program is so large that they have to be broken down into smaller units (projects or sub-program) to distribute the responsibilities and to ease the work process, thereof, the process also has to be broken down overall the work of projects and to distribute it to individual project team means multiple brains in a single program.

When several teams and managers present ideas for their projects, it works well for the different projects but not for the initiative as a whole, it is absolutely possible and often desirable to contact a project to an independent 3rd party, it is impossible to effectively contract out the program management role away from portfolio, a program manager must be an integral part of the portfolio's strategy. PMBOK Guide indicated that program management focuses on the coordination of a number of related projects over time to deliver outcomes, which benefit the organization, and projects are undertaken for the efficient delivery of a defined output.
https://translate.google.com/#view=home&op=translate&sl=en&tl=ar&text=The%20hierarchical%20arrangement%20of%20this%20portfolio%20starts%20with%2

8.3 Project: A project is a temporary endeavor undertaken to create a unique product, service, or result, a project have a specific start and a specific end date, a project is a small unit from large program or portfolio and is managed according to a common objective, every project has its own lifecycle, consisting of a definite start and a definite end and is considered a closed dynamic system, and it is bounded by time, resources, and required outcomes, a project is managed and monitored by the project manager and is terminated when the target is

achieved, or cannot be achieved, or when there is no more need of achieving the target, the target and impact of projects can be tangible or nontangible.

CFS	Portfolios report to Stakeholder	Programs report to Portfolio	Projects report to Organization
Feasibly study	Develop the Feasibly study by the portfolio	Evaluate & Define the programs and define the projects	Preparations for the necessary inputs , tools and technique required
Strategy	Determine the Direction by Portfolio	Evaluate & Define the necessary policy of projects types	Evaluate & initiate the process and their requirements
Imitation	Drawing the policy of programs needed	Evaluate and initiate the projects that will act to implement the strategy	Prepare the resources required to start implementation
Scope	Define in portfolio's strategy to be provided to the programs	Receive the strategy requirement and plan the support to projects	Define the projects procedures ,works instruction, standards , requirement od processing
Funding	loans or common shares	Receive from portfolio in shape of fund and assets	Receive from the program mostly in shape of assets and rarely funs
Resources	Formulated in a shape of Fund and Stock	Receive from portfolio in shape assets (human+ fund)	Receive from portfolio in shape assets
Monitoring & Control	Define the performance required only	Determine the types of Projects and monitoring indicators like profit rate	Define the measure of cost + benefits +KPS,s + waste rate , and
Schedule	They haven't a schedule.	They draw the policy as a guide to support projects to define and act on schedule limit	Preparing the schedule and pay commitment to the said schedule
Success criteria	Limited to collective performance comes from programs	Limited to formulating the policy of Governance	Define and use audit + Tests +inspection + comply to standards and governance

9. Project Management Office (PMO)

A Project Management Office is a specific department within an organization that is responsible for maintaining the standards of project management within that organization, the role of project management office in organizations is varying based on the type and the nature of the projects that needs to be implemented or delivered, the most common domain of work or role of PMO includes the following:

9.1 Project Support: The first and foremost role of PMO is to provide necessary project management support in the form of guidance and resources to project managers within an organization, PMO is also responsible for coaching and mentoring new project managers on various ways to educate project works,

9.2 Project Management Process: This is the most important and the most primary role of the PMO is to ensure the development and implementation of consistent standardized business processes, PMO as a part of the project helps in creating a common set of principles, practices, and templates for managing various organizational projects, a project standardization refers to ease the movement for managers between multiple projects to speed up processing and learning together, the use of standard components or principles for multiple projects is ensured and saves both time and money for any organization.

9.3 Data Gathering: The PMO is responsible for gathering of relevant project data and has to produce information to be presented for review by the management, gathering the data shall base on updates made by project managers related to a single or multiple projects (down-up convey), the PMO will be responsible for tracking the overall status of those projects, and they will assist in standardization of the compilation of information and provides ways of reporting the same to the management.

9.4 Portfolio Management: If an organization has already implemented project portfolio management (PPM), it is the responsibility of the PMO to manage and facilitate the entire process. The responsibilities will include:

- Managing resource forecast to better understanding the availability of various resources for organizational projects
- Capture project requests to ensure each of those requests have enough information to assessment the project easily
- Maintaining an updated status projects that are underway and those that have requests pending review

▪ Prioritization and scoring models for better assessment of the requests that should be approved

Example

CFS	Projects	Programs	Portfolios
Scope	Projects have defined objectives. Scope is progressively elaborated throughout the project life cycle,	Programs have a larger scope and provide more significant benefits,	Portfolios have an organizational scope that changes with the strategic objectives of the organization.
Change	Project managers expect change and implement processes to keep change managed and controlled.	Program managers expect change from both inside and outside the program and are prepared to manage it.	Portfolio managers continuously monitor changes in the
Planning	Project managers progressively elaborate high-level information into detailed plans throughout the project life cycle,	Program managers develop the overall program plan and create high-level plans to guide detailed planning at the component level.	Portfolio managers create and maintain necessary processes and communication relative to the aggregate portfolio.
Management	Project managers manage the project team to meet the project objectives.	Program managers manage the program staff and the project managers; they provide vision and overall leadership.	Portfolio managers may manage or coordinate portfolio management staff, or program and project staff that may have reporting responsibilities into the aggregate portfolio.
Success	Success is measured by product and project quality, timeliness, budget compliance, and degree of customer satisfaction.	Success is measured by the degree to which the program satisfies the needs and benefits for which it was undertaken.	Success is measured in terms of the aggregate investment performance and benefit realization of the portfolio.
Monitoring	Project managers monitor and control the work of producing the products, services, or results that the project was undertaken to produce.	Program managers monitor the progress of program components to ensure the	Portfolio managers monitor strategic changes and aggregate resource allocation, performance results, and risk

10. Management of Portfolios

Management of portfolio is the mission that closely work with the customers in order to common study the behavior of the markets , and to study the surrounding conditions and their impact on improving investment opportunities, portfolio management also works in constant communication with the customers to coordinate their requirements in order to coordinate their potential programs, which mainly depend on the requirements of the customers and their potential demand, the joint coordination between the mentioned parties is a participatory process to achieve common interests with different roles or operational activities, portfolio works to coordinate the roles of programs and determines the resources necessary for their works, while programs work on coordination the roles of the projects and determine their type, activities, and their deliverables, while projects work on processing the requirement and focus on realization of products, serveries, or result as required , what are the detailed mission of portfolio are :

10.1 Deciding the best investment plan: Portfolio is the part how decides investment tools & technique, determines the ability to undertake risks, decides customized investment solutions to the customer, stays with changes in the financial market, provides the consultation to develop investment objectives of the customers, provide advices and guidance for investment opportunities to the customers, creates reports on investment performance and activity, communicates with the customers about their accounts, studies the market conditions and economic trends, manages equity and bond portfolios with the aim of maximizing investment returns , commensurate acceptable levels of risk based on customer's needs , handles products cost as required , work together with investment research teams to identify investment opportunities,

10.2 Operation Management: Portfolio is the part how decides operation starts in coordination with the programs, portfolio works closely with managers of the program to manage their process flow and to make sure the projects are performing to their best potential, the managers keep their eyes on multiple areas within the company, assuring productivity and efficiency while seeking to reduce costs, they guide groups of people to complete their individual tasks in order to achieve company tasks.

10.3 Human Resources Management: The functions of human management is the planning, staffing supervision, hiring, training people, and handling disciplinary issues and establishing the organizational structures of the project, in addition to many other jobs such as identification of process and workflow to improve operations efficiency,

10.4 Financial Management: The functions of financial management is oversight of information and budgets, and review financial statements and monitor expenses and cost department's spending if necessary to keep the projects on budget line, financial management will also engage in cost-benefit analysis, seeking to obtain the best price for materials and oversee production methods so that output is at peak efficiency levels.

10.5 Communication Management: The function of communication is vital to the success of the project, there are many individuals who should be contacted from the beginning of the project until the closer, and there are many communication channels that projects can use to discuss business, requirements and project reports with the need to continue to communicate and involve stakeholders and others throughout the project life cycle, and successful projects work on adopting electronic communication and using software in applications because it allows projects to speed up the request and the response in addition to saving data in an easy and fast manner and can also be retrieved in an easy and fast way, electrical communication is saving time, effort and costs, as well as ensuring the confidentiality of information and secured,

10.6 Production Management: The functions of production management is to plan , control organize the process flow in integrated manner among the entire activities such as the coordinate and the monitor works of various departments involved in production, warehousing, pricing and distribution of goods, and monitor performance and implement improvements, and ensure quality of products, and manage quality and quantity of employee productivity, and manage maintenance of equipment and machinery, in addition to provide technical support where necessary overseeing the entire department, here are some of their specific responsibilities may include:

- Manage the department's budget,
- Defining the project's policies
- Developing of training curricula
- Monitoring HR systems and ensure discipline
- Oversee hiring objectives and job description creation
- Stay on top of employment trends, legal issues and best practices
- Purchase software or other tools to improve department efficiency

10.7 Supply Chain Management: Supply chain management is a process used by companies to ensure that their supply chain is efficient and cost-effective. Supply chain is the collection of steps that a company takes to transform raw materials into a final product. The five basic components of supply chain management are discussed below.

- Plan: The 1st stage in the supply chain management process is to develop a plan or strategy in order to address how the products and services will satisfy the demands and necessities of the customers, in this stage, the planning should mainly focus on designing a strategy that yields minimize cost and maximum profit,

- Source: The 2nd stage in the supply chain management process is to develop or sourcing to concentrate on building a strong relationship with vendors of the commodities or raw materials required for production, this involves not only identifying dependable suppliers but also determining different planning methods for shipping, delivery, and payment of the product.

- Execution: The 3rd stage in the supply chain management process is the manufacturing or making of products that were demanded by the customers, in this stage, the products are designed, produced, tested, packaged, and goes for delivery.

- Deliver: The 4th stage in the supply chain management process is the delivery of products to the customer at the destined location by the supplier, this stage is basically the logistics phase, where customer orders are accepted and delivery of the goods is planned. The delivery stage is often referred as logistics, where firms collaborate for the receipt of orders from customers, establish a network of warehouses, pick carriers to deliver products to customers and set up an invoicing system to receive payments,

▪ Return: The 5th stage in the supply chain management process is the return, the defective or damaged goods are returned to the vendor by the customer, in this case the companies need to deal with customer queries and respond to their complaints, this stage often tends to be a problematic section of the supply chain for many companies, the planners of supply chain need to discover a responsive and flexible network for accepting damaged, defective and extra products back from their customers and facilitating the return process for customers who have issues with delivered products.

10.8 Marketing Management: According to the Institute of Marketing management and Philip Kotler; Marketing is the business function that controls the level and composition of demand in the market. It deals with creating and maintaining demand for goods and services of the organization. Another says; it is the way of planning, organizing, controlling and implementing of marketing programmers, policies, strategies and tactics designed to fulfill the demand for the projects' product offerings or services as a means of generating an acceptable profit. Marketing involve:

▪ The setting of marketing goals and objectives
▪ Developing the marketing plan
▪ Organizing the marketing function
▪ Putting the marketing plan into action, and
▪ Controlling the marketing program

11. Project Life Cycle Approach

According to PMBOK® 5th edition Guide: A project life cycle is the sequence of phases that a project goes through from its initiation to its closure, the number and sequence of the life cycle are determined by a project management in addition to the other factors that enable the project to operate, the phases have a definite start a definite end, and control point and are constrained by time and cost and quality,

The project lifecycle can be defined and modified as per the needs and aspects of the organization, the particular objectives, deliverables, and activities vary widely from one project to another. The lifecycle provides the basic foundation of the actions that has to be performed in the project, irrespective of the specific work involved. Project phases are generally sequential, and their names and numbers are determined by the management and control needs of the organization or organizations involved in the project, the nature of the project itself, and its area of application.

https://www.invensislearning.com/resources/pmp/what-is-project-life-cycle-and-its-main-characteristics

Example

Initiating	This group includes the processes that are used to define a new project or to start a new phase of an existing project. It **includes** obtaining authorization to proceed with a particular project or phase.
Planning	This group includes the processes that are used to define the scope and objectives of the project, as well as the plan of action for achieving the objectives.
Executing	This group includes the processes that are followed to do the actual work required to achieve the project objectives.
Monitoring and Controlling	This group includes the processes that are necessary for keeping track of the project progress and performance and for implementing change management.
Closing	This group includes the processes that are followed to finalize all activities relating to the project and to close the project (or phase) formally.

12. Characteristics of the Project Life Cycle

Projects vary in size and complexity, they can be mapped to a generic life cycle by defining the beginning and end of the project, project life cycle can be documented within a methodology way, and can be determined or shaped by the unique aspects of the organization, industry, or technology employed, every project has a definite start and a definite end, the specific deliverables and activities that take place in between will vary widely within the project. The life cycle provides the basic framework for managing the project regardless of the specific work involved.

Typical Cost and Staffing Levels Across a Generic Project Life Cycle Structure
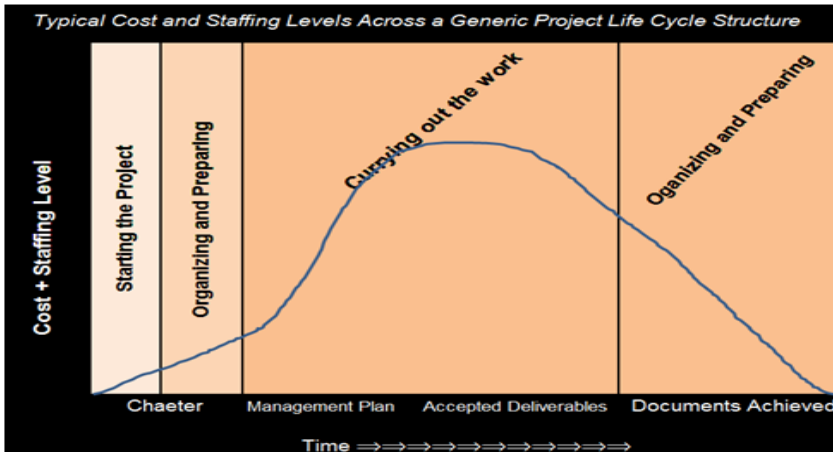
Project life cycle has important characteristics, and each phase will execute most or all processes in one or in the other form, process flow phases is usually sequential, but they can overlap too in some conditions, different phases typically have a different effort or duration, they are considered elements of the project life cycle due to their high-level nature, their numbers, needs, and the degree of control applied depend on the complexity, size, and potential impact of the project, no single standard structure for all projects, the typical cost and staffing curve above may not applicable to all projects, for example a project may need costly resources at starting of its life cycle, each phase has its own characteristic:

- Characteristics irrespective of their number
- Process and instructions
- Locations
- Skills
- Tools and control techniques
- Way of assessment of resources

- Way of assessment of risks
- Way of assessment of operational cost
- Deliverables
- Way to hand-off of the work product
- Way for project closer or termination
- Cost curve and staffing levels

According to PMBOK® 5th edition Guide: All project life cycles are not always present to the same degree. Adaptive life cycles, in particular, are developed with the intent of keeping stakeholder influences higher and the costs of changes lower throughout the life cycle than in predictive life cycles. Challenges, risks, and uncertainties exist at the beginning of every project, but these Challenges, risks, and uncertainties over the life cycle of the project, especially when a project management reach to decisions related to acceptance of the achievements, and the said challenges and risks decrease on project progresses award in achievements, that will reduce the cost also, but the cost of corrective actions may continue with excessive cots result,

Example

Impact of Variable Based on Project Time
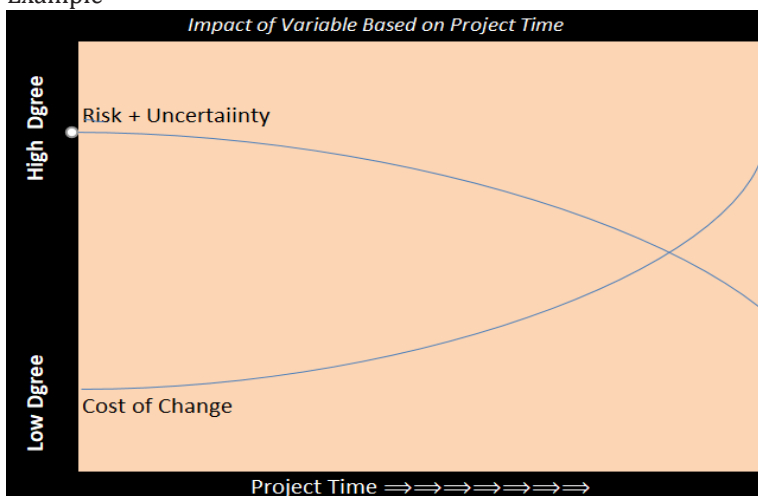
13. Project Phases

Project phase is a collection of logically related project activities that concludes when one or all objectives of the project are achieved, a project could be divided into any number of phases, and these phases are required when the work to be performed is unique to a piece of the project and are typically linked to the development of a particular major deliverable, a phase may stress processes from a specific Project Management Process Group, project phases is divided a project ma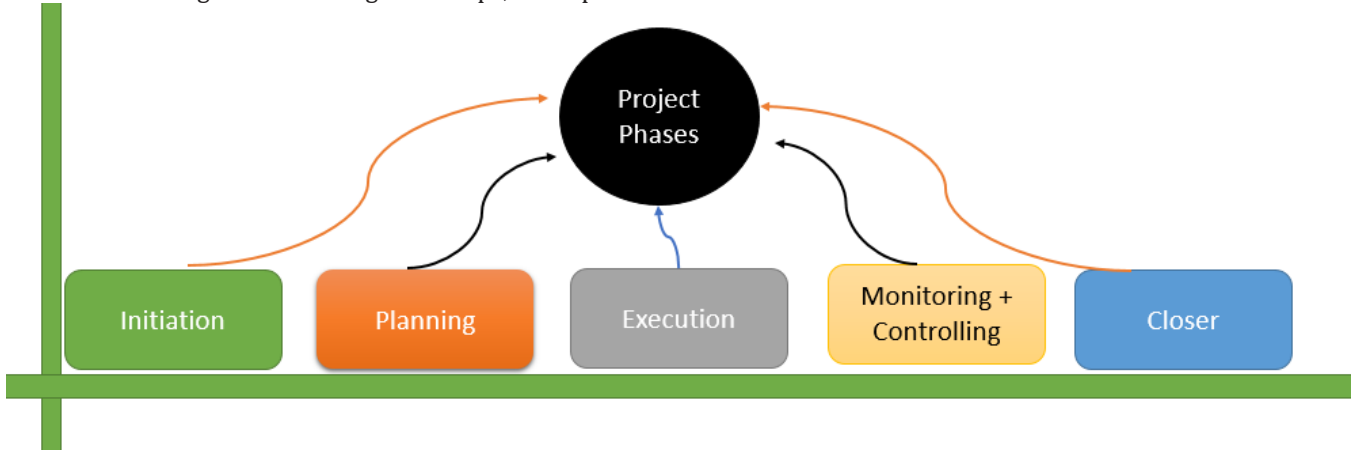nagement efforts into five phases can help give a specific efforts structure and simplify them into a series of logical and manageable steps, these phases are:

13.1 Phases-to-Phase Relationships: When projects have more than one phase, the phases are part of a generally sequential process designed to ensure proper control of the project and attain the desired product, service, or result. However, there are situations when a project might benefit from overlapping or concurrent phases, see **3** types of phase to phase relationship:

▪   Sequential relationship: In a sequential relationship, a new phase starts only when the preceding phase is complete, the step by- step nature of this approach decreases uncertainty, but may also remove options for reducing the overall schedule.

▪   Overlapping relationship: In an overlapping relationship, next phase starts before the completion of the previous one. Overlapping phases sometimes need additional resources because work has to be done in parallel. It may increase risk or could lead to rework if a succeeding phase progresses before correct information is gathered from the previous phase

13.1   Predictive life cycles: In predictive life cycles, the three main constraints of the project, scope+ time + cost, are identified early in the project life cycle because the phases are sequential and overlapping series, so it is necessary to plan the entire project at a detailed level from the beginning of the project, usually implementation different work at every stage, therefore the project may require various skills and various steps at the same time because each stage works on a specific su b-product or a specific activity, any change in the scope of the project must be managed explicitly and usually leads to a review of the plan and formal acceptance of the new plan, predictive life cycles are chosen when the product to be delivered is well defined and there is a relatively broad knowledge of how the product is built, this is the most common business model but it does not necessarily fit into the circumstances of all projects ,

Phases-to-Phase Relationships
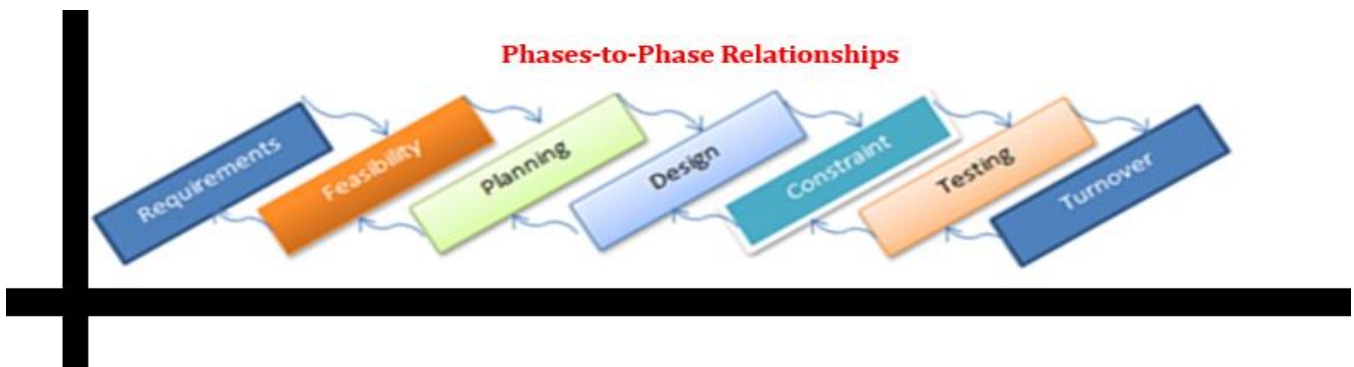
13.2 Adaptive Life Cycles: Adaptive life cycles, also known as change-driven or **Agile methods**, are used in cases of high levels of change or applications areas, it consists of a number of phases that are repeated in cycles, with a feedback loop after each cycle is completed. Each cycle proceeds based on an incomplete and limited understanding of the solution. Each cycle learns from the preceding cycles and plans the next cycle in an attempt to converge on an acceptable solution. At the discretion of the client, a cycle may include the release of a partial solution.
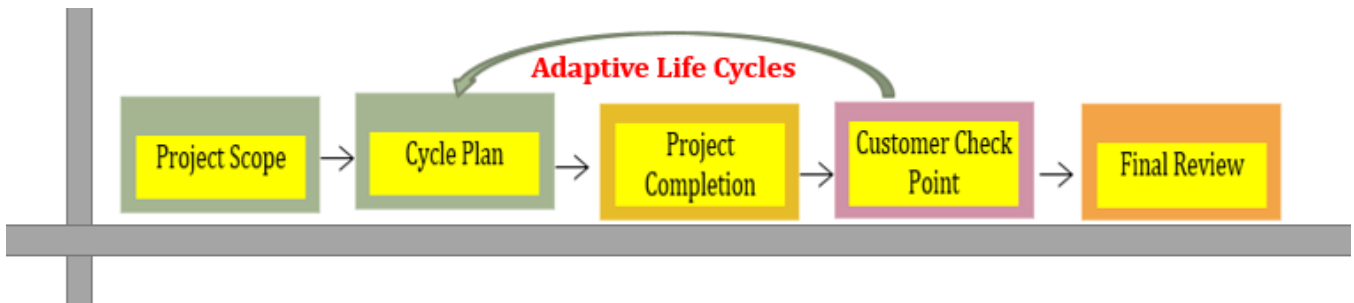
13.3 Iterative and Incremental Life Cycles: Integrative & incremental cycle is most common use in software, the first process can be taken by the developers of software is to divide the jobs into dis-connected groups, and each group is developed separately, and begins with the most important and most complex jobs in order to determine the transactions of the most frequent and increasing jobs, if we are talking about customers, the process begin as per the following example: The software developer shall separate accounts for each customer to inbound and outbound the transactions one by one, so the user can get the information from the software system for each customer separately and he can get also aggregation of accounts, and the software will repeat the same steps to the second customer , he can repeat the same step to third customer , and so on,

13.4 Integrative and Incremental application is used also for sales, inventory, human resources, procurement, planning, operations, accounts, costing, and for any area in the organization, this model has achieved a terrible development in software development and the creation of new concepts, which is characterized by the extent of its relevance to the current era and the desire to get applications in quick time as projects for up to months when they reach the waterfall model projects extends to years.
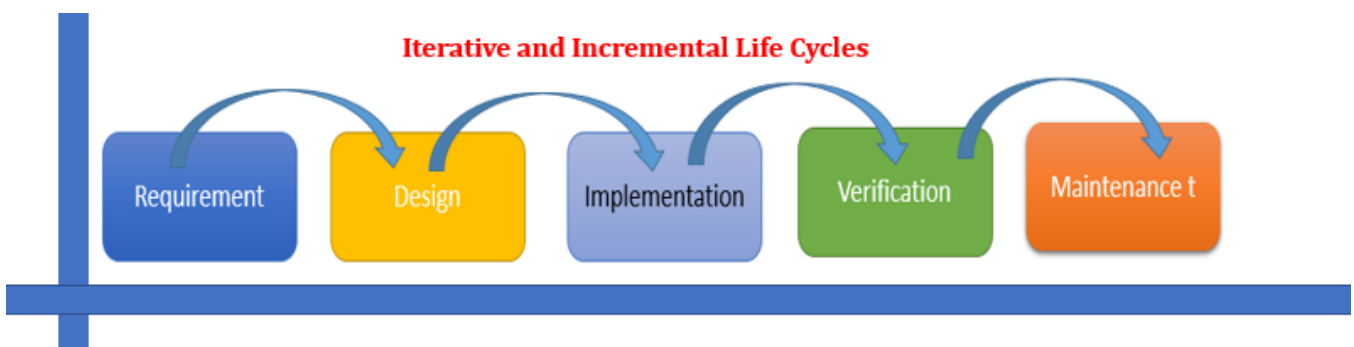
14. The 20 /80 Rule

The 20/80 rule is related to its Italian economist founder Vilfredo Pareto back in 1895, he observed that 20% of Italian wealth was owned by 20% of population, he noticed that people in society seemed to divide naturally into what he called the **Vital Few**, or the top 20 % in terms of money and influence, and the **Trivial Many,** or the bottom 80 %, he discovered that that virtually all economic activity was subject to this principle, reference to the common use of this philosophy, we can say understanding this principle is may be essential to apply how to prioritize a project tasks, days- day , weeks –week , months- month – year-year.

Getting to Yes - Excellent Project Management
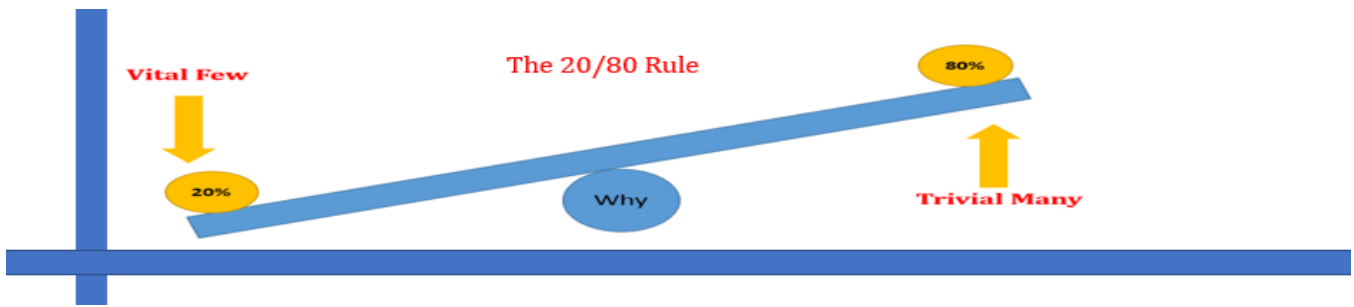
The Pareto Principle is a concept that suggests two out of ten items, on any general to-do list, will turn out to be worth more than the other eight items put together, but most managers busy themselves in the bottom 80 % the **Trivial Many**, and argue on the to the top 20 % the **Vital Few,**

Some managers often seem busy enough, but they achieve very little, the question is Why? This is because they are busy working on tasks that are of low value while they are procrastinating on the one or two activities that could make a real difference to their project. See the **Example**

Factors	what you got	%
Meeting	80% of the time is waste	20% of time is utilized
expenses	80% of expenses spend on luxury	20% of expenses spend on necessities
communication	80% of your call may be with people not in your plate	20% of you class may be with people you care about
Relationship	80% of your relation is with people not closed to you	20% of your relation with closed to you
Quality	80% of your purchases is inferior good	20% of your purchases is quality
Manager	80% of manager's time following labors movements only	20% manager's time used for important tasks

The project manager can read the 14 step that developed by Philip B. Crosby, and link them to the idea of Italian economist founder Vilfredo Pareto, so that they can obtain a very successful project. The 14 Steps that are developed by Philip B. Crosby are here under:

- Show long term management commitment,
- Establish cross-departmental quality teams,
- Identify current and potential problems
- Increase awareness ,
- Assess cost of quality,
- Take immediate action,
- Establish zero defect program
- Train supervisors
- Ensure awareness of new direction by all
- Encourage individual and team improvements
- Encourage employee feedback on obstacles
- Recognize employee participation
- Implement quality controls.
- Repeat steps to ensure continuous improvement

Chapter (2)

Organizational Influences on Project Lifecycle

Getting to Yes - Excellent Project Management

Chapter (2)

Organizational Influences on project Lifecycle

Overview

The organizational influences are defining as the sum of internal and external factors that affect the organization positively or negatively, and then influence the project life cycle such as, Internal & External Issues, Organizational Structures and Styles, Organizational Communications and Style, Organizational Cultures and Style, Project stakeholder, Project Life Cycle. Initially internal and external issues have impact on the portfolio itself, and portfolio has impact on the programs, and the programs have impact on the projects works, on the other hand the people and the process in line with technology have also impact on the culture of the organization such as policies, procedures and other aspects of project's success.

The organization of portfolio is required to evaluate its context (internal & external issues), this means , the organization need to define the influences of the various elements influence the organization, and how they reflects on the project performance, basket of complexities shall be considered such as the objectives + goals + the communication + the sales promotion+ the complexity of products +the flow of processes + information + the size of the organization + the markets + customers, and, it is also need to detect the potential risks and hunt the best opportunities ,so you can have a look at the specifications of ISO 9001 -2015,

1. Internal and External Issues "PESTEL"

Understanding the broader context of the organization helps the success of the organization based on its individual components such as organization's environment + culture and style + structure and + the governance and style, the project management systems, and many other factors influence the performance of the project, each of the internal and external issues has its own causes to impact and influence the organization and its cycle, the internal and external issues are:

1.1 Political Factors: These external factors determine how the government intervenes in the economy , and how its policies have impact on investment in many filed such as industry, trade , constructions, government intervenes in the economy through its Tools (**Fiscal & Monetary policy**), this would include taxation policy , labor law , environmental law, trade restrictions, tariffs, and political stability, these factors may also include goods and services which the government aims to provide at a zero price or through tax payments , governments have significant impact on the investment , health, education, and infrastructure of nations. The key difference is that political factors are led by the governments' policies, whereas legal factors must be complied by the nations, here is an example on political factors:

SL	Political Factors	Impact	Body	Impact on Prosperity			
				S	W	O	T
1	Prevailing Political Conditions	Unsuitability in stricken countries reduces sales	External				X
2	Fiscal & Monetary Policy (Taxes + Money Supply)	Responding to the tidal forces (Purchasing Power)	External				X
3	High cost of Energy Prices	Responding to high operational Cost (Factories Closed)	External				X
4	Bureaucratic Procedures	Responding to sunk cost (Reduces investment)	External				X
5	Government Polices Change	The political environment does not embrace investment	External				X
6	Market Lobbying Groups in Project (Buren Prices)	The political environment does not embrace investment	External		X		
7	Critical Mass (Turkey market entry + price burning)	No protection from Government + Turkey product is exempted	External		X		
8	Recent Wars and Conflicts + Un expected new Wars	The current situation makes sale difficult	External				X
9	Entry of new competitors	Responding more difficulties	External				X
10	Jordan Safety and Security Factor	Should be exploited as attractive factor	External			X	

1.2 Economic Factors: These external factors determine how the Macro-economic have impact on the economy of any country, and how micro-economic have impact on the economy of a specific country, and how the impact

will influence the international trade , which in turn directly impacts on the organization and its profitability, because these factors include economic growth , exchange rates, inflation rate, and interest rates, these factors greatly affect how businesses operate and make decisions. for example, interest rates affect a projects' cost of capital and therefore to what extent a business grows and expands, and exchange rates can affect the costs of exporting goods and the supply and price of imported goods in an economy, and employment or unemployment rates, raw material costs and foreign exchange rates . Here is an example on economic factors:

SL	Economic Factors	Impact	Body	Impact on our Prosperity			
				S	W	O	T
1	Inflation + Deflation + Recession	Discourage the markets	External				X
2	Competence of Human Resources	Increase Productivity	Internal	X			
3	Competitors	Inspire customers	Internal	X			X
4	Expansion into new markets	Reducing Waste	Internal			X	
5	Expanding Services	Increasing Welfare	Internal			X	
6	Enough Budget	Increasing Welfare	Internal	X			
7	Updated working system	Reduces downtime	Internal	X			
8	Vendors & Customers power in bargaining Electronically)	Increase their power → decrease our power	Internal				X
9	Importing most Inputs at high Prices (Foreign acquisition)	Increase Payment	External				X
10	Transportation and Insurance Prices	Decreases the competitive advantage	External				X

1.3 Social Factors: These internal and external factors determine how focus on the social environment and markets' behaviors and its trends and how to commence with competitors, this help projects to have further understanding of customers' needs and expectations, these factors reflect the cultural aspects and health consciousness, population growth rate, age distribution, career attitudes and emphasis on safety, social trends factors affect the demand for a projects' products and how that company operates, for example, companies may change various management strategies to adopt social trends caused from a specific study, these factors may include changing family demographics, education levels, cultural trends, attitude changes and changes in lifestyles, here is an example on social factors :

SL	Social Factors	Impact	Body	Impact on our Prosperity			
				S	W	O	T
1	Community Responsibilities	↑Employment Rate +↓ Unemployment Rates+↓Poverty Rates	Internal	X			
2	Encourage diversity and equal opportunities	Building a sustainable future	Internal	X			
3	Un -Employment of children and underage	Unethical behavior leads to slavery	Internal	X			
4	Employment of people with special needs	Ethical behavior + Build community responsibility	Internal	X			
5	Supporting Local Competitors	Supporting GDP+GNP	Internal	X			
6	Good Relation with Clients	Support trade	Internal			X	
7	Demographics (Cultural + Diversity + Race)	Differential Values+ Beliefs +Trends	External			X	
8	Good Environment at Work	People feeling fun at work , increase productivity	Internal	X			
9	Ethical Work Environment	Building a sustainable institutional future	Internal	X			
10	Employee Turnover	Increasing confidence	Internal				X

1.4 Technological Factors: These internal and external factors determine how technological progress and development that could affect the market of industries , trade, constructions, and others, these factors include technological aspects like research and development activity, automation, technology incentives and the rate of technological change could include changes in digital or mobile technology, and automation, bemuses there is mostly a tendency to focus on developments of digital technology, but consideration also must be given to new methods of distribution, manufacturing and logistics because these also include potential barriers to entry to the market , production level and outsourcing , and technological , quality , would quiet affect the costs, in high trends, here is an example on technological factors,

SL	Technology Factors	Impact	Body	Impact on our Prosperity			
				S	W	O	T
1	Technology Replacement (Solutions)	↓ Prices + ↓Employment + ↑Productivity +	Internal	X			
2	E-Commerce	Improve Sharing of Information + Improve Trade	Internal	X			
3	Computerized Business	Speed work + ↑Accuracy + Saving Time	Internal	X			
4	Sharing Technology with others	Improved Communication +Easy access to Information	Internal	X			
5	Using Complex Machines in Manufacturing	↑ Innovation+↑ Creativity + ↑Efficiency +↑Productivity	Internal	X			
6	Send staff to technical courses and seminars	Change the health industry	Internal	X			
7	Using of Modern Test Equipment	Convenience to education of people	Internal	X			
8	Using Renewable Energy (On Run)	↓ cost +A friend of the environment	Internal	X			
9	Participation in in Social Media	Attractive new markets	Internal	X			
10	Technological communication (Laser fiche	This is a benchmark to invention	Internal	X			

1.4 Environmental Factors: These internal and external factors determine how much impact the surrounding environment and, the impact of ecological aspects, with the rise in importance of Corporate Sustainability Responsibility (CSR), this element is becoming more important, environmental factors include ecological and environmental aspects such as weather, climate, and climate change, which may especially affect industries such as tourism, farming, and insurance, in addition to growing awareness of the potential impacts of climate change is affecting how companies works, and the products they offer, both creating new markets and diminishing or destroying existing ones, it include also recycling procedures, carbon footprint, waste disposal and sustainability, here is an example on environmental factors,

SL	Environmental Factors	Impact	Body	Impact on our Prosperity			
				S	W	O	T
1	Hazards of Chemicals Substances (RM)	Resource Depletion +Release to Land +Release to Air +Emissions	Internal	X			
2	Hazards of Operations)	Resource Depletion +Release to Land +Release to Air +Emissions	Internal	X			
3	Hazards of Composition (Diesel+ Wood+ Paper+ Waste+ Garbage)	Release to Land +Release to Air +Emissions	Internal	X			
4	Oils Hazards (Lubricant Oil + Pumps stations	Resource Depletion +Release to Land & Water +Emissions Slipping	Internal	X			
5	Emission risks (evaporation + gases)	Resource Depletion (Release to Land + Water +Emissions	Internal	X			
6	Hazard of Drilling	Dust+ Disturbance +Notices + Global Warming	Internal	X			
7	Hazard of Deforestation	Lacking of Trees + No Rain + Lacking of Oxygen + Warm Weather	Internal	X			
8	Hazard of Waste (Industrial & non Industrial)	Negatively affecting ambit environment	Internal	X			
9	Hazard of electric	Area free from hazard	Internal	X			
10	Commitment to Environmental Legislation	Positively affect to ambit environment.	Internal	X			

1.5 Legal Factors: These factors determine how much the organization must understand what is legal and what allowed within their territories they operate in, they also must be aware of any change in legislation and how they impact the business , legal factors include discrimination law, trade law, antitrust law, employment law, health and safety law, and trade regulation and restrictions, and others, these factors can affect how a company work and how much these laws drive the cost eventually affect the twin demand and supply, here is an example on legal factors:

SL	Legal Factors	Impact	Body	Impact on our Prosperity			
				S	W	O	T
1	Obtaining the necessary licenses	Work in a safely	Internal	X			
2	Compliance with local legislation & regulations	Building a sustainable institutional future	Internal	X			
3	Compliance with international laws	Building a sustainable institutional future	Internal	X			
4	Compliance with Jordanian Labor Law.	Building a sustainable institutional future	Internal	X			
5	Monitoring anticipated future legislation	Building a sustainable institutional future	Internal	X			
6	Avoiding Discrimination	Increase loyalty to the company	Internal	X			
7	Commitment with environmental legislation	Avoidance of illegal issues	Internal	X			
8	Matching the company's charter with the Jordanian law.	Avoidance of illegal issues	Internal	X			
9	Respect the law of international trade	Avoidance of illegal issues	Internal	X			
10	Transparency and non-fraud in business	Avoidance of illegal issues	Internal	X			

2. Organizational Structures and Styles

Organizational structure is a chart that outlines how certain activities or sum of activities are directed, communicated, operating and controlling their works, these activities may be include rules, roles, instruction, responsibilities, constraints, and others, these activities determine how information flows within the interdepartmental activities and within a specific project works. For example, in a centralized structure, decisions flow Top- Downward, while in a decentralized structure, decision-making power is distributed among various levels of the organization, here are some organizational styles:

| Org. Structure / Project Characteristics	Functions	Weak Matrix	Balanced Matrix	Strong Matrix	Centric Organization
Project Manager Authority	Limited or None	Low	low to Moderate	Moderate to high	Complete
Providing Resources	Limited or None	Low	low or Moderate	Moderate to high	Complete
Budget Management	Functional Manager	Functional Manager	Mixed	Project manager	Project manager
Role	Part time	Part time	Full time	Full time	Full time
Staff work	Part time	Part time	Part time	Full time	Full time

2.1 Functional Organization Structure: This is the most common type makes specialization in each function, in these styles , projects generally occur in hermitage environments, functional organization is divided to put the specialists in the top position throughout the enterprise, this type define as a system in which functional department are created to deal with the problems of business at various levels, where's functional authority remains confined to functional guidance to different departments, see the advantages and disadvantages of the functional style , and see the chart also:

The key advantages of Functional Organization are, but not limited to:
- The project is managed by an experienced manager with a high authority and ability,
- The team members work with other workers one functional area sharing the knowledge,
- The workers have the chance to get promoted within their functional areas,
- The workers with specialized skills can perform tasks quickly, efficiently and with more confidence,
- The project is getting the advantage of expertise knowledge,
- This structure applicable for small businesses that focus on one product mostly,

The key disadvantages of Functional Organization are, but not limited to:
- Everyone worker always give more importance to his departmental objectives only and ignores other objectives,
- The difficulty to act within an integrated activity,
- The conflict of interest because every departmental head wants to become a functional empire,
- Each employee specializes only in a small part of the whole job,
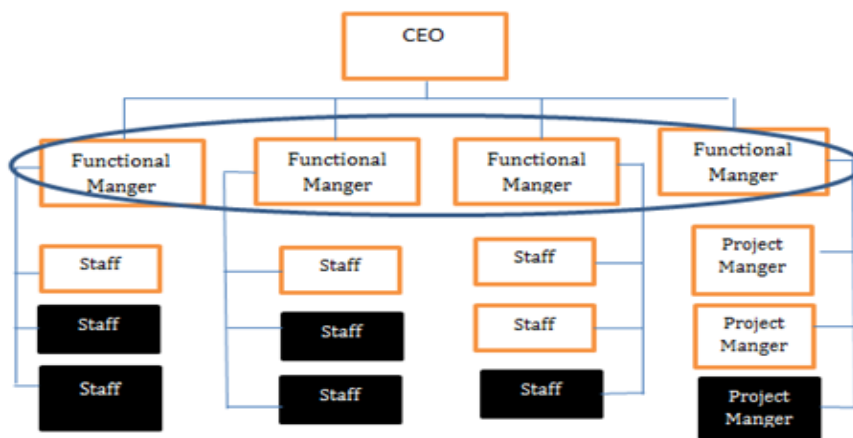
Functional Organization
Black boxes represent the engaged in project activities (Power residues with functional managers

Weak Matrix Structure: In this type of matrix structure, the project budget is controlled by the functional manager, but they work with limited authority and power because their roles are limited to work as coordinators, see the advantages and dis advantages of the weak style, and see the chart also:

The key disadvantages Weak Matrix Structure are, but not limited to:
- Accountabilities and authority can be less clear and often shared,
- Meetings and bureaucracy can rise as the amount of coordination and communication increases,
- More people become involved in the decision process, which can slow things down,
- Ambiguity increases, with competing goals and higher levels of change and flexibility,
- We can see increases in central control as leaders try to re-establish control over a more complex environment.
- There is the possibility of more resource conflict as people need to engage outside their silos to get things done,
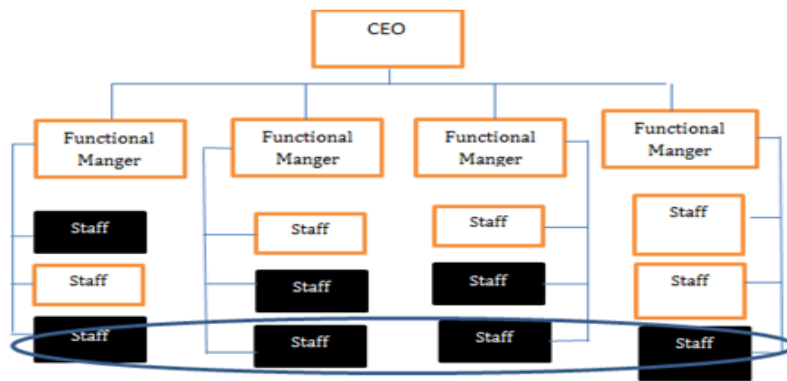
Weak Matrix Organization
Black boxes represent the engaged in project activities (Power residues with staff

2.2Balanced Matrix Structure: As the name suggests the balance of power in a Balanced Matrix Structure is distributed equally between the functional and project managers, both have equal authority and power in the project, the project manager has a full-time role, but he receives a part-time administrative staff for project management, the project budget is controlled in an equal manner by both of them, in another word, balanced matrix organization acknowledges that the need for a project manager doesn't give project manager full authority over the project and its funding, the balanced matrix is where the power is shared more equally between the vertical and horizontal legs of the matrix with respective responsibilities for people and resources carefully defined and reasonably balanced, see the chart:

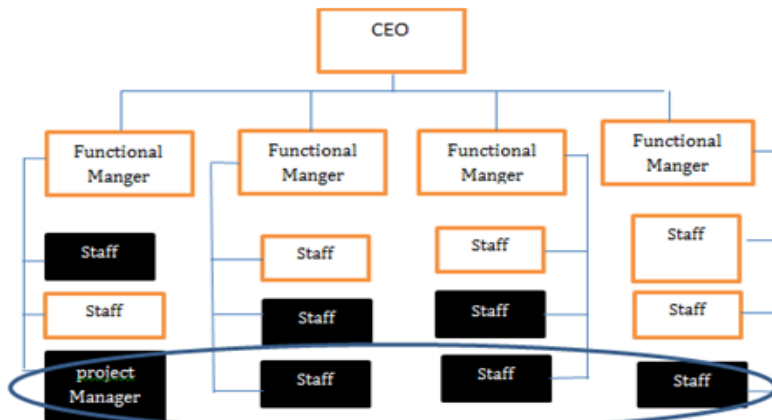**Balanced Matrix Organization**
Black boxes represent the engaged in project activities (Power residues with project manager

2.4 Strong Matrix Structure: The authority in this type lies with the project manager, he has a powerful role in the project and occupies a full-time role and responsibility, his power is unquestionable as he has a full-time administrative staff under him, he is the one that controls the project budget, and has the role of a functional manager is very less, in another word, strong matrix organization look alike the characteristics of the projectized organization and have full-time project managers with significant authority, see the advantages and disadvantages of the strong matrix structures , see the chart:

The key advantages of Strong Matrix Structure are, but not limited to:
- Project manager strives to meet the needs of global or regional customers who want to contract with him,
- Project manager strives to improve their capability to run global or regional projects and systems,
- Project manager strives to improve access to resources, skills and technologies across the organization,
- Project manager strives to improve cooperation and communication across the functional and geographic silos,
- Project manager strives to bring flexibility through faster decisions involving multiple stakeholders,
- Project manager strives to build broader people capabilities to make more integrated they need to develop people,

The key disadvantages of Strong Matrix Structure are, but not limited to
- Project manager should have domain related knowledge (e.g. Technical Knowledge),

- Team members are jack of all and kind of one,
- Team members have "no home"
- Duplication of roles and responsibilities,
- Less utilization of resources as they are completely dedicated to project,
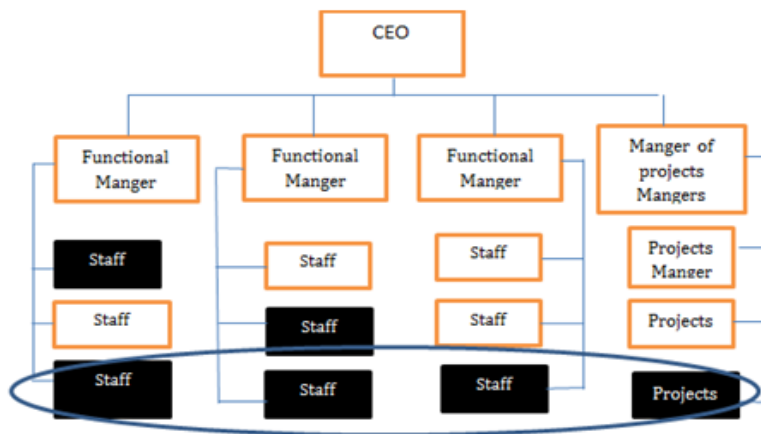
Strong Matrix Organization
Black boxes represent the engaged in project activities (Power residues with project manager

2.5 Project-Centric Organization: This is also named Projectized Organization, it is one of the most Centric Type of an organizational structures, all departments functions mastered by a project manager with a specific team report to him, this is projectized organization is dynamic and adaptive, project manager has full authority over project resources and deliverables, the centric manager control the budget and work assignments, and he has full-time team members under his control. Team Members are often collocated for better performance until the project ends, when the project is completed, the team is disbanded, and resources are released, staff allocated for project activities and with project centric organization, see the advantages and disadvantages of the Project-Centric, and see the chart also:

The key advantages of Project-Centric are, but not limited to:
- Team members are loyal to the project goal,
- Line of authority is clear, as all team members report directly to project manager,
- The style reduces conflict and decision making is faster and more flexible,
- Short, fast and clear communication lines among team,
- The style helps solve stakeholders' concerns quickly,
- The style helps fast decisions and completes the project faster,
- The style helps flexible and versatile people due to working on different projects,
- The style eases brain storming and knowledge from each other,

The key disadvantages of Project-Centric are, but not limited to:
- Absolute authority can make project manager with arrogant attitude,
- Lack of authority can make project team authority dissatisfy,
- Tense work environment due to strict implementation of schedule,
- Poor communication can cause resource duplication if there are multiple projects,
- less loyal to the organization as their practical fate may ends with the end of the project,
- People cost and equipment can be higher because they are being hired for a short period.,
- People skilled less as they worked before in many different projects, this may affect the performance quality,
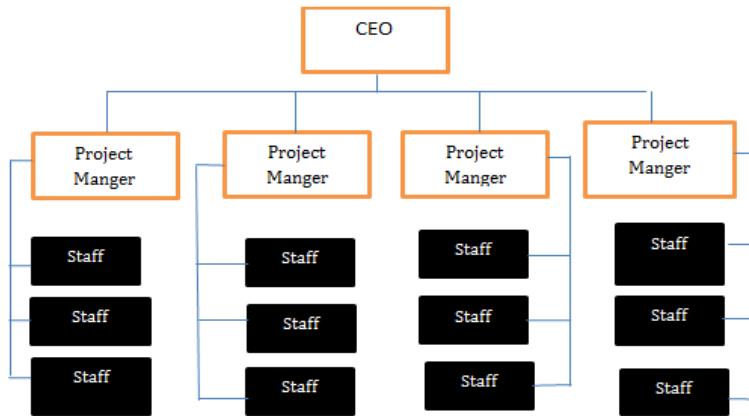
Projectized Organization
Black boxes represent the engaged in project activities (Power residues with project manager

2.6   Composite Organization: Many organizational structures include strategic, middle management, and operational levels, the project manager may interact with all three levels depending on factors such as:

- Strategic importance of the project,
- Capacity of stakeholders to influence project,
- Degree of project management maturity,
- Project management systems, and
- Resource availability and management,

- Entity controlling the project budget,
- Project manager's role, and
- Project team composition,
- Project manager's level of authority,
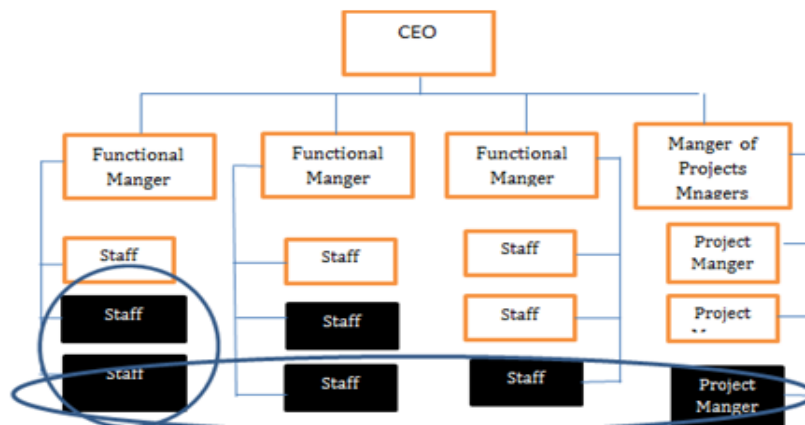
Composite Organization
Black boxes represent the engaged in project activities (Power residues with manager of project managers

3. Organizational Communications and Style

Organizational structure is a chart that defines the process flow, or channels within organizational activities, or forms of communication that occur within the organizations, its impacts project management success to a great extent, an effective organizational communication enables project managers to communicate with all relevant stakeholders, vendors, NGO's, customers , workers, market, and enable assist decision making. Electronic communications (including e-mail, social media, instant messaging, video, what-up, and web conferencing are being used by stakeholders and project team members to communicate with the project manager formally and informally, the following types of communications are very critical to project success, but not limited to:

3.1   Internal Communication: Internal communication flows inward within the interdepartmental activities, or

among people within the organization, among different groups of employees and between employers and employees, it could be oral or written, visual or audio-visual facilities, formal or informal, and upward or downward. Internal communication serves to inform, instruct, educate, develop, motivate, persuade, entertain, direct, control and caution people within the organization, and

3.2   External Communication: External Communication flows outward the organization, like the potential customers, competitors, public, press, media, and the government, it takes place in various ways and through different channels, such as letters, notices, brochures, demonstrations, telephone calls, business meetings, press releases, press conferences, audio-visual facilities, presentations, publicity films, product launch ,events, and advertisements are all examples of external communication, it is important to note that the external agency or person targeted through such communication, quite often forms an image or impression based on such communication, and it is very necessary to make it clear, intelligible and appealing specially when for the publication , leaflet , bulletin , brochure, project profile , and

3.3   Upward Communication: Upward Communication flows upward (Bottom - Top) levels in the hierarchy moves from employees to supervisors, from supervisors to managers, from managers to executives, from regional manager to general manager and so on, maybe categorized as upward communication, or from branches to regional offices, regional offices to zonal offices, zonal offices to head office is referred to as upward communication, and

3.4   Downward Communication: Downward Communication flows up downward (Top to Bottom) levels in the hierarchy moves from supervisors to employees, from the general manger downwards. It travels through senior executives to junior level functionaries, from the controlling office to the branch, from the head of the division to the head of the unit, from upper levels to lowers, and

3.5   Formal Communication: Formal Communication flows through a proper pre-defined channel and routes of communication and is deliberately controlled, the flow of information is controlled and needs serious efforts effort to be properly communicated, formal communication flows in a hierarchical structure from level to top lowers, from leaders in various departments to seniors, and from staff to supervisors, employees are bound to follow formal communication channels while performing their duties, and

3.6   Informal Communication: In Formal Communication flows through a proper issue used more often in situations where there is no rigid hierarchical tier. It's referring to communication which is multi-dimensional. Informal communication moves freely within the organization and is not bound by pre-defined channels and communication routes, informal communication is particularly quick, it is far for relational than formal communication and is by nature, a very natural form of communication as people interact with each other freely and can talk about a diverse range of topics,

3.7   Lateral Communication: Lateral Communication flows among any employees on the same organizational level, it's named a horizontal communication, it involves not only the movement of information from upper levels to the Lower levels of the organizations, but also is defined primarily as the quality of information sharing among peers at similar levels, effective lateral communication involves exchange of information among all organizational members, and

3.8   Interactive Communication: Interactive Communication flows through meetings, conferences, multimedia presentations, teleconferencing, group discussions, it is also known as the convergence model, is all about give and take. It relies on an exchange of communication from the sender to the receiver and from the receiver to the sender and back again. The interactive model allows for smooth and fast feedback, and

3.9   Mass Communication: Mass Communication flows between a large mass of people, such as public speaking, newspapers, magazines and journals, radio, television, internet, and. Mass Communication is a process in which a person, group of people, or an organization sends a message through a channel of communication to a large group of anonymous and heterogeneous people and organizations, the sender of the message is usually a professional communicator that often represents an organization, mass communication is an expensive process, unlike interpersonal communication, feedback for mass communication is usually indirect and slow, and

3.10 Grapevine Communication: Grapevine Communication flows in any order, it does not follow horizontal or vertical, the information spreads very rapidly than other channel of communications form informal communication, operates both in internal and external informal channels which can contribute to benefit the organization.

4. Organizational Culture and Style

Organizational culture is the organization's vision, values, norms, systems, symbols, language, assumptions, beliefs, norms, and habits that affect the behavior of the worker over the time , organizational culture shall include the organizational expectations, experiences, philosophy, as well as the values that guide worker behavior, organizational culture based on shared attitudes, beliefs, customs, and written and unwritten rules that have been developed over time, organizational culture develops by participation of people in common issues, there are very positive benefits from having diverse affect the people and workforce, but not limited to:

- Increase marginal productivity
- Improve creativity
- Increase profits
- Reduce waste
- Improve employee engagement

- Wider range of skills
- Improves cultural insights
- Reduced potential risk
- Improve relations among people
- Improve relations with communities

We highly recommend to diverse people from all walk regardless of their race, religion and culture to the knowledge and to share diverse experiences.,

4.1 Enterprise Environmental Factors (EEF): According to the Project Management Body of Knowledge (PMBOK® Guide) 5th edition, enterprise environmental factors refer to the conditions that are not under the immediate control of the project team that considered as constraint and have impact on the project. Enterprise environmental factors are considered inputs to most planning processes, may enhance or constrain project management options, and may have a positive or negative influence on the outcome. Enterprise environmental factors vary widely in type and nature they consider as an input to the **10** process groups, and to the sub-process groups which are **47** steps. Enterprise Environmental Factors are the obstructions caused by a lack of planning or by a lack of resources, or any reasons that can be controlled or not, these situations are called Enterprise Environmental Factors, for example:

- Vision
- Mission
- Values
- Standardization
- Norms
- Stakeholder Register
- Governance
- Culture
- Structure
- Responsibilities & Authorities
- Fiscal Policy
- Quality Policy
- Safety Policy

- Competitors Strength
- Social Responsibility
- Resources
- Communications Channels
- Legal Requirements
- Other Requirements
- Codes of Conduct
- Quality Assurance Plan (QAP)
- Product Standards
- Market Conditions+ Standards
- OH & SMS 45001 -2015
- Contracting
- Risk Management Strategy

- Knowledge Strategy
- Strategic plan
- procedures
- Work Instructions
- Infrastructure (equipment+ Test Facilities)
- Political Climate
- Environmental Climate
- Software
- People Requirements
- Interested Parties Requirements
- Commercial databases (cost+ risk + FS)
- HR Requirements
- Measure Conditions

 The tools that help businesses activities such as planning, WBS, budget, cost management, scheduling, and change control to deliver the best strategy that can be utilized to define organizational activities, and such systems are part of enterprise environmental factors. Enterprise Environmental Factors also influences the defining activities process to incorporate Organizational cultures and structure, published commercial information from commercial databases, and project management information system (PMIS) that can impact the Project's success. Enterprise environmental factors are so important that they can enhance or reduce the project management options and positively or negatively impact project works,
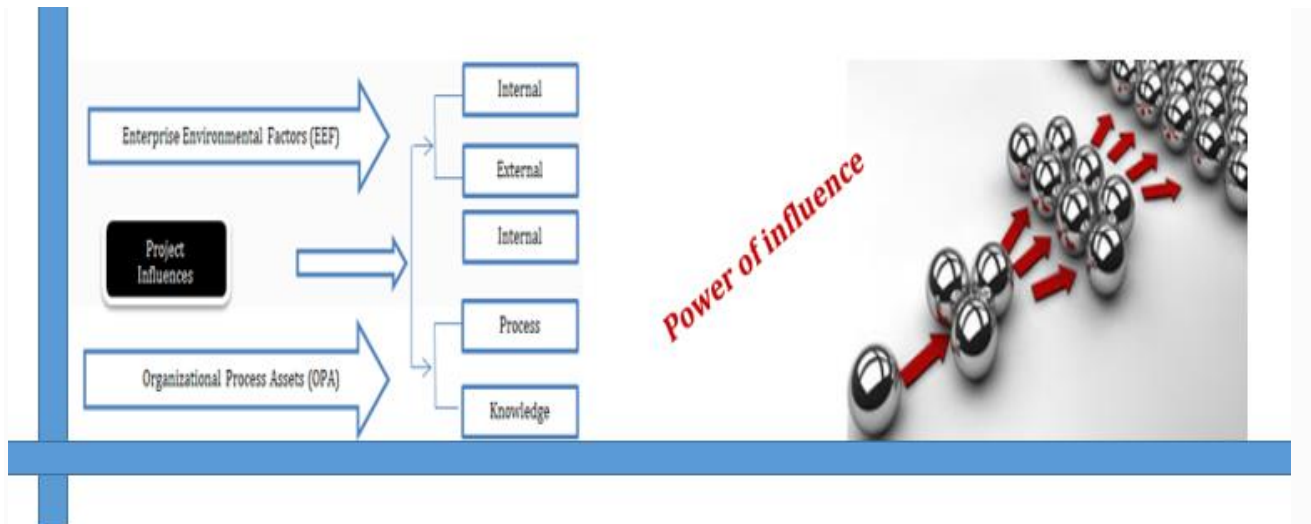
4.2 Organizational Process Assets (OPA): According to the Project Management Body of Knowledge (PMBOK® Guide) 5th edition, organizational process assets are the plans, processes, policies, procedures, and knowledge bases used to perform processes initially to lead the project to success, these processes include any artifact assets like knowledge, documentation, historical data, risk data, operational data , testing data , tools, techniques perform control the project in execution phase project, it can be tangible or intangible. Processes assets considered as an inputs to most planning processes, the project team members may update and add to the organizational process assets as necessary,

Starting a project from scratch without using any information from past projects executed by your organization or similar projects executed by other organizations is such a waste of time, so, the management has to search the historical information regarding similar projects executed in their organization, if the project is in entirely new, they need to collect information regarding similar projects from other sources, others experiences indeed a precious resource, even when it is not your own .

Each organization should have repository of information from already executed projects and these are called 'Organizational Process Assets, lessons learned from earlier projects and historical information usually constitutes organization's knowledge base, which in turn helps effective planning and execution of new project's processes. However Organizational Process Assets (OPA) are typically varying widely in type and nature to the **10** process groups and to the sub-process groups which are **47** steps, they divided them into: Processes & Procedures and Corporate Knowledge Base:

▪ **Processes & Procedures:** The first category deals with the processes and procedures needed to carry out the work, which includes, but not limited to:

o Quality objectives
o Process control
o Process of maintenance
o Process of calibration
o In-process testing and final testing system
o Quality Policy
o Quality Assurance Plan (QAP)
o Invoicing system
o Payable system

o Receivable system
o Safety Policy
o Fiscal Policy
o All operational procedures
o Standard models
o General guidelines
o Total quality Management
o Information inbounded into ERP system
o Quality objectives

▪ **Business Knowledge Base:** The second category includes basic company knowledge for storing and retrieving information, that includes, but not limited to:

o Stakeholders register

o Historical information

o   Files of previous projects
o   Register of project risks

o   Historical data+ information (risks +cost+ quality)
o   Lessons learned

5. Stakeholder

Stakeholders may be some individuals, groups, entities, organizations, or competent authorities who may affect or may be affected by, or perceive itself to be affected by the decisions or activities, or projects' results. Stakeholders are either directly involved in the project or have interests that may be affected by the project's outcome, this would include normally the members of a project team, project managers, project sponsors, executives, customers, users. Project management plan shall define the needs and expectations of the stakeholders to lead the projects for success,

Stakeholder management is the process of maintaining, organizing good relationships with stakeholders or (interested parties) who may the most influence project work or be influenced by project work. Communicating the stakeholders by the right way can play a vital role in keeping them on the right path. The right path may require a process of construction a Team –Building Activities (forming + storming + norming + performing) to maintain constructive relationships with them, the process helps a business move toward its stated goals by keeping existing stakeholders satisfied.

Stakeholder management required to identify <u>the key stakeholders, and how to assess their power, influence and interest, and get them to do what you want</u> by mapping their interest +their influence+ their power + their engagement, with clear idea of the benefits that a project can gain. Stakeholders are important for a project success , because they perceive themselves the sponsor of the project , so the project's mangers shall pay more attention to their need and expectations , the importance of stakeholder's lies in the fact that they have different levels of duties and authorities when contributing on a project , they may detract from the success of the project, either actively or passively, so project managers shall remain with them during the whole time of project's life cycle to keep them informed about   project's progress, project manager shall understand the consciously identification of the stakeholder during the project life cycle bring the interest to the project for workers , the following tables is showing the internal and external interested parties with littles explanations:
https://www.thebalancecareers.com/project-governance-basics-4126578

Internal Interested Parties (Stakeholders)	External Interested Parties (Stakeholders)
▪ Stakeholder	▪ External Competitors
▪ Sponsor	▪ Subcontractors
▪ Organizational team	▪ Government
▪ Customer	▪ External customers
▪ End User	▪ Supplier (vendors +seller)
▪ Suppliers (vendor + seller)	▪ 3rd Party Inspection
▪ Internal competitor	▪ Local community
▪ Internal pressure forces	▪ Media
▪ Labor unions	▪ NGO's

6. Governance Structures & its Elements

According to PMBOK® Guide, Project governance is the alignment of a project with stakeholders' directions enables organizations to manage projects consistently and exploit the benefits of a project, it provides a framework that helps the project manager and sponsors to make decisions suit both stakeholder needs and organizational objectives, and deal with situations where they may not be aligned. There are the **7** elements that are essential for governance to be effective, these elements apply to organizational governance and program, these elements are, but not limited to:
https://www.thebalancecareers.com/project-governance-basics-4126578

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Good Governance

Alignment | Expectation | Progressive Elaboration | Responsibility

Direction | Delivery | Risk Assessment
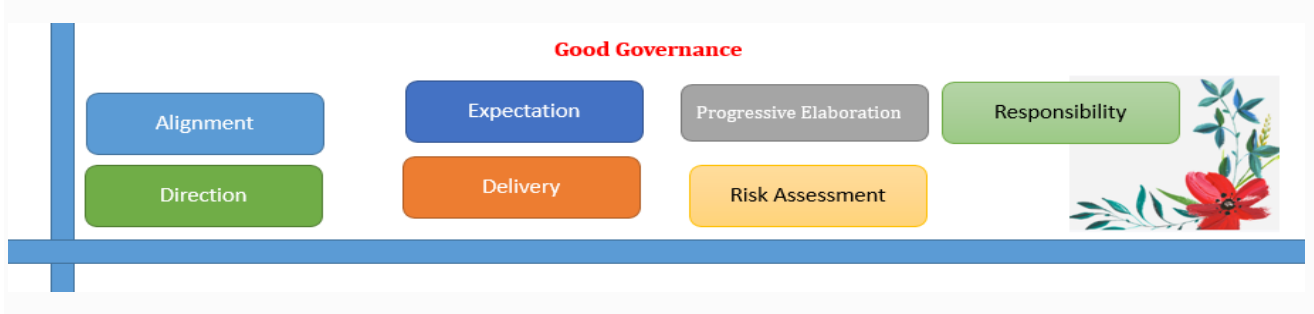
6.1 Alignment: Understanding the importance of project's vision, mission, values, strategic objectives, and ensure that a framework is in place comply with stakeholders' directions, to ensure alignment between projects and strategy has become almost a prerequisite for long-term success, and to align the existing project and the futuristic project with the organization's strategic goals, here some steps help to do that**:**

▪ **Reviewing Project Content:** It means understanding the content of the project through reviewing the current project details including the internal work environment, and reviewing the long-term market requirements, reviewing external conditions that have impact on the project progress, reviewing the requirements of stakeholders, and the project needs (fiscal and human) resources, then reviewing future trends of stakeholder , and setting reasonable, specific ,realistic and achievable expectations, and taking into account not to exaggerate the expectations,

▪ **Building a decision-making framework:** Decision is an integral part of modern management, and the project management shall build clear and indicative conditions that help in decision-making, such as determining the authority of the decision, and that the decision is based on reliable information, and implementation priorities for decision-making, and shall take rational decision based on the principle of cause & effect considering the impact of this decision on the project environment before it is taken, identification of outputs are repeated with their nonconformities, and the customer requirements shall have room also,

6.2 Direction: Direction is the 4th part of managerial function which activate the organizational methods to work efficiently for achievement of organizational purposes, direction is the motive of a project sets things in motion , and out people also in action because the 1st three function "planning + organizing + staffing" are the mere preparations for doing the work, while direction is that inert-personnel aspect of management which deals directly with influencing, guiding, supervising, motivating sub-ordinate for the achievement of organizational goals, direction has following elements

https://www.managementstudyguide.com/management_functions.htm

6.3 Expectation: This is one of many techniques used to calculate the Earned Value (EV) or named expected value of opportunity of an investment , it is using to estimate probabilities with multi-variate models to examine possible outcomes for a proposed investment, the analysis also helps investors determine whether they are taking on an appropriate level of risk given the likely outcome of the investment, this what named the study of market behavior . Business valuation and Earned Value are described in chapter (1) clause # 3.2.1

6.4 Delivery: Delivery is a link in a chain of processes that work regularly and systematically in order to deliver to customer's sound products, services or results within pre-agreed standards and specifications. Therefore, it is a set of processes that includes receipt, packaging, delivery and documentation, delivery is always linked with time (lead time for delivery),

6.5 Progressive Elaboration: Progressive elaboration is the process of investigation of a project context and complying the business works with stipulated standards, for the purpose of continual improvement, every project has its own continuous investigation and improvement methodology, the successive iterations of planning processes result in developing more effective solutions to progress, and develop a project mission, the deviated results shall be corrected as soon as appear base on the cause & effect principles, this called continues improvement in ISO 9001- 2015. Progressive Elaboration is described in chapter (1) clause # 1.3
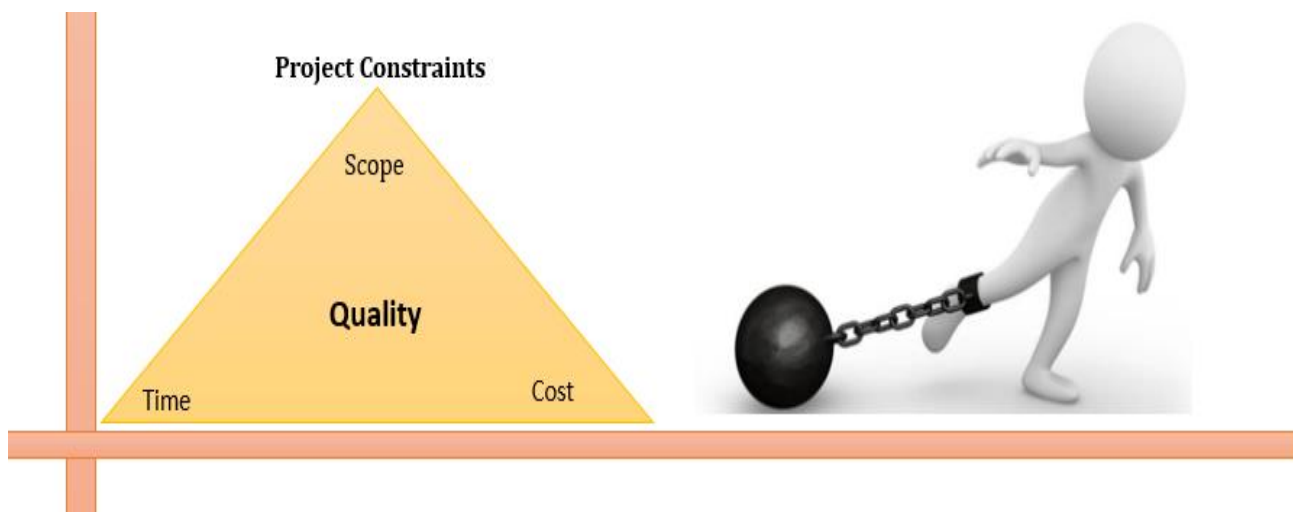
6.6 Risk Assessment : Risk is the potential for realization of unwanted, negative consequences from composes the entire conditions that affect or may affect the project, while risk assessment processes are measuring the magnitude of the potential consequences, and the probability that the consequences will occur, risk assessments can be qualitative or quantitative, depending on the nature of a risk and depending on method for evaluating the risk, risk assessment matrix is a tool that standardizes qualitative risk assessment and facilitates the categorization of risk from impacts to people, process, cost , and others , risk management is coordinated the activities to direct and control a project with regard to risk, Reference ISO 9001-2015,

6.7 Responsibility: It is concept of assigning roles to the people within the project, or assigning duties that a particular project team member is expected to do to complete the project. or providing guidance to the project team so that they can direct themselves to perform tasks that are necessary for the success of the project, responsibility shall be connected with providing the required resources to lead the project for success,

7. Project Constraints

Project constraints is the set of limitations and risks that stand in front of the project progress and that must be kept under control by the project management, need to be taken into account and addressed to ensure the project's ultimate success, the three primary constraints that project managers should be familiar with are time, scope and cost that are known as the triple constraints, or the project management triangle.

Each constraint is connected to the other two; so, for example, increasing the scope of the project will likely require more time and money, while speeding up the timeline for the project may cut costs, but also diminish the scope. However the following limitations and constraints explained with little details:
https://www.wrike.com/project-management-guide/faq/what-are-constraints-in-project-management/

▪ Time constraint: When it comes to the time constraint, proper scheduling is essential. According to the Project Management Body of Knowledge (PMBOK), the following steps should be taken for effective time management:

o Planning: It is the process of defining the project's goals including the resources and the process needed to achieve project goal
o Scheduling: It is the process of plotting out the realistic timeframe for completion of each phase of the project.
o Monitoring: It is the process of imposing controls on project operational processes including the contains time, scope and cost.

▪ Scope constraint: It is the process of defining the scope of the project to the stakeholder upfront, scope should be clearly

and regularly communicated to all stakeholders to ensure that scope creep is within the control of all activities include the customer change may have required, to keep the scope in check consider the following:

- o Provide clear documentation of the full project scope at the beginning of the project, including all requirements,
- o Communicate the scope clearly and frequently with stakeholders,
- o Set up a process for managing any changes expected and how change will be reviewed, approved, rejected, and, implemented,

▪ Cost constraint: A project's budget includes both fixed and variable costs, including materials, permits, labor and the financial impact of team members working on the project, see some ways to estimate the cost of a project:

- o Historical data: Looking at what similar projects cost in the recent past,
- o Resources: Estimating the rate of cost for goods and labor,
- o Parametric: Comparing historical data with updated, relevant variables,
- o Vendor bid: Averaging the total charge of several solid vendor bids,

Chapter (3)

Project Management Process

Getting to Yes - Excellent Project Management

Chapter (3)

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Project Management Process

Overview

A Project management process is an administrative practice of initiating, planning, executing, monitoring & controlling, and closing the work of a team to achieve specific goals at specific time within a set of constraints, these goals are based on the customers' contract, and market response (the twin demand & supply) .The objective of project management is to produce a complete project which complies with the customers' requirements, and to shape the customers' objectives, once the customers' objectives are clearly established they should influence all decisions made by other people involved in the project. The project management process requires a specific configuration that contains

https://www.inloox.com/project-management-glossary/project-management-process/

▪ Project charter	▪ Product realization
▪ Project plans	▪ project analysis assessment
▪ Project methods	▪ Project learning processes
▪ Project information exchange	▪ project objective, and
▪ Project controls	▪ Project documentation

1. Common Project Management Process Interactions

According to PMBOK® Guide 5th edition, Project Management Processes are the application of knowledge (skills + tools + techniques) to meet a project objective, a common project management is an integrative relation among **5** group processes , with about **47** sub-processes , common project management process interact together and:

https://www.gristprojectmanagement.us/strategic-planning/common-project-management-process-interactions.html

- ▪ No single method that is valid for a single process,
- ▪ Each project process aligns and connected with the other processes,
- ▪ The actions taken during one process may be affect other process,
- ▪ Integrative nature of group process requires monitoring & controlling,
- ▪ Mostly group process is discrete elements with well-defined interfaces
- ▪ Mostly group process is overlapping in many ways,
- ▪ Mostly group process is iterative during the project,
- ▪ Operating with clear dependencies and are typically perform in the same sequence on each project,

2.1 Initiation Process	2.2 Planning Process	2.3 Execution & Controlling Process	2.4 Monitoring + Controlling Process	2.5 Closing Process
Define project goals	Develop Project Management Plan	Direct and Manage Project Execution	Monitor and Control Project Work	Close Project or Phase
Define high level project deliverables	Collect Requirements	Perform Quality Assurance	Perform Integrated Change Control	Close Procurements
Define stakeholder	Define Scope	Acquire Project Team	Verify Scope + Control Scope	2
Define constraints and assumption	Create WBS	Develop Project Team	Control Schedule	
Define high level resources required	Define Activities + Sequence Activities	Manage Project Team	Control Costs	
Define initial budget	Estimate Activity Resources +Duration	Distribute Information	Perform Quality Control	
Create a project charter	Develop Schedule	Manage Stakeholder Expectations	Report Performance	
Obtain approval of project charter	Estimate Costs	Conduct Procurements	Monitor and Control Risks	
Develop Project Charter	Determine Budget	8	Administer Procurements	
Identify Stakeholders	Plan Quality		9	
10	Develop Human Resource Plan			
	Plan Communications			
	Plan Risk Management			
	Identify Risks			
	Perform Qualitative Risk Analysis			
	Perform Quantitative Risk Analysis			
	Plan Risk Responses			
	Plan Procurements 18			

In case the project is divided into phases, the process group interact within each phase and invoked to effectively drive the project completion in controlled manner, in multi-phase projects processes are repeated within each phase until the criteria for phase completion have been satisfied, in order to lead the project for success, the project team shall consider the following issues:

- ▪ Understanding the internal and external issues that may have impact on the project context
- ▪ Use a defined approach of processes to meet the project objectives
- ▪ Use a defined approach of communication and engagement with stakeholders to meet requirements

- Use a defined approach of strategic plan to meet stakeholder needs and expectations
- Use a defined approach of constraints that has impact on the project objective (cost + time + scope)

2. Project Management Process Group

Project Management Process Group acts on two main categories Knowledge Area + Process Group, these two categories are the backbone of the *PMBOK*® Guide 5th edition, every project manager will require to understand the two main categories in order lead the project for success , a project management process group refers to the idea of grouping or gathering or logical arrangement of all processes overall all phases of the project to the extent of achieving the project objectives, the integrative approach of the **5** process group referred to concepts that yields positive results to the project leaders who understands how the different process group interacts and overlaps within the project phases,

Project Management Process Group is a total of **5** specific project process that are composed of initiating + planning + executing + monitoring & controlling + the closing process. Project management process group has a clear dependencies and are typically perform in the same sequence on each project, they are independent on application, while individual process are often repeated prior to completing of the project, the constituent (the elements formulates the individual process) of each process can have interaction within each other, and can have interaction with the process group, total of project process groups consists of **5** processes , and these groups incorporate **47** sub-process logically grouped project management

2.1 Initiating Process

The Initiating phase is the 1st in the list of project management process group, the phase sets a firm foundation details on which the other 4 process are built. Initiation process is the first step translates the idea of a project, this phase is the very first phase step aims to define the project at a broad level, this phase will figure out whether the project is feasible enough to be undertaken or not , this phase is the very beginning to stakeholders carry out comprehensive research and testing to evaluate the practicality of a project, this helps in to understand the need for the project and what eventually organization is looking at in terms of benefits at the end of the project. Project Charter helps to set a vision for what is to accomplish a project. Initiating Process is crucial to lay down the groundwork for all futuristic activities, the following **10** processes are sought to identify the project requirement to achieve the project initiation:

SN	2.1 Initiation Process
1	Define project goals
2	Define high level project deliverables
3	Define stakeholder
4	Define constraints and assumption
5	Define high level resources required
6	Define initial budget
7	Create a project charter
8	Obtain approval of project charter
9	Develop Project Charter
10	Identify Stakeholders

2.2 Planning Process Group

The Planning phase is the 2nd in the list of project management process group, the phase sets a firm foundation details on which the other 3 process are built. Planning process helps to establish the baselines of project scope such as (cost + time + quality), these baselines are used to perform monitoring and controlling over process group, this is thinking ahead about the project, a project management shall outline the strategic tactics to successfully complete the project, and shall plan the project at an appropriate level of details, and shall develop the course of action required to attain those objectives, the following **18** processes are sought to identify the project requirement to achieve the project management plan:

SN	Planning Process
1	Develop Project Management Plan
2	Collect Requirements
3	Define Scope
4	Create WBS
5	Define Activities + Sequence Activities
6	Estimate Activity Resources +Duration
7	Develop Schedule
8	Estimate Costs
9	Determine Budget
10	Plan Quality
11	Develop Human Resource Plan
12	Plan Communications
13	Plan Risk Management
14	Identify Risks
15	Perform Qualitative Risk Analysis
16	Perform Quantitative Risk Analysis
17	Plan Risk Responses
18	Plan Procurements

2.3 Executing & Controlling Process

The Execution phase is the 3rd in the list of project management process group, the phase sets a firm foundation details on which the other 2 process are built. Executing process puts plan into action mode and makes things really implemented within the plan frame, project management shall also track the project plan to ensure the future execution of project plans stays in line with project objectives, the said objective means , the team starts doing the work of creating the deliverables while the project manager coordinates the resources needed to achieve the planed objectives, project team may be face some constraints such as conflict, change request, and other majeure conditions, the project shall overcome these constraints base on the plan change management, project management shall utilize the most project time and resources (utilization , maximization ,optimization) to get the best result, cost is usually the highest matter during the executing process, the following **8** processes are sought to identify the project requirement to get the project execution done:
https://pmhut.com/what-is-executing-process-group

SN	Execution & Controlling Process
1	Direct and Manage Project Execution
2	Perform Quality Assurance
3	Acquire Project Team
4	Develop Project Team
5	Manage Project Team
6	Distribute Information
7	Manage Stakeholder Expectations
8	Conduct Procurements

2.4 Monitoring and Controlling Process Group

The Monitoring and Controlling phase is the 4th in the list of project management process group, the phase sets a firm foundation details on which the other 3 process are built. Monitoring and Controlling phase puts all deliverables of a project under the eye bird of inspection, to the extent of verification and validation of the deliverables, cost is usually the

highest matter during the monitoring and controlling process, the following **9** processes are sought to identify the project requirement to get the deliverables verified and validated in execution & controlling process:

SN	Monitoring & Controlling Process Group
1	Monitor and Control Project Work
2	Perform Integrated Change Control
3	Verify Scope + Control Scope
4	Control Schedule
5	Control Costs
6	Perform Quality Control
7	Report Performance
8	Monitor and Control Risks
9	Administer Procurements

Execution & controlling process is to keep deliverables stay with magically success in the field of sound quality, this required to act on the following steps to get quality done:

▪ **Documentation controls**
o Review the Technical Data Sheet of the intermediate materials (TDS),
o Review the Technical Process Data Sheet of the intermediate materials (TPDS),
o Review the Material Specification Data Safety sheet (MSDS),
o Review the production Standards like the standards of (IEC),
o Review the Production Quality Assurance Plan (QAP),
o Review the control system (procedures, work instruction, safety instruction, calibration methods, and),
o Review the project tools & technique that are being used for measurements,
o Review the corrective and preventive mean that correct NC's or prevent progress,
o Keep in line with the management change techniques.

▪ **Process controls**
o Inspect the intermediate materials against materials specification,
o Examine the products that are in-process,
o Take the corrective or preventive action as necessary,
o Report the management change needed either in machine or process,

▪ **Testing and inspection controls**
o Sampling as international standard calls,
o Examine the products that are ready for customers,
o Release on satisfactory only,
o Records the results into your software,
o Separate the products which are Released, Hold, Rejected, and identify them by label,
o Address Non-Conformities (NC's) and deviations and record the result
o keep the team stay with magically success.

2.5 Closing Process

The Closing phase is the 4th in the list of project management process group, the phase sets a firm foundation details on which the other 4 process are built. Closing process group includes only one process, called close project or phase. Generally, the project charter will include project success criteria, project exit criteria and who will sign off the project, project exit criteria are the conditions that need to be met in order to close or cancel the project or phase, the project management plan defines how the project will be closed , and before closing the project, the project management plan has to be reviewed to ensure that all the planned work is completed, and the project is met its objectives, the following 2 processes are sought to identify the project requirement to get the close safely :

SN	Closing Process Group
1	Close Project or Phase
2	Close Procurements

The project or phase closure includes several steps to be ensured before closer;

- Scope: Ensure all deliverables are accepted by the customer,
- Cost: Ensure all costs are charged to the project + Close project accounts,
- Payment: Ensure all payment are charged to the customers + Close customers' accounts,
- Resources: Ensure all resources are closed (raw materials, equipment, vehicles, and),
- Procurement: Ensure all procurements are closed, no pending payback, no pending balances,
- Records: Update records and archive,
- Stakeholder: Measure stakeholder satisfaction
- Measurements: Cost valuation + schedules + resources vs. operation + benefits of the project + lessons learned+ update archives

3. Project Information Management System (PIMS)

Project Information Management System is a systematic process of creating, identifying, collecting, organizing, sharing, adapting, and using project information, this information may introduce to the stakeholders, sponsor, managers, worker or other interested parties to make informed decision, the project information is a strategic asset that must be managed with high rigor to impose controls on Fiscal& Human resources. A Project Management Information System is a set of interrelated components works together to collect, classify, store, and distribute the information to support decision-making. It is about how effectively a project manages the data, and how transforms data into information, and how that information eventually becomes knowledge, and when distribute and disseminate the right information to the right people at the right time. The project management information system is a technical issue and a management issues also, it is require planning and organizing the data and information cycle are both management tactical which independent from developing technological solutions.

3.1 Data is a discrete set of unorganized, scattered statements about reality, it is a raw fact, that a like to numbers, letters, words, brainstorming data, these facts can have documented in papers or DVD, pictures, TV, and,

3.2 Information is an organizes data, with a meaning and relevance, it is facts with context and perspective, and it is a collection of data that is collected and documented in the form of tables and template to become official documents and acquires the official capacity in the project for the purposes of review and take decisions, so it is considered as a historical reference over time, and valid for many purpose like litigation, payment, measurement, and,

3.3 Knowledge is a familiarity, awareness, or understanding of someone or something, subject, description, data, information ,skills, ,and, which acquired through learning, experience or education or by perceiving , discovering something , it can be more or less formal or systematic, the study of knowledge is called epistemology, Knowledge requires human interaction with information, information becomes knowledge when a person acts on it and makes it his own, conceptualizes it by placing it in relation to previous knowledge, and internalizes it by making it part of his beliefs.

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3.4 Wisdom: Wisdom is the ability to think and act rationally, by using knowledge, experience, understanding, common sense and insight. Wisdom is associated with features such as impartial judgment, sympathy, tolerance, lack of association, working in prevailing sound habits, leading knowledge to what is beneficial, right choice, and directing business toward success and prosperity.

4. Role of the Knowledge Area

According to PMBOK® 5th edition, The Project Management Institute (PMI) has published a guide to the PMBOK (Project Management Body of Knowledge. In the PMBOK, there is **47-project** management processes are further grouped into **10** separate Knowledge Areas. A Knowledge Area represents a complete set of concepts, terms, and activities that make up a professional area, these 10 knowledge areas are use in most projects most of the time, they are:

4.1   Project Integration Management   ➡ Described in chapter # (4)
- Develop Project Charter
- Develop Project Management Plan
- Direct and Manage Project Work
- Monitor and Control Project Work
- Perform Integrated Change Control
- Close Project or Phase

4.2   Project Scope Management   ➡ Described in chapter # (5)
- Plan Scope Management
- Collect Requirements
- Define Scope
- Create WBS
- Validate Scope
- Control Scope

4.3   Project Time Management   ➡ Described in chapter # (6)
- Plan Schedule Management
- Define Activities
- Sequence Activities
- Estimate Activity Resources
- Estimate Activity Duration
- Develop Schedule
- Control Schedule

4.4   Project Cost Management   ➡ Described in chapter # (7)
- Plan Cost Management
- Estimate Cost
- Determine Cost
- Control Cost

4.5   Project Quality Management   ➡ Described in chapter # (8)
- Plan Quality Management
- Perform Quality Assurance
- Control Quality

4.6   Project Human Resources Management   ➡ Described in chapter # (9)
- Plan Human Resources Management
- Acquire Project Team
- Develop Project Team
- Manage Project Team

4.7   Project Communications Management   ➡ Described in chapter # (10)
- Plan Communication Management

- Manage Communication
- Control Communication

4.8   Project Risk Management ➡ Described in chapter # (11)
- Plan Risk Management
- Identify Risk
- Perform Qualitative Risk Analysis
- Perform Quantitative Risk Analysis
- Plan Risk Respond
- Control Risk

4.9   Project Procurement Management ➡ Described in chapter # (12)
- Plan Procurement Management
- Conduct Procurement
- Control Procurement
- Close Procurement
- Project Stakeholder Management

4.10 Project Management Stakeholder ➡ Described in chapter # (13)
- Identify Stakeholders
- Manage stakeholder Engagement
- Plan stakeholder Management
- Control Stakeholders Engagement

5. Project Management Ecosystem

Projects are usually affected by internal and external environmental issues, as they operate under internal influences called the organization factors (people + tools+ process), and they operate under external influences called the world factors (political + economical + social + technological + environmental + lallation), all of them are integrated and have impact on the internal environment of the organization, projects usually operate within broader limits than the parties involved , analyzing these factors consider an inputs to the strategic planning to portfolio or program or project as intended , the factors detailed here under:
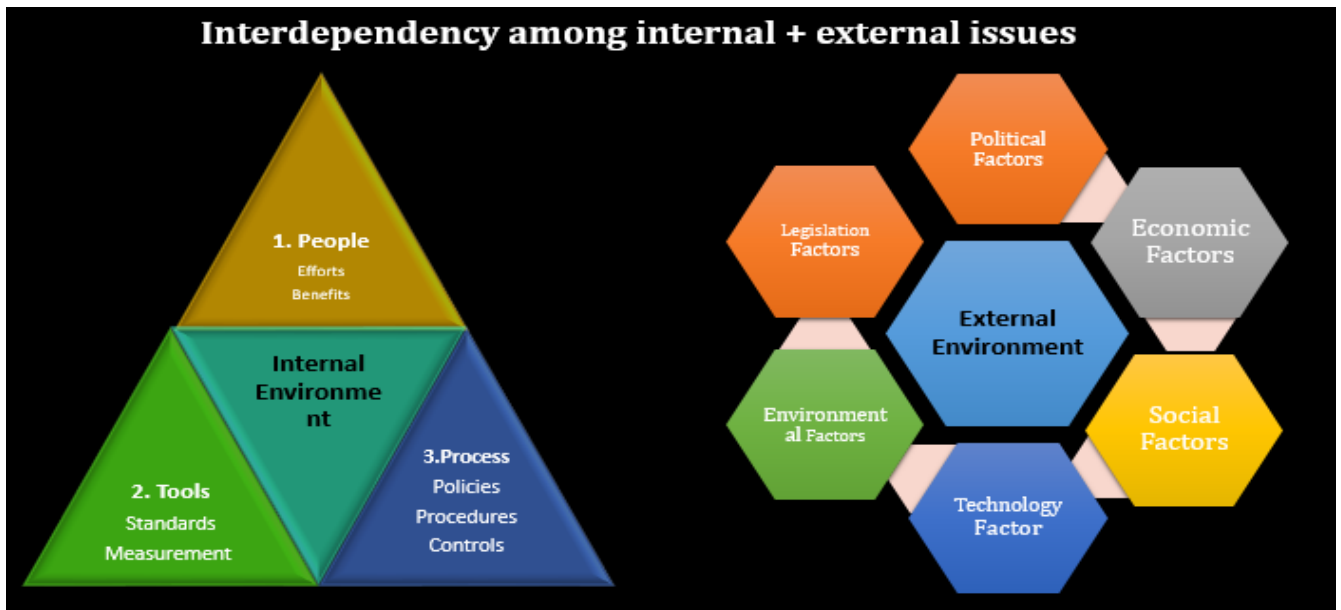
5.1 Internal Environment

- **People**: It is the set of skills and capabilities the people enjoy how manage the portfolio or program or project, the more skillful the people, the projects progress,

- **Process:** It is the set of policies and procedures and the roles and responsibilities required in managing development projects include government and donor regulations which heavily influence the project progress,

- **Tools:** It is the set of facilities such as operational facilities and testing facilities, inanition to supports provided by maintenance, and logistics, and procurements areas, the techniques and methodologies are also considered,

5.2 External Environment

- **Political Factors**: These external factors determine how the government intervenes in the economy , and how its policies have impact on investment in many filed such as industry, trade , constructions, government intervenes in the economy through its Tools (Fiscal & Monetary policy), described in chapter # (2),

- **Economic Factors:** These external factors determine how the Macro-economic have impact on the economy of any country, and how micro-economic have impact on the economy of a specific country, and how the impact will influence the international trade , which in turn directly impacts on the organization and its profitability, because these factors include economic growth , exchange rates, inflation rate, and interest rates, these factors greatly affect how businesses operate and make decisions, described in chapter # (2),

Interdependency among internal + external issues

- **Social Factors:** These internal and external factors determine how focus on the social environment and markets' behaviors and its trends and how to commence with competitors, this help projects to have further understanding of customers' needs and expectations, these factors reflect the cultural aspects and health consciousness, population growth rate, age distribution, career attitudes and emphasis on safety, described in chapter # (2),

- **Technological Factors:** These internal and external factors determine how technological progress and development that could affect the market of industries , trade, constructions, and others, these factors include technological aspects like research and development activity, automation, technology incentives and the rate of technological change could include changes in digital or mobile technology, and automation, described in chapter # (2),

- **Environmental Factors:** These internal and external factors determine how much impact the surrounding environment and, the impact of ecological aspects, with the rise in importance of Corporate Sustainability Responsibility (CSR), this element is becoming more important, environmental factors include ecological and environmental aspects such as weather, climate, and climate change, described in chapter # (2),

- **Legal Factors:** These factors determine how much the organization must understand what is legal and what allowed within their territories they operate in, they also must be aware of any change in legislation and how they impact the business , legal factors include discrimination law, trade law, antitrust law, employment law, health and safety law, and trade regulation and restrictions, and others, described in chapter # (2),

6. Strategic Planning

Strategic planning is an organizational management activity that is used to determine exactly where an organization is going over the next few years and how it's going to get there, Strategic planning is a coordinated and systematic endeavor undertaken to develop a course of step and a set of direction to enable the organization working in light of real factors that lead the organization to pass the constraints that may face the process groups, a rule of thumb is that if there's uncertainty on the horizon, then you need a strategic plan , generally , the following are the steps can be uses for preparing the strategic plan:

6.1 Identifying your Stakeholders' Register: A Stakeholder register is a project management document that identifies, assesses and classifies the stakeholders of the project, it is also a document that provides information used to plan by different ways on how to engage with the stakeholders, and how to communicate them,

6.2 Identifying your Sponsor: A sponsor is an individual, group, entity, organization, society, and, who owns the project, the sponsor is the reason for the project presence, but he doesn't manage the day-to-day operations of a project, he is above the project managers in the hierarchy structure, but he provides support to the project, and liable to assess the project success, a sponsor may acts as a CEO of the project only not as owner,

 6.3 Define your Funding Sources: It is the process of identifying the financial sources to finance as necessary, this term is used when a project implicated or raised the need for cash from its own internal reserves, and the term 'financing' is used when the need is raised from external or borrowed money,

6.4   Identify your Resources: Resources are the twin (Fiscal & Human) or the (land, labor, capital, management, entrepreneurs), in practical word the project shall identify it assets such as (raw materials, operating facilities testing facilities, team work, building vehicles. The following tips may help to identify the right resources for right operating:

- Identify your capital + funding technique,
- Identify what work is required and what you have,
- Identify the qualitative + qualitative raw materials at you own (Stores),
- Identify the qualitative + qualitative is required and what you have,
- Identify your operation needs (operating facilities + Testing facilities + Maintenance system + calibration+ Vehicles, and),
- Book your requirements,

6.4 Understanding your organization and its context: The organization is required to define the internal & external issues that can impact in a positive or negative manner on its performance including health and safety, this would include analyzing of **PESTEL** model. For example, when the company chooses its suppliers, they must understand how the supplier's activities can have an impact on their neighbors, the supplier is required to identify all relevant internal and external issues including the characteristics of the impacts, changes circumstances that can impact on health & safety, and then address these require further treatment, described in chapter # (2),

6.6 Understanding the needs & expectations interested parties: The organization is required to define the needs & expectations of the interested parties include the workers that have impact or potential impact on the organizational activities, some needs & expectations become mandatory if they have incorporated into laws and regulations of the competent authorities. For example, the exposure of workers to hazardous at a certain limit of time may accepted but if exceeded, then the company must take a necessary step to eliminate or control risks as required by the legal requirement. The compliances to the regulations is an integral part of the organization mission, so the project shall be associated with the causes & impacts or potential impacts on its activities, the organization must determine and understands issues on the table, after that the organization shall impose controls on the potential risks, and shall seek for the opportunities that suit to the project works. However, understanding the needs & expectations interested parties are listed in the following tables:

Internal Interested Parties	Their Needs	Their Expectations	OH&S
Board of Directors	Achieve the Vision	Expansion	Commitment to OH&S
Top Management	Achieve goals	creativity	Commitment to OH&S
Management Team	Achieve objectives	Promotion + Salary	Good Health Aspects
Workers	Good working situation	Promotion + Salary	Good Health Aspects
Unions	Good working situation	Improving situation	Improve OH&S
Contractors +Subcontractors	Continuity work	Long involvement	Avoid warm
Supplier	Continuity	Long involvement	Avoid warm of neighbors

External Interested Parties	Their Needs	Their Expectations	OH&S
Stockholders	Achieve profit	Expansion	Good work Environment
Legislation	Control	Commitment	Good work Environment
Regulations (Governmental Entities)	Control	Commitment	Good work Environment
Customers	Proposition value	Achieve Profit	Good work Environment
Community / Society	Environment + Support	Improving situation	Good work Environment
Media	Improve situation	Long involvement	Good work Environment
Special interested group(NGO'S)	Hunt Opportunity	Long involvement	Good work Environment

6.7 Understanding the legal requirement and other requirements:

- **Legal and other requirements shall be:**
- Documented,
- Easy to access
- Associated with activities,
- Associated with risks,

- o Reflect any change,
- o Continually improved,

- ▪ **Legal requirements act with the law with many entities like:**
- o Civil Defense,
- o Environmental Protection,
- o Health authorities,
- o Licenses & permits authorities,
- o Radiological Protection license,
- o Environment department,
- o Radiation protection,
- o Jordan Directives or Regulations,
- o Corporate Social Responsibility (CSR),

- ▪ **Other requirements shall act with**
- o Project policies,
- o Project charter,
- o Project protocols,
- o Committed to the scarcity,
- o Trade body guidance documents,
- o Contractual conditions,
- o Collective bargaining agreements,
- o Voluntary adherence to sector,
- o People involvement,

6.8 Understanding your communication technique: The organizational structure is a chart that defines the process flow, or communication channels within organizational activities, or forms the communication that occur within the organizations, communication impacts project management success to a great extent, an effective organizational communication enables project managers to communicate with all relevant stakeholders, vendors, NGO's, clients, workers, market, and enable to assist decision making. Electronic communications (including e-mail, social media, instant messaging, video and web conferencing would be used by stakeholders and project team members to communicate with the interested parties formally and informally, the types of communications are very critical to project success, described in chapter (2)

6.9   Defining your standardization: Standardization is a framework of agreements to which all relevant parties in an industry or organization must adhere to ensure that all processes associated with the creation product, services, or result, standardization measuring the performance within the limit of set guidelines that relative to the nature of industry or trades, or services,

6.10   Identifying your support: Support shall include staffing + satisfaction+ manning positions +Infrastructure + working conditions + monitoring and measuring resources + organizational knowledge+ competence of raw materials + competence products + awareness +   internal communication + external communication + formal communication + informal communication + communication inward + upward communication + technique + calibration + corrective + preventive maintenance, documented Information and ,

6.11   Understanding your market behavior : Market behavior is the process of studying market demand and supply, in order to respond to them, to study market behavior , you have to breakdown the market into homogeneous groups and as accurately as possible, in order to determine current and potential demand and supply on each location , the market demand is based on many factors such as need, want , willingness, and taste, analyzing these factors is a crucial issues in each location to enable the respondents to the demand , segmentation is to display at the moment of choosing, buying and using the goods for their intended purpose, there are many ways of behavioral segmentation as here under:
https://jgdb.com/business/marketing/types-of-marketing/what-is-behavioral-marketing

- ▪ According to the population density
- ▪ According to the purchasing power sites
- ▪ Depending on the density of purchase
- ▪ Depending on the needs of the regions

- According to the ease of provision
- According to the speed of sale

6.12 Understanding your potential competitors: Once a project teem knowing about their competitors they will able to communicate with their target audience, and they can distinguish their business , competitors learn each other's to enhance their deliverables quality and price , studying the competitors is a crucial issue , but it will more accessible in case of understanding the following points:

- **Understanding your competitors type**: Knowing your competitors type is the process of knowing the nature of act in the market and the way of manufacturing, and how he is processing his products, and how he influences the market, and base on what, you may find a direct or indirect competitors in your market that have the same business you are offerings in the market, so, getting the information on your competitors will help you to stand out above them , and you may find Indirect Competitors in your market who don't offer the same business you are offering, but they offering something else to meet the same need to the customer in an alternative way, so, you can learn from your competitors ,

- **Understanding competitors position in the market:** Knowing your competitors position is the process of knowing the strength and weakness of your competitors, the more you know about your competitor's positioning, the more you can differentiate your business from others, this will enable you to understand the base that make the competitors stand out over others, competitors may base on price, quality, retail sale, discount over a volume of sale, continuity of providing and so on

6.13 Understanding your responsibility toward government: Most projects have financial and technical obligations toward the government, and there are a lot of obligations, including:

- **Taxes:** Taxes are the major source of revenue for the Government, it is the responsibility of every business to pay a specific % in regular base as a taxes on sales to the state to support the governmental budget, moreover, it is the responsibility of every business to deduct a specific % in regular base as income taxes from employee salaries to the state to support the governmental budget,

- **Voluntary Programs**: Some projects may commit to implement voluntary programs with the government in order to support projects with societal responsibility, or something else,

- **Providing Information:** In developed countries, a high tier business leader should provide feedback information to the government on the decisions taken by the political leaders, because business leaders are having the knowledge and experience, they can place their feedback before political decision maker's act to modify or make change on based on facts,

- **Government Contracts:** Due to privatization of the economy in some countries, a number of government contracts are executed by private sector, it is the responsibility of the private sector to implement the projects according to required specifications and standards,

- **Providing Service to the Government:** In the developed countries, some businessmen are usually included in the advisory councils formed by governments, where they are appointed as members of the delegations, together with those who travel abroad to explore economic and trade issues of being professional and competent.

- **Contributions to Political Activities:** In the developed countries, some of influential businessmen participate in political activities through contributions to political parties, or through election, they may participate for securing legislation in favor of their business.

6.14 Understanding your scope: A Project Scope Management is a set of activities that work to ensure that a particular project includes all relevant and appropriate resources including tools & techniques to achieve the project's objectives, its primary aim to control what is and what is not involved in the project to accomplish and deliver a product, service, or result with the specified features and functions to the customers , scope refers to the detailed set of deliverables , these deliverables are derived from a project's requirements. Project Scope Management consists of 6 processes described in chapter # (5)

6.15 Understanding your charter: A Project Charter is a document describe the purpose of a project and its scope, it's legally authorize the beginning of the project, and it is the process of developing a document that formally authorizes the existence of a project, and provides the project manager with the authority to apply organizational

resources to project activities. The key benefit of this process is a well-defined project start and project boundaries, creation of a formal record of the project, and a direct way for senior management to formally accept and commit to the project. The inputs, tools and techniques, and outputs for this process are defined, described in chapter # (4)
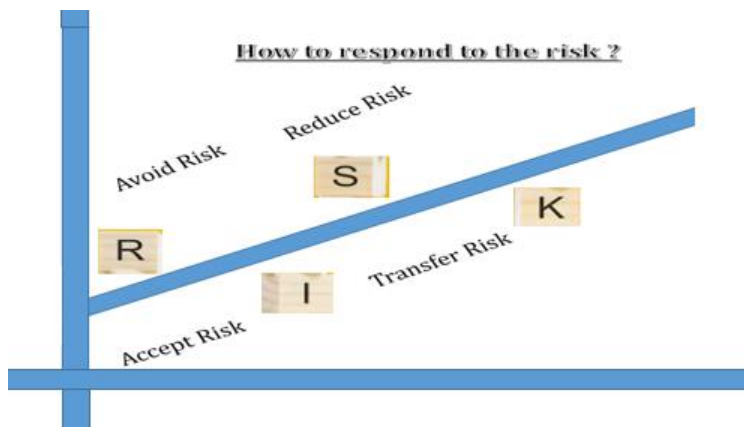
6.16   Understanding your budget: The planner shall know the funding source to understand the volume of fund he acts with, a company might raise new funds from the following sources such as loan stock + retained earnings + bank borrowing + bank borrowing + government sources + business expansion scheme funds + venture capital + franchising, and

6.17   Identifying your constraints: Project constraints is the set of limitations and risks that stand in front of the project progress and that must be kept under control by the project management, need to be taken into account and addressed to ensure the project's ultimate success, the three primary constraints that project managers should be familiar with are time, scope and cost that are known as the triple constraints, or the project management triangle.

Each constraint is connected to the other two; so, for example, increasing the scope of the project will likely require more time and money, while speeding up the timeline for the project may cut costs, but also diminish the scope, described in chapter # (2)
https://www.wrike.com/project-management-guide/faq/what-are-constraints-in-project-management/

6.18   Identifying potential risks: Risk is any uncertain event or condition that might affect a project, not all risks are negative. For example, finding easier way to do a job, or finding new lower prices in market, or change a project technology are may include risks, but they named an opportunity, but it's still handled just like a risk. Risks can be classified as a Negative Events considered as Risks (threat) with negative consequences, while Positive Events are considered as (opportunities) with positive consequences. Risks Types can create adverse consequences for the organization, and risk solutions can create positive consequences for the organization. Descried and detailed in chapter (11)
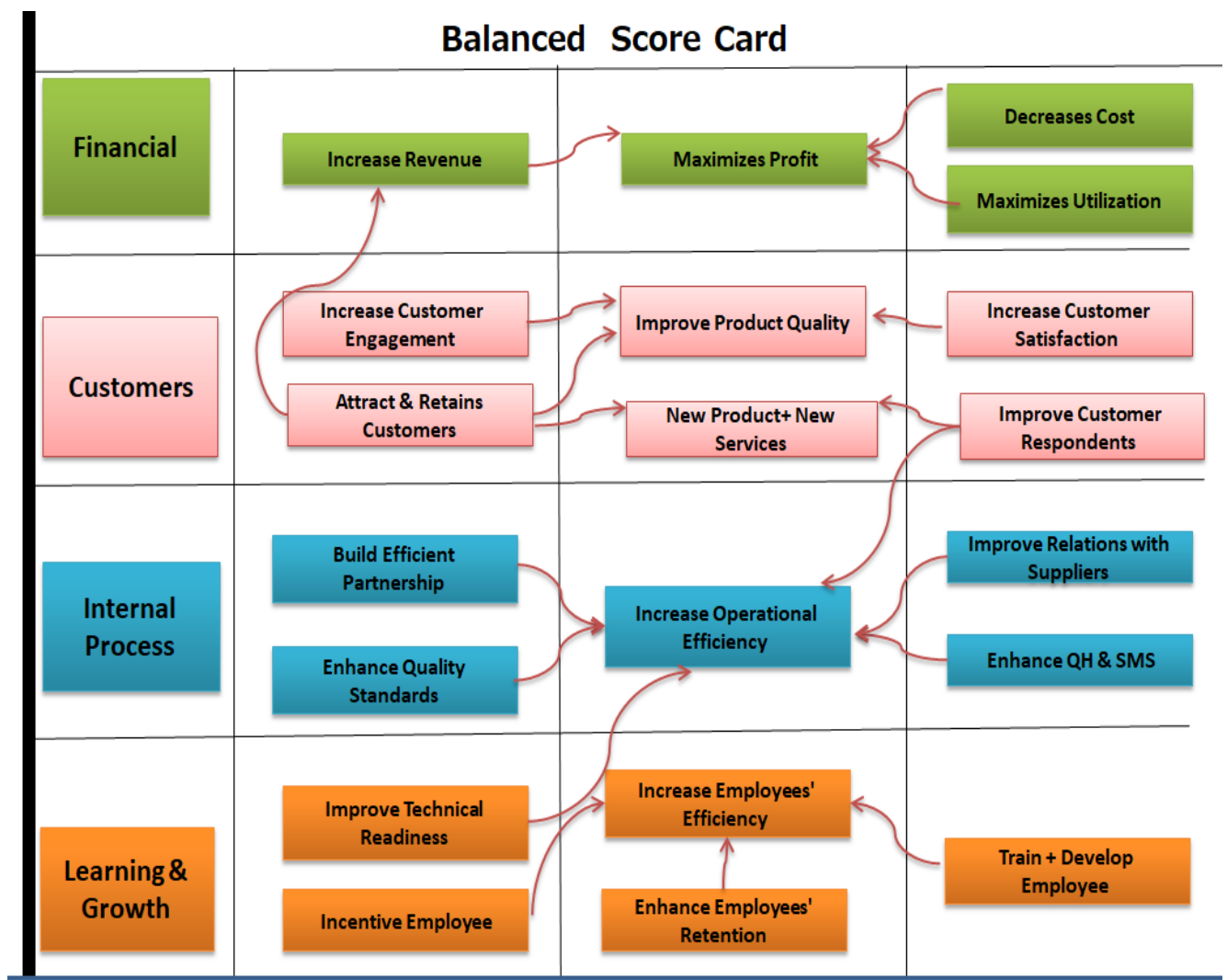

6.19 Perform SWOT Analysis:

SWOT analysis is a strategic planning system that organizations use to identify and improve various internal business functions and their resulting external outcomes. SWOT Model also is an acronym of Strengths & Weakness+ Opportunities & Threat that acts as a powerful tool during the strategic planning process. A SWOT analysis is often performed to help identify the strengths and weaknesses of a business, as well as identify any opportunities and threats that could arise, the said model can lead Time Management to the right direction at a project goals. *Weakness appears from within while threat comes from outer, and the Assumption: Goals are identified by the portfolio*

	Strength	Weakness	Act to
Internal	Availability of Strategic Plan	Lack of Experiences	
	Sufficient Resources	New Sales Team	Build on your strengths
	High operation Capacity	Lack of high capacity	Eliminate weaknesses
	Qualified Staff	No promotion	
	Opportunities	**Threats**	**Act to**
External	Expansion to Sought African Market	Competitors	
	Complying with Competitors	Government Legislation	
		Closed Boarders	Take advantage of available opportunities
		Out sourcing	Recognize potential threat
		High Energy Price	

6.20 Perform Balance Scorecard Analysis (BSC): A balanced scorecard is a strategic planning system that organizations use to identify and improve various internal business functions and their resulting external outcomes, and can achieve

- Communicate what they are trying to accomplish
- Align the day-to-day work that everyone is doing with strategy
- Prioritize projects, products, and services
- Measure and monitor progress towards strategic targets

Balanced Score Card

Explanation of Balance Score Card

Prospective	Strategic Objectives	CFS's	Initiatives	Action Plan	KPI's
Financial	❖ ↑ Net Profit	❖ ↑ Revenue ❖ ↑ Utilization ❖ ↓ Cost of Production	❖ Base on Profitable sales ❖ Cash Flow Rate ❖ Return to Investment ❖ ↓ Cost of process	❖ ↑Financial Analysis Ratios ❖ Show Results to Mgt.	❖ Profitability Ratio ❖ Liquidity Ratio ❖ Performance Ratio
Customers	❖ Retain old Customers ❖ Attract new Customers	❖ ↑ Customer Satisfaction ❖ ↑ Customer Loyalty ❖ New Products ❖ New Services ❖ Improve Products Quality ❖ Improve Responsiveness	❖ Newness ❖ Brands (GC+JC+JGC) ❖ Market Study ❖ ↑ Value Added ❖ Improve Information Technology	❖ ↑Relations with customers ❖ Known about changes ❖ Find the Expectations	❖ Customer Satisfaction ❖ Local Market Share ❖ Foreign Market Share ❖ Delivery Periods
Internal Process	❖ ↑ Operational Efficiency	❖ Build Efficient Partnership ❖ Improve Relation with Vendors ❖ Enhance Quality Standard ❖ Enhance Safety & Health Standard	❖ ↓ NCR's ❖ ↓ Downtime + Breakdown ❖ Process Control ❖ Improve work System ❖ ↓ Cost ❖ M/C Utilization ❖ Improve ITS ❖ Proposition Value	❖ Control RM. Arrivals ❖ Plan of Purchase ❖ Manufacturing Plan ❖ Waste Reduction ❖ Speed up Production ❖ Preventive MA	❖ M/C Utilization ❖ NCR Rate ❖ M/C Capacity ❖ Waste Rate
Leering & Growth	❖ Knowledge ❖ (People+ system+ Process)	❖ Improve Technical Readiness ❖ Incentivize People ❖ Enhance People Retention ❖ Train & Develop People	❖ Publicize Knowledge ❖ Improve Training ❖ Encourage Technology ❖ Attract Skillful staff	❖ Laser fiche ❖ New sessions / Courses ❖ People Suggestion ❖ Innovations ❖ Promote from within	❖ Marginal Productivity ❖ Turn Over ❖ Evaluation of People

Chapter (4)

Project Integration Management

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Project Integration Management

Project integration management is the coordination of all elements of a project including" tasks, resources, stakeholders, and any other project elements", in addition to managing conflicts between different aspects of a project, making trade-offs between competing requests and evaluating resources. Project integration management helps assessment of the project situation and decision making as an essential part of project integration management. Project integration management helps project to manage together not separately. Project integration is not only takes into account how the aspects of the project relate to each to others but also how other parts of the organization relate to the project. Projects are complex with many different parts that need to be managed. For example, a project management needs to oversee all of project elements such as; Schedule + Cost + Scope + Quality + Resources + Risks + Changes + Stakeholders, and,
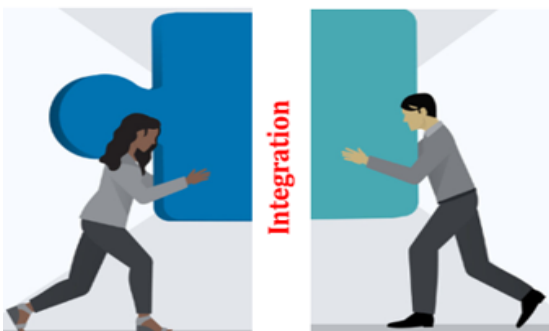
Project Integration Management is necessary in situations where individual processes interact to achieve the desired project, and the project management needs to address each process, and the project environment acquires to determine the level of implementation for each process of the project. The integrative nature of the projects can be understood by thinking of other types of activities performed while completing a project, for example some activities performed by the project management team may need to develop, review and analyze something like:

https://www.wrike.com/project-management-guide/faq/what-is-project-integration-management/

- A wide scope of the project,
- A wide scope of the deliverables,
- Further assumptions, constraints,
- The factors influence the project progress,
- The qualitative and quantitative of resources,
- The Enterprise Environmental Factors (EEF),
- The Organizational Process Assets (OPA),
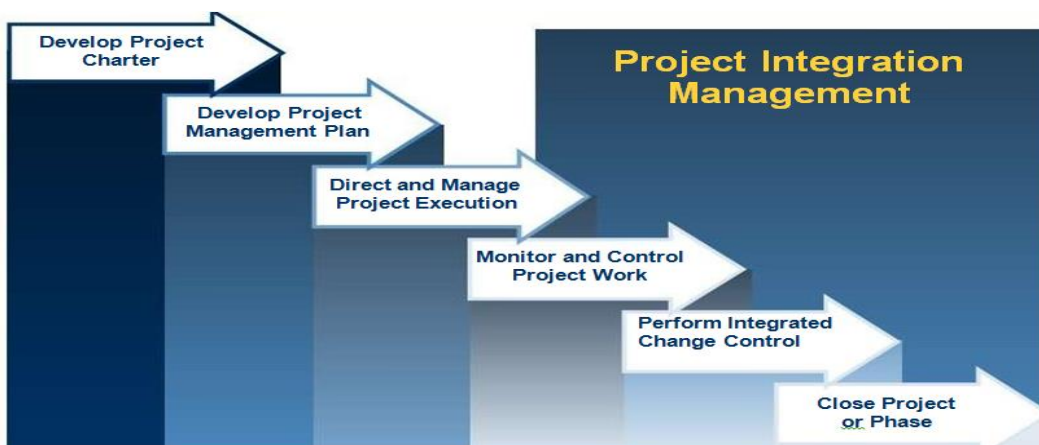
The project integration management includes defining the processes, activities and controls for merging, unifying and coordinating the various processes and project activities within the project life cycle. The project integration management also includes standardizing what is possible in the process and integrating what is possible and simplifying what is possible in the process, in addition to strong communication, and complementary incentive measures that Essential to controlling project implementation to the extent that the group process is completed, the said collaboration will lead to successful stakeholder expectations management. The Project Integration Department includes 6 processes:

1. Develop Project Charter Process

A Project Charter is a document describe the purpose of a project existence, and determine a project scope, it's legally authorize the beginning of the project, and it is the process of developing a document that formally authorizes the existence of a project, and provides the project manager with the authority to apply the resources to the project activities. The key benefit of this process is a well-defined project start and project boundaries, creation of a formal record of the project, and a direct way for senior management to formally accept and commit to the project. The inputs, tools and techniques,

1.1 Inputs

1.1.1 Project Statement of Work (SOW)

A statement of work is a document employed in the field of project management with narrative description of deliverables and timelines for a vendor providing deliverables to the customers, it is a formal document and must be agreed upon by all parties involved. The SOW must contain an appropriate level of detail so all parties clearly understand what work is required, the duration of the work involved, what the deliverables are, and how is acceptable. This part should provide a general description of the project as well as highlight the project's background and what is to be gained by the project. SOW often accompanies a request for proposal (RFP). SOW shall provide background is necessary for bidding vendors. SOW is usually created as a part of a contract, Project managers should pay enough attention to make SOW clear to all stakeholders to avoid disputes in on deliverables, budgets, or timelines. SOW should include the following baselines:

▪ **Scope of Work**: This part should provide a brief narrative statement of what you expect to achieved as a result of this scope of work, scope shall determine the deliverables and tasks will work to achieve the deliverables, this part shall highlight what is and is not included in the scope of the project,

▪ **Period of Performance:** This part should specify the time frame that is required to implement the project or the contract in advance, based on the end date to comply with some external requirements such as new government regulations, it is important to determine the performance period from start to end that contributes to determining the cost of the project. In case of a project can't e complete during the specified period, it may be necessary to amend the contract which increases the project costs on the manufacture, this called scope creep,

▪ **Place of Performance:** This part should describe where the work will be performed by the manufactures or contractors, as some of industrial work may need the implementation to be in customer site, this is actually depending on the nature of industry or work being performed, it is important to define the place of performance, and shall be contractually agreed,

▪ **Work Requirements:** This part should include a description of the actual tasks which the project will require. This should include what tasks need to be completed in order for successful completion of this project or the contract, including the process and resources, every effort should be made to include as much detail as possible to close any gap that could occur within implementation of the contract,

▪ **Schedule and Milestones:** This part should define the time frame of deliverables and milestones for this project, it is important that all milestones of tasks, and schedule information are as accurate as possible since vendors or manufactures will need to consider these elements in their proposals,

▪ **Acceptance Criteria:** This part should define how the customer will accept the deliverables resulting from this SOW, the acceptance of deliverables must be clearly defined and understood by all parties, this part should include a description of how both parties will know when the work is acceptable, how it will be accepted, and who is authorized to accept and validated by the customer,

▪ **Other requirements:** This part should define any special requirements, such as what the action in case of majeure conditions raised, and what the bout the insurance on delivery, what are the external test needed, and what are payment conditions, and the most TTD, what are the exclusion,

1.1.2 Business Case

A Business Case is a formal or verbal document or presentation contains the reasons for initiating a task or a project as a case, the case shall be structured and shall have a strong presence, in short it should contain (pros & cons) details on costs, risks assessment, market behavior, and it should include what actions to be taken as well as their timescales, the best business case that one have convincing conclusion, and should also warn of what might happen if nobody takes the necessary actions. It is more likely to convince management to agree with him if he makes a good case, it is easier to make a good Business Case for short run actions than long run, as a short run actions lead to immediate, measurable, and considerable benefit, while to convince people to agree to long run projects is much more difficult because the long- run proposal undermines the bottom line, the task may be near impossible, in this context, bottom line is the profits.
https://marketbusinessnews.com/financial-glossary/business-case/

Example on Business Case of a certain Company

Define the Problem	Define the alternative Solutions	Define the preferred solution	Define the approach
Hard Competition	check another location Enhance your quality Reduce your Prices	Enhance your quality	Increase in process test and final test ratio,
High Emery Cost	Use another type of Energy Stop machine on peak period Produce on orders only	Use another type of Energy	Use the lower price Energy
Difficult outsourcing	Seek for new vendors Seek for material replacement Reduce your waste	Seek for material replacement	Diversity of vendors
Closed Borders (Pandemics Disease	Maintain your local market Keep on touch with competent authority Contact your new agent may have power	Keep on touch with competent authority	Ride winner + Sell loser

Business case is the heart of any project as it outlines the justification for undertaking the project, the investment required not just money, but time and effort, thus, the key question a Business Case must answer if the project is worth or not, then the purpose of a Business Case is to measure the costs for undertaking the project against the expected benefits of the project once completed.

▪ **Business case must include why the project is founded by using he following justifications:**
o What is the strategic need for the project?
o What risks that could affect the business case?
o What is the best option before considering doing course of action?
o What is the project estimated to cost and how will this be funded?
o What are the benefits will the project receive once this project is complete?
o What is the expected return on investment based on cost and benefits analysis?

▪ **The business case and example justifies the initiation of a project:**
o Market demand: A project is authorized to build more fuel-efficient cars in response to gasoline shortages
o Business need: A project may combine and streamline processes to reduce costs due to high overhead costs
o Customer request: A project is authorized to build a new substation to serve a new industrial park
o Technology: A project is authorized to develop electronic tickets instead of papers due to new technology
o Legal requirement: A project is authorized to establish guidelines for handling toxic materials
o Social need: A project is authorized to develop water networks to transport water to remote areas,

o Ecological impacts: A project is authorized to make nuclear waste cemeteries

1.1.3 Contract

A contract is a legally binding agreement that recognizes and governs the rights and duties of the parties to the agreement. A contract is legally enforceable because it meets the requirements and approval of the law. An agreement typically involves the exchange of goods, services, money, or promises of any of those.
http://www.businessdictionary.com/definition/contract.html

- Contracts with Workers
- Contracts with External Experts
- Contracts with Insurance Companies
- Contracts with ISO Certification
- Contracts with Customers
- Contracts with Suppliers
- Contracts with Manufacturers
- Contracts with 3rd Party Inspection
- Contracts with Maintenance Offices
- Contracts with Security &Protection Entities
- Contracts with Consulting Offices
- Contracts with Construction and Excavation Offices
- Contracts with Legal Law Offices
- Contracts with Chartered Accountant Offices
- Contracts with Shipping and transport offices
- Contracts with General Services Offices
- Lease and Rental Contracts

1.1.4 Enterprise environmental Factors (EEF)
Described in chapter (2) clauses # 4.1
Described in chapter (4) clauses # 1.1.4 + 2.1.3+ 3.1.3 + 4.1.3+5.1.4

1.1.5 Organizational Process Assets (OPA)
Described in chapter (2) clauses # 4.2
Described in chapter (4) clauses # 1.1.5 + 2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.3

1.2   Tools & Techniques

1.2.1 Expert Value Judgment

Expert Value Judgment is a technique in which judgment is provided based upon a specific set of criteria and expertise that has been acquired in a specific knowledge area such as application area, or production area, a particular discipline, an industry, trade, supply, and, these expertise may be provided by any group or person or entity , with specialized education, knowledge, skill, experience, or training, this knowledge base can be provided by a member of the project team, or multiple members of the project team, or by team leaders, expert value judgment requires an expertise that is not present within the project team and, as such, it is common for an external group or person with a specific .Expert value judgment is often used to assess the inputs used to develop the project charter. Expert value judgment is applied to all technical and management details during this process, such expertise is provided by any group or individual with specialized knowledge or training and is available from many sources, including:
https://translate.google.com/#view=home&op=translate&sl=en&tl=ar&text=Expert%20value%20Judgment

- Sponsors
- Consultants
- Stakeholders
- Customers
- Supplier
- Technical associations
- Professional associations
- Training associations
- Industry groups
- Subject matter experts (SME)
- Project management office (PMO)
- Workers
- Media,

Expert Judgment: It is a very common input from individuals or groups specialized knowledge or training in:

- Business analysis: They know how to drill down for business analysis
- Requirements deriving: They can elucidate the implied needs from the customer, as well as the stated needs
- Requirements analysis: They can make sense of what they uncover

- Requirements documentation: They can record the list of requirements
- Diagramming techniques: They can present the information in a meaningful way
- Facilitation: They can assist stakeholders and the team to work together efficiently, and
- Conflict management : They can help prevent the stakeholders fighting over requirements.
- Requirement of similar: They can get requirements from other similar project

1.3   Outputs

1.3.1   Project Charter

Project Charter is the result (output) comes from project SOW+ Business Case + Contract + EEF +OPA. It is a statement of objectives in a project, includes setting project goals, roles and responsibilities, identifying stakeholders is used to provide the project framework required to plan the scope management process. The project charter provides the high-level project description and product characteristics from the project statement of work, in short it is the document issued by the project initiator or sponsor that formally authorizes the existence of a project and provides the project manager with the authority to apply organizational resources to project activities. It documents the business needs, assumptions, constraints, the understanding of the customer's needs and high-level requirements, and the new product, service, or result, project charter outputs are, but not limited to:

https://www.invensislearning.com/resources/pmp/how-to-create-a-scope-management-plan

- Justifies the project existence,
- Identifies the project purpose
- Measure the project goals and objectives,
- Determine the high-level requirements,
- Defines the project high-level description
- Defines the products high –level description
- Identifies the high –level budget,
- Defines and assess the high-level risks,

- Sets the assumptions,
- Defines the constraints,
- Defines the milestone and schedule (project success)
- Defines the stakeholder list,
- Authorize a project start
- Defines the requirements,
- Assigned project manager authority,

In short a Project Charter is a process of defining, preparing, and coordinating all subsidiary plans and integrating them into a comprehensive project management plan. The project's integrated baselines and subsidiary plans may be included within the project management plan.

2. Develop Project Management Plan Process

The Project Management Plan is a document formally approved and used to manage project execution, its provide a comprehensive framework of what has to be achieved through the execution of the project process, and to measure and report the project performance, It allows organizations to be _proactive rather than reactive,_ project management plan allows organization to foresee its future and to prepare accordingly, organization can proactive rather than merely reacting to situations as they arise. Being proactive allows organizations to keep up with the ever-changing trends in the market and always stay one step ahead of the competition, it sets up a sense of direction as the plan helps to define the direction in which an organization must travel, and aids in establishing realistic objectives and goals that are in line with the vision and mission charted out for it. The PMP should be used as a reference for any decision that is made on the project and for clarification of unclear areas actions required to define, prepare, integrate and coordinate the various planning activities.

2.1 Inputs

2.1.1 Project charter
Described in chapter (4) clause # 1.3.1+ 2.1.1

2.1.2 Outputs from other Processes
Output from other process is refers to the process of imitation and planning inputs which are:

- Defies the project management process to be followed,
- Serves as a baseline for project execution and control,
- Documents assumptions, constraints, and decisions,
- Aids in communication between stakeholders,
- Define project reviews,
- Define how changes will be managed,
- Describe how performance measurement baseline will be maintained,
- Defines phases in the project life cycle,

2.1.3 Enterprise environmental Factors (EEF)
Described in chapter (2) clauses # 4.1
Described in chapter (4) clauses # 1.1.4 + 2.1.3+ 3.1.3 + 4.1.3+5.1.4

2.1.4 Organizational Process Assets (OPA)
Described in chapter (2) clauses # 4.2
Described in chapter (4) clauses # 1.1.5 + 2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.3

2.2 Tools & Techniques

2.2.1 Expert Value Judgment
Described in chapter (4) clause # 1.2.1 +2.2.1 + 3.2.1+ 4.2.1 +5.2.1+6.2.1

2.3 Outputs

2.3.1 Project Management Plan

The Project Management Plan is a document formally approved, is used to manage project execution of a project, it contains necessary documents to define, prepare, integrate and coordinate the various planning activities. The inputs of project management plan is Project Charter+ Outputs from other planning process + Enterprise environmental factors + organizational process assets.

Project Management Plan	Project Documents	
Change management plan	Activity attributes	Project staff assignments
Communications management plan	Activity cost estimates	Project statement of work
Configuration management plan	Activity duration estimates	Quality checklists
Cost baseline	Activity list	Quality control measurements
Cost management plan	Activity resource requirements	Quality metrics
Human resource management plan	Agreements	Requirements documentation
Process improvement plan	Basis of estimates	Requirements traceability matrix
Procurement management plan	Change log	Resource breakdown structure
Scope baseline is the approved version of a • Project scope statement • WBS + • WBS dictionary	Change requests	Resource calendars
Quality management plan	• Cost forecast • Schedule forecast	Risk register
Requirements management plan	Issue log	Schedule data
Risk management plan	Milestone list	Seller proposals
Schedule baseline	Procurement documents	Source selection criteria
Schedule management plan	Procurement statement of work	Stakeholder register
Scope management plan	Project calendars	Team performance assessments
Stakeholder management plan	Project charter Project funding requirements Project schedule Project schedule network diagrams	Work performance data Work performance information Work performance reports
Source: A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Fifth Edition		

Getting to Yes - Excellent Project Management

 The subsidiary plans that are listed under the project management plan are used to create the scope management plan and will influence the approach taken for planning and managing project scope. The project management plan works as a baseline that describes the importance of creating a scope management plan for a project.

- Scope baseline: scope baseline quall Scope Statement + WBS + WBS Dictionary, its determine if a change required
- Scope management plan: Describe how the project scope will be controlled.
- Change management plan: Defines the process for managing change on the project.
- Configuration management plan: Defines those items that are configurable and require formal change and control,
- Requirements management plan: Describes how the project requirements will be analyzed, documented, and managed.

The main purpose of such a document are to provide a comprehensive framework of what has to be achieved, on execution of the project, and what procedures to be used, and which methods to measure and report the project performance, and also as to how the information will be communicated, a project management plan is the document that describes how the project will be executed, monitored, and controlled. _It integrates and consolidates all of the subsidiary plans and baselines from the planning processes_. Project baselines contains the most functions of operations in the project. Any deviation will require change request that may affect the configuration of management plan , these component are :

- Integration management plan
- Scope management plan
- Time management plan
- Cost management plan
- Quality management plan

- Human resources management plan
- Communication management plan
- Risk management plan
- Procurement management plan
- Stakeholder management plan

Management
Charter
Organizational Structure
Responsibilities & Authorities
Team Performance Assessments
Milestone List
Stakeholder Analysis
Stakeholder Management Strategy
Stakeholder Register
Stakeholder Requirements
Responsibility Assignment matrix
Duration Estimates

Operations
Statement of Work
Source Selection Criteria
Activity List
Resource Breakdown Structure
Resource Calendars
Resource Requirements
Work Performance Information
Work Performance Measurements
Performance Reports
Forecasts
Proposals

Vendors
Vendors Approved List
Vendors Evaluation
Vendors Development
Vendors List

Records & Logs
Assumption log
Change Log
Risk Register
Certification of Products

Customers
Customers Satisfaction
Customers Behavior
Customers Development
Customers List
Potential Customers

Performance Measures
KPI's
Least squares
Regression
6 Sigma
Discounted Cash Flow

Finance
Funding Requirements
Budgeting
Valuation of Product

Quality Control
Quality Control Measurements
In process Test + Final Test
Requirements Traceability Matrix

Procurement
Procurement Contracts
Procurement Documents
Procurement Evaluation

Policies
Fiscal
Human Resources
Risk Assessment

3. Direct and Manage Project Work Process

Direct and Manage Project Work is the process of leading and performing the work defined in the project management plan and implementing approved changes to achieve the project's objectives. The key benefit of this process is to provide overall management of the project work. Direct and Manage Project Work Process includes the integration part of executing process group which are varied process group from project to anther .The main purpose of the direct and manage project work process is coordinating these activities and processes to produce project outputs as planned. Direct and Manage Project Work process involves managing people, doing the work and implementing approved changes. Project management plan activities are performed during executing phase and this is mainly ensured with the help of Direct and Manage Project work process. If there are variances from the planned values in the actual results, change requests might be raised. If these requests are approved, they are implemented with the help of direct and manage project work process.

https://blog.masterofproject.com/direct-and-manage-project-work-process/

3.1 Inputs

3.1.1 Project Management Plan
Described in chapter # (4) clause 2.3.1 +3.1.1 + 4.1.1 + 5.1.1 +6.1.1

3.1.2 Approved Change Requests

A change request is a proposal to alter a product, services, or result, change often come from client, or by team member during processing, this can happen when a client wants to change or alter the agreed upon deliverables, change requests can also be initiated internally, and can include things like changing or upgrading software, product, tender, or something else. Generally, change request is initiated inside the scope, and outside the scope of the project, change requests that are inside the scope involve small corrections to an existing requirement, but they usually have minimal impact on the budget or the rest of the team, while the change requests that are outside the scope take a considerable amount of time to implement and have more sizeable impact on the budget.
https://tallyfy.com/change-request/

Change request is often inevitable and should be expected at some point in any project, and when the entire team is up-to-date on the change request it can be dealt with in an appropriate and timely manner, it is the change requests that are not approved or not communicated to the other team members that ultimately cause a problem. Approved change requests review is part of change control , all requests to change within a particular project is evaluated for approval. Change is happing because of rejection or adjournment, change request always happen, and it is important that the changes affect the project positively, Approved change request is a type of change request that is processed through integrated work change planning and initiating processes usually do not raise any change requests, generally, change request comes from the Execution and Monitoring processes, and then a project is performing integrated change control due to:

▪ **Organizational Change Management:** It is the practice of organizational management changes due to the diversity of workers in in terms of age, gender, ethnicity, race ,religion, such change may acquire the organization to mergers + acquisitions + restructuring based on the people culture to make socializing factor among them is acceptable , the strategy is to convert the resistance into positive outcomes to establish a culture that embraces change, phases of change will be ranged from restructuring of people , or repositions of people , or reallocating them,

▪ **Conditional Change Management:** It is the practice of organizational management changes due to reasons, such as new opportunity appears in the demand, new expansion in product is required urgently by the customers, external events related to competition, external events related to government regulations, errors or omissions discovered in the plan, new risk appear threat the plan, Stakeholders need, majeure condition like conflict or natural disaster, and

▪ **Program Change Management:** It is the practice of project management changes due to the conditions change, such as fluctuation in Market Behavior, Exchange Rate, Economic Depression, Economic Recession, Economic Recovery, Change in Demand, Change in Supply, interstate Change, Force Majeure, these reason my acquire the Control Board (CCB), to change the direction of program to cope with the needs of the markets and to fast respond to changes,

▪ **Project Change Control Management:** It is the practice of project management changes due to operational condition such as new technology on operation facilities, new technology on testing facilities, new tools and techniques acquire change, knowledge area acquire to change the process, new design is better than applied design, Imperfection in intermediate materials acquire change, urgent maintenance,

▪ **Work Change Management:** It is the practice of project management changes due to departments and teams that are faced with an environment of constant change often develop their own change management practices, the focus of departmental change management may be to improve the success rate of changes and prioritize change to match the budget and resource constraints, or to make disposition on new change and reviewing all changes requests results and lead them for correction.

3.1.3 Enterprise environmental Factors (EEF)
Described in chapter # (2) clause 4.1
Described in chapter # (4) clause 11.1.4 + 2.1.3+ 3.1.3 + 4.1.3+5.1.4

3.1.4 Organizational Process Assets (OPA)

Described in chapter (2) clause 4.2

Described in chapter # (4) clause 1.1.5 + 2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.3

3.2 Tools & Techniques

3.2.1 Expert Value Judgment

Described in chapter # (4) Clause 1.2.1 +2.2.1 + 3.2.1+ 4.2.1 +5.2.1+6.2.1

3.2.2 Project Management Information System (PMIS)

According to The PMBOK® Guide – 5th editions, a Project Management Information system consisting the tools and techniques used to gather and to integrate, and to disseminate the outputs of project management processes. It is used to support all aspects of the project from initiating up to closing, and can include both manual and automated systems. A (PMIS) can be a framework to guide the progress of a project and help to increase its success rate, (PMIS) brings accurate and relevant information to management within the required time frame, and helps to speed up the decision-making process and any action necessary to ensure that the project is on track in terms of time, budget and objectives. Functions of Project Management Information System include:

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

Example

Milestones Achieved	Inbound ing Data	Out bounding Data	Statis tical Recor ds	Analyzing Cost & Benefits	Rating Calculation	Estimation of PESTEL	Effectiveness Metric	Efficiency Metric	Capacity Metric	Productivity Metric:	Quality Metric	Waste Volume Rating
Project Integration Project management	X	X	X	X	X	X	X	X	X	X	X	X
Project scope Project management	X	X	X	X	X	X	X	X	X	X	X	X
Project Time Project management	X	X	X	X	X	X	X	X	X	X	X	X
Project Cost Project management	X	X	X	X	X	X	X	X	X	X	X	X
Project Quality Project management	X	X	X	X	X	X	X	X	X	X	X	X
Project Human resources Project management	X	X	X	X	X	X	X	X	X	X	X	X
Project Communication Project management	X	X	X	X	X	X	X	X	X	X	X	X
Project risk Project management	X	X	X	X	X	X	X	X	X	X	X	X
Project Procurement Project management	X	X	X	X	X	X	X	X	X	X	X	X
Project Social responsibility	X	X	X	X	X	X	X	X	X	X	X	X

3.3 Outputs

3.3.1 Deliverables

Deliverables are any unique and verifiable product, service result provided to the customer with a specific standards, deliverables are typically tangible, and have a performance

value, deliverables shall be accepted by the customers before delivering , providing the deliverables shall attain the acceptable shall meet the customers' needs and expectations. Generally, deliverables are subjected to in-process testing and final testing based on standardization customized to the deliverables nature, each product or service or result have its own way for testing and standards. However, it should be also clear the different between Validation of deliverable & Verified deliverable, the answer comes in Project Management Body of Knowledge (PMBOK® Guide) fifth edition 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
Design drawings
Proposals
Project reports
Building permits
building, a road section, a bridge

Engineering projects
Design drawings (electrical, mechanical)
Product prototypes
Finished product – a machine, a car
Product manual
Quality check reports
Progress reports

IT projects
Requirement specification (document)
User interface
Backend development
Set up of Test system
Set up of Live system
Data migration
User training

3.3.2 Work Performance Information

The project work includes collecting routine information related to the project activities including administrative, financial, and operational and others events, the said information is in-bounded into the software system to be retrieved in a form of horizontal and vertical reports in a systematic and organized manner that can be classified and analyzed as needed. This information is very much important in planning, executions, monitoring, controlling, and closing of a project . The repots retrieved from the software is named Data. A Project Management Information System is a set of interrelated components works together to collect, classify, store, and distribute the information to support decision-making. It is about how effectively a project manages the data, and how transforms data into information, and how that information eventually becomes knowledge, and when distribute and disseminate the right information to the right people at the right time. The project management information system is a technical issue and a management issues also, it is require planning and organizing the data and information cycle are both management tactical which independent from developing technological solutions.

3.3.3 Change Requests

A change request is a formal proposal to modify any document, deliverable, or baseline. The approved change request will replace the associated documents, deliverables, or baselines, and may be result in an update to other parts of the project management plan, when issues found while project work is performed, change requests are submitted to modify project policies or procedures, project scope, project cost or budget, project schedule, or project quality. Other change requests cover the need for preventive or corrective actions to manage negative impact later in the project, change request can be direct or indirect, externally or internally initiated, and can be optional or legally, or contractually mandated, change request is implemented and recorded as necessary for reference,

When the project determines the need for change, the change shall be carried out in a planned and systematic manner, and the purpose of the change and any of its potential consequences shall be considered, the integrity on change shall be discussed for all concern people, and the availability of resources shall be on mind, in addition to

the clear allocation or reallocation of responsibilities and authorities. Change may require:

- Corrective Action: It is used to eliminate the cause of a nonconformity and to prevent recurrence,
- Preventive Action: It is used to prevent occurrence of a nonconformity,
- Defect Repair: It is applying to modify a nonconforming on product or services, or result,
- Updates: It is reflecting the modified or additional ideas or content to the projects activates,
- Recording facts.

3.3.4 Project Management Plan Updates

As above in clause # 2.3.1 of this chapter, a Project Management Plan is a document formally approved, is used to manage project execution of a project, it contains necessary documents to define, prepare, integrate and coordinate the various planning activities. The input of project management plan is <u>Project Charter+ Outputs from other planning process + Enterprise environmental factors + organizational process assets.</u> The subsidiary plans that are listed under the project management plan are used to create the scope management plan and will influence the approach taken for planning and managing project scope. The project management plan works as a baseline that describes the importance of creating a scope management plan for a project. Update may be including:

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

3.3.5 Project Documents Updates

Project documents update is the process of modifying a project documents based on new fact, or based on new necessity, many outputs are specified, but sometimes it may be necessary to update other project documents, the measure documents a project shall keep are mostly 10 documents , that are:

- Business Case,
- Project Charter,
- Project Management Plan,
- Project Schedule,
- Project Risks assessment
- Project Status Reports,
- Project Budget Tracker,
- Lessons Learned Review,
- Project Closure Document
- Documents of operations in all areas,

4. Monitor and Control Project Work Process

Monitor and Control Project Work is the process of tracking, reviewing, and reporting the progress to meet the objectives defined in the project management plan, the key benefit of this process is allow stakeholders to understand the current state of the project, the steps taken, and budget, schedule, and scope forecasts, the inputs, tools and techniques. This process involves monitoring performance measures. In order to detect whether the project is going as planned. Such as budget performance measurement of the premeasuring schedule performance of the project will show whether the project will be completed on planned date. this process is majorly concerned with:

- Measuring the actual performance against the planned performance,
- Monitoring the implementation of approved changes request,
- Deciding the need for corrective or preventive and action,
- Maintaining a historical database of project outputs for your reference in a timely manner,
- Providing new knowledge to the interested parties,

4.1 Inputs

4.1.1 Project Management Plan
Described in chapter # (4) clause 2.3.1 +3.1.1 + 4.1.1 + 5.1.1 +6.1.1

4.1.2 Work Performance Reports

Performance report is a detailed statement that contains the results of activities works performance in a specific time frame, it is the physical or electronic representation of work performance information intended to generate decisions, actions or awareness. Work Performance reports provide a general view that helps to understand if a project is performing as planned or is deviated from the original plan. Basically, performance reports are very important project documents for both project managers and stakeholders. They provide a clear picture of the project's current performance. If the project is performing as planned, the project team and stakeholders feel comfortable; otherwise, they must struggle to bring the project on track. In this article, we will talk about the importance of project performance reporting and discuss the tools and techniques, it may include:
https://www.projectcubicle.com/work-performance-reports/

- Analysis of past performance of procurements + seller competence + cost + quality + schedule + scope creep, and
- Summary of changes approved in the reporting period,
- Current status of risks and potential risks may be appearing,
- Results of variance analysis,
- Work completed during the reporting period,
- Work to be completed during the next reporting period,
- Forecasted project completion,
- Other relevant information consider review and asked by stakeholders,
- Change efficiency on application,
- Non-conformity to correct them,
- impact on project process+ objectives+ quality + cost + schedule

4.1.3. Enterprise environmental Factors (EEF)
Described in chapter # (2) clauses # 4.1
Described in chapter # (4) clauses # 1.1.4 + 2.1.3+ 3.1.3 + 4.1.3+5.1.4

Organizational Process Assets (OPA)
Described in chapter (2) clauses # 4.2
Described in chapter (4) clauses # 1.1.5 + 2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.3

4.2   Tools & Techniques

4.2.1 Expert Value Judgment
Described in chapter # (4) Clause 1.2.1 +2.2.1 + 3.2.1+ 4.2.1 +5.2.1+6.2.1

4.3   Outputs

4.3.1 Change Request
Described in chapter # (4) Clause 3.3.3 +4.3.1+5.1.3

4.3.2 Project Management Plan Updates
Described in chapter # (4) Clause 3.3.4 +4.3.2+5.3.2

4.3.3 Project Documents Updates
Described in chapter # (4) Clause 3.3.5 + 4.3.3 +5.3.3

5. Perform Integrated Change Control Process

A change request is a formal proposal to modify any document, deliverable, or baseline. An approved change request will replace the associated document, deliverable, or baseline and may result in an update to other parts of

the project management plan , while integrated change control process , it is called 'Integrated' because the change in on part of the project may cause an impact on others parts of the project, so, if a change occurs in one part of the project, it needs to be assessed across the whole of the project as here under:

- Check if the change is accepted, rejected, handled, delayed,
- Decide change based on realistic project plan + complete product + complete scope
- If change is accepted, check the root cause for change to prevent nonconformity (NC) from recurrence
- Do special procedure for Integrated Change Control Process
- Control change impact on others area, or product, services or results

5 .1 Inputs

5.1.1 Project Management Plan

A Project Management Plan Described above in clause # 2.3.1, but it is called here 'Integrated' because the change in on part of the project may cause an impact on others parts of the project, so, if a change occurs in one part of the project, it needs to be assessed across the whole of the project, the mission here is to prepare and coordinate the various planning activities. It also explains how the project is executed, monitored and controlled, and closed. The elements of the Project Management Plan that can be used include:

- Change Management Plan: To provide guidelines for managing the change control process and records,
- Configuration Management Plan: To define items that require formal change control, and the process for controlling changes,
- Scope Baseline: Every project has a scope, it is the approved version of project scope statement + WBS+ WBS dictionary,
- Cost Baseline: The cost baseline helps the project manager to assess the impact of the changes to the project's actual cost,
- Schedule Baseline: It is the processes related to the starting point and closer point , and includes Scope + Cost +Time

5.1.2 Work Performance Information

Work Performance information reports should be distributed with the monotonous collection of data, including schedule progress, subsequent delays and their causes, critical path activities, activities presenting delays, and actions for recovery and other vital data for managing the work. In whole, a physical representation of work performance information compiled in project documents, intended to generate decisions, actions, recommendations. Work performance reports for the perform integrated change control process includes reports on:

- Resource availability,
- Human resources,
- Schedule data,
- Cost data,
- Earned value management (EVM) reports,

5.1.3 Change Requests
Described in chapter (4) clause # 3.3.3 +4.3.1+5.1.3

5.1.4 Enterprise environmental Factors (EEF)
Described in chapter (2) clauses # 4.1
Described in chapter (4) clauses # 1.1.4 + 2.1.3+ 3.1.3 + 4.1.3+5.1.4

5.1.5 Organizational Process Assets (OPA)
Described in chapter (2) clauses # 4.2
Described in chapter (4) clauses # 1.1.5 + 2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.3

5.2 Tools & Techniques

5.2.1   Expert Value Judgment
Described in chapter # (4) Clause 1.2.1 +2.2.1 + 3.2.1+ 4.2.1 +5.2.1+6.2.1

5.2.2   Change Control Meetings

Change control meeting are held when review or change is needed on deliverables, services, and results, or when process or any others in the project required change, a Change Control Board (CCB) is responsible for meeting and reviewing the change requests and approving, acceptance or rejection of changes, the CCB may also review configuration management activities also, the role and responsibility of CCB is clearly defined and agreed upon by appropriate stakeholders and documented in the change management plan, the CCB decisions shall be documented and communicated to the stakeholders for information and follow-up actions, the change control process helps avoid unnecessary changes that might disrupt services and also ensures the efficient use of resources. The change steps are:
https://www.projectsmart.co.uk/what-is-change-control.php

- **Proposing Change:** This process gives the ability for anyone in the project team (including the customer) to suggest a change to the project such as:

o Determine the change required,
o Business case or justification for change,
o The expected change benefit,
o Benchmarking if available,
o Quantifiable cost and estimation,
o Feasible study if needed,

- **Summary of Impact:** This process is carried out by the project manager, who will consider the overall effect on the project, covering the following items:

o Quantifiable cost savings and benefits,
o Legal, regulatory or other unquantifiable reason for change,
o Estimated cost of the change,
o Impact on timescales,
o Extra resources needed,
o Impact on other projects and business activities,
o New risks and issues,

- **Decision:** After this assessment of change request the project manager recommends whether to carry out the change or not based on facts he recommends to approved authority who will consider all the information provided by the project manager, the decision will be within the limit of:

o Accept with no comments
o Accept with comments
o Reject with comments
o Postponement or defer for further advice

- **Implementing a Change:** Once the change is approved, the change shall have planned for implementation at agreed time with the stakeholders, a regression test plan is needed in case the change needs to be backed out, after implementation, it is usual to carry out a post-implementation review.

- **Closing a Change:** Once the change is implemented, the requester checks and agrees on the change, and it is closed in the Change Log by the project manager

- **Documentation:** The following documents are working with the change process that are:
  o Business Case
  o Change Request Form
  o Change Log

5.3   Outputs

5.3.1 Change Request Status Updates
Described in chapter (4) clause # 5.3.1

5.3.2 Project Management Plan Updates
Described in chapter (4) clause # 3.3.4 +4.3.2+5.3.2

5.3.3 Project Documents Updates
Described in chapter (4) clause # 3.3.5 + 4.3.3 +5.3.3

6. Close Project or Phase Process

According to the Project Management Body of Knowledge (PMBOK® Guide) 5th edition, close a Project or Phase is the process of finalizing all activities across all of the Project Management Process Groups to formally complete the project or phase, the Close project or phase process can be thought as the process that performs a controlled shut down at the end of the project. As is normal within a project, there is documentation to be archived, capturing any lessons learned to be passed on for future projects, ensuring that any contracts are properly shut down, and updating any organizational process assets, Key activities typically include:
https://www.pm-primer.com/close-project-or-phase-process/

- Review project documents, and update if required
- Update project resource assignments
- Document the project outcomes
- Request formal acceptance from stakeholders/customer
- Analyze the project management processes to determine their effectiveness
- Document the Lessons Learned
- Archive all project documentation for future historical reference

6.1   Inputs

6.1.1 Project Management Plan
Described in chapter (4) clause # 2.3.1 +3.1.1 + 4.1.1 + 5.1.1 +6.1.1

6.1.2 Accepted Deliverables
Described in chapter (4) clause # 6.1.2

6.1.3 Organizational Process Assets (OPA)
Described in chapter (2) clauses # 1.1.5 + 2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.3

6.2 Tools & Techniques

6.2.1   Expert Value Judgment
Described in above in chapter (4) clauses # 1.2.1 +2.2.1 + 3.2.1+ 4.2.1 +5.2.1+6.2.1

6.2.2   Meetings

Meetings deemed a way of sharing information and knowledge to solve problems, and to make decisions, and to provide status updates, meeting is a brainstorm of ideas, and essential to build team morale and to build relationships, when the

meeting run professionally its provoke strong emotions to attendee, , but it is rum poorly it will burn up precious time of attendance and moves frustration. Successful project managers have extraordinary meeting skills to lead the meeting with the interested parties such as employees, vendors, customers, contractors, NGO's, and others, meeting shall held with specific agenda and time frame, mostly the meeting is call for handling issues that affect company operations either positively or negatively. Meetings can be a total time suck, at the same time there are situations when meetings are needed, to figure out some situational tips to guide on the importance reasons:

- **The meetings are hold to the purpose of:**
  o Solve Problems: To resolve a specific issue, or to fix a repeated claim from a customer, or to reform process, and,
  o Make Decisions: To make decision on expansion or contraction of project works, or on implications or dispute, and
  o Provide Status Updates: To identifying the challenges, obstacles that prevent teams to achieve milestones
  o Brainstorm Ideas: To generate ideas on product, service, and brings knowledge to everyone, and enriches attendees
  o Build Team Morale: To boost team morale, break the ice between management and staff, allow all to feel valuable,

- **Kickoff Meeting shall act on meeting:**
  o Content: Call for the meeting as necessary to discuss substantial or urgent business case,
  o Time: Call for the meeting as soon as possible not to keep thing pending and don't spend unnecessary time
  o Team: Involve the concern people and avoid the intervention of non-specialist on non-concern,
  o Theme: Identify the purpose of the meeting and identify the expected result and ask how to be achieve,
  o Feedback: Listen well to the attendee one by one and make common business case for discussion,
  o Facts: Share the key facts that you know about the project that have impact on your issues,
  o Mastering: Don't focus on palming others, and don't barging over position,
  o Result: Provide time frame for receiving reply from attendee as next steps in a stipulating meeting,

- **Use a fixed agenda and time to keep the team engaged and get Status Meeting:**
  o Project Schedule Status: Attendee shall understand the impact of delays or opportunities presented by completing work,
  o Project Scope Status: Explain how much work is completed with an emphasis on significant project milestones,
  o Project Budget Status: Keep the team informed about the project budget, like expenditures vides the planed,
  o Risk assessment: Ask about the risks that impacted and risks that have potential impact on project progress,
  o Team Member Updates. Encourage everyone to share ideas and comments on what have not covered,

- **Stakeholders are important contributor and be sure to attend the largest number of them**
  o Identify appropriate stakeholders who have for high touch communication,
  o Listen to their opinions because they are experience in the market issues and its variables,
  o Ask them benchmarking with other similar to your industry,

- **Surprises are happing always seek for new opportunities to make change**
  o Meeting agenda: Provide the meeting agenda in advance so that attendees know which changes will be discussed.
  o Discuss change assessment: Present your professional opinion on the change's impact to the project.
  o Make change recommendation: Request the project sponsor approve or comment on the change request.

- **Schedule the meeting with the project team and review meeting**
  o Ground Rules: Explain your expectations and the purpose of the meeting before starts
  o Lessons Learned: Clarify the value added by the meeting within short time, and what is the progress received,

6.3 Outputs

6.3.1 Final Product, Service, or Result Transition

According to the Project Management Body of Knowledge (PMBOK® Guide) 6th edition, the product, service, or result created by the project will be handed over or transitioned to a different group or organization if it is an external project, but it will be handed over to the organization itself in the case of an internal project. 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 in process to avoid imperfection with production,
- Inspect in final process as a final test to release them for pass, this the phase of verification,

- Record in testing area,
- Send for packing and warehousing,
- Handover to the export or local as agreed with the customers, partially or totally as agreed with the customers,
- Invoice and record in accounts for payment purpose
- Close the whole payment means closing the work order itself,
- Measure the return on investment is a vital action to understand where the project stands,

6.3.2 Organizational Process Assets Updates (OPA)

Described in above in chapter (4) clauses # 6.3.2

Chapter (5)

Project Scope Management

Chapter (5)

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	5.2.1	Inspection	100
	5.3	Outputs	100
	5.3.1	Accepted Deliverables	100
	5.3.2	Change Request	100
	5.3.3	Project Documents Updates	100

6 — Control Scope Process

6	6.1	Inputs	Page No.
	6.1.1	Project Management Plan	101
	6.1.2	Work Performance Information	101
	6.1.3	Requirements Documentation	101
	6.1.4	Requirements Traceability Matrix	101
	6.1.5	Organizational Process Assets (OPA)	101
	6.2	Tools & Techniques	101
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	6.3	Outputs	102
	6.3.1	Work Performance Measurement	102
	6.3.2	Organizational Process Assets Updates	102
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Project Scope Management

A Project Scope Management is a set of activities that work to ensure that a particular project includes all relevant and appropriate resources including tools & techniques to achieve the project's objectives, its primary aim to control what is and what is not involved in the project to accomplish and deliver a product, service, or result with the specified features and functions to the customers , scope refers to the detailed set of deliverables , these deliverables are derived from a project's process . Project Scope Management consists of 6 processes that are:
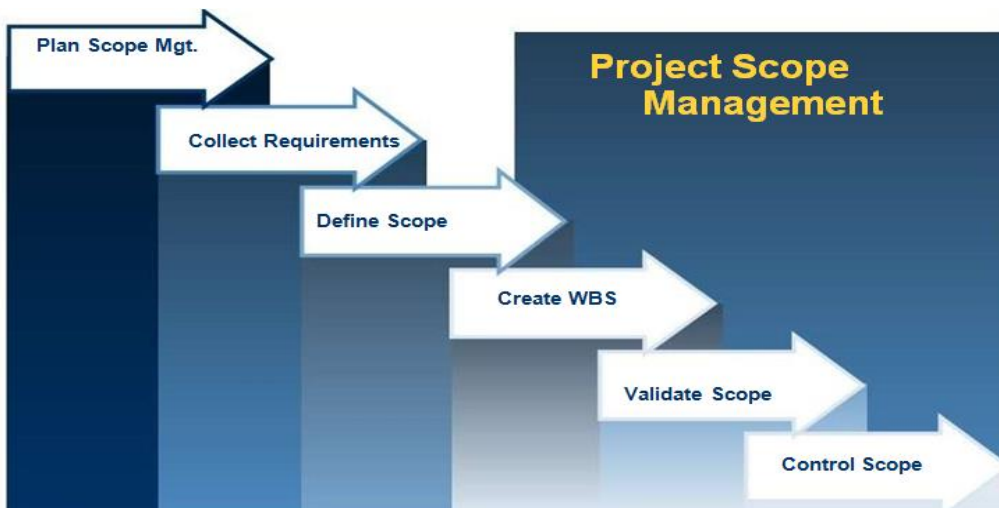
A project scope management is primarily concerned with defining and controlling what is and is not included in the project includes the work required to complete the project business successfully. Project scope is a varying base on the internal and external issues that have impact on its operations, this varying in scope may be require change in product scope and project scope, this called Scope Creep,

Scope Creep is defined in PMBOK® Guide –the 5th edition as, adding functionality features without addressing the effects of time, costs, quality, risks, and resources even without customer approval, this phenomenon can occur when the scope of a project is not properly defined, or not documented, or not controlled, it is generally considered a negative occurrence that is to be avoided, scope creep can be classified into Technical Scope Creep + Business Scope Creep, this would be originated from:

- Poor implementation of change control,
- Incomplete gathering of requirements before the beginning of project execution,
- Insufficient involvement of critical stakeholders, customers, and sponsor,
- Lack of support from the executive sponsor,
- Change in the internal and external issues, so look into PESTLE analysis,

Project scope management refers to set of processes that ensure a project's scope is accurately defined and mapped. Scope Management techniques enable project managers and team work to allocate the right amount of work necessary to successfully complete the business, so, a project manager and team member shall ensure that all work are integral part of the project is completed as agreed in the project management plan in collaboration with the customers to avoid scope creep and to do the work required only without excessive efforts on extra work,

1. Plan Scope Management Process

Plan Scope Management Process is the collection of processes that are used to ensure that the project includes all the tasks required and all resources required , and excluding all the tasks that are out of scope range , the primary purpose of the scope management plan is to define how the project scope will be explained, developed, structured, and verified, it also a component of the project or program management plan that describes how the scope will be

defined, developed, monitored, controlled, and verified. The development of scope management plan and the detailing with the project scope begins with the analysis of <u>information contained in the project charter.</u> The key benefit of this process to provide guidance and direction on how scope will be managed throughout the project. Here are a set of steps that may monitor project scope management:

- **Define Project Needs:** It is the first step to establish a project timeline and allocate project resources and set a project goals, only with these defined steps, you will be able to understand the work that needs to be done, after that a project team can allocate tasks and provide direction to operate the project within the given time and budget,

- **Understand the Project Objectives:** It is very much important to establish the objectives of the project, which may include a new product, a new service, or developing a new piece of software, there are several objectives that could be central to the project, and the project manager shall ensure the team delivers results according to the specified features or functions,

- **Define the Scope:** The resources and work that goes into the creation of a product or service or result are essentially what defines the scope of a project, the scope generally outlines the goals that will be met to achieve a satisfactory result. The twin Project Scope + Product Scope are widely used to explain the project management scope, which includes:
  https://www.invensislearning.com/resources/pmp/how-to-create-a-scope-management-plan

  o **Product Scope:** It is the features or characteristics of a product regardless of the design, function or parts, and the critical point, product scope refers to the actual tangible product that is finally produced, the project manager shall thing in:
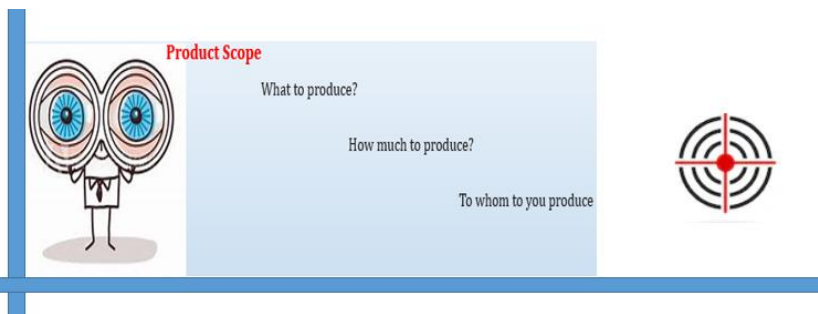
  o **Project Scope:** It is the set of steps operating to produce a certain product, service or result, this will include the whole process of operation, testing, supply chain, and others to make the product ready for delivery, the project manager shall thing in:
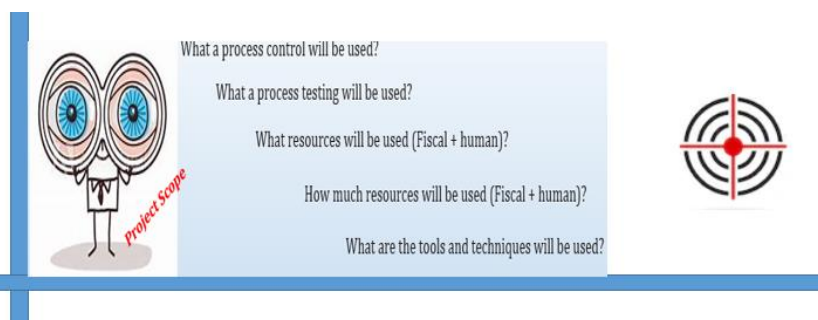
1.1 Inputs

1.1.1 Project charter
Described in chapter (4) clause # 1.3.1+ 2.1.1
Described in chapter (5) clause # 1.1.1+2.1.1 +3.1.1

1.1.2 Quality Management Plan

A Quality Management Plan is a document contains of a set of Test Requirements customized for each specific

product, such as product let say of (PVC Compound), for testing the said product we need quality management plan or what called in industry (Quality Assurance plan) , this plan must contain the whole specification (standards) for testing the PVC Compound against the standards to be released for PASS and finally delivered to the customer , the QAP shall be available in both side the manufacturer and the importer sites to guide them for exact testing , because both are testing according to unified and consolidated International standard that has a specific code for each item,

In industries there will be a 3rd party inspection may interrupt for inspection if contractually call for that. However, the product shall be tested according to specific criteria which are the Quality management plant in the area of the manufacturers and the importer when they received the product. In short Quality Management plans apply to project deliverables and project work processes. Quality control activities monitor and verify that project deliverables meet the defined quality standards. Here the difference between Product Validation and Verification of a product:

▪ Validation: Means the product is made and approved by a project → but still awaiting the <u>Acceptance</u> from the customer, it called the product is Validated,

▪ Verification: Means the product is made and approved by a project, and <u>Accepted</u> by the customer, it called the product is Verified, the example shows the Board of Testing of PVC Compound, shall be in Quality Management Plan

SL	Subject	Property under Test	Unit	Standard Value
1	Before Ageing	Tensile Strength	N/mm²	Minimum ( )
2		Elongation at break	%	Minimum ( )
3		Others		
1	After Ageing	Ageing Condition	Days /C°	
2		Tensile Strength	N/mm²	Minimum ( )
3		Elongation at break	%	Minimum ( )
4		Retention of Elongation	%	Minimum ( )
1	Variation After Ageing	Tensile Strength	N/mm²	Maximum ( )
2		Elongation at break	%	Maximum ( )
3				
1	Ageing Condition for Loss of Mass	Loss of Mass	mg/cm²	Maximum ( )
2		Cool Bend Test at (........................°C)		Shall have no Crack
3		Cold Impact Test (........................°C)		Shall have no Crack
4		Cold Elongation Test (........................°C)	%	Minimum ( )
5		Hot Deformation at 120 °C	%	Maximum ( )
6		Hot Pressure Test (........................°C)	%	Maximum ( )
7		Hot Shock Testate 150 °C		Shall have no Crack
8		Insulation Resistance Constant at 70 °C	M OHM KM	Minimum ( )
9		Specific Gravity		

1.1.3   Project Life Cycle Description
Described in chapter (1) clause # 7

1.1.4   Development Management Approach

The global economy has become more project-oriented, as the practice of project management is expanding, especially in the industries sector, and modern industries have replaced traditional industries specially in China, America, and most of Europe have expanded rapidly. The researchers developed and adapted new and sophisticated methodologies such as waterfall model, iterative, incremental or agile approaches. These adaptations will occur if the project is broken into its own phases. The most common methodology is **Agile Manifesto** is specialized to PMI,

Four values of Agile

▪   People Interactions: People and interaction is over Processes and Tools, because the people who respond to business and customers' needs and drive the development process to satisfy the customer need,

▪   Working Software: Working software is over comprehensive documentation, delivery of a project is more important than documentation, documentation is required but just enough document is required that is related to technical specifications, technical requirements, technical bulletin, interface design documents, test plan, documentation plan, and approvals required for each stage of implementation. In water fall model more documentation is high level requirement, and obligation to contract is a must, this obligation with no elastic response to customer change may reduce quality and delivery of performance. Agile does not eliminate documentation, but it streamlines it in a form that gives the developer what is needed to do without getting into bogged down in minutiae. Agile documents requirements are sufficient for a software developer to begin the task of building a new function and repeatable functions,

▪   Customer Collaboration: Customer collaboration is over contract negotiation, the model allows more response to customer's change and finally to respond to market new requirements, the work may start not in one bulk but divided into several stages, so the customer can see physical result gradually and can approve result gradually also,

▪   **Responding to Change:** Responding to change is over following the Plan. Change may be expensive to the manufacture, but they must coordinate the change and share the excess cost with the customer. The intention was to develop detailed, elaborate plans, with a defined set of features and with everything, generally, having as high a priority as everything else, and with a large number of many dependencies on delivering in a certain order so that the team can work on the next piece of the puzzle,

Twelve principles of Agile

- Customer Satisfaction: The customer will happy because of early and continuous software delivery at regular intervals,
- Acceptance of changing Requirements: The customer will happy because of accepting change as a respond to the market,
- Continues Delivery: The customer will happy because of ensuring regular delivery of working software,
- Collaboration: The customer will happy because of better decisions made between stakeholders and technical team are aligned,
- People Involvement: The customer will happy because of support , trust and motivate the people involved to create better work
- Face-to-Face Interactions: The customer will happy because of communication become successful when teams are co-located.
- Measure of Progress: The customer will happy because of delivering of software gradually allow to measures progress,
- Support a Consistent Development Pace: The customer will happy because the teams can deliver software fast + repeatable,
- Enhancement of Technical Detail and Design: The customer will happy because the right skills and good design are ensured,
- Simplicity: The customer will happy because the team just enough to get the job done for right now.
- Self- Organizing: The customer will happy because the team is motivated with power to share ideas to deliver quality products,
- Regular Organizing: The customer will happy because of team Self-improvement, process improvement, advancing skills, and techniques help team members work more efficiently,
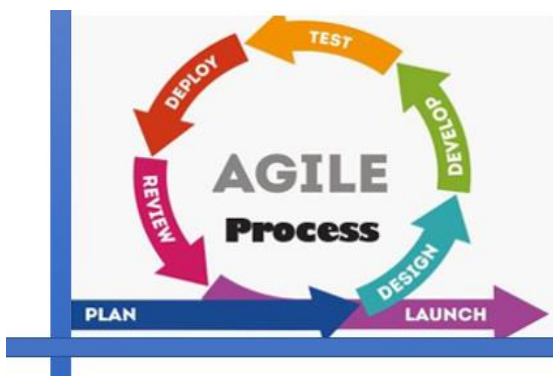
1.1.5 Enterprise Environmental Factors (EEF)
Described in chapter (2) clause # 4.1
Described in chapter (4) clause # 1.1.4 + 2.1.3+ 3.1.3 + 4.1.3+5.1.4

1.1.6 Organizational Process Assets (OPA)
Described in chapter (2) clause # 4.2
Described in chapter (4) clause # 1.1.5 + 2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.33
Described in chapter (5) clause # 1.1.5+3.1.3+4.1.3+6.1.5

1.2 Tools & Techniques

1.2.1 Expert Value Judgment
Described in chapter (4) clause # 1.2.1 +2.2.1 + 3.2.1+ 4.2.1 +5.2.1+6.2.1
Described in chapter (5) clause # 1.2.1+3.2.1

1.2.2 Data Analysis

Data analysis is the process of cleaning, transforming, and modeling the data to useful information for decision-making. Project managers use analytical techniques that analyze problems, they shall base on fact or documented information in order to accurately forecast potential outcomes while factoring the variables. There are many types of analytical techniques used by project managers. Moreover, the experience of the project manager as well as the type of data and problems, and variables involved can also determine the type of techniques used to analyze the data. Some of methods and techniques are well known and very effective such as:
https://www.guru99.com/what-is-data-analysis.html

- **Descriptive Analysis:** It is a statistical technique looks at the data and analyzes of past events and situations for getting an idea of how to approach the future,

- **Regression Analysis:** It is a statistical technique that allows modeling the relationship between the dependent variable and one or more independent variables. This technique is used to predict values such as prices of a product, and taking into account other variables.

- **Factor Analysis:** It is a technology Factor Analysis taking a bulk of data and reducing it to a smaller data, to be manageable and more understandable. It's a way to find hidden patterns, show how these patterns overlap, and show properties that can be seen in multiple styles, it's also used to create a set of variables for similar elements in a group (these variable sets are called dimensions). It can be a very useful tool for complex data sets that include psychological studies, socio-economic status and other concepts involved. http://intellspot.com/types-data-analysis/

- **Dispersion Analysis:** It is analysis used in data mining that are spread to which a set of data is stretched. It is a technique of describing how extended a set of data, the dispersion has two matters: first it represents the variation of the things among themselves, and second, it represents the variation around the average value. If the difference between the value and average is significant, then dispersion is high, otherwise, it is low, this method is not so common use, http://intellspot.com/types-data-analysis/

- **Discriminant Analysis:** It is the analysis uses variable measurements on different groups of elements to confirm the points that distinguish the groups, and it is commonly use to classify the new elements, and use to classify credit card applications into low-risk and high-risk categories, also it is use to categorize new product or customer into different groups among others,

- **Time Series Analysis:** It is the Values taken on a variable over the time such as, daily sales or revenue, and tabulated or plotted as chronologically ordered numbers or data points. To yield valid statistical inferences, these values must be repeatedly measured, often over a period of time. Time series consist of four components: Seasonal variations that repeat over a specific period such as a day, week, month, season, + Trend variations that move up or down in a reasonably predictable pattern+ Cyclical variations that correspond with business or economic 'boom-bust' cycles or follow their own peculiar cycles+ Random variations that do not fall under any of the above 3 components: https://www.businessdictionary.com/definition/time-series.html

▪ **Artificial Neural Networks (ANN):** It is a piece of a computing system designed to simulate the way the human brain analyzes and processes information. It is the foundation of artificial intelligence , and solves problems that would prove impossible or difficult by human or statistical standards. ANNs have self-learning capabilities that enable them to produce better results as more data becomes available, https://www.investopedia.com/terms/a/artificial-neural-networks-ann.asp

▪ **Decision Trees:** This is a tree-shaped graph algorithm that is commonly used in data mining, representing classification or regression models, the data is divided into small and small subgroups that contain similar values, while at the same time developing a relevant decision tree continuously, the tree is built to illustrate how and why an option can lead to the next option with the help of branches,

▪ Fuzzy Logic: It is a computing approach that is based on "Degree of Truth" and is not limited to Boolean (true or false). The term 'Fuzzy' means something which is vague or not very clear, the said approach is applied to scenarios where it is difficult to categorize states as a binary (True or False) , it can incorporate intermediate values like partially true and partially false, it can be implemented across a wide range of devices ranging from small micro-controller to large IT systems, it tries to mimic human-like decision making, which can incorporate all values in between True and False, https://www.educba.com/fuzzy-logic-system/

1.2.3 Alternative Analysis

Alternative analysis is the process of finding and classifying a set of choices and to put them in order to select which is the best for achieving a specific objective including the approach of implementation of the selected alternative, the alternative shall work for project, investment, management and others fields, a project shall have a series of alternatives to select over other.

Critical thinking about the best alternative????

Opportunity cost is the next best alternative

Project managers use the process of choosing from selling many assumed possibilities and practical alternatives to achieve the goal in optimal ways, such as choosing the best means of work or choosing base on:

▪ **Inputs:** For example, the selection among different types raw materials grades, and human skills,
▪ **Tools and techniques:** For example, the selection among different tools and methods of processing and operations,
▪ **Outputs:** For example, the selection among different ways of evaluating a product, or service, or the result,

1.2.4 Meetings
Described in chapter (4) clause # 6.2.2
Described in chapter (5) clause 1.2.4

1.2 Outputs

1.3.1 Scope Management Plan

Scope Management Plan is a work that needs to be accomplished to deliver a product, service, or result with a specified features and functions, project scope management refers to the set of processes that ensure a project's scope is accurately defined and mapped, or it is a component of the project or program management plan that describes how the scope will be defined, developed, monitored, controlled, and verified. Scope management plan is a major input into the Develop Project Management Plan process, and the other scope management processes. The components of a scope management plan include: https://www.simplilearn.com/project-scope-management-importance-rar89-article

- Process for preparing a detailed project scope statement,
- Process that enables the creation of the WBS from the detailed project scope statement,
- Process that establishes how the WBS will be maintained and approved,
- Process that specifies how formal acceptance of the completed project deliverables will be obtained, and
- Process to control how requests for changes to the detailed project scope statement will be processed,

1.3.2 Requirement Management Plan

Requirement Management Plan is a key tool for business and project success, these requirements help ensure that the final delivery from a project or services, or result aligns with the project plan, requirements management plan is an iterative set of activities that help ensure that elicitation, documentation, refinement, and changes of requirements is adequately dealt with during a lifecycle, with a view toward satisfying the overall mission or need in a quality manner, and to the customers' satisfaction, requirements should be managed in organizational strategy within the portfolio, programs, and projects, that reflected in operations management. The contents of a typical requirement management plan contain the following sections: **https://www.lucidchart.com/blog/tips-for-a-perfect-business-requirements-document**

- Planning, tracking and reporting of requirement activities,
- Configuration management activities like how the changes should be initiated, analyzed, traced, tracked and reported,
- Requirement prioritization process,
- Product metrics used as well as the rationale for using them,
- Traceability structure used to reflect
- which requirement attributes will be captured in the traceability matrix,

A Guide to the Business Analysis Body of Knowledge (more commonly known as the PMBOK® Guide) lists nine primary elicitation methods:

- Brainstorming
- Document analysis
- Interface analysis
- Focus groups
- Prototyping

- Requirements workshops
- Interviews
- Observation
- Surveys

2. Collect Requirements

Collect Requirements is the process of determining, documenting, and managing stakeholder needs and expectations to meet project objectives. The key benefit of this process is to provide the basis for defining and managing the project scope during scope management. There are many tools and techniques to gather project requirements. It seems practical to collect all requirements at the start of project, in collection requirement process, the first step is to identify stakeholders' needs and expectation, and second to document these needs, and then to manage them overall the project to meet project goals. This process forms the basis for project scope definition, the said process contributes to the success or failure of a project. As per PMI, about 70% project's failure is attributed to requirement collection base on industry and base on the type of project, Stakeholder's play an essential role in influencing the success of the project as they involve in determining, documenting, and managing the requirements
https://www.greycampus.com/blog/project-management/project-management-how-to-collect-requirements-for-your-project-effectively

2.1 Inputs

2.1.1 Project Charter
Described in chapter # (4) clause # 1.3.1+ 2.1.1
Described in chapter # (5) clause # 1.1.1+2.1.1 +3.1.1

2.1.2 Stakeholder Register

Getting to Yes - Excellent Project Management

The stakeholders are individuals, groups, entity, or organizations that may be affected by the decision, outcome or even a small activity related to a particular project, stakeholder register is deemed as a project management document that identifies, assess and classifies the stakeholders of the project, stakeholder register is deemed also a document that provides information used to plan different ways on how to engage the stakeholders, stakeholder register is used as an input to create the different project management processes, like the Plan Stakeholder Management, Plan Procurement Management, Plan Risk Management, Plan Communications Management, Plan Quality Management, Collect Requirements , and Identify Risks , Stakeholder register is one of their inputs , stakeholder register is at least contains the following information about the stakeholder:
https://project-management-knowledge.com/definitions/s/stakeholder-register/

Stakeholder Register

Project Title			
Project No.			
Project Artifacts			
Project Sponsor Name			
Project Manager Name			
Location of Doc's		updating Date	

ID	Role	Impact	Influence	needs	Responsibility
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

More information can be added to stakeholder register like:

- Address, phone numbers, emails, website, and
- Power, if low or high,
- Influence,
- Current engagement level,
- Desired engagement level,
- Their Interest, and need,
- Category if internal, or external, or primary, or secondary,
- Organization or group they belong to
- Their role in the society,
- Job title (if applicable) Communications sent to date,
- Comments and notes such as contacts, affiliations, and

A project is deal with its internal and external stakeholders who are associated with determining the project's objectives and uncertainty issues, so high level threats or opportunities require the involvement of senior level management and high level of management, while medium level threats or opportunities is managed by specific response procedures, while low level threats or opportunities is managed by routine procedures with specific application of resources,

2.2 Tools & Techniques

2.2.1 Interviews

An interview is a face to face conversation between an interviewer and an interviewee, the interviewer asks questions to which the interviewee responds, the information is offered by the interviewee to interviewer may be used or provided to other audiences, the objectives of an interview:

- Verification of the applicant's personality,
- Verification of the applicant's information provided in the CV,
- Verification the qualification is applicable to the work,
- Verification the ability of the applicant to work in a certain position,
- Establishing the mutual relation between the employee and the company,
- Help the applicant to understand the nature of question in futuristic interviews,
- Help the company to understand the experiences image in the market,
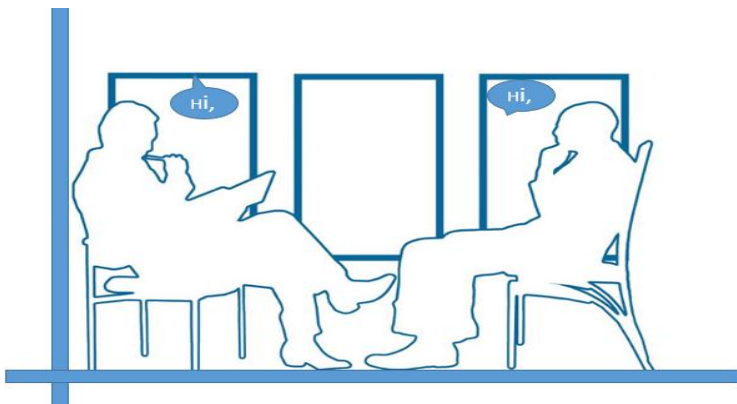
2.2.2 Focus Groups

Focus groups is an interactive discussion among the workers, vendors , customers , and interested parties , focus group is a technique to understand the taste , direction , requirement, expectation of others , the data provided by the group is considered an interactive result, discussion every suggestion has to be considered and summarized, the focus groups techniques are techniques that bring prequalified stakeholders as well as experts to learn about attitudes and expectations about a particular product, result or services, within brainstorming each group may have a given topic of their choice, usually the result will is field for further analysis ,there are a lot of topics on the table like :

2.2.3 Facilitated Workshops

Facilitated workshops is one of the tools and techniques of collect requirements and define scope of the project, it is may be useful way for activities where brainstorming or ideas collection is important , facilitated workshops is a focused sessions to bring cross-functional stakeholders together in order to define product requirements, it is also

an effective way of reconciling the differences of stakeholders as a joint application designs sessions. Facilitated workshops focuses on bringing-up the team and the experts together to improve the project management processes, policies, or directions to respond on change in marker behavior, it is also an extremely effective way to enhance the communication between the stakeholders of the project. Facilitated workshops is also called joint application designs sessions, it focuses on bringing the team and the experts together to improve the project management processes, workshops bring a vital advantage like:

- Users are usually very motivated,
- Have flexibility over length and frequency of sessions,
- Can offer a series of workshops that build on one another,
- Can bring-up data-base decision making,
- Reducing the time required to achieve objectives
- Overcoming communication difficulties
- Relying on the skills that contribute to issues being discussed
- Using the resources effectively
- All work to the end results
- All sharing common aim
- May be a unique opportunity to discuss major issues and problems and reach agreement
- All sharing the idea of consensus not compromise
- All sharing the idea high confidence of workshop output because of the active involvement in decision-making

2.2.4 Group Creativity Techniques

Group Creativity Techniques is the critical feature allows the project manager to collect new ideas and concepts from the team members through initiating proper communication, this is a technique that is used to generate ideas within a group of stakeholders, stakeholders are the decision makers when it comes to finalizing the deliverables of a product. Group Creativity Techniques encourage creative actions, whether in economic, project, heath , social responsibility and other, they focus on a variety of aspects of creativity, including techniques for idea generation and divergent thinking, the technique may go to reframing of problems to lead them for appropriate solutions , the techniques used for enhancing the creativity of the groups through the following methods:
https://toggl.com/blog/6-group-decision-making-techniques-your-team-needs-now

- Brainstorming
- Nominal group technique
- Mind mapping
- Affinity diagram
- Multi-criteria decision analysis

2.2.5 Group Decision Making Techniques

Decision Making is the process of deciding about something important, especially in a group of people or in an organization, while a Group Decision Making Techniques is a process to generate as many suggestions as possible toward developing new ideas, and final decision, the following steps allows to generate the useful ideas that lead for rational decision making, this may have achieved by using the following techniques:

- Brainstorming Techniques: This technique is used to generate as many suggestions as possible that are more lead toward developing new ideas, and making a final decision, in some cases, one idea will stand out from the others and be chosen as the resolution.

- Nominal Group Technique: This technique is used to take the above brainstorming suggestion to one step further by including a voting process, this technique is not as simple as counting how many hands are raised for each available option. Instead, each member of the group is given the opportunity to place their vote and also give an explanation as to why they feel it is the best choice.

- Delphi Technique: This technique is used to settle disputes (Conflict Resolution) among the members if the options in front of them are large and open, the role of project manager here is to categorizes the options, deletes

what can be deleted and merges what can be combined in order to narrow the options and then re-put them up for deeper discussion,

▪ Voting Technique: This technique is used in situations where the decision will be the direct result <u>of a basic yes or no</u> answer. A straightforward vote may be the simplest solution, this tactic can be an easy way to resolve small issues or determine the best course of action for basic questions, it will be up to team manager to decide when a basic vote is work,

▪ Rank the Possibilities: This technique is used for determining and ranking the ideas by using a voting technique or working as a team to prioritize ideas that achieve the superior objective,

▪ Pros & Cons List: This technique is used to list the positive ideas against the negatives suggestions to select less negatives that may be more useful to achieve the objectives of the projects,

2.2.6 Questionnaires and Surveys

A questionnaire is a set of questions typically used for research purposes which can be both qualitative as well as quantitative in nature, a questionnaire asks <u>open ended questions , and closed ended questions</u> with restricted options to answer via email, telephone or face-to-face meetings , a <u>questionnaire is used to collect data from a list of questions , but it is not used to look for trends, behavior or a bigger picture, limited in the scope</u> of a project,
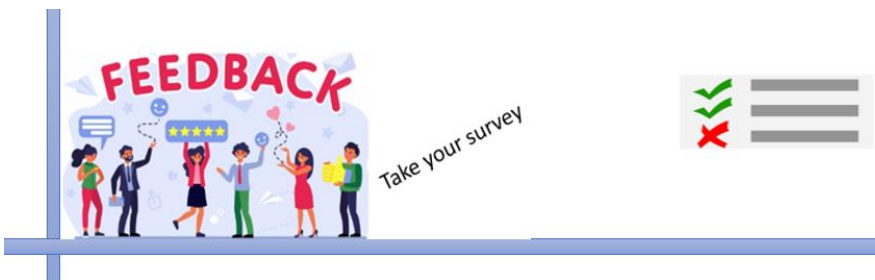
A survey is a sophisticated quantitative research method comprised of questionnaire with the intention of efficient gathering of data from a set of respondents, a survey mainly <u>consists of closed ended questions with very few open ended questions</u> for free form answers, a survey look for trends, behavior, and the bigger picture, see the example of questionnaire that may asked to the targeted statistical society of a project:

SN	Customer Focus
1	Does your organization understands its context as inputs to strategic planning?
2	Does your organization based on engineers to design the products?
3	Does your organization analyzing the marker behavior Periodically?
4	Does your organization relies on customers to identify their needs and expectation?
5	Does your organization consider customer satisfaction is improving deliverables?
6	Does your organization satisfy with customer satisfaction analysis?

SN	Learning and Growth
1	Does your organization have a specific training plan for the workers and maintained ?
2	Does your organization encourages the workers to accept diversity and race?
3	Does your organization provides the necessary resources education and training?
4	Does your organization support workers ideas for change management?
5	Does your organization adopt the innovations of the workers?
6	Does the workers satisfied with the organizational care toward workers

SN	Leadership
1	Does your leadership defines and understands the company's vision?
2	Does your leadership focuses on inspiring people, and engage everything happening?
3	Does your leadership good communicator and an excellent listener?
4	Does your leadership understands what actually matters to the people , are they trusted?
5	Does your leadership take action on what they say?
6	Does your leadership show the ability to ensure that perspective is being realized?

SN	Progressive Elaboration
1	Does your organization engage with change management?
2	Does your organization involve people in change management?
3	Does your organization based on preventive action as a proactive approach ?
4	Does your organization consciously assess potential risk
5	Does your organization has strategic plan to assess internal and external issues?
6	Does your organization has a benchmarked with similar companies?

SN	Statistical process Control
1	Does your organization design the group processes complies with its goals?
2	Does your organization own ERP System to inbound & outbound data?
3	Does your organization has its own data based decision making?
4	Does your organization used statistical technique such as 6 sigma in estimation?
5	Does your organization used KPIs to identify process control?
6	Does your organization has an automation system in shop floor?

SN	Process Management
1	Does your organization has its own documented process?
2	Does your organization has its own documented procedures?
3	Does your organization have changed management process?
4	Does your organization has its own process on risk assessment?
5	Does your organization process consider human resources as vital element?
6	Does your organization involve people associated in activities in change?

SN	Vendors Relationship
1	Does your organization strive to establish long-term relationships with vendors?
2	Does your organization diversify the vendors for long run relations?
3	Does your organization has the tools & technique to evaluate the vendors?
4	Does your organization has the tools & technique rating the vendors?
5	Does your organization include the competent vendors in Approved Vendor List?
6	Does your organization would select a quality supplier over one with a lower price?

SN	Product Design
1	Does your organization works along with international standards?
2	Does your organization has raw materials specification?
3	Does your organization consider the customer requirements in new t design?
4	Does your organization consider change design to reduce production cost only?
5	Does your organization considers the risk assessment in design?
6	Does your organization associate PS, QC and OPl areas in design?

2.2.7 Observations

Observation is a process for assessing the job performance of workers during and after carrying out the tasks, or a process for evaluating the performance of products, services and results during or after the establishment, evaluation is usually done from within the organization itself during the implementation of tasks or after completion on observation of something need change , and evaluation is also done by a third party inspection , so may he note something goes wrong , this called observation , so necessary steps shall be taken to correct the case,

Observations are very helpful in complex detailed processes where the end users who use the product have difficulty or reluctant to articulate their experience and requirements, observation is also known as "job shadowing." It is usually done externally by an observer who views a business expert performing a job. It can also be done by a "participant observer" who performs a process or procedure to experience how it is done to understand and uncover hidden requirements,

2.2.8 Prototypes

A prototype is the original model, a sample on which to base future designs , it is a term used in a variety of contexts of a product , services or results, by making early sample, model, or release of a product built to test a concept or process, it is generally used to evaluate a new design to enhance precision by system analysts and users, its provides specifications for a real, working a product , services or results before involving in huge deliverables , it provides observation about the design, specification, performance in advance , and
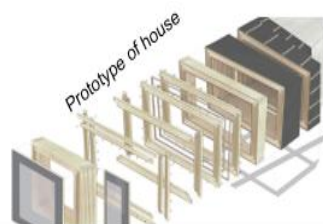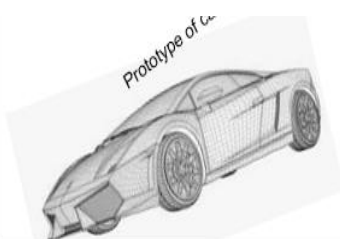
2.3 Outputs

2.3.1 Requirements Documentation

Described in chapter # (5) clause # 2.3.1+3.1.2+4.1.2+5.1.2+6.1.3

Requirements documentation describes how individual requirements meet the business need for the project. Requirements may start out at a high level and become progressively more detailed as more about the requirements is known. Before being base lined, requirements need to be unambiguous (measurable and testable), traceable, complete, consistent, and acceptable to key stakeholders. The format of a requirements document may range from a simple document listing all the requirements categorized by stakeholder and priority, to more elaborate forms containing an executive summary, detailed descriptions, and attachments. Components of requirements documentation can include, but, are not limited to:

- **Business requirements including:**
  o Business objectives for traceability,
  o Business rules for the performing organization and,
  o Guiding principles of the organization,

- **Stakeholder requirements including:**
  o Impacts to other organizational areas,
  o Impacts to other entities inside or outside the performing organization and,
  o Stakeholder communication and reporting requirements,

- **Solution requirements including:**
  o Functional and nonfunctional requirements,
  o Technology and standard compliance requirements,
  o Support and training requirements,
  o Quality requirements and,
  o Reporting requirements and,
  o Solution requirements can be documented,

- **Project requirements including:**
  o Levels of service, performance, safety, compliance and,
  o Acceptance criteria,
  o Transition requirements,
  o Requirements assumptions, dependencies,
  o Constraints identification,

2.3.2 Requirements Management plan (RMP)

Described in chapter # (5) clause # 2.3.2

Requirements Management is an iterative set of activities that help ensure that elicitation, documentation, refinement, and changes of requirements is adequately dealt with during a lifecycle, with a view toward satisfying the overall mission or need in a quality manner and to the customers' satisfaction. The contents of a typical RMP contain the following sections:

https://www.pmi.org/learning/library/requirements-management-planning-for-success-9669

- Defining the stakeholder roles and responsibilities,
- Defining the requirements management process (elicited, analyzed, documented, and managed)
- Defining requirements type,
- Mapping the requirements types,
- Naming and numbering convention,
- Prioritization of requirements,
- Controlling of requirements,
- Requirements of versioning (Support documents)
- Requirements baseline (requirements change control)

- Communication strategy for requirement changes
- Requirements management tools,

2.3.3 Requirements Traceability Matrix (RTM)
Described in chapter # (5) clause # 2.3.3 +5.1.3+6.1.4

A Traceability Matrix is a document that co-relates any two-baseline documents that require a many-to-many relationship to check the completeness of the relationship, it is used to track the requirements and to check the current project requirements are met, it is a document that maps and traces user requirement with test cases. It captures all requirements proposed by the client and requirement traceability in a single document, delivered at the conclusion of the Software development life cycle. The main purpose of the said matrix is to validate that all requirements are checked via test cases such that no functionality is unchecked during Software testing, the said Matrix is also a table in shape of a spreadsheet that shows if each requirement has a respective Test case or cases to make sure if the requirement is covered for testing, It is basically used to ensure that all the requirements and change requests are or will be tested,

- **Requirements Traceability:**
  o Business needs,
  o Opportunities, goals,
  o Objectives,
  o Project scope,
  o WBS deliverables
  o Product design
  o Product development
  o Test strategy and test scenarios, and
  o High-level requirements to more detailed requirements,

- **Requirements Traceability advantages:**
  o Gives overview of all the requirements,
  o Shows how requirements are linked to Test Cases,
  o Makes sure 100% coverage of requirements,
  o No special tool is requiring,

3. Define Scope Process

A scope Process is the set of process determines what is include and what is not include in the project to achieve deliverables, and it is the process is drawing the boundaries of the project ability to make the required deliverables within the availability of   Resources and Organizational Process Assets(OPA), the project can outline the work that will be delivered throughout the project. Scope process is the 3rd process of the Project Scope Management , it comes after Plan Scope Management Process + Collect Requirements Process, the process defines the work is required and also makes sure that all of this work and only this work is done, it is outline what will be delivered throughout the project within a specific time , it is holds a major role in the scope management because during this process the project scope is finalized the scope. In short , defining the scope process boundaries of Charter + Requirements Document + Organizational Process Asset, that will finalizes the project scope.

3.1 Inputs

3.1.1 Project Charter
Described in chapter (4) clause # 1.3.1+ 2.1.1
Described in chapter (5) clause # 1.1.1+2.1.1 +3.1.1

3.1.2 Requirements Documentation
Described in chapter (5) clause # 2.3.1+3.1.2+4.1.2+5.1.2+6.1.3

3.1.3 Organizational Process Assets (OPA)
Described in chapter (2) clause # 4.2
Described in chapter (4) clause # 1.1.5 + 2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.3
Described in chapter (5) clause # 1.1.5+3.1.3+4.1.3+6.1.5

3.2   Tools & Techniques

3.2.1 Expert Value Judgment
Described in chapter (4) clause # 1.2.1 +2.2.1 + 3.2.1+ 4.2.1 +5.2.1+6.2.1
Described in chapter (5) clause # 1.2.1+3.2.1

3.2.2 Product Analysis

A Product analysis is the evaluation of a product for the purposes of product development, review or purchasing, selling this may be performed by the producer, the customer and a 3rd party if contractually call, a product may be tested and information gathered from sources such as customers and industry analysts, product analysis may involve a comparison to competing products on the market. In the case of evaluation by a customer, the product may be assessed based on a set of requirements or customer needs. So, product analysis is a process that is used to define the scope of the product, it basically means that when analyzing the product through its scope, generally product analysis may include , but not limited to the following hypothesis:
https://simplicable.com/new/product-analysis

▪ **Hypothesis Readiness:**

o **Cost:** What is meant by the cost assessment is that, the design and production of the products, services , or result with the highest possible quality and the lowest possible cost , so the product can compete in the market.

o **Functions:** What is meant by the function is that, the performance of the product, service or result shall be effective and performs the purpose that was produced for, for example, children's toys shall be unbreakable 'and perfume shall give the required smell with reasonable sustainability in the body, and cable produce shall release a stable current,

o **Features:** What is meant by the features is that, the method of use is easy, for example air conditioners have remote control to operate, and the advantage is between one a product over another in ease of use.

o **Performance:** What is meant by the performance of a product is that, the effectiveness in operating , for example the responsiveness of snowboard.

o **Figure of Merit :** What is meant by the figure of merit is that the more ease measuring the performance , the more acceptable the product,

o **Product Ingredients:** What is meant by the product ingredients is that ,the more high quality of raw materials used in the product , the more the product is acceptable , for example the children dry milk shall be natural not chemical,

o Sensory Analysis: What is meant by the sensory analysis is that, some products can be evaluated by human sensors, like taste, smell, touch, sight, sound and sensation.

o **Product Appearance:** What is meant by the product appearance is that, the external shape of the product, the more attractive the external appearance is the more acceptable the product,

o **Customer Experience:** What is meant by the customer experience is that, the services offered to customer after sale is considered as a heart of sale,

o **Packing:** What is meant by the packing is that, the process of designing the package such as containers, wrappers etc. It plays a very significant role in the marketing success or failure of many products especially for non-durable consumer products.

▪ **Hypothesis Competence:**

o **Customization :** What is meant by the customization is that, the ability to configure or to suit the product reference to your preferences or requirements.

o **Compatibility:** What is meant by the compatibility is that, how well the product integrates with other things, for example such Venus engine can be installed on several types of Hyundai cars

o **Standards:** What is meant by the compatibility is that, compliance with standards, for example baby toys that comply of standards certified to have low emissions or not to manufactured from XLPE Materials

o **Efficiency:** What is meant by the efficiency is that, the comparison between what is really being produced or performed with what can be produced taking into account the same amount of resources, such as: money, time and labor, in simpler terms, efficiency measures whether there is any waste in your company. Depending on the industry you work in, efficiency may be more desirable than productivity, but usually their importance is proportionate

o **Durability:** What is meant by the durability is that, the ability of the product to retain value over time and when subjected to stresses. For example, Mercedes car that still looks new after 15 years as opposed to one that looks old within 5 years like Korean cars, this may be evaluated with accelerated life testing or with information from existing customers of the product

o **Reliability :** What is meant by the reliability is that, the consistent performance over time, for example, a printer that maintains high uptime across all customers versus a printer that has a reputation for downtime and being difficult to maintain.

o **Sustainability:** What is meant by the sustainability is that, the effect products have on the environment and the effect product has on society, to make a positive impact on either one of those areas. When companies fail to assume responsibility, the opposite can happen, leading to issues like environmental degradation, inequality, and social injustice. By the way several investors today use Environmental, Social, and Governance (ESG) metrics to analyze an organization's ethical impact and sustainability practices; they look at factors such as a company's carbon footprint, water usage to drive business success, for example ethically required accompany to look to the vendors their impact on environment and society at their region also,

o **Safety:** What is meant by the safety is that, the product must perform safely, for example the cables and electrical connections shall be well insulated so as not to cause electric shock to the users

o **Risk:** What is meant by the risk is that, the vendor may go to closure when he provided the final product of some software program, that may cause risk on services after sales, or such as Kodak that have not kept pace with technological development to its product, that may cause risk on the company itself and on the users,

o **Terms & Conditions:** What is meant by the terms & conditions is that, the legal agreements that come with a product, for example, how much the product has an impact on the environment in time of operating such as the diesel engines

o **Conformance Quality:** What is meant by the conformance quality is that, the benchmarking the quality with other products produced by other company, it is include the duration the product can serve, for example laying out a cable in the tranches shall sty about 17 years at least

o **Reputation:** What is meant by the reputation is that, the product with experiences of other shall have a sound reputation that make the product more acceptable that other, for example Mercedes has good fame or standing over others as a result of uses by public

o **Technical Term of Delivery:** What is meant by the reputation is that, the conditions relating to the supply of a product from remote areas and the conditions related to shipping, insurance, storage, unloading and delivery and the accompanying documentation of L/C's and other bank transactions, and what about the materials that arrive in a damage condition and other,

3.2.3 Alternatives Identification

Alternative Identification is the way of generating different choices or alternatives to plan or implement something to optimize a certain objective, but before alternatives searching for alternative, the organization must correctly identify the problem, and relevant criteria for judging alternatives must be specified, at first, the policy analyst can generate a large number of alternatives, but later reduce them to a manageable number, and consider alternatives suit to the problem and to the status quo, at second these alternative shall be prioritized , and then to select the as per some criteria that are often used in judging the suitability of alternatives include:

https://project-management-knowledge.com/definitions/a/alternative-analysis/

- Cost: How much the alternative increases or decreases the cost?
- Reliability: How much the alternative has a proven success?
- Stability: How much the alternative will stay under some management change?
- Immunity: How much the alternative will stay if one of its component parts fails?
- Flexibility: How much the alternative can accomplish more than one thing?
- Riskiness: How much the alternative is vulnerable for risk?
- Communicability: How much the alternative is easy to understand?
- Merit: How much the alternative is effective to pass the problems?
- Simplicity: How much the alternative is easy to implement?
- Compatibility: How much the alternative complies with existing norms and procedures?
- Reversibility: How much the alternative is easy to return to our prior state if it fails?
- Durability: How much the alternative sty stands in different future states?

Alternative analysis is often performed to give decision-makers choices for continuing existing programs or starting a new one, and it identifies cost-effective actions to avoid duplication of efforts as well as decrease the risks in delivering successful programs in the future.

3.2.4 Facilitated Workshops
Described in chapter (5) clause # 2.2.3 + 3.2.4

3.3 Outputs

3.3.1 Project Scope Statement

A project scope statement is a tool used to describe the major deliverables of a project including the key milestones, such as high level requirements, assumptions, and constraints. The project scope statement is a useful tool for future decision making when new change requests are considered to modify the project scope. It also defines the boundaries of a given project and clarifies what deliverables are in and out of scope. But Scope creep can come from people in your internal team for a number of reasons: https://thedigitalprojectmanager.com/scope-creep/

- The team member is unclear on what the scope of the project is.
- The team member wants to develop what they want to develop, and not what's in scope.
- The team member makes decisions in a vacuum.

The following Figure describes a project scope statement and show how to create a project scope statement. an

effective project scope includes the following items: https://www.matchware.com/project-scope

Getting to Yes - Excellent Project Management

▪ **Define Project Idea:** A project idea is the process of understanding the boundaries environment, and understanding the needs and expectation of the market direction, the ideas born from the needs, with some calculations about the cost and benefit analysis, understanding the benefit in general will lead to adopt the idea that lead to adopt a specific project,

▪ **Define Project Assumption:** A project assumption is the process of setting up the requirements of the market toward a specific product, or services, or result, and the identification of resources needed, and the identification of competitors, and the identification of ambit work condition, and the expected benefits. Explicitly stating what is out of scope for the project helps to manage stakeholders' expectations.

▪ **Define Product Scope Description:** A product scope description is a documents describes the details of the product, result, or service, the description may include the characteristics, the functions, ingredients, the expiry date, the shape, the packing, the side effect, the dosage, the description may explain the nature of the product. For example, if the product is a bridge, the product scope might be its length, width, and load strength, while if the product is a cell phone its scope will be its screen size, battery backup, processor speed, camera type, and memory, and if the product is a service, the scope will be the details on the tasks and responsibilities of the person who will deliver, etc.

▪ **Define Key Deliverables**: The deliverables are the results of the project processes, these deliverables may be a product, service, or result , deliverables can vary according to the project's specifications and the stakeholders' requirements, but all clients and stakeholders want deliverables that thoroughly wrap up the project at its closure, and measure performance against expectations throughout the project, deliverables types ,sizes, quantitative, and qualitative can be reported by project managers , Project managers should work alongside stakeholders to list the items that will deliver at the end of the project, and project scope deliverables are the expected outputs of the project, Projects are executed activities to meet certain objectives, it is helpful to conduct a brainstorming session to determine the specific deliverables that will result from the project, this would include deliverables quality , cost, quantity and,

▪ **Define Project Boundaries:** The boundaries determine the content of a project, and it clearly defines the extent of the project scope baseline, and serves as an efficient tool for making decisions on the content of project work. In this article we talk about how to identify the project boundaries and why project boundaries identification is important for implementing a project. Project Boundaries Statement determine what is included in the project and what's not. The boundaries are defined as measurable and auditable characteristics and closely linked to project objectives. They create a holistic project perception, determine limits and exclusions of the project, and form the content of project scope in terms of expected results, to identify the project boundaries, have a look into the following factors:

o Project Goals: A project goals will identify the extent of project work and overall duration, so the project boundaries will be defined considering the high-level expectations of the project,

o Key Project Phases: The 5 phases are Measure, Plan, Produce, Introduce, and Manage. The Measure phase and the Manage phase will be the limits of project work in terms of the implementation process,

o Product Scope: The key characteristics of the product being produced by the project are defined in the product scope statement. Project boundaries identification will depend on stakeholder requirements to the product,

o Group Accountability: The roles and responsibilities of the key project participants are defined in the Project Governance Chart which forms group accountability,

▪ **Define Project Constraints:** With any project, there are limitations and risks that need to be taken into account, and addressed to ensure the project's ultimate success, the three primary constraints that project managers should be familiar with are time+ scope + cost , that are known as the triple constraints or the project management triangle, these constraint are connected into each other . For example, increasing the scope of the project will likely require more time and money, while speeding up the timeline for the project may cut costs, but also diminish the scope,https://www.wrike.com/project-management-guide/faq/what-are-constraints-in-project-management/

▪ Define Project Exclusions: Project exclusion is a description of tasks, items, and actions was deliberately excluded from the project scope, mostly these exclusions may contractually agree with the customer. For example, the customer may ask its products without packing,

▪ Define Product Acceptance Criteria: Acceptance criteria refers to a set of pre-defined requirements that must be met in order to mark a user story complete, acceptance criteria are also sometimes called the "definition of done" because they determine the scope and requirements that must be executed by developers to consider the user story finished, we have here a few traits of effective acceptance criteria:
 https://www.productplan.com/glossary/acceptance-criteria/

o Testable: Easy to test and the results of these tests must leave no room for interpretation
o Clear and concise: Easy to read the different between the actual or test value and the assumed one
o Understood: Criteria shall be available and understood among all concern
o Inspiring: Criteria should be written in the context of a real user's experience

3.3.2 Project Documents Updates
Described in chapter (4) clause # 3.3.5 + 4.3.3 +5.3.3
Described in chapter (5) clause 3.3.2+4.3.4+5.3.3+6.3.5

4. Create WBS Process

A work breakdown structure (WBS) is a tool used to define and group a project's discrete work packages in a way that helps organize and define the total work scope of the project, the WBS elements may include either products, service, or results, and provides the necessary framework for detailed cost and time estimating and control, The WBS is a way to divide the large project into smaller portions , or division and sub-division to get things done faster and more efficiently, the said tool makes the struck of the project a hierarchical structure that can outlines the project and breaks it down into smaller parts to ease manage these parts by team member , and they can work simultaneously by different team members,
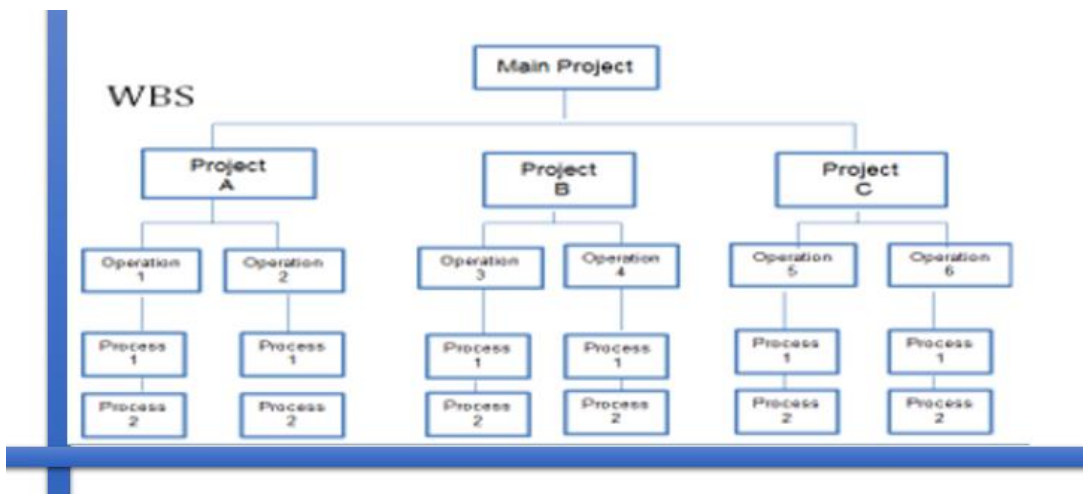
4.1 Inputs

4.1.1 Project Scope Statement
Described in chapter (5) clause # 3.3.1+4.1.1

4.1.2 Requirements Documentation
Described in chapter (5) clause # 2.3.1+3.1.2+4.1.2+5.1.2+6.1.3

4.1.3 Organizational Process Assets (OPA)
Described in chapter (2) clause # 4.2
Described in chapter (4) clause # 1 1.1.5 + 2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.3
Described in chapter (5) clause # 1.1.5+3.1.3+4.1.3+6.1.5

4.2 Tools & Techniques

4.2.1 Expert Value Judgment
Described in chapter (4) clause # 1.2.1 +2.2.1 + 3.2.1+ 4.2.1 +5.2.1+6.2.1
Described in chapter (5) clause # 1.2.1+3.2.1

4.2.1 Decomposition

Decomposition is a technique used for distribution dividing and sub-dividing the total project scope (*project deliverables into smaller groups+ project works into smaller portions*) in purpose of managing project deliverables & project works easily, the said explanation is called the work package which is defined from the lowest level of the WBS includes which must include (cost + schedule +control) that can be estimated and managed easily. For example Dividing similar raw materials + finished product + spare parts + services + result into groups for each main code group, and each subsidiary take a subsidiary code linked with the main code, in addition to breaking down the activities to smaller portion in preparation to make the WSB stage. The level of decomposition is often guided by the degree of control needed to effectively manage the project, the level of detail for work packages will vary with the size and complexity of the project's activities, decomposition of the total project work into work packages generally involves the following activities:

- Identifying and analyzing the deliverables,
- Identifying and analyzing the related works,
- Structuring and organizing the WBS,
- Decomposing the upper level of WBS into lower-level detailed portions,
- Developing codes to the WBS portions,
- Ensuring that the decomposition of the deliverables + work package is suited to the complete picture of the project,

4.3 Outputs

4.3.1 WBS

The WBS is a technique used for the decomposition of the total scope (Project's works) in shape of a hierarchical decomposition, the hierarchy shape enable the project team to accomplish the project objectives and create the required deliverables, the more lower the level of WSB, the more details of the project works, breaking down the structures into several work package acquire to establish a control and unique account code for each work package to calculate the total cost , schedule , and resources, of each work package.

A control account is a management control point where scope, budget, actual cost, and schedule are integrated and compared to the earned value, each control account may include one or more work packages, but each of the work packages should be associated with only one control account.

The WBS represents all products and project work, the total of the lower level works shall roll up to the higher levels so that nothing is left out and no extra work is performed, that is why this decomposition is called create 100% rule, the project create WBS it is : https://edward-designer.com/web/create-wbs-vs-decomposition-for-pmp-exam/
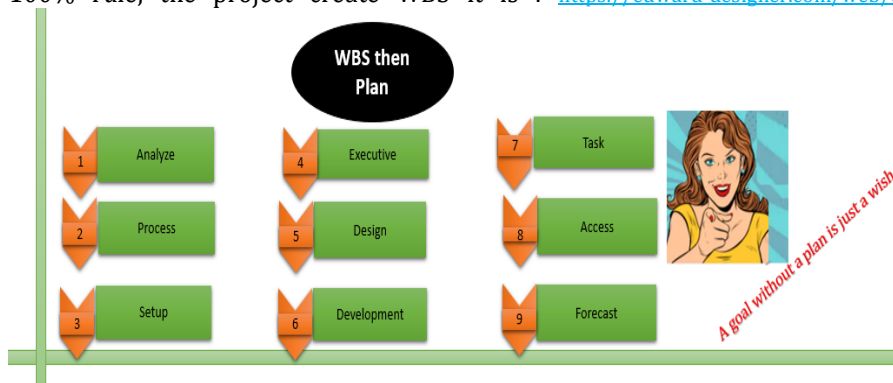
- Graphical chart to facilitate clear understanding,
- Hierarchical approach to identify all work,
- Serve as communication tool among stakeholders,
- foundation of planning,
- Tool to evaluate scope changes,
- Allows team members to understand the project activities,
- Describes project total work,
- Describes Project deliverables,
- Describes project costs,
- Describes project quality,
- Describes project risks,
- Includes control accounts,
- Includes Work Packages (no overlap between different work packages)
- Have a unique code (code of account)

4.3.2 WBS Dictionary

WBS Dictionary is one of the project documents, it is the output of create WBS process, after the creation of WBS, each work package is associated with a WBS dictionary to describe what will be done in the scope of regarding work package, the WBS Dictionary is a document provides a description of the work to be done for each WBS work package, it is a supplement to the WBS with additional information or attributes for each work packages, each entry can include:

Source: PMP Exam Prep Boot Camp

- Description of the work to be done
- Quantifiable deliverables
- Activities and milestones
- Resources required
- Code of account identifier
- Schedule milestones, for the work
- Agreement information
- Responsible organization
- Cost estimates
- Acceptance criteria
- Assumptions and constraints,
- Quality requirements,
- Responsible organization

The objective of WBS dictionary is help to prevent the scope creep by defining the details of the work package, *what needs to be done within a work package is detailed in the WBS dictionary*, project team members are illuminated with the scope and this helps prevent the team to do the unnecessary work or any work that is out of the project scope, the WBS dictionary contains:

- Top level information about the work package,
- Scope that defines the needs to be done in detail in project area,
- Acceptance criteria describes in what circumstances or conditions the work package will be accepted,
- Deliverables is described in WBS dictionary under which work package that will be produced,
- Assumptions that may be true, but they may not, any assumption about the work package must be listed in this area,
- Resources assigned area shows the organizations or individuals who will perform the work package activities,
- Duration area of the WBS Dictionary shows how long it will take to complete and deliver the work package in the project,
- Schedule milestones include the critical points that need to be passed when delivering a work package,
- Partial cost of each operative area that defines will reflect the total budget on project closure,
- Final date that this work package must be delivered,
- Shows the interdependencies of work that are predecessors and successors of the work package,
- WBS Dictionary includes the bottom line of approved partial work that = the total work package accepted by the customer,

4.3.3 Scope Baseline

A baseline refers to an accepted and approved project plan, a baseline is a must for a project manager to monitor and evaluate the success of the project, without a baseline there is no possibility to compare the current performance of the project with the initial estimated one, because a baseline is used as a base for future measurement of project performance, it is important to store the baseline into software for future reference and to

ease comparing against the project performance. Usually a project can have multiple baselines depending on the project economic of scale, and how often the project plan will change. Once a baseline gets approved the manager should save it as a baseline in project plan. <u>The scope baseline is the approved version of a scope statement, work breakdown structure (WBS), and its associated WBS dictionary</u>, that can be changed only through formal change control procedures and is used as a basis for comparison. It is a component of: *Scope Baseline = Project scope statement + WBS +WBS Dictionary*

During the project execution, comparisons can be done among the initial baseline estimates and the current status to compute variances, this comparison can be done either manually or automatically by software which preferred, then a project baseline may include many data and it is so difficult to manage it as a whole without breaking down into several parts to make the complexity of baseline management easier to deal with. Project baselines generally include: <u>https://pmvidya.com/blog/scope-baseline/</u>

▪   **Project scope statement:** It is a document that describes in detail the projects' deliverables and the work required to create those deliverables, it deemed a detailed description of the entire scope of the project, it's help common understanding of the entire scope of the project among all the stakeholders , and it's an explicit declaration of project exclusions , and it's help in managing stakeholders' expectations , and it's provide a baseline to check any changes or additional work inside or outside the project boundaries , and it's help in planning and executing the project effectively.

▪   **Work Break down Structure (WBS):** It is the breakdown of the entire work that needs to be done into different work packages, and placing them in a hierarchy structure, it's include the <u>work package</u> that defined as the lowest level component of WBS that can produce a verifiable outcome,

▪   **WBS Dictionary:** It is a document that provides detailed information about each component in the Work Breakdown Structure(WBS), and it's detailed the information about the deliverables, activities, and schedule of each component. WBS Dictionary is a document that supports the WBS,

4.3.4 Project Documents Updates:
Described in chapter (4) clause # 3.3.5 + 4.3.3 +5.3.3
Described in chapter (5) clause # 3.3.2+4.3.4+5.3.3+6.3.5

5. Verify Scope Process

Verify Scope is the process of formalizing the acceptance of the completed project deliverables. The project charter identifiers who can sign-off that the project is complete and the project scope statement includes and identifies such criteria for completion, it is very important to differentiate between validation and verification. Verify scope is concerned with the acceptance of the product by the project manager, the sponsor, or other key stakeholders, quality control focuses on the commitment with the required specifications ensures that deliverables are technically correct. Verify scope is to obtain customer acceptance, there may occasionally be situations where such deliverables are not those originally defined, but that the customer can accept what has been delivered. In short, verify scope determines completeness, and perform quality control checks correctness. Obviously the verify scope process will be used after some or all of the product components have been delivered, and for this reason may be performed several times during the project,

5.1   Inputs

5.1.1 Project Management Plan
Described in chapter (4) clause # 2.3.1 +3.1.1 + 4.1.1 + 5.1.1 +6.1.1
Described in chapter (5) clause # 1.3.2 + 5.1.1+6.1.1

5.1.2 Requirements Documentation
Described in chapter (5) clause # 2.3.1+3.1.2+4.1.2+5.1.2+6.1.3

5.1.3 Requirements Traceability Matrix

Described in chapter (5) clause # 2.3.3 +5.1.3+6.1.4

5.2 Tools and Techniques

5.2.1 Inspection

Inspection is an organized examination to a product, services, or result, but mostly it used in industries sector , inspection implemented formally and informally , visual and physical , this would base on the type of standard requirement , each product, services or result have a certain characteristics and nature , and the inspection have a certain criteria and slandered to examine the deliverables, and the results are usually compared to specified requirements and standards for determining whether the item or activity is in line with these targets. Generally, the following are the types of inspection

▪ **Pre-Process Inspection:** The manufacture is mostly locking to the cost rather than quality of intermediate materials that will use as an input in their product, Pre-production Inspection tells the buyer which kind of raw materials will be used, as manufacturers are often interested in lowering the cost of intermediate materials by purchasing substandard materials, and this may be disastrous for the buyer,

▪ **In -Process Inspection:** The manufacture is implementing In-Process test, and may allow the customer to have an idea of average product quality in -process or witness the process early within production cycle, it is the most useful and the most under-rated tool at the disposal of importers, who often only rely on final inspection, in case of non-conformity takes place on finished products that comes out of the lines, corrective shall be taken to close the said case,

▪ **Final Inspection:** The manufactures is implementing Final Test, and may allow the customer to have an idea of average product quality in final test or witness the process early within testing cycle. We recommend manufacturers and customers to attend a part of the manufacturing and inspection processes if possible, so that they do not become confused when the deliverables arrived to them,

5.3 Outputs

5.3.1 Accepted Deliverables

Accepted Deliverables are the deliverables that meet the acceptance criteria or standards are formally signed off and approved by the customer or sponsor, formal documentation received from the customer or sponsor acknowledging formal stakeholder acceptance of the project's deliverables is forwarded to the close project or the phase process , in this case these are deliverables that are accepted by the customer or client., and become output of validate scope process, and customer does the validation of deliverables.

5.3.2 Change Request

Described in chapter (4) clause # 3.3.3 +4.3.1+5.1.3
Described in chapter (5) clause # 5.3.2+6.3.3

Change Requests here is the completed deliverables that have not been formally accepted are documented, along with the reasons for no acceptance of those deliverables, those deliverables may require a change request for defect repair, the change requests are processed for review and disposition on non-conformity through the Perform Integrated Change Control process

5.3.3 Project Documents Updates

Described in chapter (4) clause # 3.3.5 + 4.3.3 +5.3.3
Described in chapter (5) clause # 3.3.2+4.3.4+5.3.3+6.3.5

Project documents here that may be updated as a result of the Validate Scope process include any documents that define the product or report status on product completion. Verified project documents may require approvals from the customer or sponsor in the form of signatures or signoffs,

6. Control Scope Process

Control Scope is the process of monitoring the status of the project and product scope and managing changes to the scope baseline, the Control Scope is a process which allows the scope baseline to be maintained throughout the lifecycle of the project The key benefit of this process is that it allows the scope baseline to be maintained throughout the project, Control Scope is a process which is probably one of the most crucial in maintaining the scope baseline and changes the scope baseline whenever necessary. The project managers will mainly look to avoid the scope creep, which is a process where the scope is expanded in an uncontrolled manner.

Control the scope ensures all requested changes and recommended corrective or preventive actions are processed through the Perform Integrated Change Control process. Control Scope is also used to manage the actual changes when they occur and is integrated with the other control processes. The uncontrolled expansion to product or project scope without adjustments to time, cost, and resources is referred to as scope creep. Change is inevitable; therefore, some type of change control process is mandatory for every project.
https://www.invensislearning.com/resources/pmp/how-to-control-scope-in-a-project

6.1 Inputs

6.1.1 Project Management Plan
Described in chapter (4) clause # 2.3.1 +3.1.1 + 4.1.1 + 5.1.1 +6.1.1
Described in chapter (5) clause # 1.3.2 + 5.1.1+6.1.1

6.1.2 Work Performance Information
Described in chapter (4) clause # 3.3.2 +5.1.2
Described in chapter (5) clause # 6.3.1+6.1.2

6.1.3 Requirements Documentation
Described in chapter (5) clause # 2.3.1+3.1.2+4.1.2+5.1.2+6.1.3

6.1.4 Requirements Traceability Matrix
Described in chapter (5) clause # 2.3.3 +5.1.3+6.1.4

6.1.5 Organizational Process Assets (OPA)
Described in chapter (2) clause # 4.1
Described in chapter (4) clause # 1.1.5 + 2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.3
Described in chapter (5) clause # 1.1.5+3.1.3+4.1.3+6.1.5

6.2 Tools and Techniques

6.2.1 Variance Analysis

Variance analysis is an important technique that allows project teams to continuously compare planned performance with actual project data, variance analysis assists project teams in identify and analyze deviations in project performance, it further helps to identify the causes & effect factors, and assess the root causes of deviation. Variance analysis requires a great deal with discipline in data collection and interpretation, project team shall identify deviation in baseline performance, it further establishes causes of variances and assesses severity of impact, the team implement corrective actions to restore project performance, and also the team shall propose preventive actions to avoid future occurrences. Project team as well as quality control area shall identify the deviations base on a specific tools and techniques, and shall structure variance analysis base on the following

elements:

- Identify the root cause of the deviations,
- Identify Cause & Effect of the deviations,
- Assess the quantum of deviations,
- Assess the cost of the deviations,
- Assess the factors impact the project performance,
- Assess the resources needed to reform the deviations,
- Assess the schedule (time frame) to reform the deviations,
- Establish the corrective actions as necessary,
- Establish the preventive actions to prevent recurrence,
- Calculate the cost and benefit analysis,
- Check baseline scope (Procedure, QAP, calibration, and) and ask for change request if any,
- Risk Control by using the data obtained from variance analysis of scope + schedule costs,

6.3 Outputs

6.3.1 Work Performance Measurements

Work Performance Measurements is named the Key Performance Indicators (KPI's) , help team work to measure the effectiveness of various functions and processes important to achieve organizational objectives, Business use KPIs at multiple levels to evaluate their success at reaching targets. High-Level KPIs may focus on the overall performance of the business, while Low-Level KPIs may focus on processes of departments such as purchasing, sales, production, planning, personnel, calibration, stores, QC, planning, and others. KIPs allow executives update their business plan in line with their new strategy, and make their deliverables or achievement is possible. KPIs should be relevant to the business or department and simple to use, when a project developing the KPIs only as necessary without exaggeration, some example on KPI's is exploded shortly:

- **Operation Area Metrics:**

o Effectiveness Metric: It is the relationship between Results obtained & Capacity (by using Ratio), the best way to do that is by achieving the Results expected to higher profits.

o Efficiency Metric: It is the relationship between Results obtained & Resources used (by using Ratio), the best way to do that is by using the minimum quantity of resources to reduce costs.

o Capacity Metric: It is the relationship between the Amount that can be produced & the Time for this to occur (by using Ratio), For example a project is capable to produce 50 Mt / day in average while it is producing at presents 20 Mt / day, the question is "Why?"

o Productivity Metric: It is the relationship between the Amount that can be produced by (A) machine & the Amount that can be produced (B) machine at fixed time and resources (by using Ratio), which is productive more?

o Quality Metric: It is the relationship between the Total output & the outputs suitable (*the degree of acceptance*) and appropriate for use (by using Ratio), the targeted Non-Conformity in relation with frequency of Non-Conformity occur for each machine or cable meters. etc.

o Waste Volume Rating: It is the relationship between the total output & the scrap generated for each machine within a specific period (by using Ratio), the more closed period the accuracy the result will be to enable the concern to take corrective action where deviations raise.

- **Quality control Metrics:**

o Product deviated from Design: This is a critical metric in regulated industries, this metric plays a crucial role in cost of intensive capital investment, it is measure the percentage of products produced vides design estimation, in another word it is the relationship between estimated raw materials in design and the real raw material used.

o   Passed Tests: Sometimes you need to look beyond the requirements level and peer into the execution of every test configuration within a test, KPI is 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.

o   Equilibrium Test with third Party: How much your physical test deviated from international agencies like KEMA, some companies can see too many clients get hung up on the severity level of defects as a result of faultier test. It is a great KPI to monitor the quality, but make certain that your employs test   and balances when setting the severity of a defect. After you ensure the necessary test and balances are in place, then you can set a threshold for this KPI.

o   Rejected Defects: The Rejected Defects of testing KPI is known for its ability to identify a training need for your staff, if your team is rejecting a high number of defects with a comment like "works as designed", maybe you should take your team through the design documentation of the application under test, so no more than 5% of the defects submitted should ever be rejected.

o   Waste Volume Measure: Waste value measure is the relationship between the total output & the scrap generated for each machine within a specific period (by using Ratio), the more closed period the accuracy the result will be to enable the concern to take corrective action where deviations raise.

6.3.2 Organizational Process Assets Updates
Described in chapter (2) clause # 2.5
Described in chapter (4) clause # 6.3.2
Described in chapter (5) clause #6.3.2

6.3.3 Change Requests
Described in chapter (4) clause # 3.3.3 +4.3.1+5.1.3
Described in chapter (5) clause # 5.3.2+6.3.3

6.3.4 Project Management Plan Updates
Described in chapter (4) clause # 3.3.4 +4.3.2+5.3.2
Described in chapter (5) clause # 6.3.4

6.3.5 Project documents Updates
Described in chapter (4) clause # 3.3.5 + 4.3.3 +5.3.3
Described in chapter (5) clause # 3.3.2+4.3.4+5.3.3+6.3.5

Chapter (6)

Project Time Management

Chapter (6)

Getting to Yes - Excellent Project Management

Project Time Management

Overview

Project Time Management is the process of developing , analyzing , controlling , and completion a project or deliverables on a stipulated time. Time management is the efficient use of time by means of efficient organization, efficient productivity, and efficient planning. Project managers are tasked with overseeing their projects from initiation to closer, they are utilizing the machinery, people skills, and other resources to complete the work in most efficient ways to reduce the cost and time and higher the quality is the prime objective of any project. Project managers may develop a sequence list of tasks that need to be completed to track the progress of work through a set of steps called the function of project management, and the time is the 3rd function. Project managers may even implement changes to projects as necessary to make better use of time, and they may keep notes on what went well or what need correction,

Project Time Management required a project to define its processes and simplify them by implementing a Work Breakdown Structure (WBS) of the work package into small component is the crucial factor, this called the segmentation or decomposition of work package , and once the segmentation is made the result is called Schedule Activities , that is to provide a basis for estimation, scheduling, executing and monitoring & controlling the project tasks, the process of defining and planning the Schedule Activities may base on:

https://www.excelr.com/project-time-management-7-processes

- Braking down the activities into integral parts,
- Recording time within each part of the projects,
- Use Timesheets to monitor the time spent by staff,
- Identify and resolve time management issues,
- Keep project plan up-to-date at all times,

Project Time Management refers to a component of overall project management in which a timeline is examined and developed for the completion of a project or deliverable. Time management is a key aspect of managing a project, when a team is working on a project, it needs to be organized to meet deadlines and streamlined to have quick collaboration. To keep the thing simple let us proceed to detail the Project Time Management Process to achieve the desired goal as a milestone to get the project fleshed out:

1. Define Activities Process

Activities process is the steps of identifying and documenting a course of actions to be performed to produce the project deliverables, activities that must be performed to get the project objectives are defined, these activities are

usually as small as possible to be completed within a very short time, ad these , the key benefits of this process is to break down work packages into activities that provide a basis for estimating, scheduling, executing, monitoring, and controlling the project work. In another word in Project Management, 'activities' characterize the measure of work that changes over a plan for appropriate outcomes. Activities in a project are the method to identify and document the activities that are accessible to produce the project deliverables

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1.1 Inputs

1.1.1 Scope Baseline
Described in chapter (5) clauses # 4.3.3
Described in chapter (6) clauses # 1.1.1

1.1.2 Enterprise Environmental Factors (EEF)
Described in chapter (2) clauses # 4.1
Described in chapter (4) clauses # 1.1.4 + 2.1.3+ 3.1.3 + 4.1.3+5.1.4
Described in chapter (6) clauses # 1.1.2+3.1.4+4.1.6+5.1.8

1.1.3 Organizational Process Assets (OPA)
Described in chapter (2) clauses # 4.2
Described in chapter (4) clauses # 1.1.5 + 2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.3
Described in chapter (5) clauses # 1.1.5+3.1.3+4.1.3+6.1.5
Described in chapter (6) clauses # 1.1.3+2.1.5+3.1.5+4.1.7+5.1.9+6.1.4+6.3.2

1.2 Tools and Technique

1.2.1 Decomposition
Described in chapter (4) clauses #4.2.1
Described in chapter (5) clauses # 1.2.1

1.2.2 Rolling Wave Planning Templates (RWP)

Rolling wave planning is the process of planning in waves or stages as the project starts and later the details become clearer, it involves progressive elaboration and that based on the fact that activities required in the immediate future will be known in greater detail than those further into the future. The uses of progressive elaboration means processing work packages in more detail as the project unfolds, this planning method does not exempt the project manager from creating a list of milestones and assumptions for the project planning of coming stages , this method can apply when: http://www.free-management-ebooks.com/faqpm/arollingwave.htm

- The Phases of a project is not clear to make long run plan, so the plan here will be limited to the clear phase only,
- The deliverables planned are not clear to make long run plan, so the plan here will be limited to the clear deliverables only,
- The different phases of the project are not possible to organize together because stages or waves are not clear,

Rolling wave planning involves many details on short run, when each phase is get closer the second plan appears as the phase become clearer, exactly as same as the following picture, "the man is prioritizing to pass the wave against to him and the second will follow". Rolling waves planning is   the process of dividing the work structure into time phases, at the end of each phase. The project manager investigates the work breakdown structure (WBS) and expands it to include more details for the new phase, this technique is particularly suited to the projects where the work involve one phase is highly variable and dependent on the outcome of the previous phase, such as construction projects, or projects that require prototypes. Rolling wave planning takes place in 4 easy steps:
https://www.projectengineer.net/rolling-wave-planning-in-4-easy-steps/

Rolling Wave Planning

Breakdown Work structure (WBS) , then expands it to include more details for the new coming phase,,

- **Create a project WBS:** Means the possibility of breaking down the project structure into small phases allows other phases planning processes takes place later on , once the first a phase is clear , it needs separate management plan , separate budget, separate time schedule, and separate monitoring and controlling until the deliverables realized, then , the second face become more clear, so , it's also need the requirement as same as the first phase , such as separate management plan , separate budget, separate time schedule, and separate monitoring and controlling until the deliverables realized, then , the third face become more clear, and need the same steps to realize the deliverables, and so on,

- **Divide a project into phases:** When the detailed information or knowledge of the future work plan is not clear to important future phases in order for the project to continue, the work shall be divided to get more accurate detailing, for example, if you are building a prototype and you face some uncertainty about the business plan after the initial model, you do not have many options to complete the stage, so you should resort to dividing the work,

- **Provide realistic detail for each phase:** After the project is divided into several stages, the project management shall provide realistic details for each stage, the work details structure for these stages will contain fewer elements, and the phase will be divided into smaller parts, this is the essence of rolling wave planning,

- **Go back to step 1st phase**: Once the first phase is complete successfully, this an is an indication to go to the second phase or wave, these are sequential and frequent action,

1.2.3 Expert Value Judgment
Described in chapter (4) clauses # 1.2.1 +2.2.1 + 3.2.1+ 4.2.1 +5.2.1+6.2.1
Described in chapter (5) clauses # 1.2.1+3.2.1
Described in chapter (6) clauses # 1.2.3+3.2.1+4.2.1

1.3 Outputs

1.2.1 Activity List

Activity List is a comprehensive list which includes all schedule activities required to complete the Project. Each activity describes a particular scope of work with sufficient details. All the activities in the list should have unique title. The activity list decomposes work packages into schedule activities that provide a basis for estimating, scheduling, executing, monitoring, and controlling the project work. This process is performed throughout the project, the list created is called activity list which may include: Survey & Marking + Excavation for foundations + Grading & Compaction + Blinding for footing + Reinforcement & Form work + Concrete Pouring for foundation.
http://planningbuff.weebly.com/pmp-concepts/activity-list-vs-activity-attributes

Activity List includes the activity identifier and a scope of work description for each activity in sufficient detail to ensure the project team members understand what work is required to be completed. Creating a comprehensive schedule is one of the more difficult activities that project managers face because team members often find themselves with project manager works in another way with others that lead them to frustration. However, to improve your chances for success just see the following **6** simple steps below:

▪ **Define the Schedule Activities:** Means Work Breakdown Structure (WBS) of the work packages and decompose them further into schedule activities. Take each WBS work package, and decide what activities are required to create that package.

▪ **Sequence the Activities:** This step requires you to do a breakdown of the activities and arrange them according to the priorities of their completion, there may be overlap in activities, but it is important to know the priorities and put them in a specific activity list.

▪ **Estimate the Resources for Each Activity:** It's include twin resources , *the 1st is Human Resources* such as labor , mangers, team work, stakeholders, entrepreneurs, and *the 2nd is Fiscal Resources* such as money ,machines, equipment, vehicles, intermediate materials (RM), building, and supports such as maintenance, and all that are necessary for executing the project, determining the resource requirements is very important for successful management , the ability of the project to estimate *quantitative (Volume) & qualitative (characteristics)* resources is very crucial to the project success, , in addition to the calculation of costs accurately affects the cost process of the project life cycle life as well as delivery time also, It is important for project managers to know that although this particular process is an integral part of developing the time schedule of the project,

▪ **Schedule Development:** This step is the process where the sequence of activities, resources needed for the activities, and the duration of each activity is used to optimize the overall project schedule. Tools used in this process include critical path method, schedule compression, what-if scenario analysis, resource leveling, and critical chain methods. Each of these topics could have one or more articles dedicated to it, so we will not go into the detail of each.

Standard Activity Attributes Template:

Activity Attributes		
Project:		**Date:**
Activity ID: This information comes from the project activity list.	**Activity:** This is the name of the activity from the project activity list.	**WBS No:** This identifies where this activity can be found in the WBS.
Activity Description: This information includes a detailed description of the work to be performed for this activity and should be consistent with what is provided in the project activity list.		
Activity Responsibility: This section lists who is responsible for executing the work associated with this activity.	**Resources and Skill Sets Required:** This section describes the resources needed to perform the work. For human resources this section should included necessary skill sets and skill levels required to complete the work.	
Activity Predecessors: This section lists other activities which must occur before this activity.	**Predecessor Scheduling:** This describes if the predecessor has a start-start, start-finish or other type of scheduling relationship.	**Predecessor Dependency:** This section describes any dependencies on predecessor activities like lead times, lag times or other requirements.
Activity Successors: This section lists other activities which must occur after this activity.	**Successor Scheduling:** This describes if the successor has a start-start, start-finish or other type of scheduling relationship.	**Successor Dependency:** This section describes any dependencies on successor activities such as lead times, lag times or other requirements.

Source : https://www.projectmanagementdocs.com/template/project-documents/activity-attributes/#axzz6WL8A3rGd

1.2.2 Activity Attributes

Activity attributes are details of project activities which are used to help project planning and scheduling. These details are necessary because they allow the project team not only to understand the work requirements associated with each project activity, but also to consider how activities may impact one another and affect the overall project. Activity attributes may be captured and logged either manually via a standard form or template or they may be entered into project and scheduling software.

Some of the details included in the activity attributes are: activity ID, name, and description; WBS ID; predecessor and successor activities and relationships; resource and logistical requirements; constraints; assumptions; location of activity work to be performed; and who is responsible for performing the work. It is also important to note that the information contained in the activity attributes must be consistent with the activity list:

https://www.projectmanagementdocs.com/template/project-documents/activity-attributes/#axzz6WL8A3rGd

- ID
- WBS ID
- Activity codes
- Activity resources
- Activity Type of resources
- Activity description of resources
- Predecessor activities
- Successor activities

- Logical relationships
- Leads and lags
- Resource requirements
- Imposed dates
- Constraints
- Assumptions
- Location of work to be performed

Activity attributes can be used to recognize the specific people who will be handling specific pieces of the work or to specifically state where the work will be carried out. Other uses include indicating the effort levels that will be required. These include the Level of Effort (LOE), discrete effort, or Apportioned Effort (AE). Developing a schedule that will identify when planned activities will be selected, ordered and sorted is another use of activity attributes.

1.2.3 Milestone List

A milestone list is the process of marking a project progress, without project milestone tracking, you are just monitoring tasks and not necessarily following the right path in your project. A milestone is an important event in a project because it is representing a moment of time when a project management achieve an important event in a project, it should be assigned zero duration. Milestones are crucial in project management as they can add value to the project scheduling. It allows project management to determine if their projects are on schedule or not. A milestone list is a project management document that identifies all the milestones of the project. It also indicates if a particular milestone is critical which is required by the contract or optional for the project.

Distinguishing between tasks and milestones can be difficult on larger projects, if you have ever been confused about what is a task and milestone, then yourself the following questions:
 https://www.teamgantt.com/blog/the-how-and-why-of-using-milestones-in-your-project-plan

- Is this a task or a deliverable?
- Is this an event that impacts the project?
- Will this impact the final deadline?
- Is this an important moment in the project that will indicate forward progress?
- Does this need to be reviewed by stakeholders?

Essentially, you want to make the most important events of your project milestones so they can be easily seen and mapped by the project team. Milestones are given additional significance over tasks in a plan so the project manager can track the tasks while the team and stakeholders focus on forward progress. Milestones make it easier to keep projects on track by calling out major events, dates, decisions, and deliverables. Here are a few examples of project milestones you might include in your plan: https://www.teamgantt.com/blog/the-how-and-why-of-using-milestones-in-your-project-plan

- Spotlight on important dates: such as deadlines of deliverables + start date of a specific phase + end dates for project phase,
- Key deliveries: such as the more concern the market + the more profitable deliverables + the less computable in the market,
- Potential bottleneck: such as constraint of cost + constraint of cost quality + constraint of cost scope + external environment,
- Client and stakeholder approvals: such approval on expansion + contraction+ diversity + new market entry,
- Important meetings and presentations: that may create value added + create new knowledge + born new ideas,

2. Sequence Activities Process

Sequence activities is the process of identifying and documenting relationships among the project activities, the key benefit of this type of process relations is that it defines the logical sequence of work to obtain the greatest efficiency within the given constraints. In the project management process groups and knowledge area mapping the

sequence activities fall under the planning process group and project time management knowledge. The project schedule development uses the outputs from the processes to define activities, sequence activities, estimate activity resources, and estimate activity durations in combination with the scheduling tool to produce the schedule model.

In the sequence activities data flow diagram, every activity and milestone <u>except the first and last</u> should be connected to at least one predecessor with a finish-to-start logical relationship and at least one successor with the finish-to-start or finish-to-finish logical relationship. Sequencing can be performed by using project management software or by using manual or automated techniques.

https://project-management-knowledge.com/definitions/s/sequence-activities/

2.1 Inputs

2.1.1 Activity List
Described in chapter (6) clauses # 1.3.1+2.1.1+3.1.1+4.1.1+5.1.1

2.1.2 Activity Attributes
Described in chapter (6) clauses # 1.3.2+2.1.2+3.1.2+4.1.2+5.1.2

2.1.3 Milestone List
Described in chapter (6) clauses # 1.3.3+2.1.3

2.1.4 Project Scope Statement
Described in chapter (5) clauses # 3.3.1+4.1.1
Described in chapter (6) clauses # 2.1.4+4.1.5+5.1.7

2.1.5 Organizational Process Assets (OPA)
Described in chapter (25) clauses # 4.2
Described in chapter (4) clauses # 1.1.5 + 2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.3
Described in chapter (5) clauses # 1.1.5+3.1.3+4.1.3+6.1.5
Described in chapter (6) clauses # 1.1.3+2.1.5+3.1.5+4.1.7+5.1.9+6.1.4+6.3.2

2.2 Tools and Technique

2.2.1 Precedence Diagramming Method (PDM)

A Precedence Diagramming Method is strategy for scheduling activities in a project plan in a graphical representation technique. It shows the inter-dependencies of activities and is used in schedule development, this method is used for developing a project schedule network diagram that utilizes nodes to represent activities and associates them with projectiles that illustrate the dependencies. This method is likewise called the activity-on-node (AON), this method is used in drawing the project schedule network diagrams such as critical path network, critical chain network diagram, and others. This Diagramming Method shows activity relationships, and it is an important communication tool for stakeholders. Activity on node diagram (AON)
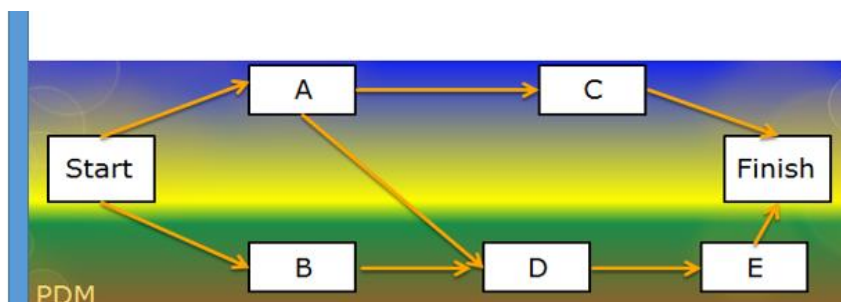
In the precedence diagramming method for creating network diagrams, each box, or node, represents an activity—with the arrows representing relationships between the different activities. The arrows can therefore represent all four possible relationships:

- Finish to Start (FS): This is used when an activity cannot start before another activity finishes.
- Start to Start (SS): This is used to illustrate when two activities are able to start simultaneously.
- Finish to Finish (FF): This is used when to tasks need to finish together
- Start to finish" (SF): This is an uncommon dependency and only used when one activity cannot finish until another activity starts.

2.2.2 Dependency Determination

A Dependency is a method utilized in recognizing the proper sort of dependency that is used to make the relationship among two activities. The activities are named as predecessor (which alludes to the principal action) and successor (the work that goes before the first). Dependencies in project management are well-defined as connections among the projects that decide the sequence in which project management activities should be executed. These tasks might be multiple preceding tasks which mean that two activities can be appropriate at the same time. Furthermore, they are described by the four types of dependencies such as discrete, mandatory, external and internal dependency [roject management is being used 4 Types of Dependencies **https://translate.google.com/#view=home&op=translate&sl=en&tl=ar&text=successor**
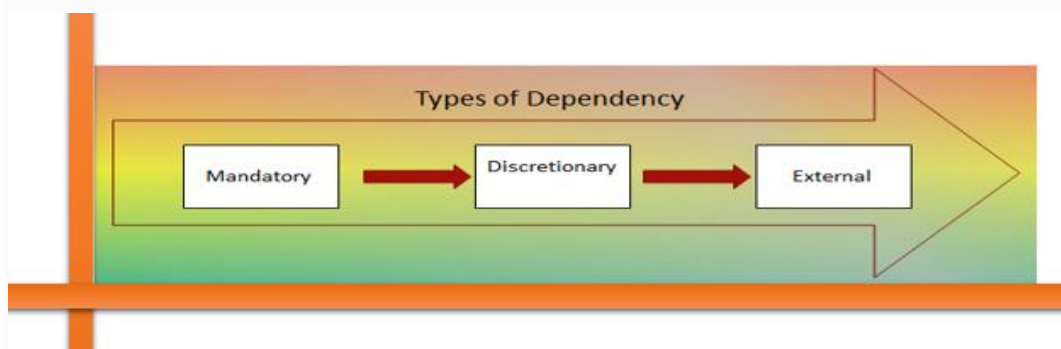
- **Mandatory Dependency:** They are necessary and legally as an integral part of the workplace. Regularly involving physical impediments, the project team figures out the dependencies that are required to implement amid the process of sequencing the tasks, it is also denoted as hard logic and should not be mistaken for relegating plan imperatives in the scheduling tool. For example:

o   Two activities must be performed at the same time (starting and/or finishing at the same time)
o   An activity cannot begin until another activity is completed

- **Discretionary Dependencies:** They are referred as preferable logic, because of best practices or lessons learned from prior experiences, or Soft Logic application area of the project where a particular sequence is needed, even though there might be other sequences that are adequate. Discretionary Project Dependencies are defined by the Project Team, because there could be more than one way to define a sequence between 2 activities, the team would choose their preferred sequence, and can make random float values that can restrict advanced scheduling options, hence, needs to be documented it also must be audited and considered for modifications when optimizing systems are in use, and the project team figures out which dependencies are optional amid the way toward sequencing the tasks. For example:

o   Activity will take place at the same time along with another group of activities
o   Activity will begin after few days of the completion of another activity

- **External Dependency:** External Project Dependencies are defined between non-project Activities and project activities. The non-project activities are done by people who are external to the Project Team such as representatives from the customers' or vendors' of a project, ISO representative, or 3rd party inspection or any

other external groups. The project activities, on the other hand, are done by the Project Team. The Project Team usually does not have control over non-project activities. For example:

o   Get approval from the external organization must be gotten before beginning an activity,
o   Finishing of a project milestone is connected to the completion of a milestone within another project.
o   Developing external dependencies in your project schedule can be cultivated in diverse ways,
o   Embed an achievement that reflects the accomplishment of the external dependency,
o   Embed a planning segment that reflects the scheduling of the external dependency,
o   Associate definite activities in other project plans that require utilization of big business planning too,

Internal Dependency: They are defined between two project activities. The Project Team, usually, has complete control over project activities. The project management team figures out which conditions are inward amid the way toward sequencing the activities.

2.2.3 Applying Leads and Lags

Lead and lag are two terms associated with the relationships that may occur between multiple schedule activities and both play an important role in network diagram development. Lead and Lag Time mean ,When the first activity finishes, a second activity starts. This is a Finish to Start sequence (FS), and it is widely used in a network diagram. There are many instances when the second activity starts when the first activity is about to finish, or a second activity will start a few days after the end of the first activity. They are an integral part of a network diagram. You apply Lead and Lag after you sequence activities and identify the dependencies.
https://pmstudycircle.com/2013/02/lead-time-and-lag-time-in-project-scheduling-network-diagram/

▪   **Lead time** is the acceleration of a successor activity. In other words, the second activity can begin (and be conducted in parallel) as the first activity. Lead is only found activities with finish-to-start relationships: A must finish before B can start. In order to leverage a lead, which will compress the total combined duration of both activities, the dependency must be discretionary, meaning that there is no physical limitation on completing (A) before (B) begins. According to the PMBOK Guide 6th Edition, "Lead time is the amount of time whereby a successor activity can be advanced with respect to a predecessor activity. When the first activity is still running when the second activity starts, it is Lead. Lead Time is the overlap between the first and second activities.

▪   **Lag Time:** is the amount of time whereby a successor activity is required to be delayed with respect to a predecessor activity. When the first activity completes and there is a delay before the second activity starts, this is called Lag. The delay is known as Lag Time. Lag Time is the delay between the first and second activities.

 In short both Lead Time and Lag Time play an important role in developing the schedule baseline. Lead and Lag can be used in any type of dependency in a network diagram. They are very helpful and offer project managers flexibility in schedule development.
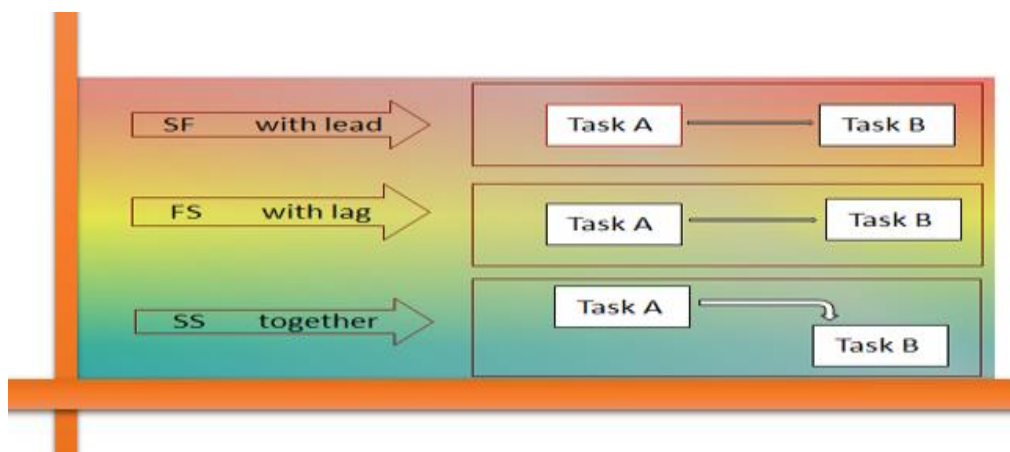
2.2.4 Schedule Network Template

Schedule network templates are set of activities and relationships that have been established that can be used repeatedly for a particular application area or an aspect of the project where a prescribed sequence is desired. The organizational knowledge base for storing and retrieving information includes schedule network diagrams along with issue and defect management databases containing issue and defect status, control information, issue and defect resolution, and action item results. In the process of sequence activities, the schedule network diagrams fall under the outputs of the process. A schedule network diagram in project management is a graphical representation of the logical relationships, also referred to as dependencies, among the project schedule activities. It is produced manually or by using project management software. It can include full project details, or have one or more summary activities. A summary narrative can accompany the diagram and describe the basic approach used to sequence the activities. Any unusual activity sequences within the network should be fully described within the narrative. It also contains the logical relationships of predecessors and successors that will be,

https://projectvictor.com/knowledge-base/schedule-network-templates/

2.3 Outputs

2.3.1 Project Schedule Network Diagrams

A network diagram is a graphical design represents the Process-flow for a project, it often looks like a map or a stream with a series of boxes and arrows, it is used to map out the schedule and work sequence for a project, as well as track its progress through each stage, up to completion, it encompasses every single action and outcome associated with the project, a network diagram also illustrates the scope of a project. A network diagram allows a project manager to track each element of a project and quickly share its status with others, and showing data in fast visual way, and can improve comprehension and enhance retention, a network diagram can also boost performance and productivity, while reducing stress among your team members. There are two main types of network diagrams in project management:

https://www.wrike.com/project-management-guide/faq/what-is-a-network-diagram-in-project-management/aaa
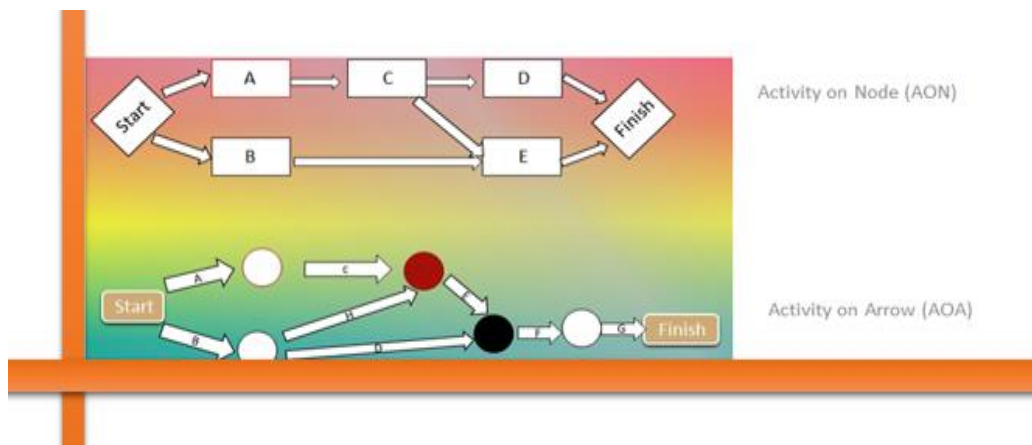
Arrow diagram method (ADM) uses arrows to represent activities associated with the project. The tail of the arrow represents the start of the activity and the head represents the finish. The length of the arrow typically denotes the duration of the activity. Each arrow connects two boxes, known as "nodes." The nodes are used to represent the start or end of an activity in a sequence. The starting node of an activity is sometimes called the "i-node," with the final node of a sequence sometimes called the "j-node. The only relationship between the nodes an activity in an ADM chart can represent is that of "finish starting" or FS.

2.3.2 Project Documents Updates
Described in chapter (4) clauses # 3.3.5 + 4.3.3 +5.3.3
Described in chapter (5) clauses # 3.3.2+4.3.4+5.3.3+6.3.5
Described in chapter (6) clauses # 2.3.2+3.3.3+4.3.2+5.3.4+6.3.5

3. Estimate Activity Resources Process

Estimate Activity Resources Process includes the twin resources , *the 1st is Human Resources* such as labor , mangers, team work, stakeholders, entrepreneurs, and *the 2nd is Fiscal Resources* such as money ,machines, equipment, vehicles, intermediate materials (RM), building, and supports such as maintenance, and all that are necessary for executing the project, determining the resource requirements is very important for successful management , the ability of the project to estimate *quantitative (Volume) & qualitative (characteristics)* resources is very crucial to the project success, in addition to the calculation of costs accurately affects the cost process of the project life cycle as well as delivery time also, it is important for project managers to know that although this particular process is an integral part of developing the time schedule of the project,

3.1 Inputs

3.1.1 Activity List
Described in chapter (6) clauses # 1.3.1+2.1.1+3.1.1+4.1.1+5.1.1

3.1.2 Activity Attributes
Described in chapter (6) clauses # 1.3.2+2.1.2+3.1.2+4.1.2+5.1.2

3.1.3 Resource Calendars

Project Calendar is a tool used to plan work activities in daily, weekly, monthly or yearly, or at all times if they are computerized in specific programs such as Software, so these calendars can define dates and modify and cancel them according to work need. The calendar can include work schedules with customers, suppliers, government agencies and all the interested parties. The calendar also provides the setting of official work dates and additional works and specifies human resources, supply chain and their dates to enable the project to align business according to the timing of delivery, building a calendar will be useful if you want to plan marketing activities, divide elements of product strategy, write content evaluation or schedule any plans and tasks. Here is 4 types of project management calendars that are named: Base + Project + Resource +Task.
https://hygger.io/blog/what-project-calendar-do-we-use-for-supporting-planning-efforts/

▪ **Base Calendar**: A base calendar is the real template a project may use to create the other types of calendars, it is the base calendar defines working days, working times, days off, holidays, for a project, in Meddle Scale Companies (MSC), they may use a single base calendar for their entire teams this aligns with how the business run, while in the Large Scale Companies (LSC), they may use multiple base calendars for their entire teams this aligns with how the business run,

▪ **Project Calendar:** A project calendar shall be built with the help of the above base calendar, it reflects all the days and dates the project team is planned to work, Project calendar then is specific to a particular project. It considers all the project's constraints and requirements. This calendar gives to project manager a comprehensive view of the project's milestones and the

basic tasks that the project will work on and helps define the project's material requirements

▪**Resource Calendar**: A resource calendar also includes the days, dates and time a specific resource is planned to work, a resource can be a person or equipment, devices, raw material, services, result, each type of resources a separate calendar, these types of calendars are a critical for planning tool, and human, and another resources, some managers combine the resource calendar with the project calendar to get a clear overview of what each person on the team is working on.

▪   **Task Calendar:** A task calendar is aimed to reflect a specific task. It captures tasks and resources that fall outside of the purview of the project calendar**.**

3.1.4 Enterprise Environmental Factors (EEF)
Described in chapter (2) clauses # 4.1
Described in chapter (4) clauses # 1.1.4 + 2.1.3+ 3.1.3 + 4.1.3+5.1.4
Described in chapter (6) clauses # 1.1.2+3.1.4+4.1.6+5.1.8

3.1.5 Organizational Process Assets (OPA)
Described in chapter (2) clauses # 4.2
Described in chapter (4) clauses # 1.1.5 + 2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.3
Described in chapter (5) clauses # 1.1.5+3.1.3+4.1.3+6.1.5
Described in chapter (6) clauses # 1.1.3+2.1.5+3.1.5+4.1.7+5.1.9+6.1.4+6.3.2

3.2 Tools and Techniques

3.2.1 Expert Value Judgment
Described in chapter (4) clauses # 1.2.1 +2.2.1 + 3.2.1+ 4.2.1 +5.2.1+6.2.1
Described in chapter (5) clauses # 1.2.1+3.2.1
Described in chapter (6) clauses # 1.2.3+3.2.1+4.2.1

3.2.2 Alternative Analysis

Alternative analysis is the assessment of the different choices available to select the best one that achieve particular project objectives, the projects mostly are having many choices in their life-cycle mostly rendering to the cost volume, it is mostly provides decision-makers the choices for continuing existing programs or starting a new one, with this, it identifies cost-effective actions to avoid duplication of efforts as well as decrease the risks in delivering successful programs in the future. For example:

- ▪   The context of the organizational structure,
- ▪   The Organizational Structures and Styles,
- ▪   The Organizational Communications and Styles,
- ▪   The Organizational Cultures and Styles,
- ▪   The Project Partnership,
- ▪   The Governance Structures and Styles,
- ▪   The Insourcing and styles,
- ▪   The Outsourcing and styles,
- ▪   The Targeted markets,

Alternative analysis achieves a particular project management objective, it is an analytical comparison of different factors like operational cost, risks, quality, effectiveness, efficiency, as well as the imperfection in an operational capability. It requires different tools such as life-cycle costing, sensitivity analysis, and cost-benefit analysis, with alternative analysis, options to the solution are identified to satisfy the needs of an existing or new program.

Alternative analysis is one of the crucial documents produced needed for program reviews and milestones within a project management plan. Most project managers need an alternative analysis before they can even start with the program. The recommendations from the alternative analysis determine whether another program should commence or if the existing one should be continued,

3.2.3 Published Estimating Data

Published estimating data is one of the tools & techniques used in project process to assess the activity resources, benefiting from the scientific journals, publications, magazines, books, brochures, newspapers, project archives , and technical publications data. The team can use these collections of data to guide their estimates. For example, in industry, a project manager may use specific information about the Material Specification or about Material Data Sheet, Material Safety Sheet, Material Process Sheet, and other to process the material in an optimal way, published data can help estimate how quickly a set of people can complete a task easily. The database shall maintain by organization about the unit price and production rates for resources which includes man, machine and material considering different geographical locations. Using this data one can estimate the budget and the resources required to execute the project. This database will be routinely updated by the organization,

3.2.4 Project Management Software

Project management software become wildly popular in recent years, the most important feature is tracking the progress of work of the project, some managers are based on setting the plan, and assigning the resources to tasks, but do not benefit from the feature of monitoring the project performance on software project at all, project manager can track the progress of work in software by monitoring the actual work that that was done, software program calculates the actual and expected effort and cost and predicts the time and effort expected at the end of the project, and calculate the performance of the variances and shows indicators and reports that support decision makers in improving the project performance, all these benefits and many others cannot be done without using the baseline feature that is a copy of the project plan details. Baseline stores data of five basic elements for each task:

- Task Start Date
- Task End Date
- Task Duration

- Task Cost
- Task Work

Project management software refers to the assignment of responsibilities to several levels in management to solve large and complex projects that span different departments and tasks that are very often interconnected with each other's. Project management software assists project managers to collaborate and achieve goals in a timely manner while managing resources, cost, jobs, and assigning tasks, tracking time, budgeting, resource planning, and others, the ability to assign dependencies to tasks, which helps managers determine where a breakdown in productivity is occurring and assign the necessary resources to fix the problem. Task dependencies are often represented through Gantt charts, such as the one below:

Milestones	Jan		Feb		Mar		Apr		May	
Receiving Work Order										
Request Raw materials										
preparing the machines										
Estimation Production Time										
Start Production										
Testing in process										
Testing final										
Delivery										

Project management become increasingly complex and this often leads to the need to won software to manage the information system. Business professionals often rely on the project software solutions to help them oversee multiple businesses, and easily mitigate risks by identifying failed aspects of the project using a time tracking program that predicts completion dates for each stage of the project. Software is a collection of programs designed to operate, control, and extend the processing capabilities of the computer itself. Software system is generally prepared by the computer manufacturers; these software products is among the most useful tools that can help companies in becoming as competitive as possible. Here are 7 benefit of Project Management Software

- **Collaborate:** It promotes the cooperation among people to deliberate documents, timelines, outstanding work, and,
- **Communication:** It promotes communications among internal & external parties like workers, customers, vendors,
- **Budget:** It promotes Inbounding and Out bounding the data and recall report used in budgeting
- **Monitoring:** It promotes the progress of the work is essential in processing and monitoring the stages of projects
- **Document:** It promotes the interested parties to share documents as integral part for success
- **Decision:** It promotes the data-base decision making
- **Progress:** It promotes at all level with Human resources & Fiscal resources as well as interested parties,

3.3 Outputs

3.3.1 Activity Resource Requirements

Activity Resource Requirements is defined in the PMBOK 5th edition as   the types and quantities of resources required for each activity in a work package. Activity resource requirements includes the type, the number, and the skill level of the needed resources. It's useful to include the assumptions that led to the estimates and the basis of estimates of resources needed, and to organize the resources requirements based on breakdown the structure to categorize parts,

This means that hierarchical representation of resources is needed for each type and such as the staff and skills needed for each month. Managing the project resources is how the project manager and project team planning the resources requirements, this requirement need to manage a series numbers of process, and shall know the three primary methods of estimating, Analogous, Parametric, and Three point, are used in conjunction with bottom up or top down estimating to determine the resource requirements. https://www.projectengineer.net/project-resource-management-according-to-the-pmbok/

- **Plan Resources Management: The project manager shall define resources with respect to the Cost & Quality:**
  o The type and grade of resource is required,
  o The quantity needed from the same type and grade considering what you have in your stores,
  o The skilled and the other tier of people needed,
  o The manufacturing facilities needed,
  o The testing facilities needed,
  o The support facilities needed like crane and truck, forklifts, and

- **Estimate Activity Resources: project manager shall estimate resources with respect to the Cost & Quality:**
  o The planed type and grade of resource,
  o The planed quantity from the same type and grade considering what you have in your stores,
  o The planed skilled and the other tier of people needed,
  o The planed manufacturing facilities needed,
  o The planed testing facilities needed,
  o The support facilities needed like crane and truck, forklifts, and

- **Acquire Resources: The project manager shall acquire resources with respect to the Cost & Quality:**
  o Include the agreed resource in project management plan,
  o Schedule shall consult to determine when the resources are needed,
 o Advertised about the project with the staff needed,

o Prepare a project procurement plan,

- **Develop Team: The project manager shall develop team with respect to the Cost & knowledge:**
o Ask additional knowledge to complete your deliverables,
o Train them for additional knowledge to complete your deliverables,
o Put right person in the right place,

- **Manage Team: The project manager shall inspire team with respect to the Cost & knowledge**
o Consider he project team is one of the most important components of project success,
o Consider he project team assignments tend to change as they trained and have good knowledge,
o Support their good ideas and inspire them for better change,
o Evaluate the project team assess their strengths and weaknesses and enhance their performance,
o Let project team feel fun within work,

- **Control Resources: Project manager shall control the resources with respect to the Cost & accountability:**
o Provide the project team with regular procedures and work instruction,
o Provide the project team with regular safety instruction,
o Provide the project team with PPE and keep them comply with,
o Inspire the project team to utilize, to optimize, to maximize their effort and keep eye bird on them,
o Use measures such as 6 Sigma + least squares, regression, KPI'S to the extent of getting to Cost-benefit analysis,

3.3.2 Resource Breakdown Structure

Resource Breakdown Structure is a hierarchical model that is used to break down the resources structure into groups or parts to simplify the identification of resources needed in facilitating and completing a project, the term is refer to a particular hierarchal structure that is put into place for the purposes of illustrating and demonstrating the totality of the resources that current exist to the project team, and presenting this information in an organized fashion for easy recollection by all of those who may need it. The resources are broken down into categories as well as resource types that may be used in resource leveling schedules, as well as to those that may be used for purposes of identifying needs in regards to human resources and staffing
https://project-management-knowledge.com/definitions/r/resource-breakdown-structure/.
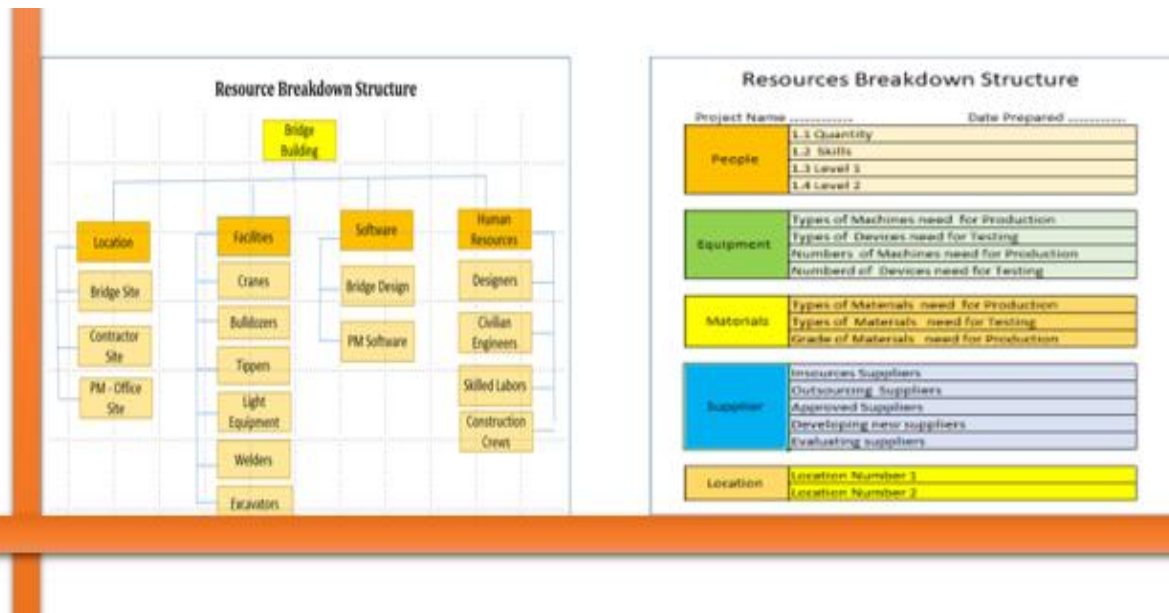
3.3.3 Project Documents Updates
Described in chapter (4) clauses # 3.3.5 + 4.3.3 +5.3.3
Described in chapter (5) clauses # 3.3.2+4.3.4+5.3.3+6.3.5
Described in chapter (6) clauses # 2.3.2+3.3.3+4.3.2+5.3.4+6.3.5

4. Estimate Activity Durations Process

According to the PMBOK (Project Management Body of Knowledge) 5th edition, Estimate Activity Durations is the process of estimating the number of work periods needed to complete individual activities with estimated resources. The key benefit of this process is that it provides the amount of time each activity will take to complete, which is a major input into the Develop Schedule process. Estimate Activity Durations work on sequential steps to avoid guessing:

- Defining the volume of activities required to carry out the activities,
- Estimating the volume of efforts required to carry out the activities,
- Estimating the volume of resources required to carry out the activities,
- Estimating the activity durations, and how much the cost will be,
-

The inputs, tools and techniques, and outputs of this process are depicted here under:

4.1 Inputs

4.1.1 Activity List
Described in chapter (6) clauses # 1.3.1+2.1.1+3.1.1+4.1.1+5.1.1

4.1.2 Activity Attributes
Described in chapter (6) clauses # 1.3.2+2.1.2+3.1.2+4.1.2+5.1.2

4.1.3 Activity Resource Requirements
Described in chapter (6) clauses # 3.3.1+4.1.3+5.1.4

4.1.4 Resource Calendars
Described in chapter (6) clauses # 3.1.3+4.1.4+5.1.5

4.1.5 Project Scope Statement
Described in chapter (5) clauses # 3.3.1+4.1.1
Described in chapter (6) clauses # 2.1.4+4.1.5+5.1.7

4.1.6 Enterprise Environmental Factors (EEF)
Described in chapter (2) clauses # 4.1
Described in chapter (4) clauses # 1.1.4 + 2.1.3+ 3.1.3 + 4.1.3+5.1.4
Described in chapter (6) clauses # 1.1.2+3.1.4+4.1.6+5.1.8

4.1.7 Organizational Process Assets (OPA)
Described in chapter (2) clauses # 4.2
Described in chapter (4) clauses # 1.1.5 + 2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.3
Described in chapter (5) clauses # 1.1.5+3.1.3+4.1.3+6.1.5
Described in chapter (6) clauses # 1.1.3+2.1.5+3.1.5+4.1.7+5.1.9+6.1.4+6.3.2

4.2 Tools and Technique

4.2.1 Expert Value Judgment
Described in chapter (4) clauses # 1.2.1 +2.2.1 + 3.2.1+ 4.2.1 +5.2.1+6.2.1
Described in chapter (5) clauses # 1.2.1+3.2.1
Described in chapter (6) clauses # 1.2.3+3.2.1+4.2.1

4.2.2 Analogous Estimating

Analogous Estimating is one of the most important technique in project management, this technique is used to estimate the cost of any activities base on benchmarking with similar projects, the estimation is implemented in an analogous way. For example, comparing your sales vide a simpler project sale, or comparing your production capacity vides a simpler project production capacity, or comparing your people turnover vide a simpler project people turnover. Project management use this technique when there is no much documentation or information is available in the project, a project manager as well as a project team can make benchmarking with a similar project as same as the following figure,

A project can also take the data from the past of a project to make the said comparison, of course, it's much better if past data is available and taken by expert people, we can say this is a parallel draw between current and past projects events, but may some adjustments is needed to get the project cost more accurate. The estimation can be more accurate if the similarity is high and the estimators are experts. Analogous estimating is also known **as top-down estimating**, it is faster but least accurate, but it is useful if you have fewer details.

4.2.3 Parametric Estimating

Parametric Estimating Like analogous estimating because it based on a historical data to calculate cost, it takes variables statistical data from similar projects and applies them to the current one. For example if you have an area of 1000 square meters and you want to asphalt this area, then you may return back to a similar previous work cost and the price of the asphalt per square meter is equal to 15 Euros, then you will estimate the total cost for the 1000 square meters asphalt in the amount of 15000 Euros, in the light of this estimation, you can estimate human resources, materials, equipment, etc. Parametric estimation is more accurate than analogous estimation because this technique uses the statistical relationship between historical data and variables,

4.2.4 Three-Points Estimating

Three-point estimating is a technique utilizes an optimistic and pessimistic estimate to determine the ideal estimate value for a project task, it helps reduce biases and uncertainties while estimating assumptions. Here, we determine three estimates, instead of one, and you take their average to reduce the uncertainties, risks, and the bias, there are two generally accepted formulas for three point estimates, they are, the Triangular distribution + Beta distribution,
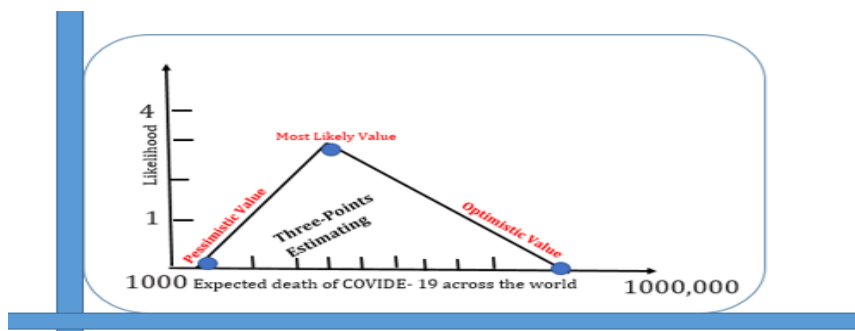
- **Triangular Distribution:** The simplest three-points estimate is the simple average of the three values (known as the triangular distribution); the triangular distribution is the default and should be used if there is no reason to use anything else.

$$E = (O + P + M) / 3 ....Where:$$

- o E = Estimated Cost
- o O = Optimistic Value
- o P = Pessimistic Value
- o M = Most Likely Value

- **Beta Distribution:** The beta distribution places the final estimate closer to the most likely value: The beta distribution should be chosen when there is more confidence in the most likely value, that is, where the final estimate should be tighter to the mean

$$E = (O + 4M + P) / 6 ....Where:$$

- o E = Estimated Cost
- o O = Optimistic Value
- o P = Pessimistic Value
- o M = Most Likely Value

4.2.5 Bottom-up Estimating

Bottom-up estimating is a vital part of project planning, especially for determining project time and cost, the way is used to approximate an overall value by approximating values for smaller components and using the sum total of these values as the overall value, by building detailed cost and time estimates for a work package, the probability of being able to meet the estimated amounts improves substantially, as this type of estimating is used to create a schedule or budget, as the project work is broken down, or decomposed, into smaller components and estimate the duration and the cost is assigned to each component. The schedule is determined by aggregating the individual duration estimates, while the budget is determined by aggregating the individual cost estimates.
 https://study.com/academy/lesson/bottom-up-estimating-definition-disadvantage-examples.html

The advantage of bottom-up estimating:
- Gives greater accuracy of estimation,
- Each component of the project cost and time is known for reference,
- Involvement of areas in charge will obtain new experience,
- The experience obtained make the people familiar and faster too conduct another estimation,
- The project got the estimation better comply with reality,
- Give good incentive to the manager to start the project not to hesitate,

The disadvantage of bottom-up estimating:
- It takes long time to complete the takes,
- It takes large amount of work or complex work is involved,
- It engage people with jobs may not related to their jobs,
- Involving new people having another work may acquire more cost like over time,
- The method prefers accuracy over expediting completion or fast achievement,

4.2.6 Reserve Analysis (Allocations)

 Reserve analysis is used in developing a budget, takes into consideration both contingency reserve and management reserve. Reserve analysis is an analytical technique used to update the reserves kept against risk that something slipping through the cracks, a project manager must work on a specific method to counter the risks by using type of reserves analyses to stay stand in front of potential risks in yearly base , and when the project

preparing the annual estimated budget. A reserve amount is allocated to meet the potential risks that the project management may face. There are two main types of reserves:

- **Management Reserve:** It is an amount of money created from retained earnings to meet unexpected losses or potential risks, this reserve can be in either cost or time, this reserve is not random but it is an estimate reserve based on various risk management techniques budgeted in annually base, there are 2 types of management reserves:

  o Contingency Reserve: Project retains allocations in the budget annually to encounter the potential situation such as risks and threats, or majeure conditions, the project can use this amount or part of it to pay on some urgent expenses to reduce potential risk like loses, waste, majeure conditions,

  o Optional Reserve: Project retains allocations in the budget annually to encounter the potential situation such expansion in the project or products, or for developing new technology, or to face the competitors through developing the products, the project can use this amount or part of it to pay on some urgent expenses to secure better utilizing of the resources,

- **Statutory Reserve:** It is the amount of money, securities or assets that need to be set aside as a legal requirement by insurance companies and financial institutions to cover its claims or obligations which are due in the near future. This is a mandatory reserve since the Government doesn't want to take chances in case an insurance company fails to make payments for the creditors,

4.3 Outputs

4.3.1 Activity Duration Estimates

Activity Duration Estimates   is a process that involves analyzing different activity and estimates how long it takes to accomplish a certain task with the estimated amount of resources that stated in project management plan , the said estimation is important because its provides the amount of time that each activity will require to accomplish its objectives, it's also important to work on the project inputs such as the schedule management plan, activity list, activity attributes, resource calendars, project scope statement, risk register, resource breakdown structure, enterprise environmental factors (EEF) and the organizational process assets (OPA). All of these things are necessary to come up with a good estimate for each individual activity, and finally to estimate the activity duration to the project,

4.3.2 Project Documents Updates
Described in chapter (4) clauses # 3.3.5 + 4.3.3 +5.3.3
Described in chapter (5) clauses # 3.3.2+4.3.4+5.3.3+6.3.5
Described in chapter (6) clauses # 2.3.2+3.3.3+4.3.2+5.3.4+6.3.5

5. Develop Schedule Process

Develop Schedule process is a technique of analyzing activity sequences, durations, resource requirements, and schedule constraints to create the project schedule model, a project schedule will include the start and end dates of each project activity include the relationship among the activities, the resource of activities, the total duration of the project activities, a good schedule will let the stakeholders of the project to use their time wisely to deliver results. Moreover, it also ensures that the project life cycle will be able to meet the necessary deadline.

5.1 Inputs

5.1.1 Activity List
Described in chapter (6) clauses # 1.3.1+2.1.1+3.1.1+4.1.1+5.1.1

5.1.2 Activity Attributes
Described in chapter (6) clauses # 1.3.2+2.1.2+3.1.2+4.1.2+5.1.2

5.1.3 Project Schedule Network Diagrams
Described in chapter (6) clauses # 2.3.1+5.1.3

5.1.4 Activity Resource Requirements
Described in chapter (6) clauses # 3.3.1+4.1.3+5.1.4

5.1.5 Resource Calendars
Described in chapter (6) clauses # 3.1.3+4.1.4+5.1.5

5.1.6 Activity Duration Estimates
Described in chapter (6) clauses # 4.3.1+5.1.6

5.1.7 Project Scope Statement
Described in chapter (5) clauses # 3.3.1+4.1.1
Described in chapter (6) clauses # 2.1.4+4.1.5+5.1.7

5.1.8 Enterprise Environmental Factors (EEF)
Described in chapter (2) clauses # 4.1
Described in chapter (4) clauses # 1.1.4 + 2.1.3+ 3.1.3 + 4.1.3+5.1.4
Described in chapter (6) clauses # 1.1.2+3.1.4+4.1.6+5.1.8

5.1.9 Organizational Process Assets (OPA)
Described in chapter (2) clauses # 4.2
Described in chapter (4) clauses # 1.1.5 + 2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.3
Described in chapter (5) clauses # 1.1.5+3.1.3+4.1.3+6.1.5
Described in chapter (6) clauses # 1.1.3+2.1.5+3.1.5+4.1.7+5.1.9+6.1.4+6.3

5.2 Tools and Techniques

5.2.1 Schedule Network Analysis

Schedule Network Analysis is a method of developing a project schedule by using a graphical representation of all the project tasks, and developing logical relationships among them, this method includes identifying early and late start and finish dates of the project activities, (*need to define project schedule slack + possible float time of tasks*). The graphical show that you need to establish what is called a schedule network diagram that visually depicts a specific manner in which all the tasks on a project schedule are going to happen, and how they are linked into each other.

Schedule network diagram can display interdependencies among the tasks, in other words it is a detailed report showing how and when you are going to execute every next step of a project (*series of events explaining how project schedule activities are linked together*). Schedule network template is a standardized model is accepted in certain organization to speed up the process of schedule network diagram development (*development of networks of project schedule activities*). For creating a final schedule, a schedule network analysis is completed by using an initial schedule and multiple techniques based on:
http://www.taskmanagementguide.com/glossary/what-is-schedule-network-analysis.php

▪ Critical path method

- Critical chain method
- Resources leveling
- What if scenario applying Leads & Lags?
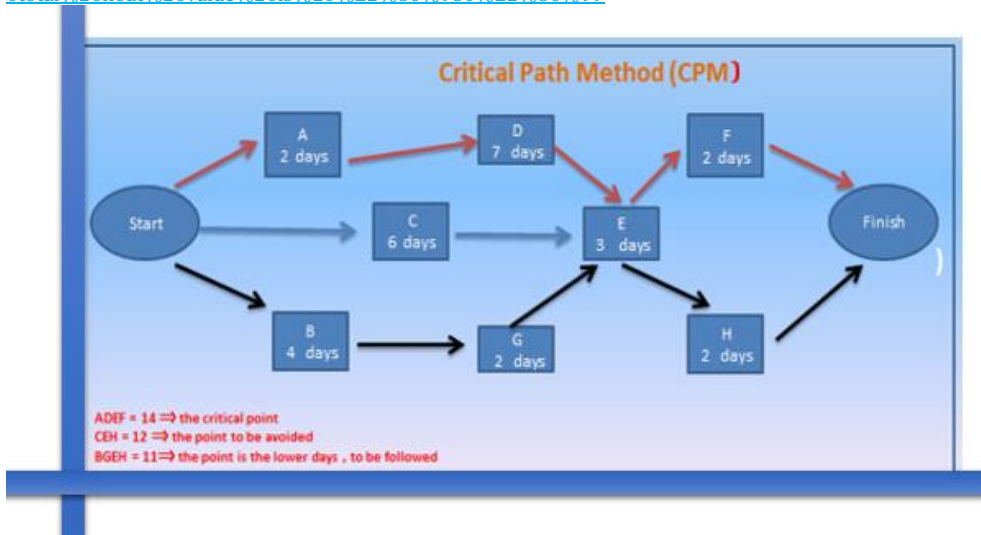- Schedule compression
- Schedule tool

5.2.2 Critical Path Method (CPM)

Critical Path Method is a network analysis method deemed as a one of several techniques for doing project planning, its find out which sequence of activities has the least measure of scheduling resilience by which it predicts the duration of the project, it based on the estimation of the standard time needed for execution of activities, the method manages both time and cost of a project, the critical path of the project is established by identifying the critical activities of the project, critical activities are the activities whose total float value is **zero.**
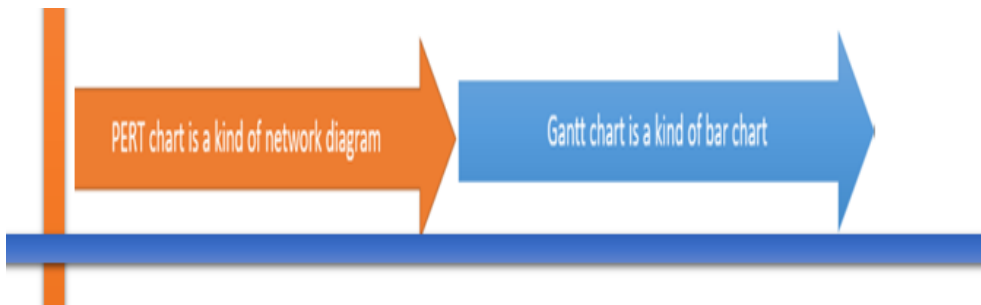
PERT and Gantt charts are visualization tools that are often used in project management, both of these charts are used for task scheduling, controlling, and administering the tasks necessary for the completion of a project. The difference between them is that a PERT chart is a kind of network diagram, while a Gantt chart is a kind of bar chart.

https://translate.google.com/#view=home&op=translate&sl=en&tl=ar&text=Critical%20activities%20are%20the%20activities%20whose%20total%20float%20value%20is%20%E2%80%980%E2%80%99

- **Key benefits of CPM**
o   CPM is effective way to manage new projects,
o   CPM It is extensively used in industry,
o   CPM identifies activities that can be parallel to each other,
o   CPM visualizes projects in a clear graphical form,
o   CPM Helps to compare the planned with the real status,
o   CPM Identifies all critical activities that need attention,
o   CPM promotes a new concept if it is applied correctly,
o   CPM provides demonstrates of dependencies that help scheduling activities of individuals,

- o CPM displays the activities outcomes as a network diagram,
- o CPM gives fair and concise procedure of documenting of project,
- o CPM helps in determining the pending time,
- o CPM allows the communicating of a project plans, schedules, time and cost performance,
- o CPM confirms rationalization, optimization. Maximization, and utilization of resources effectively,
- o CPM confirms the utilization of time and duration easily and show deadlines,
- o CPM Makes dependencies clear and transparent,

▪ Key stages of CPM

- o Identifying a project activities and divide the work structure into list of activities, each must have a duration + specific date
- o Identifying a project sequences and give links between activities because some actions depend on the completion of others,
- o Creating the project network of the activities, and determine activities dependencies, and creating the network,
- o Determine the time needed to complete each activity,

▪ A critical path helps to make the longest sequence on the critical path using the following parameters:

- o Early Start (ES): Represents the time when all previous tasks are completed.
- o Early Finish(EF): Represents the nearest start time and the time required to complete the task.
- o Late Finish (LF): Represents all activities are completed without postponing the deadlines.
- o Late Start (LS): Represents the last end time minus the time it takes to complete the task.

5.2.3 Critical Chain Method

Critical chain method is a schedule network analysis technique that modifies the project schedule base on limited resources, and focuses on managing the duration buffer and resources, in addition to the focuses on activities and scheduled based on Late start (LS) + Late finish (LF) it mixes deterministic and probabilistic approaches to schedule network analysis. Critical chain and Critical Path are frequently confused. Nevertheless, there is a wide world of difference between the two approaches. The critical chain method (*derived from the theory of constraints*) has a resource focus, whereas critical path method is task order focuses.
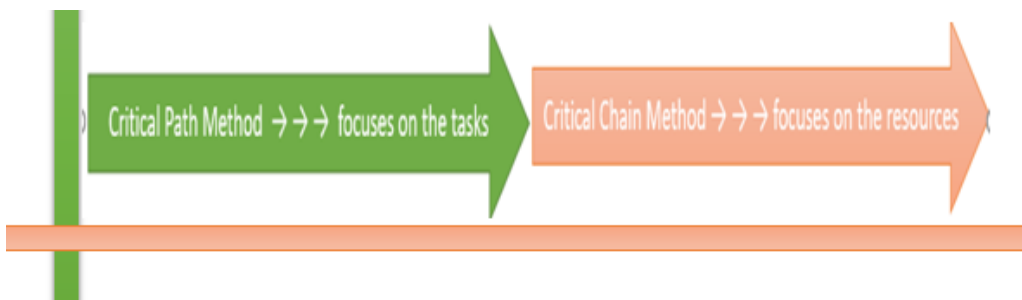
Given the key attributes of change projects, such as poorly defined project tasks, multi-stakeholder environment etc., critical chain modeling best addresses the inherent uncertainty associated with change and human behaviors, and consequently keeps projects better under control, the critical chain method addresses the human response to executing multiple tasks and divides the work into natural work streams, critical path, on the other hand, concentrates on tasks in terms of resource and time efficiencies, causing schedule risk,

5.2.4 Resource Leveling

Resource leveling is the process of planning a project's resources scientifically based on actual needs supported by work orders, and based on expectations derived from market behavior, or through statistical studies of the project's history, or with all of them, projects usually work to fortify the project with the necessary resources, so project managers avoid peaks and troughs. There are two ways to fortify the project with resources, the first is to build a safety stock to routine demand base on statistical sales, the second is to build the inventory base on real

work orders received from the customers, but with some consideration to the market fluctuations, this mean the focus of the survey of the market behavior,

Project managers usually study the triple constraints (time + cost + scope) to achieve the quality over the resources required which is also a technique in which start and end dates are adjusted based on the resource selection in order to balance resource demand with available supply, the resource reconciliation problem must be formulated as a problem optimization, and the problem can be solved by various optimization algorithms such as precision or optimization algorithms,

SN	Resource Leveling	Resource Smoothing
1	Add resource if a project faces limited resources , demand for a resource exceeds the supply	Add resource if a project faces limited duration
2	Add resource to remove all resource conflict with other activities shared the same resource	Add resource just to remove as much as possible resource conflict , but not all resource conflict
3	No need to add resource if may not require additional resources	Add limited resource to address leftover resource conflict to finalized the deliverables
4	Activities may be shifted beyond the float available while rescheduling the activities	Activities are shifted only to the extent of the finalizing float resource available
5	Add resource if a project if the project duration get extended	No need to add resource if the project duration remains the same
6	Add resource if a project if get change in the critical path	No need to add resource if the change can solved by change the critical path or the duration
7	keep safety stock to face urgent demand at a constant level	Keep limited quantity

Resource Optimization is a technique is use to optimize the resource period of fluctuation or when there is a need to keep the resource usage at a constant level based on schedule network analysis technique applied to a schedule that has already been analyzed by the Critical Path Method (CPM), and when resources when resources have been over allocated. It rarely happens that a project has all resources as per its schedule to complete the project, even if a project have them during project execution, then a project manager shall use them to save cost to the project, it is risky to keep high stock and it is risky to keep nothing, a project manager has to use resource optimization techniques such as Resource Leveling and Resource Smoothing technique as per the following table:

5.2.5 What if scenario applying Leads & Lags?

Lead is the acceleration of a successor activity, in other words, the second activity can begin (and be conducted in parallel) as the first activity. Lead is only found activities with finish-to-start relationships: A must finish before B can start. In order to leverage a lead, which will compress the total combined duration of both activities, the dependency must be discretionary, meaning that there is no physical limitation on completing A Before B begins. Please refer to the clause # 2.2.3 in chapter (6),
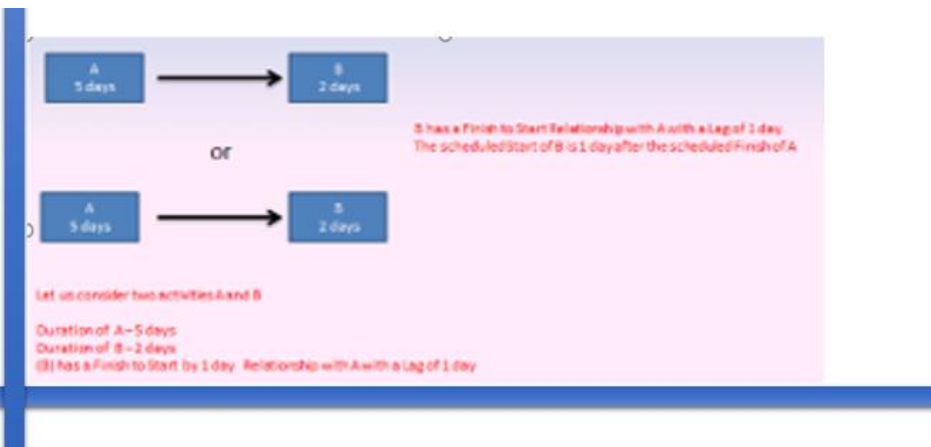 source: https://www.pmlearningsolutions.com/blog/lead-versus-lag-pmp-concept-15
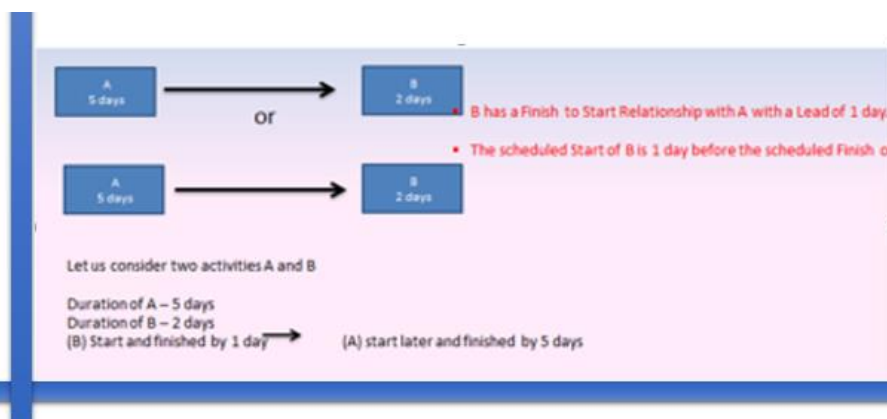
NB: The above example, a Project Team would need 6 days to complete these activities. If the said FS relationship was without any Lead, the Project Team would have needed 7 days. Please refer to the clause # 2.2.3 in chapter (6), source: https://www.pmlearningsolutions.com/blog/lead-versus-lag-pmp-concept-1
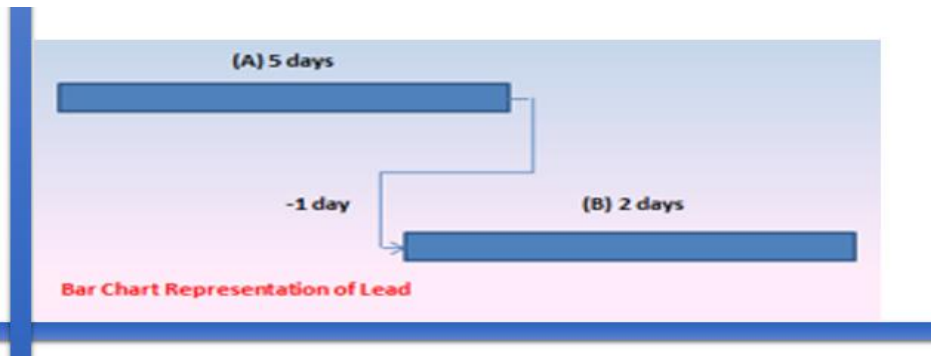
Lag is the delay of a successor activity and represents time that must pass before the second activity can begin. There are no resources associated with a lag. Lag may be found in activities with all relationship types: finish-to-start, start-to-start, finish-to-finish, and start-to-finis,

NB: The above example, a Project Team would need 6 days to complete these activities. If the said FS relationship was without any Lag, the Project Team would have needed 7 days.
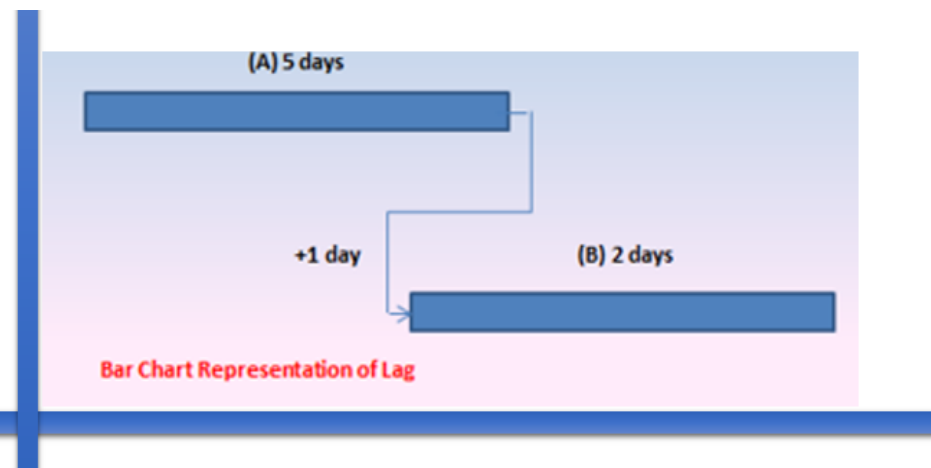
5.2.6 Schedule Compression

Schedule compression is a technique used in project management to meet an update delivery date, or to meet new opportunity, or to reform failure in the schedule, or as a result of unavailability of promised resources, or the occurrence of unidentified risks, or to face force majeure, or to meet client urgent need, but two main reasons accepted well from the project management:

- If there is an opportunity to get another project (Tender) if you can complete this one early,
- If there a need to launch early to precede competitors,

A project can use one of two schedule compression techniques, fast-tracking and crashing, to decrease the project's duration with no change in scope. **http://acqnotes.com/acqnote/tasks/schedule-compression**

- **Crashing:** Crashing is a technique used to shorten the schedule duration for the least incremental cost by adding resources , a project manager must review the critical path activities and find ones that can be completed early with extra resources, that can provide the highest compression with the least cost , a project manager is required also to review the impact on other activities and to provide the solution, in such cases with may more work duration you may require to pay more cost in case of overtime, or more resources, or monetary rewards,

- **Fast-Tracking:** fast-tracking is a schedule compression technique in which activities or phases normally performed in a sequence are done in parallel for at least a portion of their duration, a project manager must review the critical path activities and find ones that can be completed early with extra parallel machines or people, a project manager is required to review the critical path and list all vital activities, a project manager shall review the impact on other activates schedule and to give more float to team work, more care shall be given to the closed phases to utilize paths durations seclude also, Afterward, you will rearrange **the fast-tracked activities** and reanalyze the schedule.

As a rule of thumb, you can fast track sequential activities by 33%. This means you can start the next activity when the previous is 66% complete. Both activities partially overlap. It will increase the risk but within acceptable limits. **https://translate.google.com/#view=home&op=translate&sl=en&tl=ar&text=Afterward%2C**

5.2.7 Scheduling Tool

Scheduling tool is one of the factors that influence the sequence activities process. It is part of the enterprise environmental factors (EEF) to be used in developing the schedule model. Automated scheduling tools contain the schedule model and expedite the scheduling process by generating start and finish dates based on the inputs of activities, network diagrams, resources and activity durations using schedule network analysis.

It can be used in conjunction with other project management software applications as well as manual methods to perform schedule network analysis to generate an updated project schedule. Part of the project management is the develop schedule wherein this process provides a benefit once you enter schedule activities, durations, resources, resource availabilities and logical relationships into the scheduling tool, it generates a schedule model with planned dates for completing project activities. Tool The tools used in businesses to create results are usually considered to be computer related these days.
 https://project-management-knowledge.com/definitions/s/scheduling-tool/

- Bar Chart : It is   a graphical tool used to present data in a way that is easy,
- Organization Chart : It is a charts provide valuable if not essential data to organizations particularly in reference to gathering,
- Seven Basic Quality Tools : they are a standard toolkit used by quality professionals who are responsible for planning, monitoring, and controlling the issues related,
- Change Control System : It is any system that has been implemented that serves the essential purpose

5.3 Outputs

5.3.1 Project Schedule

Project schedule is a tool that helps project managers outline the start and finish times for each individual task, thereby providing a graphical representation of how long the project is expected extend, a project schedule takes into realize the how to identify tasks and activities,

- Resource requirements,
- Duration of tasks and activities,
- Deadlines,
- Resource requirements,

Developing a project management schedule is a complex process that involves identifying activities sequences, setting milestones for those activities and subsequently designing the project schedule management plan. The project manager would have to ensure that just enough time is allocated to each activity as too little time could reduce the quality, while more time is costly, to avoid these pitfalls, a project manager shall develop a project schedule carefully considering the factors of Time + Human + Material considering the following factors:
https://www.nutcache.com/blog/what-is-a-project-schedule-management-plan/

▪ **Mapping the work breakdown structure:** This is a graphic representation of the scope breakdown, and breakdown of the actual work that needs to be done that qualifies it to meet the requirements of the stakeholders

▪ **Sequencing of activities:** Identification of dependencies (lead & Lag) amongst activities and dependencies may be classified as either external or internal, external dependencies refer to a situation where a particular component of the project may have been subcontracted to another organization, with the delivery of said component a prerequisite for the kickoff of the next activity. , feature may draw based on:

- Finish to start: An activity must finish before the successor can start,
- Finish to finish: An activity must finish before the successor can finish,
- Start to start: An activity must start before the successor can start,
- Start to finish: An activity must start before the successor can finish,

▪ **Estimating tasks of duration:** Estimating the duration of each activity won't be accurate always, because a project manager is dealing with human may absence and machines may breakdown within process, in addition to several techniques that help project managers estimate time, the best way to estimate time duration for activities is to refer to historical information from similar projects done in the past based on analogous method,

▪ **Identification of risks:** It is the process of listing potential project risks along with their characteristics that may affect a project, the results of risk identification are normally documented in a risk register, which includes a list of identified potential risks along with their sources, potential risk responses, and risk categories, this information is used for risk analysis, which in turn will support creating risk responses, the purpose of the risk identification process is to ensure that all potential project risks are monitored and controlled , the strategies for dealing with these risks will be devised during later risk management steps,

▪ **Development of the project schedule:** In this stage, a number of tools can be employed, it all depends on the size and needs of the organization, and industry type, a tools can be uses such as PERT Method, Critical path Method, Gantt Chart and others,

5.3.2 Schedule Baseline

Schedule baseline is a touchstone of a project, it is a controlled and documented technique involve the all tasks and processes related to the project, project baseline is the starting point for your project plan, it considers a reference to your time duration of a project , If the project exceeds the specified time drawn in schedule baseline , a project manager has to take action as delay is happened and he need to make adjustments to speed up your progress, It should not be changed without following formal change control procedures A project baseline typically has 3 baselines: Scope + Cost +Time

Baselines are separately monitored, controlled, and reported to ensure each is on track, while if they are fully integrated, it may be referred to as a performance measurement baseline (PMB), that provides a project manager with the ability monitor and manage how a change in one component affects the others,

- **Bennett of Schedule baseline**

  o   The ability to measure the actual cost
  o   The ability to measure the actual scope
  o   The ability to measure the plane with actual realization
  o   The ability to measure activities performance
  o   The ability to be a standard to measure a project's progress
  o   The ability calculates Earned Value (EV)
  o   The ability to analyze project trends and forecast

- **Problems caused by not having a project baseline**

  o   Inadequate resourcing: Due to unplanned schedule, you may not know resources needed and when.
  o   Schedule delays: Due to mistimed procurement, material delivery, you may face risk and loss
  o   Issues with quality management: Due to unclear scope baseline can result in substandard quality
  o   Change management: Due to a lack of proper t baselines in place, or verbal informed.
  o   Unreported progress. Due to the inability to accurately to repot as you don't have a baseline to compare with
  o   Dissatisfaction: Due to no measurement of progress and not informed to the customer and sponsor

5.3.3 Schedule Data

Schedule Data is the collection of information that used for describing and controlling the schedule, they include at least the schedule milestones, schedule activities, activity list and attributes that are in advance mentioned in project plan, but a project may have detailed document including more detailed data that support the schedule date , let see some of these documents:
https://project-management-knowledge.com/definitions/s/schedule-data/

- **Data developing schedule :** you may need to analyze activity sequences, durations, resource requirements, and schedule constraints to create a schedule model for project execution and monitoring and controlling of Schedule baseline, Project schedule ,Schedule data ,Project calendars , and Change requests,

▪ **Data controlling schedule :** Monitoring the status of the project to update project schedule and managing changes to the schedule baseline, you need to control Work performance information, Schedule forecasts, and Change requests,

▪ **Data Project documents :** Collecting the list of project documents is extensive, and basically includes all other documents used on the project that are not part of the Project management Plan of Inputs and Outputs , such as Activity attributes, Activity duration estimates, Activity list , Assumption log , Basis of estimates , Change log, Cost estimates, Cost forecasts, Issue log , Lessons learned register , Milestone list, Physical resource assignments , Project calendars , Project communications , Project schedule , Project schedule network diagrams , Project scope statement , Project team assignments , Quality control measurements , Quality metrics , Quality reports , Requirements documentation , Requirements traceability matrix , Resource breakdown structure , Resource calendars , Resource requirements , Risk register, Risk report , Schedule data , Schedule forecasts ,Stakeholder register , Team charter, Test and evaluation documents ,etc.

Schedule Data will be reviewed and updated in the control schedule process, Schedule Data shall be updated and compiled into schedule model to reflect actual progress of the project and remaining work to be completed by using the scheduling tool and the supporting schedule data are used in conjunction with manual methods or other project management software to perform schedule network analysis to generate an updated project schedule, that will be generated from the schedule model populated with updated schedule data to reflect the schedule change and manage the project.

5.3.4 Project Documents Updates
Described in chapter (4) clauses # 3.3.5 + 4.3.3 +5.3.3
Described in chapter (5) clauses # 3.3.2+4.3.4+5.3.3+6.3.5
Described in chapter (6) clauses # 2.3.2+3.3.3+4.3.2+5.3.4+6.3.5

6. Control schedule Process

Control Schedule is the process of monitoring the status of the project activities to update project progress and manage changes to the schedule baseline to achieve the plan, control schedule process helps to capture the current schedule status, determine the variance from the schedule baseline, understand the nature of the variance and its causes, and respond by taking appropriate action,

6.1 Inputs

6.1.1 Project Management Plan
Described in chapter (4) clauses # 2.3.1 +3.1.1 + 4.1.1 + 5.1.1 +6.1.1
Described in chapter (5) clauses # 1.3.2 + 5.1.1+6.1.1
Described in chapter (6) clauses # 6.1.1

6.1.2 Project Schedule
Described in chapter (6) clauses # 5.3.1 +6.1.2

6.1.3 Work Performance Information
Described in chapter (5) clauses # 3.3.2 +5.1.2
Described in chapter (6) clauses # 6.3.1+6.1.3

6.1.4 Organizational Process Assets (OPA)
Described in chapter (2) clauses # 4.2
Described in chapter (4) clauses # 1.1.5 + 2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.3
Described in chapter (5) clauses # 1.1.5+3.1.3+4.1.3+6.1.5
Described in chapter (6) clauses # 1.1.3+2.1.5+3.1.5+4.1.7+5.1.9+6.1.4+6.3.2

6.2 Tools and Technique

6.2.1 Performance Reviews

Performance reviews measure, compare, and analyze schedule performance such as actual start and finish dates, percent complete, and remaining duration for work in progress. Various techniques may be used, among them:

▪ **Trend Analysis:** it is used to examine the trends in the status data at least during project reviews, to detect budget, schedule, to measure optimization of machines , and other problems as early in the project as possible, in case a trend analysis reveals a need for negotiating project changes, such as the project end date, the budget, staffing, or project deliverables, deal with this as soon as possible, the earlier you propose needed changes, the more likely you will be to get support and agreement. Waiting too long to confront trends often leads to canceling projects.

▪ **Critical path Method:** Critical Path Method is a network analysis approach, and one of several related techniques for doing project planning. It finds out which sequence of activities has the least measure of scheduling resilience by which it predicts the duration of the project. It is based on the estimation of the standard time needed for execution of activities, the method manages the both time and cost of a project. In this method, the critical path of the project is established by identifying the critical activities of the project. Critical activities are the activities whose total float value is **zero**. Described in chapter (6) clause # 5.2.2

▪ **Critical chain Method:** Critical chain method is a schedule network analysis technique that modifies the project schedule to account for limited resources, and focuses on managing the duration buffer and resources, in addition to the focuses on activities and scheduled based on Late start (LS) + Late finish (LF) it mixes deterministic and probabilistic approaches to schedule network analysis. Critical Chain and Critical Path are frequently confused. Nevertheless, there is a world of difference between the two approaches. The Critical Chain Model (derived from the Theory of Constraints) has a resource focus, whereas Critical Path is task order focused. Given the key attributes of change projects, such as poorly defined project tasks, multi-stakeholder environment etc., Critical Chain Modeling best addresses the inherent uncertainty associated with change and human behaviors, and consequently keeps projects better under control, the Critical Chain Method addresses the human response to executing multiple tasks and divides the work into natural work streams, Critical Path, on the other hand, concentrates on tasks in terms of resource and time efficiencies, causing schedule risk. Described in chapter (6) clause # 5.2.3

▪ **Earned value management:** A Project objective is a way to communicate project's team, those individuals who will be executing the project and creating the deliverables that better meet the quality expectations of project stakeholders. Project management objective is the successful development of the project's procedures of initiation, planning, execution, regulation and closure as well as the guidance of the project team's operations towards achieving all the agreed upon goals within the set scope, time, quality and budget standards. Projects are temporary and, unique endeavors. Temporary because they only happen once and have a specific duration and unique in that they are not routine enterprises, but a set of procedures intended to produce a singular product, outcome, service or result, this may include. Described in chapter (1) clause # 11
https://www.clarizen.com/objectives-of-project-management/

6.2.2 Variance Analysis
Described in chapter (5) clauses # 6.2.1
Described in chapter (6) clauses # 6.2.2

6.2.3 Project Management Software
Described in chapter (6) clauses # 3.2.4+6.2.3

6.2.4 Resource Leveling
Described in chapter (6) clauses # 5.2.4+6.2.4

6.2.5 What if scenario applying Leads & Lags?
Described in chapter (6) clauses # 5.2.5+6.2.5

6.2.6 Schedule Compression
Described in chapter (6) clauses # 5.2.6+6.2.6

6.2.7 Scheduling Tool
Described in chapter (6) clauses # 5.2.7+ 6.2.7

6.3 Outputs

6.3.1 Work Performance Measurement
Described in chapter (5) clauses # 4.3.1
Described in chapter (6) clauses # 6.3.1

6.3.2 Organizational Process Assets Updates
Described in chapter (2) clauses # 2.5
Described in chapter (4) clauses # 6.3.2
Described in chapter (5) clauses # 6.3.2

6.3.3 Change Requests
Described in chapter (4) clauses # 3.3.3 +4.3.1+5.1.3
Described in chapter (5) clauses # 5.3.2+6.3.3
Described in chapter (6) clauses # 6.3.3

6.3.4 Project Management Plan Updates
Described in chapter (4) clauses # 3.3.4 +4.3.2+5.3.2
Described in chapter (5) clauses # 6.3.4
Described in chapter (6) clauses # 6.3.4

6.3.5 Project Documents Updates
Described in chapter (4) clauses # 3.3.5 + 4.3.3 +5.3.3
Described in chapter (5) clauses # 3.3.2+4.3.4+5.3.3+6.3.5
Described in chapter (6) clauses # 2.3.2+3.3.3+4.3.2+5.3.4+6.3.5

Chapter (7)

Project Cost Management

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Project Cost Management

Project Cost Management is the process of valuation the life cycle costs including project initial cost and the ongoing costs for the life of the product, the ongoing cost are usually far greater than the project first cost ongoing costs which may include:

- People costs to operate the project product,
- People cost to maintain the project product,
- Utilities cost,
- Materials consumed by the project product
- Insurance costs of the project product,
- Sunk cost,
- Others,

A project is required to prepare careful budget and adhere to it, a project works to a gain return on investment as much as possible, cost management linked with time management to ensure that the project is completed within a stipulated budget and within a stipulated schedule time , the most important mission of cost management is the estimating , allocating , and controlling the costs in a project with respect to the triple constraints (cost + scope+ time) , that must be tapped by cost management, cost estimation is very much sensitive to the success of any project, in estimation process the following consideration shall be in mind,

Considerations	Process
Level of accuracy	Rounding off of data to prescribed precision rules
Organizational procedure links	Linking of the WBS to a unique CA
Control thresholds	Allowable deviations before action needs to be taken
Rules of performance measurements	EVM rules
Reporting formats	Format and frequency for various cost reports
Process descriptions	Documentation of each of the three cost management processes
Source: PMP Exam Prep Boot Camp	

Project Cost Management considers a project success is often measured by how well the project overcome the triple constraint (cost + scope+ time), and provides quality deliverables accepted to the customer. Costs may be classified into direct costs and indirect costs, the purpose of this classification is to assign costs elements, costs may divide into two types:

https://www.investopedia.com/ask/answers/041415/what-are-different-types-costs-cost-accounting.asp

▪ **Direct Cost:** It is a price that can be directly tied to the production of specific product or services or result, it can be attributed to the cost of the objects, direct and indirect costs are the two major types of expenses or costs that companies can incur, direct costs are often variable costs, meaning they fluctuate with production levels such as inventory. Direct costs are easy to assign, while indirect costs are more difficult to assign to a specific product,

▪ **Indirect Cost:** It is a price that can indirectly ties to the expenses unrelated to producing a good or service or results, it can't be easily assign to a product, department, activity, or project. For example, with Toyota company, , the direct costs associated with each vehicle include tires and steel, while the electricity used in operation is considered as indirect cost because the electricity is used for all the products stages in the factory , no one product can be traced back to the electric bill, another examples of indirect costs include depreciations calculated on machinery , and administrative expenses, and sunk cost also,

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1. Estimate Costs Process

All of the costs are associated with completing a project within scope according to its timeline, and forecasting the financial and other resources needed to complete a project within the limit of the defined scope. Initial, high-level estimates are often used in the earliest stages of project planning and can determine whether or not a project is ultimately pursued. Once a project is approved and an organization chooses to move forward with it, more detailed of cost estimates become necessary in order to appropriately allocate various resources, this should include all types of costs associated with to bring- up a project to completion. There are two key types of costs addressed by the cost estimation process: Direct costs: These are the costs associated with a single area, such as a department or this particular project itself. Examples of direct costs include fixed labor, materials and equipment and Indirect costs: These are costs incurred by the organization at large, such as utilities and quality control. Within these two categories, some typical elements that a cost estimation will take into account include:
https://www.wrike.com/project-management-guide/faq/what-is-cost-estimation-in-project-management/

- Labor: the cost of project team members working on the project, both in terms of wages and time.
- Materials and equipment: The cost of resources required for the project, from physical tools to software to legal permits.
- Facilities: the cost of using any working spaces not owned by the organization.
- Vendors: the cost of hiring third-party vendors or contractors.
- Risk: the cost of any contingency plans implemented to reduce risk

1.1 Inputs

1.1.1 Scope Baseline
Described in chapter (5) clauses # 4.3.3
Described in chapter (6) clauses # 1.1.1
Described in chapter (7) clauses # 1.1.1+2.1.3

1.1.2 Project Schedule
Described in chapter (6) clauses # 5.3.1 +6.1.2
Described in chapter (7) clauses # 1.1.2+2.1.4

1.1.3 Human Resources Plan

Human Resources Plan is a part of a Project Strategic Plan, human resources plan is the process of staffing the right number of people at the right places , at the right time based on the project requirement to perform the task required to meet a project objectives, and to satisfy the individual needs , anticipated vacancies arise in the said plan may due to the new requirement , or new promotion, or transfer, or retirement, or termination, or for new opportunities, the said plan is made in the first stage of project initiation, in time of preparing the strategic plan to a project, or within expansion , or on management change , However we have a little bit details on human resource planning process:

- **Evaluating Current HR capacity:** To evaluate a project current HR capacity, the first step is to evaluate a project current staff before any moves to hire new employee, to balance a project need with the talent available in the project,

- **Forecasting a futuristic HR needs:** Once a project has a full inventory of its resources, a project shall evaluate what the futuristic need, considering the training of recent staff. However, forecasting is the detailed process of determining future human resources needs in terms of quantity and quality, and the caliber of talent required to meet a project's current and future needs.

- **Developing Talent Strategies:** After determining a project's staffing needs by assessing the current workforce capacity and forecasting supply and demand, it's the time to begin the process of developing and adding talent using the recruitment phase of the talent development process, or training or to combine them,

- **Reviewing and Evaluating:** Once a project human resource management process plan has been in place for a

set amount of time, a project can evaluate whether the plan has helped a project to achieve its goals, in sensitive industries, they shall keep a line with workers needs not to lose them, as a strong company culture is integral in attracting top talent with adherent maintaining a safe work environment work by focusing on employee health, safety,

1.1.4 Risk Register

Identification of potential risks that constitute weakness or vulnerabilities or threat is very much important, risks usually have negative impacts on the business works , but some other may constitute benefit to the business , project management shall identify the potential risk in Risk Register to monitor their impact on the business , and to monitor their volume and severity and their sources , risk may arise from within in the work , and may arise from the outer of the work, both of them may cause weakness or threat to the work , potential risks must be identified and described in an understandable and clear way in Risk Register,

Assessment of potential risks in project activities is for evaluating their weight, to address and prioritize them according to their weight and based on the probability of occurring (likelihood) , and the seriousness of the outcome if they do (impact), risk assessment activities are sometimes referred to risk analysis or risk mapping, risk assessment can be quantitative or qualitative, for quantitative analysis, explicit values are assigned to the probability of a risk occurring, and impact is often measured in financial terms, while for qualitative risk assessments do not use numbers, and their main aim is to identify those risks are perceived to pose the most danger,

Risks assessments provide an opportunity to identify and understand vulnerabilities, and threats that could impact negatively on the business, an organization can prioritize expenditure and effort on risk mitigation base on a control strategies, risk assessments are an opportunity for the whole team to participate in identifying key risks and obtain a mutual understanding of critical issues that might impact on that lead to success,

Risk register (also called Risk Log) is a master document for all risk related processes, it can be created during risk identification, but it can be updated throughout the project management life cycle, it is part of project management plan, it contains complete information about project that helps to estimate the cost incurred on risks and potential risks, risk register may include, but not limited to:

- Risk description
- Risk sources
- Risk Triggers
- Risk likelihood
- Risk owner
- Risk Category

- Risk causes
- Risk severity
- Risk Ranking
- Risk Frequency of occurrence
- Risk response plan
- Risk emergency plan

- Risk fallback plan
- Risk contingency plan
- Risk occurrence sequences
- Risk firefighting system
- Risk training needs
- Risk cost aggregation

1.1.5 Enterprise Environmental Factors (EEF)
Described in chapter (2) clauses # 4.1
Described in chapter (4) clauses # 1.1.4 + 2.1.3+ 3.1.3 + 4.1.3+5.1.4
Described in chapter (6) clauses # 1.1.2+3.1.4+4.1.6+5.1.8

Described in chapter (7) clauses # 1.1.5

1.1.6 Organizational Process Assets (OPA)
Described in chapter (2) clauses # 4.2
Described in chapter (4) clauses # 1.1.5 + 2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.3
Described in chapter (5) clauses # 1.1.5+3.1.3+4.1.3+6.1.5
Described in chapter (6) clauses # 1.1.3+2.1.5+3.1.5+4.1.7+5.1.9+6.1.4+6.3.2
Described in chapter (7) clauses # 1.1.6+2.1.7+3.1.4+3.3.3

1.2 Tools and Techniques

1.2.1 Expert Value Judgment
Described in chapter (4) clauses # 1.2.1 +2.2.1 + 3.2.1+ 4.2.1 +5.2.1+6.2.1
Described in chapter (5) clauses # 1.2.1+3.2.1
Described in chapter (6) clauses # 1.2.3+3.2.1+4.2.1
Described in chapter (7) clauses # 1.2.1+2.2.3

1.2.2 Analogous Estimating
Described in chapter (6) clauses # 4.2.2
Described in chapter (7) clauses # 1.2.2

1.2.3 Parametric Estimating
Described in chapter (6) clauses # 4.2.3
Described in chapter (7) clauses # 1.2.3

1.2.4 Bottom-up Estimating
Described in chapter (6) clauses # 4.2.5
Described in chapter (7) clauses # 1.2.4

1.2.5 Three-Point Estimating
Described in chapter (6) clauses # 4.2.4
Described in chapter (7) clauses # 1.2.5

1.2.6 Reserve Analysis
Described in chapter (6) clauses # 4.2.6
Described in chapter (7) clauses # 1.2.6+2.2.2

1.2.7 Cost of Quality

Cost of Quality refers to the total costs valuation to bring up a business (product + service + result) to a specific standards and norms, it can be evaluated by project management within the limit of stipulated standards , each business has its own standards based on the nature of the business , the cost of quality is the twin costs of conformance + the costs of non-conformance of the business, when the a business meets or exceeds its design specifications and standards , and become free from imperfection , then we can say the business is high conformity.

The prevention, detection, and dealing with defects (nonconformity) incurred costs that are called costs of quality, so, cost of quality refers to the all costs that are incurred to prevent defects in products, and this concept isn't limited to the duration of a specific project, costs of quality do not just relate to manufacturing, it also related to all the activities from initial including research and development (R & D) until to deliver the business to the customer successfully, the complete product life-cycle is included while deriving the Cost of Quality. The overall cost of quality is reviewed as a part of project management to make decisions on how much will be invested in quality. There are **2** main categories within the definition of cost of quality, the cost of Conformance and Cost of Non Conformance

Cost of conformity (Prevention Cost)	Cost of non- conformity (Failure Cost)
▪ Cost of quality planning	▪ Cost of Scrapping inventory and waste
▪ Cost of quality training	▪ Cost of re-work
▪ Cost of reliability engineering	▪ Cost of warranty
▪ Cost of data analysis	▪ Cost of liability or insurance
▪ Cost of test engineering	▪ Cost of low sales
▪ Cost of inspection (In process)	▪ Cost of lost customers
▪ Cost of Studies and surveys (R&D)	▪ Cost of low reputation
▪ Cost of test equipment	▪ Cost of low team morale
▪ Cost of calibration of production and testing facilities	▪ Cost of decreased efficiency
▪ Cost of losing opportunities	▪ Cost of product return cost

▪ **Cost of Conformity is incurred to prevent and detect the nonconformance / failure- they are:**

o **Prevention Costs:** Prevention costs include all costs which are incurred for activities that are specifically designed to prevent poor product quality from happening, it is very much less expensive to prevent a problem from happening than it is to find and to correct the problem after it has occurred is expensive, prevention costs are incurred for activities whose purpose is to reduce the number of defects, a project employs shall understand the tools & techniques that prevent defects,

o **Appraisal Costs**: Appraisal costs include all costs which are incurred for activities that are specifically customized to inspect the product that customized to the customer, it is also called (cost of inspection). However, performing appraisal activities does not prevent defects from occurring, most managers now realize that maintaining a team of inspectors is not an effective approach to quality control, a better way is asking employees to be responsible for their own quality control, along with creating designs for how to manufacture a defect-free product, this approach allows quality to be built into the product, rather than relying on inspections to identify any defects.

▪ **Cost of Non Conformity is incurred to reform or to rectify a poor quality- they are:**

o **Cost of Internal Failure:** Internal failure costs result from identification of defects before they are shipped to the customers, these defects are identified within the scope of the project, the cost here is includes the rejected cost + reform cost + scrap cost + downtime cost + staff cost + reputation cost, these cost are attributed to quality problems, this increases the level of internal failure costs which is unprofitable,

o **Cost of External Failure:** External failure costs result from delivering a defective product to the customer, the cost here is includes warranty cost + repair cost + replacements cost + product recalls cost + sale loss cost +liabilities from legal action against a company + reputation for poor quality + decimate a business's profits + cost of scrap, these types of costs are not there in the balance sheet, but they can definitely have an adverse impact on the income statement, products with defects shouldn't reach the customers , we can ensure that they don't slip through to become external failures, even if we have an external failure, we should act fast and resolve them with the customer before shipping, that is why quality is define as the degree to which a set of inherent characteristics fulfills requirements.
https://www.simplilearn.com/project-quality-management-cost-of-quality-article

1.2.8 Project Management Estimating Software

In addition to chapter (6) clause # 3.2.4 + 6.2.3 that have been described the Project Management Software, it is mostly very much necessary to estimate the cost of quality of the software techniques as quality is completely integral to any software project is about making sure that software works in the way it is supposed to work every time, software estimating the quality is very much helps to Quality Assurance as declared here under:

▪ **Saves project Money:** Using advanced software for testing quality throughout a development process of testing will save time and money and efforts, while the use of a faulty software even throughout a development process of the testing will decimate a business's profits,

▪ **Prevents Suffocation:** Offering a quality software prevents system outages and data loss, and prevents communication breakdowns, otherwise software will be disastrous for quality work,

▪ **Inspires Customer Confidence:** Offering a quality software makes test results clear, fast, accurate, accessible, easy to report, and measure the accumulative result easily, this will drive the customer for more confidante,

▪ **Brings in More Profit:** Offering a quality software to invest in quality assurance makes a project benchmarking is vital and more practical, and makes a project in higher position among competitors,

▪ **Boosts Customer Satisfaction:** Offering quality software that works when and how you want it to work will boost your reputation by producing happy customers, as you give them the quality from the beginning and they will reward you with loyalty.

▪ **Enhances Productivity:** Offering quality software provides a clear, documented, steady, sequential, consistent, and agile data, and gives meaning analytical that can be reversed into graphical curves for rapid understanding,

1.2.9 Vendor Bid Analysis

Vendor bid analysis is the process of determination the appropriate cost from several vendors , most of the projects are quoting the prices using the questions from at least three vendors , so they can easily compare the quality and the rock bottom prices they may need , most of the projects are keeping in their register **Approved Vendor List**, this list shall contain the accepted or the qualified vendors from the point view of the purchaser, the said list deemed a historical reference for the repentance of purchases. Vendor bid analysis is one of the tools and techniques used to estimate the costs, it involves estimating what the project or sub-component should cost fair value. Cost estimating methods may include analysis of what the project should cost, based on the responsive bids from qualified vendors, when projects are awarded to a vendor under competitive processes, additional cost estimating work may be required of the project team to examine the price of individual deliverables and to derive a cost. Generally, the business attention is focused on the Value Added, project need to analysis the vendors bid through:

▪ **Vendors Approved List (Adding the qualified vendors)**
o Approve the higher Quality Rating + Delivery Rating + Price Rating,
o Approve the ability of continuity providing the purchases,
o Approve the ability to create the alternatives of products,
o Approve the foot feet in market,
o New vendors' entry with better comparative advantages,

▪ **Vendors Approved List (rule out some vendors)**
o Vendors who announced no longer manufacturing or supplying the material,
o Vendors who are considered as no longer reliable as vendors,
o Vendors rating is not improved within 1 year,
o Vendors quality not advance same as competitors,

▪ **Vendors Assessment based on Quality Rating (QR)**
o By measuring the percentage of rejections on each consignment,
o By measuring the percentage of defect on each services,
o By measuring the vendor continuity supply,
o By measuring the vendor satisfaction to both sides importer and exporter

▪ **Vendors Assessment based on delivery Rating (DR)**
o Frequency of on-time deliveries to early and late deliveries- Reduce # of errors.
o Frequency of right quantity delivered,
o Frequency of right product delivered,
o Frequency of right quantity delivered,
o Purchase documentation accuracy,

▪ **Vendors Assessment based on Cost Rating (CR)**
o Saving cost charge on a project,
o Providing opportunities with regards to cost + time+ quality,
o The % discounts given on qualitative purchases,

- o The ability to reduce risk on purchases with warranties,
- o The more safety the products provided,

There may be hidden risks that could harm delivery or quality and affect the continuity of supply and push manufacturers to lose their business for reasons that are unfair and immoral. For example, many companies are looking for cheap raw materials to reduce their production costs, if this is the case: These companies have to incur the potential catastrophe, the purchase of cheap products such as Chinese-made Door Locks Pads + Sanitary Ware, for several times they were broken during the installation, these Locks + Sanitary Ware are made from mixed sand and some iron, but not of iron at least. Carpenters and Plumbers were buying again and again without getting any benefits, therefore, they getting away from Chinese Industries. Chinese Industries has become closer to the truth of retreated and fallen in front of the Taiwanese, Malaysian and other Industries.

1.3 Outputs

1.3.1 Activity Cost Estimates

According to Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) 5th edition: Activity cost estimates are quantitative assessments of the probable costs required to complete project work. Cost estimates can be presented in summary form or in detail. Costs are estimated for all resources that are applied to the activity cost estimate, this includes:

▪ **Direct Cost:** It is a price that can be directly tied to the production of specific product or services or result, it can be attributed to the cost of the objects, direct and indirect costs are the two major types of expenses or costs that companies can incur, direct costs are often variable costs, meaning they fluctuate with production levels such as inventory. Direct costs are easy to assign, while indirect costs are more difficult to assign to a specific product,

▪ **Indirect Cost:** It is a price that can indirectly ties to the expenses unrelated to producing a good or service or results, it can't be easily assign to a product, department, activity, or project. For example, with Toyota company, , the direct costs associated with each vehicle include tires and steel, while the electricity used in operation is considered as indirect cost because the electricity is used for all the products stages in the factory , no one product can be traced back to the electric bill, another examples of indirect costs include depreciations calculated on machinery , and administrative expenses, and sunk cost also.

Activity Cost Estimates is one of the most important processes in project management. You can use it for many purposes, if an organization wants to know the cost to quote the correct price when bidding for a project, Activity Cost Estimates is also the process of forecasting the project's cost with a defined scope. Rework and defects are deemed a direct result of a lack of attention to quality. The higher the rework, the more time and money is wasted and the cost and basic schedule increased. Lack of attention to quality adds unnecessary risk to the project, resulting in a massive amount of work and additional expenses. It is important to know at the beginning of the project what acceptable quality and how it is measured in the project in order to carry out the work with quality and to avoid many problems at a later stage of project operations,
https://translate.google.com/#view=home&op=translate&sl=ar&tl=en&text=%D8

1.3.2 Basis of Estimates

Cost of Estimate is the process of forecasting the cost and other resources needed to complete a project within a defined scope, cost estimation for each element required for the project and to calculate the total amount that determines a project's budget, estimating is generally where all the cost data is generated for a project, the amount and type of additional details supporting the cost estimate that vary by application area, regardless of the level of detail, the supporting documentation should provide a clear and complete understanding of how the cost estimate is derived

▪ **Activity cost estimates requirements:**

- o Documentation of the basis of the estimate,
- o Documentation of all assumptions made,

- o Documentation of any known constraints,
- o Indication of the possible range estimates among alternatives,
- o Indication of the confidence level of the final estimate,

SL	Estimate Base	Definition	Uses	Memory Trick
1	Expert Judgment	Someone who knows a lot more than you do about estimating a cost	When you can! Expert judgment is a useful tool in a variety of situations	When in doubt, ask someone who knows more than you!
2	Analogous Estimating	Using values from a similar project to estimate costs for your current project	Know a similar project and need a rough estimate in a short amount of time? Use it!	Find analogies to similar projects, but remember that its use is limited due to the nature of projects , they create something new and unique, so analogy can only go so far.
3	Parametric Estimating	Using similar data as you might use in analogous estimating but spending more time to use current variables and analyze	Do you have some analogous data but have more time? Use it!	Historical data + other variables + statistical analysis = parametric
4	Bottom-Up Estimating	Estimating each work package, then rolling up to a summary level	It's time consuming, but uses it when you need a more precise estimate.	Estimating every work package in excruciating detail
5	Three-Point Estimation	Using formulas to improve accuracy	When you have Pessimistic (P), Most Likely (L), and Optimistic estimates (O)	Know the formulas! (Sorry, no other way, folks!), Triangular = (P+L+O)/3, PERT Beta = (P+4L+O)/6
6	Reserve Analysis	Contingency reserves (AKA allowances) that account for the "known-unknown" risks & management reserves that account for the "unknown-unknown" risks	Throughout the project contingency reserves may be used or decreased/remove as the project progresses. If management reserves are used, then they need to be added to the cost baseline	Contingency reserves are for the "known-unknowns" that you ID in your risk register. Management reserves are for when the unexpected happens, and management can approve or deny use. Both make up reserve analysis!
7	Cost of Quality (COQ)	Assumptions about quality used to develop cost estimates	If needed, depending on the focus on quality within your project	This tool is described in more detail in the Quality Management Plan — just known that it can impact cost!
8	Project Software	Software used to do simulations and make estimates	When available and you need to make complicated calculations easier	Use it if you have complex calculations and it is available to you
9	Vendor Bid Analysis	Analyzing & using bids from vendors to determine what is an appropriate cost, especially if you don't have much information	Don't know what something will cost, and neither does your team? Collect bids from vendors, then analyze to get a range.	Don't get this one confused with a Procurement Process — Vendor Bid Analysis allows you to develop a cost estimate if you don't have your own expertise.
	Source	https://magoosh.com/pmp/10-cost-estimation-techniques-in-project-managment/		

- **Cost Estimate Activity Resources Steps:**

- o Reviewing Resource Availability: The resources shall be available as planned, and shall be to valuated according to the scientific methodology like Analogous, Parametric, Bottom-up, three points estimating, and

- o Reviewing WBS and Activity List: The WBS represents the whole picture of the project activities, when the components of WBS valuated, the WBS is the total,

- o Customization of Resources: The customization is the process of allocation the resources according to the process as necessary, this is to allot who will complete a specific project activity to ease the estimates, and to make Cost Center

- o Reviewing the Historical Data: The historical data shall be documented, the historical for a specific project may be useful to estimate the resource to another similar project,

- o Reviewing Project Policies: A project may have a specific policies and rules on purchasing and distributing the resources, and the cost estimate shall act according to the set policies and rules,

- o Expert Value Judgment: The experts are right people how can direct a project management on what resources are needed and when shall be available, and where shall be distributed,

- Taking Decisions on Resources Needed: During the estimate of activity resources, a project team might need a specific resource for a specific project, and it is not utilized for any other projects, then it would be wise to release the required resource as necessary,

- Breaking Down Complex Activity to Estimate: This point is related to WBS that decomposing the activities to smallest tasks to simplify the estimate, a further breakdown of a task should be possible and amid to estimate activity resources,

- Qualified Resource Needed: This point is related to the type of resources needed including human resources and facilities to be assigned to the project based on exert value judgment,

- Update Project Documents: Most project have different levels of activities, each activity shall have its own documents, as in numerous different processes, activities done in the estimate activity resources process require an update of project archives

1.3.3 Project Documents Updates

Described in chapter (4) clauses # 3.3.5 + 4.3.3 +5.3.3
Described in chapter (5) clauses # 3.3.2+4.3.4+5.3.3+6.3.5
Described in chapter (6) clauses # 2.3.2+3.3.3+4.3.2+5.3.4+6.3.5
Described in chapter (7) clauses # 1.3.3+2.3.3+3.3.6

2. Determine Budget Process

A Project Budget is the total amount of monetary resources that are allocated for particular goals and objectives of the project for a specific period of time. The purpose of project budget management is to estimate and control project costs within the approved budget and to achieve the stated goals of the project process is formally identifying, approving and paying the costs or expenses incurred on the project.

The process of determining budget for a project is an activity of aggregating the cost estimates of individual activities, or a work package, to develop the total cost estimate that allows setting a formal cost baseline. This baseline is used to state the budget. The budget may differ from the formal cost baseline and constitute the funds authorized to perform the project and its activities. The purpose of the process is to authorize and allocate the monetary resources necessary to complete all project activities and deliver the project on schedule. The main output of the process is a set of monetary resources requirements that serve as a foundation for estimating and controlling the budget and provide valuable data to the project resource management process

https://mymanagementguide.com/guidelines/project-management/cost-management/determining-project-budget/

2.1 Inputs

2.1.1 Activity Cost Estimates
Described in chapter (7) clauses # 1.3.1+2.1.1

2.1.2 Basis of Estimates
Described in chapter (7) clauses # 1.3.2+2.1.2

2.1.3 Scope Baseline
Described in chapter (5) clauses # 4.3.3
Described in chapter (6) clauses # 1.1.1
Described in chapter (7) clauses # 1.1.1+2.1.3

2.1.4 Project Schedule
Described in chapter (6) clauses # 5.3.1 +6.1.2
Described in chapter (7) clauses # 1.1.2+2.1.4

2.1.5 Resource Calendars
Described in chapter (6) clauses # 3.1.3+4.1.4+5.1.5
Described in chapter (7) clauses # 2.1.5

2.1.6 Contract
Described in chapter (4) clauses # 1.1.3
Described in chapter (7) clauses # 2.1.6

2.1.7 Organizational Process Assets (OPA)
Described in chapter (2) clauses # 4.2
Described in chapter (4) clauses # 1.1.5 + 2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.3
Described in chapter (5) clauses # 1.1.5+3.1.3+4.1.3+6.1.5
Described in chapter (6) clauses #1.1.3+2.1.5+3.1.5+4.1.7+5.1.9+6.1.4+6.3.2
Described in chapter (7) clauses # 1.1.6+2.1.7+3.1.4+3.3.3

2.2 Tools and technique

2.2.1 Cost Aggregation

Cost aggregation is the summing the cost for the individual work package to control the financial account up to the project level. This is achieved by the summation of the lower-level cost estimates that are associated with different work packages within the work breakdown structure, the given cost control account can also be used to calculate the cost aggregation, the cost aggregation is coupled with other tools to determine the budget such as funding limit reconciliation and reserve analysis.
https://www.dummies.com/careers/project-management/pmp-certification/techniques-to-determine-budget-for-the-pmp-certification-exam/

2.2.2 Reserve Analysis
Described in chapter (6) clauses # 4.2.6
Described in chapter (7) clauses # 1.2.6+2.2.2

2.2.3 Expert Value Judgment
Described in chapter (4) clauses # 1.2.1 +2.2.1 + 3.2.1+ 4.2.1 +5.2.1+6.2.1
Described in chapter (5) clauses # 1.2.1+3.2.1
Described in chapter (6) clauses # 1.2.3+3.2.1+4.2.1
Described in chapter (7) clauses # 1.2.1+2.2.3

2.2.4 Historical Relationship

The historical relationship is due to the project's stock from the implicit and the explicit information that the project possesses, whether documented or undocumented with the aim of collecting and documenting it, and therefore considering it historical information that is useful as a reference when needed for purposes of cost estimation for purpose of calculating previous prices or any information that contains resources , the project leader may use the information for the purposes of gathering as much information as possible about projects, activities or events that occurred in previous time periods for the purposes of providing sufficient vision and background to the team when making decisions that will ultimately affect the project's path,

Resources that can be used for purposes of collecting this amount of information can range from formal and informal materials such as final reports that have been written and distributed externally or more reports that have been written and published internally, as well as other miscellaneous data, any miscellaneous project files, records and historical notes , And any written communications that may have been made, whether written or electronic, and any previously closed contracts that may exist,

2.2.5 Funding Limit Reconciliation

Funding Limit Reconciliation is the process of comparing the planned fund expenditure against the commitment of funds to the project, and the process of comparing the planed fund expenditure against the real expenditure. The expenditure of funds should be reconciled with any funding limits on the commitment of funds for the project. A variance between the funding limits and the planned expenditures will sometimes necessitate the rescheduling of work to level out the rate of expenditures. This is accomplished by placing imposed date constraints for work into the project schedule.

2.3 Outputs

2.3.1   Cost Performance Baseline

Project Baseline refers to an accepted and approved project plan, besides the schedule baseline, the cost/budget baseline is the most important part of a project baseline. The cost baseline handles the amount of money the project is predicted to cost and on the other side when that money will be spent. It is an approved budget usually in a time distribution format used to estimate, monitor, and control the overall cost performance of the project, in some cases there can be several intermediary baselines when the project was not well planned or when significant changes appear to the scope of the project.

The initial baseline is usually what gets budgeted in the company's financials, all types of baselines are closely related and changes to one of them will result in changes to the others, if a change is made in the project scope baseline, the schedule baseline will have adjusted, then the cost baseline will probably have to be changed as well. Cost Performance Baseline is integral part of a project baseline, because the total activities cost is a project baseline that come from bottom-up. Cost performance is the measurement of activities expenditure against the planed baseline, the more expenditures the activities against the cost baseline is the more non-conformity is raised, and the less expenditures the activities against the cost baseline is the more advanced performance the project,
https://www.rationalplan.com/projectmanagementblog/creating-budget-cost-baseline-projects/

2.3.2 Project Funding Requirement

In project management, the project managers need to know exactly what their funding requirements are, even before they commence with the project. There are two types of funding management requirement and these include the total funding requirement and the period requirement. The total funding requirement is defined as the cost that is identified in the cost baseline. It also includes the management reserves. The period funding requirement is defined as the annual and quarterly payments. Both of these funding requirements are derived from the cost baseline.

The cost baseline is an important element in determining the project funding requirement and it includes the projected expenditures as well as the anticipated liabilities that may arise in the middle of the project. The funding may occur in incremental amounts in project management. They might not also be evenly distributed. This particular project management document should also include the sources of the funding or where the funds will be obtained. It is one of the necessary inputs that is used creating the control cost that is necessary for monitoring and updating the project costs and its changes.
https://translate.google.com/#view=home&op=translate&sl=en&tl=ar&text=In%20project

2.3.3 Project Documents Updates
Described in chapter (4) clauses # 3.3.5 + 4.3.3 +5.3.3
Described in chapter (5) clauses # 3.3.2+4.3.4+5.3.3+6.3.5
Described in chapter (6) clauses # 2.3.2+3.3.3+4.3.2+5.3.4+6.3.5
Described in chapter (7) clauses # 1.3.3+2.3.3+3.3.6

3. Control Cost Process

Control costs is the process of monitoring and controlling and updating the status of a project expenditures in order to control the costs of process flows and change request, projects face risks within the execution , to allow project managers keep a watchful eye on the cost , and to be always aware of the risks , and how to avoid or mitigate them, and allow him to detect the deviation on real cost spent against the cost baseline, it is very much necessary for project manager to assess the cost change within a project life cycle ,the control costs allow a project manager to determine the deviation from cost baseline or the deviation from cost management plan, to take the necessary corrective action and to close the phase, and keep watch eye on:
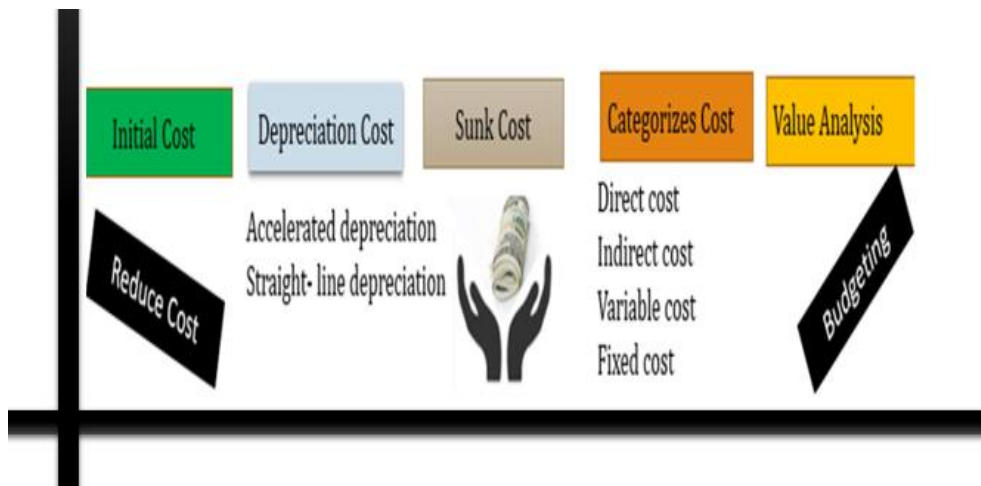
Control costs process is very important phase that keep a bird eyes on the project process from initiation up to closer, and allow a project manager to keep a watch eye on management change, and aggregation the cost that incurred on project process, and evaluation the deviation to the extent of correct them. However, a project management relies on control costs in order to determine the changes in the costs involved in implementing and executing the project. It relies on both inputs and outputs in order to analyze the cost data. The inputs necessary include the project management plan, funding requirements, work performance information, and organizational structure process assets, using these information, as appropriate can create satisfactory outputs such as an accurate cost forecast, change request, project management plan updates,

3.1 Inputs

3.1.1 Project Management Plan
Described in chapter (4) clauses # 2.3.1 +3.1.1 + 4.1.1 + 5.1.1 +6.1.1
Described in chapter (5) clauses # 1.3.2 + 5.1.1+6.1.1
Described in chapter (6) clauses # 6.1.1
Described in chapter (7) clauses # 3.1.1

3.1.2 Project Funding Requirement
Described in chapter (7) clauses # 2.3.2+3.1.2

3.1.3 Work Performance Information
Described in chapter (4) clauses # 3.3.2 +5.1.2
Described in chapter (5) clauses # 6.3.1+6.1.2
Described in chapter (6) clauses # 6.1.3
Described in chapter (7) clauses # 3.1.3

3.1.4 Organizational Process Assets (OPA)
Described in chapter (2) clauses # 4.2
Described in chapter (4) clauses # 1.1.5 + 2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.3

Described in chapter (5) clauses # 1.1.5+3.1.3+4.1.3+6.1.5
Described in chapter (6) clauses # 1.1.3+2.1.5+3.1.5+4.1.7+5.1.9+6.1.4+6.3.2
Described in chapter (7) clauses # 1.1.6+2.1.7+3.1.4+3.3.3

3.2 Tools and Techniques

3.2.1 Earned Value Management (EVMS)

Earned Value is an expands concept and ideal form of project evaluation, it is a mathematical method used to measure projects performance and progress, it is considering the amount of work planned against the amount of work achieved, it is taking into account the work completion based on the stipulated time and cost, it is measuring the execution performance against the budget figures, it is it including all forms of values like economic profit, economic values, value added, shareholder values, employee values , market values , supplier values, customer values, managerial values, and projects well-being in the long run, many of these forms of values are not directly measured in monetary terms. Earned value is the total sum of all tangible elements include monetary assets, stockholder equity, fixtures, equipment, fitting, and utility, while, and intangible elements include brand, recognition, good well, public benefit, and trademarks,
and,
https://translate.google.com/#view=home&op=translate&sl=en&tl=ar&text=fixtures%2C%20%0A%0Ang.
https://en.wikipedia.org/wiki/Business_value

Constrained Optimization Methods	Method	Basis of Decision
Linear	BCR (Benefit Cost Ratio)	Select the Project with highest Opportunity Cost
Nonlinear	Weighted Scoring Model	Select the project that has a Shorter Score
Dynamic	Payback period	Select the project with the project with greatest Payback period.
Integer	NPV (net present value)	Select the project with highest NPV
Multi- objective	IRR (internal rate of return)	Select the project with the higher IRR.
Programing algorithms	Opportunity cost	Focus on minimizing Lost Opportunity.

(A) **Cost Ratio:** The Cost Ratio is measuring the cost ratio that the project incurs within its lifecycle, the more the cost ratio a project incur the less the benefit, and the less cost ratio a project incur the more benefit, in another word, benefit cost ratio (BCR) includes only tangible benefits, when ratio is > 1 is favorable, while when the ratio ≤ 1 is unfavorable, See the example in the table below,

- Project (A), the ratio is ≥ 1, so the benefit is favorable,
- Project (B), the ratio is ≤ 1, so the benefit is not favorable,
- Project (C), the ratio is ≤1, so the benefit is not favorable,
- Project (D), the ratio is = 1, so the benefit is favorable,
- Project (E), the ratio is ≥ 1, so the benefit is favorable,
- In the following example project (A) is provided more profit ratio over project (E) 1.17 - 1.09 = 0.08

Project	Initial Investment	Expected cash flow	Benefits
A	30,000.00	35,000.00	1.17
B	40,000.00	30,000.00	0.75
C	50,000.00	25,000.00	0.50
D	60,000.00	60,000.00	1.00
E	70,000.00	76,000.00	1.09

(B) **Weighted Scoring Model**: The weighted scoring model is a visual representation of project scores based on a set criterion that determine which project to selected, it is clear that the project © is selected for study,

Criteria	Project Details	Weight	Remark out of 50 %			
			Project A	Project B	Project C	Project D
Market	Demand Level	5	2	3	5	4
	Promotion ability	5	1	3	2	4
	Future demand	5	3	3	2	4
Cost & Profitability	Investment costs are commensurate with available resources	5	3	2	1	4
	Profitability rate of similar companies	5	5	4	3	1
	waste	5	1	2	3	2
Technical issues	Availability of raw materials	5	2	4	3	4
	Availability of machinery	5	3	2	4	2
	Availability of technical expertise	5	2	2	3	1
	Availability of managerial expertise	5	2	5	5	2
Total weight		50	24	30	31	28

(C) Payback Period: The payback period is the amount of time it takes for an investment to pay back or to return back money paid for an investment, this is an important time-based measurement because it explains how profitable and risky an investment is. For example, suppose you have an opportunity to buy one plots of land, and you have four investment options, each plot has annual expected payback different from the other, which plot of land you will buy, of course, you will buy the minimum period of time payback which is Area (A) based on the following formula, because you can your investment in shorter time,

$$Payback\ Period = \frac{Initial\ investment\ made}{Net\ annual\ cash\ inflow}$$

Details	Area A	Area B	Area C	Area D
Initial Investment ($)	100,000.00	100,000.00	100,000.00	100,000.00
Expected Cash Flow ($)	50,000.00	30,000.00	25,000.00	45,000.00
Payback Period	2	3.3	4	2.2

(D) Net Present Value (NPV): The net present value is the measurement of the to what extent a project is acceptable or not acceptable to the interested parties, it is the difference between the present value of the future cash flows from an investment and the amount of investment. Present value of the expected cash flows is computed by discounting them at the required rate of return. NPV analysis is used to help determine how much an investment, project, or any series of cash flows is worth. It is an all-encompassing metric, as it takes into account all revenues, expenses, and capital costs associated with an investment in its Free Cash Flow (FCF). In addition to factoring all revenues and costs, it also takes into account the timing of each cash flow that can result in a large impact on the present value of an investment. For example, it's better to see cash inflows sooner and cash outflows later, compared to the opposite,

http://www.businessdictionary.com/definition/net-present-value-NPV.html

$$NPV = \frac{CF_0}{(1+r)^0} + \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \frac{CF_3}{(1+r)^3}$$

- CF: The cash flow within a period 0, 1, 2, 3
- r: Discount rate %

(E) Investment Alternative: In the following example we assume that 2 project provide annual return for useful life 5 years at Minimum Acceptable Rare of Retune (MARR) 10%. Which project is greater NPV? →→

Project (A) is provided NPV = 145,815.74 Euro
Project (B) is provided NPV = 163,397.31 Euro ⎤ Project (A) is better than Project (B) , so the best alternative is Project (A)

D8 fx =C8/POWER((1+10%),5)

	A	B	C	D	E	F	G	H	I
1									
2	Project (A)					Project (B)			
3	year	Initial Investment	Expected cash flow	FV/DCF		year	nitial Investmen	Expected cash flow	FV/DCF
4	1	100,000.00	34,000.00	30,909.09		1	125,000.00	40,000.00	36,363.64
5	2		34,000.00	28,099.17		2		40,000.00	33,057.85
6	3		34,000.00	25,544.70		3		40,000.00	30,052.59
7	4		34,000.00	23,222.46		4		40,000.00	27,320.54
8	5		34,000.00	21,111.32		5		40,000.00	24,836.85
9	Total	100,000.00	170,000.00	128,886.75		Total	125,000.00	200,000.00	151,631.47
10	Investment Alternative - NPV of project (A)			28,886.75		Investment Alternative - NPV of project (B)			26,631.47

(F) Cost Alternative: In the following example we assume that 2 project provide annual of cost for useful life 5 years at Minimum Acceptable Rare of Retune (MARR) 10%, which project is lesser Cost Value? →→

Project (C) is costing = 145,815.74 Euro
Project (D) is costing = 163,397.31 Euro } Project (D) is more costly than project (C) , so the best alternative is Project (C)

D8 fx =C8/POWER((1+10%),5)

	A	B	C	D	E	F	G	H	I
1									
2	Project (C)					Project (D)			
3	year	Initial Investment	Expected cash flow	FV/DCF		year	nitial Investmen	Expected cash flow	FV/DCF
4	1	70,000.00	20,000.00	18,181.82		1	80,000.00	22,000.00	20,000.00
5	2		20,000.00	16,528.93		2		22,000.00	18,181.82
6	3		20,000.00	15,026.30		3		22,000.00	16,528.93
7	4		20,000.00	13,660.27		4		22,000.00	15,026.30
8	5		20,000.00	12,418.43		5		22,000.00	13,660.27
9	Total	70,000.00	100,000.00	75,815.74		Total	80,000.00	110,000.00	83,397.31
10	Cost Altenative of Project (C) =			145,815.74		Cost Altenative of Project (D) =			163,397.31

(G) Discounted Cash Flow (DCF): It is the application of the time value of money principle, the idea is that, money that will be received or paid at some time in the future has less value today than an equal amount collected or paid today. Calculating the sum of future discounted cash flows is a very important standard to determine how much an investment is worth at present, it is a method used by professional investors and analysts at investment organizations to determine how much to pay for a business, whether it's for to determine whether a given project will be a good investment, like for a new product launch or a new manufacturing facility, the following table shows the DCF at 5% for 5 years with remarks,

https://www.business-case-analysis.com/discounted-cash-flow.html
http://www.fao.org/3/x5648e/x5648e0k.htm
https://corporatefinanceinstitute.com/resources/knowledge/valuation/dcf-formula-guide/

$$DCF = \frac{CF1}{(1+r)1} + \frac{CF2}{(1+r)^2} + \frac{CF3}{(1+r)^3} + \cdots + \frac{CFn}{(1+r)n} \quad Where$$

DCF: The sum of all future discounted cash flows that is expected to attain, or NPV net present value or the fair value.
CF: The total cash flow for a given year, CF1 is for the 1st year, CF2 is for the 2nd year, and so on.
r: The discount rate in decimal, it is the target rate of return that you want on the investment.

Year	Expected Cash flow	(What is the PV or DCF or the Fair Value) in the Opposite Year
1	50,000.00	50000.000
2	50,000.00	47619.048
3	50,000.00	45351.474
4	50,000.00	43191.880
5	50,000.00	39176.308
6	50,000.00	41135.124
Total	300,000.00	266,473.834
What is the meaning of 266,473.834 ÷ 300,000.00 = 0.98 (It means that the 300,000.00 Euro is discounted by 0.98% over 6 years		

Year	Actual PV	In inflation at 5%
1	50,000.00	50,000.000
2	50,000.00	47,500.000
3	50,000.00	45,125.000
4	50,000.00	42868.75
5	50,000.00	40,725.313
6	50,000.00	38,689.047
Total	**300,000.00**	**264,908.11**

What is the meaning of 264,928.11 ÷ 300,000.00 = 0.88 & (It means that the 300,000.00 Euro is reduced by 0.88% over 6 years when inflation rate was 5 %

(H) Internal Rate of Return (IRR) : It is the rate in which the net present value of all the cash flows (both positive and negative) = zero, it is used to evaluate the attractiveness of investment, in case the IRR of a new project exceeds expected required rate of return, then the project is desirable, while in case the IRR falls below the required rate of return, then the project should be rejected, the said methods takes into account the time value of money, and it analyzes an investment project by comparing the internal rate of return to the Minimum Acceptable Rate of Return, (MARR).

Project manager shall always pick the project with the highest NPV, not necessarily the highest IRR, because financial performance is measured in money value. For example, if you faced with two projects with similar risks, project A with 20% IRR and Project B with 40% IRR, but project A has a higher NPV because it is long-term, you would pick project A, the second big issue with IRR analysis is that it assumes you can continue to reinvest any incremental cash flow at the same IRR, which may not be possible,

https://investinganswers.com/dictionary/i/internal-rate-return-irr
https://www.accountingformanagement.org/internal-rate-of-return-method/
https://www.investopedia.com/ask/answers/022615/what-formula-calculating-internal-rate-return-irr-excel.asp

Year	Expected Cash flow	Expected Cash Flow	Present Cash Flow
0	Initial Investment	-500,000.00	-500,000.00
1		150,000.00	136,363.64
2		150,000.00	123,966.94
3		150,000.00	112,697.22
4		150,000.00	102,452.02
5		39,500.00	24,520.18
Total			0.00
PV = 0.00		IRR = 10%	

(L) Opportunity Cost: The fundamental problem of economics is the issue of scarcity of resources, so the organization must be paid to the optimal use and distribution of these scarce resources, opportunity cost is the profit lost when one alternative is selected over another. For example, you have $1,000,000 and choose to invest it in a product line that will generate a return of 5%. If you could have spent the money on a different investment that would have generated a return of 7%, then the 2% difference between the two alternatives is the foregone opportunity cost, another example is shown in the following figure:
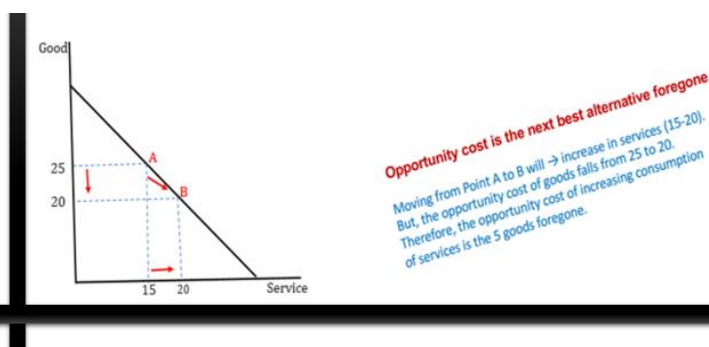
Opportunity cost is the return of a foregone option less than the return on the chosen option, so opportunity costs can guide you to more profitable decision-making which is the first choice, on selection among alternative, the assessment of the relative risk of each option shall be taken into account. The following are example on chosen the best project among different alternatives:

Example

CFS	Project A	Project B	Project C
Benefit Cost Ratio	1.15	0.75	0. 90
Payback Period			
Net Present Value			
Internal Rate of Return			

Example

CFS	Project A	Project B	Project C
Benefit Cost Ratio			
Payback Period	12 Months	36 Months	18 Months
Net Present Value			
Internal Rate of Return			

Example

CFS	Project A	Project B	Project C
Benefit Cost Ratio			
Payback Period			
Net Present Value	$45,000	$68,000	$-33,000
Internal Rate of Return	4.8%	6.8%	-4.2

Out of the above calculation, there will be many ways to choose the best project such as the 10 types of Feasibility Study are commonly known which allows project manager to gather all positive and negative points of the project to determine the project success ratio

- Technical Feasibility Study
- Managerial Feasibility Study
- Economic Feasibility Study
- Financial Feasibility Study
- Cultural Feasibility Study
- Social Feasibility Study
- Safety Feasibility Study
- Political Feasibility Study
- Environmental Feasibility Study
- Market Feasibility Study

3.2.2 Forecasting

Forecasting is a technique that uses the estimation of the value of a variable or a set of variables at some future point in time, forecasting exercise is usually carried out in order to provide an aid to decision-making and in planning the future, forecasting works on the premise that if we can predict what the future will be like we can modify our behavior now to be in a better position, when the future arrives may, then forecasting may include:
https://translate.google.com/#view=home&op=translate&sl=en&tl=ar&text=Forecasting%20

- **Forecasting may include:** Analyzing the data and information based on experiences of the experts may yield the knowledge about a series event such as:
o Forecasting the economic growth and its trends,
o Forecasting the economic inflation and its trends,

- Forecasting the market behavior and its trends,
- Forecasting the market demand and supply,
- Forecasting the customers, taste,
- Forecasting the interstates and exchange rate,
- Forecasting projects inventory volume of raw materials and finished products,
- Forecasting production planning,
- forecasting financial information and allocation the budgets,

▪ **Forecasting Methods:** All project management decisions require analyzing information and data in order to extrapolate the future. Projects depend on quantitative and qualitative analysis in looking ahead, as follows:

▪ **Quantitative Methods:** These types of forecasting methods are based on the value judgments, opinions, intuition matters, emotions, or personal experiences and are subjective in nature. They do not rely on any rigorous mathematical computations:

- Common Opinion: Forecasting based on collectively ideas may occur in meeting or sessions,
- Market Survey: Forecasting based on questionnaires to evaluate market demand and supply,
- Sales Force Analysis: Forecasting based on salesperson estimates sales in their areas,
- Delphi Method: It is the approach in which consensus agreement is reached among a group of experts,

▪ **Quantitative methods:** These types of forecasting methods are based on mathematical analyzing to read the future, they rely heavily on mathematical computations:

- Time-Series Models: This model looks at past data and attempt to predict the future movement,
- Associative or casual Models: This model assume that the variables in question are related to each other's,

▪ **Calculation Methods:** These methods are related to the quantitative calculation, as follows:

- Naïve: The method uses last period's actual value as a forecast,
- Simple Mean: The method uses an average of all past data as a forecast,
- Simple Moving Average: Simple Moving Average
- Weighted Moving Average: Uses an average of a specified number of the most recent observations, with
- each observation receiving a different emphasis (weight)
- Exponential Smoothing: A weighted average procedure with weights declining exponentially as data become older
- Trend Projection: Technique that uses the least squares method to fit a straight line to the data
- Seasonal Indexes: A mechanism for adjusting the forecast to accommodate any seasonal patterns inherent in the data

3.2.3 To-Complete Performance Index (TCPI)

According to the PMBOK Guide, the term, to-complete performance index (TCPI) is a measure of the cost performance that is required to be achieved with the remaining resources in order to meet a specified management goal, expressed as the ratio of the cost to finish the outstanding work to the remaining budget. The TCPI in Earned Value Management describes the performance efficiency required to achieve a cost objective; it is the measure of the required future cost performance that must be achieved with the remaining resources in order to meet a specified management goal, The TCPI indicator is a ratio of the work remaining to be accomplished divided by the amount of unspent funding:

▪ The work remaining is calculated from the difference between the total project budget (Budget at Completion or BAC) and the Earned Value (EV) accrued.

▪ The funds remaining are the difference between the Actual Cost (AC) incurred to date and the target total cost (TC) the project is required to achieve, either the original BAC, or a different target cost agreed by management. Therefor the funds remaining can be assessed in several different ways, the two most common are: The difference between the AC and the BAC, or The difference between the AC and an Estimate At Completion (EAC) approved by management (this may be the current EAC2 or a different approved EAC),

https://www.deepfriedbrainproject.com/2009/08/to-complete-performance-index-tcpi.html
https://mosaicprojects.com.au/WhitePapers/WP1097_TCPI_in_EVM.pdf

Acronym	Term	Description	Formula
PV	Present Value	Planned cost to implement the planned work	PV (Budget Cost)
EV	Earned Value	Value of work actually done	EV
AC	Actual Cost	Actual cost paid on completion base on invoices or documents	AC
SV	Schedule Variance	Measures arrears (Time), or how much the project action get late	SV = EV - PV
SPI	Schedule Performance Index	Measures arrears (Time), or how much the project action get late (in present)	SPI = EV ÷ PV
CV	Cost Variance	Have you exceeded the budget? And by how much ?	CV = EV - AC
CPI	Cost Performance Index	Measures the performance of each Euro on implementation	CPI = EV ÷ AC
	Cumulative	Cumulative Cost Performance Index	Cum. CPI = Cum. EV ÷ Cum. AC
BAC	Budget at Completion	Total estimated budget of the project. This Value is fixed and Constant	
EAC	Estimate at Completion	The project manager's bottom-up EAC	EAC= AC + Bottom up ETC
		EAC at budget rate	EAC = AC + BAC - EV
		EAC at current CPI	EAC = BAC ÷ CPI
		EAC considering both CPI and SPI	EAC = AC = BAC - EV ÷ Cum. CPI X Cum. SPI
ETC	Estimate to Complete	From this point how much more the project would cost to complete	ETC = BAC - EV ÷ CPI
VAC	Variance at Completion	Completion. Difference between actual Budget and Planned Budget	VAC= BAC – EAC
TCPI	To-Complete Performance Index	TCPI using current BAC	TCPI = (BAC-EV) ÷ (BAC-AC)
	To-Complete Performance Index	TCPI using new EAC	TCPI = (BAC-EV) ÷ (EAC-AC)

Source : https://www.whizlabs.com/blog/earned-value-management-forecasting/

3.2.4 Performance Reviews
Described in chapter (6) clauses # 6.2.1
Described in chapter (7) clauses # 3.2.4

3.2.5 Variance Analysis
Described in chapter (5) clauses # 6.2.1
Described in chapter (6) clauses # 6.2.2
Described in chapter (7) clauses # 3.2.5

3.2.6 Project Management Software
Described in chapter (6) clauses # 3.2.4+6.2.3
Described in chapter (7) clauses # 3.2.6

3.3 Outputs

3.3.1 Work Performance Measurements
Described in chapter (5) clauses # 4.3.1
Described in chapter (6) clauses # 6.3.1
Described in chapter (7) clauses # 3.3.1

3.3.2 Organizational Process Assets (OPA)
Described in chapter (2) clauses # 4.2
Described in chapter (4) clauses # 1.1.5 + 2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.3

Described in chapter (5) clauses # 1.1.5+3.1.3+4.1.3+6.1.5

Described in chapter 6) clauses # 1.1.3+2.1.5+3.1.5+4.1.7+5.1.9+6.1.4+6.3.2
Described in chapter (7) clauses # 1.1.6+2.1.7+3.1.4+3.3.3

3.3.3 Change Requests

Described in chapter (4) clauses # 3.3.3 +4.3.1+5.1.3
Described in chapter (5) clauses # 5.3.2+6.3.3
Described in chapter (6) clauses # 6.3.3
Described in chapter (7) clauses # 3.3.4

3.3.4   Project Management Plan Updates

Described in chapter (4) clauses # 3.3.4 +4.3.2+5.3.2
Described in chapter (5) clauses # 6.3.4
Described in chapter (6) clauses # 6.3.4
Described in chapter (7) clauses # 3.3.5

3.3.5 Project Documents Updates

Described in chapter (4) clauses # 3.3.5 + 4.3.3 +5.3.3
Described in chapter (5) clauses # 3.3.2+4.3.4+5.3.3+6.3.5
Described in chapter (6) clauses # 2.3.2+3.3.3+4.3.2+5.3.4+6.3.5
Described in chapter (7) clauses # 1.3.3+2.3.3+3.3.6

3.3.6   Budget Forecasts

A budget is financial planning at the level of organizations, and through the estimated budget the general lines of the activities of the organization are drawn up in the financial periods following the period of the establishment of its estimated budget. The benefit of using the estimated budget as one of the financial planning methods is that , its help in anticipating the production or manufacturing cost that the organization will incur in order to be able to continue the production or sales operations as the owners hope,

 The budget estimate the productive capacity of the organization, and determine the extent of its ability to sell what is produced according to market variables and the overall conditions that may affect the activity of the organization positively or negatively, and the budget is design to a specific period in which to expect What will happen throughout that period.

A budget doesn't <u>predict what will happen, but sets a plan for what the business owner wants to happen</u>. A forecast, on the other hand, estimates the future financial progress and outcomes of the business. Management teams use historical data and growth rates to forecast what the business's financials will look like in the future.

When it comes to creating a budget, remember that a budget should consider the expected demand for products and services + take a company's highest priorities and arrange the appropriate resources to cover those priorities show potential problems early enough that a company can take action + have a baseline to show against the actual results. Creating a business budget helps the project benefit by:

- Pointing out funds leftover that you can reinvest.
- Predicting slow months and keeping you out of debt
- Estimating what it will take to become profitable
- Providing a window into the future
- Helping you keep control of the business

3.3.7   Budget Preparation Process – Example

Budget preparation is a process with designated organizations and individuals having defined responsibilities that must be carried out within a given project management scope, this process is normally established and controlled by a legal and regulatory framework, a project budget shall enjoy the following necessities

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Factors	Influences
Comprehensiveness	Covers all organizational activities and supports
	All estimates gross not netting take place
Transparency	Budget classifications shall meet international standards
	Connecting policies and expenditures through a program structure
Realism	Budget based on a realistic framework
	Estimates based on reasonable revenue
	Financing provisions realistic
	Costing based on Realistic assumptions about inflation, expenditures , exchange rates
	How are future cost implications taken into account
	Is there a clear separation between present and new policies
	How far are spending priorities determined and agreed under the budget process?

3.3.7.1 Project Integration Management: Integration is the tool for successfully developing project budget because it's defines and each activity process needed to the coming year based on historical factors + expected tenders + change request + and, integration management here includes <u>the processes and activities needed to identify, define, combine, unify, and coordinate the various Process Groups to simplify futuristic need</u>, integration make easy choices about where to concentrate resources and effort periodically, and we assumed the budgeting is conducted in the 1st of January of each year and in this part each activity separately must understand its scope to be bottom-up hit the mark. Combining the needs of all activities to gathers because we assume that some activities will share the same resources, that why a project manager can update project budgets based on changes in any of the knowledge areas.

3.3.7.2 Project Scope Management: once the scope agreed and sign by stakeholder, a project team will understanding the project scope and the product scope, then the scanned requirements will understood also , scope definition is essential to successful projects, so the project manager understands the following points and they shall update budgets when the scope changes! And keep informing your stakeholders and the business owner.

- The deliverables may require by the customers
- The change request before planning the budget
- The no more scope creep
- The resources a project will use
- The tools and technique a project will use
- The recent resources in work such as human + optional + testing facilities + maintenance requirement, and
- The futuristic resources needed such as human + optional + testing facilities + maintenance requirement, and
- The change request if expected
- The new needs for new expected + agreed work orders
- The schedule constraints

3.3.7.3 Project Time Management: Once the scope is clear to the all interested parties, it's the time to determine the following activates and the time needed to run the deliverables, so these activities are the base tools for creating and maintaining the cost of running the project and ultimately to work on the budget,

- Activity Definition: Identifying specific schedule activities that need to be performed to produce the various project deliverables. It includes creating lists of activities that need to be performed.

- Activity Sequencing: Identifying and documenting dependencies among schedule activities. Create Network diagrams with dependencies and update activity lists.

- Activity Resource Estimating: Calculating the type and quantities of resources required to perform each schedule activity. Create a Resource Breakdown Structure and calendar.

- Activity Duration Estimating: Estimating the number of work periods that will be needed to complete individual schedule activities.

▪ Schedule Development and Control: Analyzing activity sequences, durations, resource requirements, and schedule constraints to create the project schedule, and then controlling any changes to the project schedule.

Schedules is updated to actual to reflect time that is either under or over budgeted.
Schedule "baselines" to compare to actual to determine when changes need to be made to budgets.
Requested changes and corrective actions that are taken into account for schedule and project plan updates

3.3.7.4   Identifying Project Cost Management: once the Schedules is updated to actual to reflect time that is either under or over budgeted, Project Cost Management includes the processes involved in planning, estimating, budgeting, and controlling costs so that the project can be completed within the approved budget, it's includes:

▪ **Cost Estimating:** Evaluation the costs of the resources needed to complete project activities, and identifying the tools needed and need to be estimated if new required,

▪ **Cost Contingency Reserve:** Determining of individual activities or work packages analyze project cost and tracking time for each activity and compare with the original baselines to handle the costs and overruns at all times.

▪ **Cost Budgeting:** Aggregating of the estimated costs of individual activities or work packages to establish a cost baseline,

▪ **Cost Control :** Influencing the factors that create cost variances and controlling changes to the budget such as : Influencing the factors that create changes to the cost baseline + Ensuring requested changes are agreed upon Managing the actual changes when and as they occur + Assuring the potential cost overruns do not exceed the authorized funding periodically and in total for the project +Monitoring cost performance to detect and understand variances from the cost baseline +Recording all appropriate changes accurately against the cost baseline +Preventing incorrect, inappropriate or unapproved changes from being included in the reported cost or resource usage+ Informing appropriate stakeholders of approved changes +Acting to bring expected cost overruns within acceptable limits

3.3.7.5   Project Quality Management: Quality Management can reduce the cost of conformance and nonconformance, by preventing re-work and cost overruns due to quality that differs from scope. Quality planning identifies which quality standards are relevant to the project and determines how to satisfy them, and Quality Assurance and Control includes monitoring results to verify compliance and identifying ways to eliminate causes of unsatisfactory performance. The concept of "prevention over inspection" means that it costs less to prevent quality issues than it does to correct; meaning better control over the budgets, Good Quality Management techniques will assist in stable budgets

3.3.7.6   Project Human Resource Management: Human Resource Management cause the significant risk to your project budgets through the reduction of risk factors of people, Illness, incompetence, poor teamwork, and wage strikes, to reduce the cost HR must involve the lower tier of the people in planning the budget, and inspire them for bringing up ideas of develop their job, and reduce cost, it very much necessary to train the people, and to invest on workforce,

3.3.7.7   Project Communications Management: Communications is the knowledge areas in each project as, in-bounding and out-bounding the data will create Varity of report that have impact of preparing the budget , its employs the processes required to ensure timely and appropriate generation, collection, distribution, storage, retrieval, and ultimate disposition of project, Performance reporting includes status reporting, progress measurement and forecasting, a project manager has to ensure that the communications plan includes procedures necessary to provide timely and accurate status and performance reports.

3.3.7.8   Project Risk Management: Risk management is absolutely critical to the development, maintenance, and eventual effectiveness of your project budgets, it's includes:

▪ Risk Management Planning: Assign resources needed and estimates their costs and include in a project budget
▪ Risk Response Planning: Develop alternatives to reduce risk threats and include their cost in a project budget
▪ Risk Identification: Determines risks and risk triggers that might have impact include their cost in a project budget
▪ Risk Qualitative & Quantitative Analysis: Analyze & estimate the potential cost of risks included in a project budget
▪ Risk Monitoring and Control: Track risks and residual risks and identify new risks and consider their cost in budget

3.3.7.9   Project Procurement Management: Project Procurement Management includes the processes to purchase or acquire the products, services, or results needed from abroad to perform the work in a project, procurement has affected on project budgets because Contractual and legal implications can include health, safety, security, performance, environmental, insurance, intellectual property rights, equal employment opportunity, licenses, and permits, a project manager shall base on safer contracts that have fixed price rather than contract with changeable prices, a project manager shall include in purchasing contracts technical term of delivery (TTD) that save the resources of a project such as insurance + safety of products, MSDS + MPS+MTS, and,

Using a systematic tools and technique in addition to a Microsoft based on the project management knowledge areas to enable you assist in developing and maintaining complete and accurate project budgets.
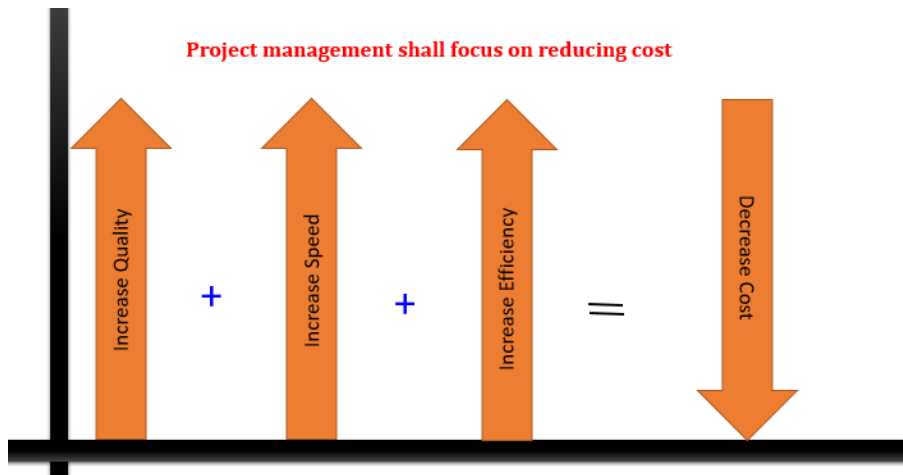
Chapter (8)

Project Quality Management

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Chapter (8)

Project Quality Management

Quality is the degree to which the project fulfills the requirements is defined as quality standards, a project can't achieve quality if all of the stated and unstated requirements are not defined in the project scope statement, while quality management is the process of creating and following policies and procedures to ensure that a project meets the defined requirements that was intended to meet from the customers perspective is termed as Quality Management,

https://translate.google.com/#view=home&op=translate&sl=ar&tl=en&text=%D8

Rework and defects are a direct result of a lack of attention to quality. The higher the rework, the more time and money is wasted and the cost and basic schedule increased. Lack of attention to quality adds unnecessary risk to the project, resulting in a massive amount of work and additional expenses. It is important to know at the beginning of the project what acceptable products, and how it is measured in the project in order to carry out the work with quality, and to avoid many problems at a later stage of the project,

Quality means meeting a specific standard for a product, service, or result, quality of a business works meets pre-defined measurable specifications, such as ISO standards and documented theories in addition to various experiences create a high-quality style of products, services, and results that meet the desires of customers and stakeholders, and this is beneficial to the providers of this business, and creates a kind of free competition in the markets, therefore there will be a race in developing services and people's lives. This chapter will start with three factors that create quality and will go to simpler detail these are:

1. Plan Quality Processes

The quality management plan is a process of defining requirements and standards that are already present within the international specifications, and specified in many relevant bodies, such as ISO standards, and BASIC standards, customers' standards, international standards, industrial sector standards, government regulatory, and others. The said standards are very important to direct the project work provisions into clear and specific requirements. A project shall comply with the requirements of the plan to achieve the product with high quality, and directs workers about how to manage quality and verify their validity throughout the project's work period. The quality planning process and its associated methods, tools, and techniques have been developed because in the history of modern society, organizations have rather universally demonstrated a consistent failure to produce the goods and services that unerringly delight their customers.

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1.1 Inputs

1.1.1 Scope Baseline
Described in chapter (5) clauses # 4.3.3
Described in chapter (6) clauses # 1.1.1
Described in chapter (7) clauses #1.1.1+2.1.3
Described in chapter (8) clauses # 1.1.1

1.1.2 Stakeholder Register
Described in chapter (5) clauses # 2.1.2
Described in chapter (8) clauses # 1.1.2

1.1.3 Cost Performance Baseline
Described in chapter (7) clauses # 2.3.1
Described in chapter (8) clauses # 1.1.3

1.1.4 Schedule Baseline
Described in chapter (6) clauses # 5.3.2
Described in chapter (8) clauses # 1.1.4

1.1.5 Risk Register
Described in chapter (1) clauses # 6.1.8
Described in chapter (3) clauses # 6.7
Described in chapter (7) clauses # 1.1.4
Described in chapter (8) clauses # 1.1.5

1.1.6 Enterprise Environmental Factors (EEF)
Described in chapter (2) clauses # 4.1
Described in chapter (4) clauses # 1.1.4 + 2.1.3+ 3.1.3 + 4.1.3+5.1.4
Described in chapter (6) clauses # 1.1.2+3.1.4+4.1.6+5.1.8
Described in chapter (7) clauses # 1.1.5
Described in chapter (8) clauses # 1.1.6

1.1.7 Organizational Process Assets (OPA)
Described in chapter (2) clauses # 4.2
Described in chapter (4) clauses #1.1.5 + 2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.3
 Described in chapter (5) clauses # 1.1.5+3.1.3+4.1.3+6.1.5
Described in chapter (6) clauses # 1.1.3+2.1.5+3.1.5+4.1.7+5.1.9+6.1.4+6.3.2
Described in chapter (7) clauses # 1.1.6+2.1.7+3.1.4+3.3.3
Described in chapter (8) clauses # 1.1.6+2.1.7+3.1.4+3.3.31.1.7+3.1.6

1.2   Tools and Techniques

1.2.1 Cost-Benefit Analysis
Total quality management is a concept that reduces the costs of quality during the manufacture of the product and during the product inspection, and analysis the efficiency of the comprehensive quality management system, the traditional view of optimal distribution of quality work has been dead because optimal quality costs have begun to impose control on the product during Manufacturing and during the Inspection in order to achieve the level of **zero defect**, quality management cannot be successful without calculating the cost of manufacturing and the cost of quality, because this cost is assigned to it a cost center with the aim of analyzing the cost and benefit, for this reason, the quality of manufacturing costs has been classified into **2** categories named Cost of quality :

- Cost of conformance,
- Cost of no conformance,

The work on monitoring the cost of conformity and the cost of non-conformity aimed to raise the level of prevention and to reduce of failure costs. Cost and benefit analysis is a measure of efficiency of achieving a comprehensive quality system according to the implementation of the comprehensive quality program within the limit the following determinations:

- Increase Quality,
- Increase Speed,
- Decrease Cost,
- Increase Productivity,
- Decrease Re-work,
- Increase Customer Satisfaction,

1.2.2 Cost of Quality
Described in chapter (7) clauses # 1.2.7
Described in chapter (8) clauses # 1.2.2

1.2.3 Control Charts

Control Chart or Run Chart is the process of plotting the data of a variable over time such as sales change over the time, production capacity over the time, nonconformities and errors occurs over the time, change management over the time, a project progress over the time, it is easy to draw, and easy to explained, but is more effective to show the change or progress in a control Figure , and it is quite useful for quality controls it is defining the upper limits and lower limits , and the medium limit when specifying the data . In the following figure you can see the error In-process testing is higher than in final testing, this good practice because the most of errors were controlled before sending to final testing, that is why in final testing errors very much reduced and the no-conformity cost is reduced also, see how much the chart is useful,

Control Chart or Run Chart is the process of providing where the higher efficiency in production, and where is the lower efficiency, and what are the defects make the production faulty, and shows increase profit, and diminish costs, that is why the control chart is widely used in industry, and covers nearly everything from service organizations and providers to financial consulting offices, as well as in various other applications in daily life. Control charts are a graphic that depicts whether sampled products or processes are meeting their intended specifications or not. When each chart analyzes a specific attribute of the product it is called a univariate chart, these charts are important tools of statistical quality control to measure quality performance,
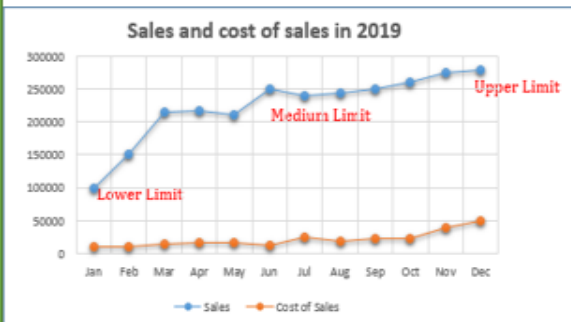
Control Chart or Run Chart determines whether or not a process is stable or has predictable performance, upper and lower specification limits are based on requirements of the agreement, they reflect the maximum and minimum values allowed, they show a deviated reading from specification limits or standards like calibration reading vides standards, or sales against intervals , control charts help visualize variation, find and correct problems when they occur, predict expected ranges of outcomes and analyze patterns of process variation from special or common causes. In this example you can see the sales is increasing at an increasing rate, and the cost of sales is also increasing in a direct proportion in line with sales with positive correlation, see how much the chart is useful,

1.2.4 Benchmarking

Benchmarking is the process of comparing actual practices with planned practices of operations result, sales results , benchmarking may apply to those of comparable projects to identify best practices, and can identify the gaps between similar project and functions, benchmarking may generate new ideas for improvement, and many other benefits of such as:
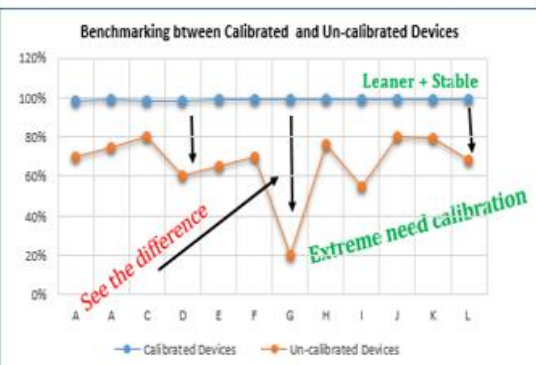
▪ Competitive Analysis: Benchmarking requires a project to identify the areas of work that need to be improved to compare its results with similar projects (competitors), the process of analysis that taken by the project is considered as the first step on the path to competitive analysis and development the project,

▪ Monitor Performance: Benchmarking requires a project to keep watch eye on analyzing the current status trends of a project, which will need a project manager to continuously monitoring performance as an inherent characteristic of a work,

▪ Continuous Improvement: Benchmarking requires a project to look at all possible opportunities to hunt the best to the progress of a project, have a look to the above Figures and think what Kaizen said, this improvement should not merely be something that improves once and is forgotten, but something that improves over time and is continuous.

▪ SMART Goal Setting: Once benchmarking has been carried out, new goals and new performance metrics are set in order to improve performance, these goals are more competitive with wider targets to compete competitors,

▪ Inspire Interested Parties: Once benchmarking has been carried out, and improvement achieved within the limit of a project SMART goal set out, it is the times to inspire people that their benchmarking is achieve comparing with competitors. That mean employees will take pride in their job and the work they do.

▪ Knowledge Area: Once benchmarking has been achieved, the entire people will understand their competitive advantage, comparative advantage and their absolute advantage, so all know how to compete with competitors,

1.2.5 Design of Experiments

Design of Experiments is a statistical method that shows the effect of the various experiments that take place on the product, or on the service, or on the result during preparation for production, or during production, or during a production inspection. This work shall include a set of factors that affect negatively or positively on the value of the product or the service or the result in term of quality (shape + performance + content), the process of discovering, collecting and classifying these factors and their effects leads to a systematic use of them to improve and develop a business, and finally to improve the level of customer satisfaction,

Factors affecting the development of the product have side effects such as <u>influencing the cost of the product, and ultimately its affect the level of sales and the improvement of production , and inspires workers to continue to discover new factors that are included in the list of influencing factors for improving and developing the product,</u> so we emphasize that these effects provide a statistical framework for changing all important factors systematically, rather than changing factors one by one, it must provide analysis experimental data that give the optimal conditions for a product or process, highlights factors that influence results, and detects the presence of interactions and synergies between these factors. This is precisely the design of experiments.

1.2.6 Statistical Sampling

Statistical sampling is the process of selecting random variables form products, services, or results to test them against written standards, in order to discover deviations, collecting the samples is a critical step in determining the validity of samples, any errors that occur in sampling may cause catastrophic results. In light of this, the sampling must be verified correctly and from the correct source and in the correct quantity according to the Quality

Assurance Plan (QAP), these samples are submitted for testing, the testing must be carried out according to specific and written standards, and the results shall be compared with a stipulated standards, and the results shall be receded for further review,

Statistical sampling purpose is to obtain a truly representative sample of the bulk material, it should be carried out according to systematic methods and based on statistical principles , and to ensure the validity of the samples taken, and to ensure about any precautions to be taken to prevent contamination or deterioration of the sample, any deviations from established sampling plans should be documented, and justified, which should include an assessment on any impact , the deviation may have on the validity of the sample, and all deviations must be approved by laboratory management, and authorized by the Quality Assurance Department, sampling shall be documented as appropriate, and shall include the following data for the purpose of statistical issues:
https://learnaboutgmp.com/good-laboratory-practices-cglp/your-2-minute-guide-to-sampling-in-a-quality-control-laboratory-video/

- Material identification,
- Quantity identification,
- Manufacturer identification,
- Origin identification,
- Batch number identification,

- Technical Term of Delivery (TTD)
- Financial documents (INV + LC+PL)
- Third Party Inspection if any,
- Identity the standards reference such QAP #
- Consignment documents (TC +MSDS+PDS

1.2.7 Flowcharting

Flowcharting is a diagraming that depicts a process, system or computer algorithm, they are widely used in multiple fields to document, study, plan, improve and communicate often complex processes in clear, easy-to-understand diagrams. Flowcharts, sometimes spelled as flow charts, use rectangles, ovals, and potentially numerous other shapes to define the type of step, along with connecting arrows to define flow and sequence. They can range from simple, hand-drawn charts to comprehensive computer-drawn diagrams depicting multiple steps and routes. Flowcharting is being used to develop understanding of how a process is done, and to study a process for improvement, and to communicate to others how a process is done, and when better communication is needed between people involved with the same process, and to document a process, and when planning a project, the following Figure explore the mission pf the flowcharting: https://www.lucidchart.com/pages/what-is-a-flowchart-tutorial
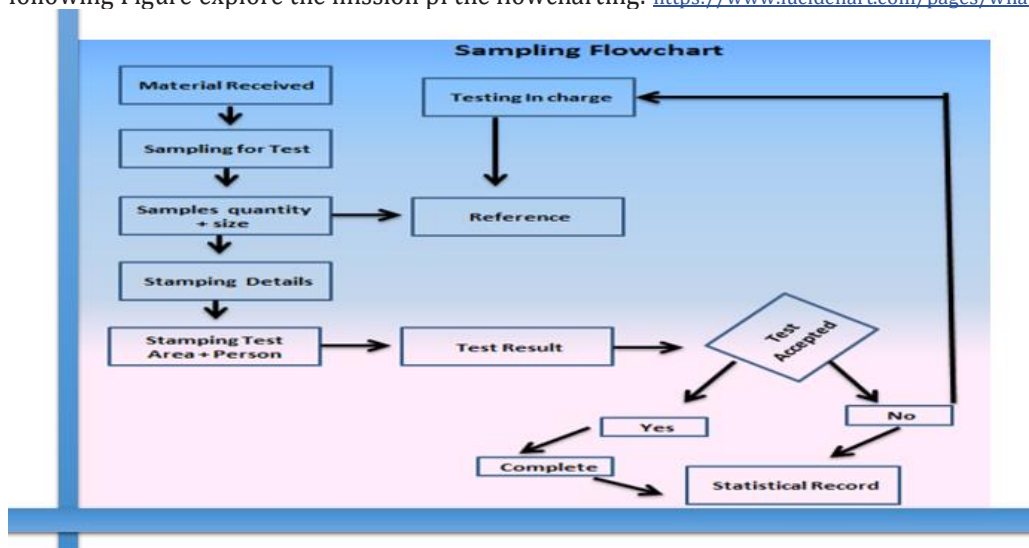
1.2.8 Quality Management Methodologies

Many methodologies in project management with their own set of rules, principles, processes, and practices, implementation of any of them is based on the type of project you will undertake, the point of selecting a project management methodology is to maximize the use of resources and time, there is no methodology that is perfect to use for every single project. Projects vary in scope and requirements, which means the right methodology to implement will also vary. The following Quality management methodologies:
https://zenkit.com/en/blog/7-popular-project-management-methodologies-and-what-theyre-best-suited-for/

- **Total Quality Management Principles to Improve Processes**
- Customer focus,
- Total employee commitment,
- Process approach,
- Integrated system,
- Strategic and systematic approach,
- Continual improvement,
- Fact-based decision-making,
- Communications,

- **Six Sigma and application**

6 Sigma applied for the 1st time by Frederick James , the statistical curves of 6 Sigma is very accurate measurement of values of deviation, it based on how to count the combinations of variables and its deviations from the mean, it is a statistical expression refers to 3.4 defect per million opportunities as in the past, 6 Sigma at present means achievement of lower number of defect per million opportunity , when the deviation counted 6 sigma or less this would reflect boarder of tolerance, then the efficiency of 6 Sigma approached to 9.99 % at a level of 6 Sigma, but the fact is that, not the entire operations or process, or services are   applicable to reach to the level of 6 Sigma , have a look at the following steps 6 step protocol:

- Identify desired product characteristics
- Classify criticality of characteristics
- Determine if   characteristics are controlled by part or process
- Determine allowable tolerance
- Determine process variation
- Change design to achieve 6 Sigma performance

6 Sigma is an excellent indicator to reduce waste and cost of defects and saving the time and efforts also, finally 6 Sigma leads to substantial satisfactory to the twin party of the customers and the organization. To reduce errors to only 1 in 100 ,000.00. 6σ It is a strategic process established by Motorola in 1987, and it is defined as a methodology that seeks to improve quality, eliminate waste and defects, improve product and service outputs, and determine the causes of any problem or defect in order to reduce and eliminate it. Operations are first applied within the DMAIC framework, which is defined as improving an existing process, 6 sigma provides the following benefits:

- Improving the manufacturing process.
- Improving the manufacturing quality.
- Reducing the cost of manufacturing.
- Reducing the waste in process based as same as Kaizen calls.
- Creating new opportunities to use alternative materials in production.
- Innovation in the field of new types of production- diversity of products
- Innovation in the field of new markets entry- developing new markets.
- Improving the customer satisfaction.
- Developing new standards in place of national and internationals.
- Improving trades process and controlling the defects.
- Measuring the volume of financing.
- Rule out defects up to Zero defects in excellent cases.
- Helping in fast corrective action of the imperfections.
- Creating a quality monitoring over all the organization process flow.
- Leading top management for rational decision making.
- Increasing marginal productivity of machines and workers-optimization

$$s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n - 1}} \qquad \sigma = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n}}$$

Sigma Level	Defect per million opportunity (DPMO)	Defect %	Success (Yield %)
1 Sigma	691,462.00	69.000	31.00
2 Sigma	308,538.00	31.000	69.00
3 Sigma	66,807.00	6.700	93.30
4 Sigma	6,210.00	0.620	99.38
5 Sigma	233.00	0.023	99.98
6 Sigma	3.40	0.00034	10.00

- **PDCA Cycle**

(PDCA) Cycle is a four-step problem-solving iterative technique used to improve business processes, it was developed by American physicist Walter A. Shewhart during the 1920s, the method was popularized by Dr. W Edwards Deming in the 1950s approach is compressing the following points:

- Plan: Decide the resources + identify internal & external issues + identify interested parties needs + identify risks + opportunities
- Do: Put the plan into action,
- Check: Measure the processes & performance against requirements, and what you want to achieve.
- Act: Take actions to deal with nonconformities and to improve OH&S performance.
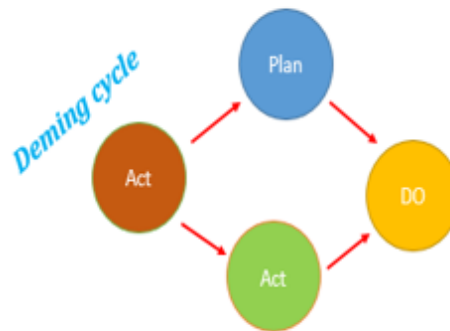
- **Just-in-Time (JIT)**

Just-in-time (JIT) is a practices that mostly followed by the Japanese auto industry, it is mostly an inventory policy not a quality improvement policy, is the philosophy behind the MRP systems now in use in most manufacturing plants, the idea is focus is on decreasing inventory cost as follows:

- Early arrival of material increases the inventory cost,
- Late arrival causes work slowdown or shutdown,
- Material or part of it are made available when needed ,

- **Lean Thinking**

Lean thinking or lean management Is the same as the "JIT is based on the idea of eliminating waste, but lean thinking includes two extra features,

- The lean organization eliminates many levels of management, bringing everyone closer to the processes,
- The strong process analysis orientation of each step in the work, and rule out unnecessary steps, its more structured than JTI,

- **The international Standard Organization (ISO)**

ISO is a worldwide federation of national standards bodies, it is a nongovernmental organization that comprises standards bodies from more than 160 countries, with one standards body representing each member country. ISO specified the requirements for a quality management system (QMS), they are using the standard to demonstrate the ability to consistently provide products and services that meet customer and regulatory requirements. ISO is accepted as an international quality standard by the European Union informally by virtue of its use in most of the

world wide,

ISO is almost 70% is a management system that is largely oriented towards relying on documenting operations in the workplace, this approach is similar to the Total Quality Management System (TQM) that oriented towards documenting the operations rather than working to improve them. ISO with new trend has increased the focus on improving operations, as well as TQM did also, so obtaining ISO certificates has become very important because it works to improve operations and raise the level of quality, and reduces the waste, in addition to that , it has narrows the gaps between process group and helps to simplify the procedures, merging the possible ones, and canceling what can be canceled, it's now inspires workers to speed performance and measure achievement in scientific ways,

- **Basic Steps to Progress: By Joseph M. Juran's theory**
  - Continuous improvement through dedication and sense of urgency,
  - Extensive training,
  - Commitment from senior management and leadership,

- **Ten Steps to Quality improvement: By Joseph M. Juran's theory**
  - Keep Score,
  - Maintain momentum,
  - Give recognition,
  - Communicate results,
  - Solve problems,
  - Report progress,
  - Organize to meet goals,
  - Provide training,
  - Set goals,
  - Awareness of both need & opportunity for improvement,

- **Juran's Trilogy: By Joseph M. Juran's theory**
  - Quality Planning,
  - Quality Control,
  - Quality Improvement,

- **Quality Vaccine: By Philip Crosby**
  - Determination (to approach to ZERO defects)
  - Education (to reduce failures)
  - Implementation (to control + monitor implementation)

- **Zero Defects: By Philip B. Crosby**
  - Prevention is the key,
  - Preventing defects saves nonconformance costs of quality,
  - Focus on upfront planning lowers rework, improves productivity,

- **14 Steps to Improvement: By Philip B. Crosby**
  - Show commitment for the long term,
  - Establish cross-departmental quality teams,
  - Identify current and potential problems,
  - Increase quality awareness and individual commitment,
  - Assess cost of quality,
  - Take immediate action,
  - Establish zero defect program,
  - Train supervisors,
  - Ensure awareness of new direction by all,
  - Encourage individual and team improvements,
  - Encourage employee feedback regarding quality obstacles,
  - Recognize employee participation,
  - Implement quality controls,

o   Repeat steps to ensure continuous improvement,

- **Seven Deadly Diseases: By Deming's**

The Seven Deadly Diseases of Management refer to behaviors that are severely toxic to organizational effectiveness and also barriers that managers face in the line of their work, they are:
https://sites.ualberta.ca/~yreshef/orga432/deadly.htm

o   Lack of constancy of purpose: Poor purpose lead to poor planning lead to leas product and service that will have a market and keep the company in business and provide jobs only,

o   Emphasis on short-term profits: Short term thinking lead to short term profit, this is the think of fast entry to fast exit the market, which means inferior good using and inferior good producing because the performance review stresses short term profits, quality will not be important to the worker,

o   Personal review system: Assigning review, evaluation of performance, merit rating, annual review, or annual appraisal, by whatever name, this a type of lie, cut corners to reach fast at any cost , and people might be rewarded and punished on the basis of random chance,

o   Mobility of management: Mobility of management works deteriorate the workers moral , manager becoming familiar with the process of people he manages, his drive his interest to short term rather than long term works , he lose the opportunity to develop the important missions,

o   Use of visible figures only for management: Being not considering clear figures that are unknown destroy the project, for example. By treating one customer poorly, how many potential customers have you lost? + By dealing with the workers autocratically   way, how they will tell their mistake? + No one says no to the leader In a meeting, how he will get new ideas?

o   Excessive medical cost: Excessive medical cost reduces the patients to the clinics, reduces the subscribers in health programs, the companies stress on insurance on the expense of the workers, reduces the visitors to the clinics, reduces the remedies percentage , diseases increases , society is not safe,

o   Excessive costs of liability: swelled by lawyers that work on contingency fees. For example, there are no obstetricians in eastern North Carolina because fame and wealth people sue obstetricians for bad behavior, the costs of insurance against wrong practices become so high, that obstetricians in that region cannot do their jobs unless they are included into insurance companies that cover their insurance premiums,

1.2.9 Additional Quality Planning Tools

Other quality planning tools are used to define the quality requirements and to plan effective quality management activities. These include, but not limited to:

o   Brainstorming: This technique is used to generate new ideas
o   Force field analysis: These are diagrams of the forces for and against change.
o   Nominal group technique: This technique is used to generate ideas in small groups and to be reviewed by a larger group.
o   Quality management and control tools: These tools are used to link and sequence the activities identified

1.3   Outputs

1.3.1 Quality Management Plan

Plan Quality Management is one of the component of a project management plan, it is the process of identifying quality requirements such as resources , manning , procedures , sequence of activities , and quality standards to develop the deliverables, the plan includes how a project will demonstrate compliance with relevant quality requirements and quality standard , the quality plan provides guidance and direction on how quality will be managed and validated throughout the project, the information used for the development of the quality management plan includes :

- ▪ **Key Requirements**
- ○ Scope baseline: It includes Project Scope Statement (project description + project deliverables + acceptance criteria + technical issues + (WBS) that defines the deliverables and work packages + WBS dictionary)
- ○ Schedule baseline: It is a document of the accepted schedule performance measures, including start and finish dates of a project deliverables,
- ○ Cost baseline: It represent the level of the accepted time interval being used to measure cost performance , including the other cost incurred,
- ○ Other management plans: These plans contribute to the overall project quality and may highlight actionable areas of concern with regard to the project's quality,

- ▪ **key components**
- ○ Project deliverables: The most description to the product specification and technical particulars (TP)
- ○ Project processes: The most setting of the quality process to conduct testing.
- ○ Quality standards: The criteria valid to a specific business, called product standards,
- ○ Customer satisfaction: The measurement measures the level of acceptance of deliverables,
- ○ Quality control Activities: The level of monitoring and controlling the deliverables to the extent of acceptance,
- ○ Stakeholder expectations: The effectiveness of a project realization of a product and achieving high competitive level,
- ○ Quality assurance activities: The ability to monitor the QMS, and to create high level quality deliverables,

1.3.2 Quality Metrics

Quality Metrics is the process of describing the products attributes and process attributes, by using a suitable method to measure the efficiency, effectiveness, maximization, and optimization, utilization, actually a value given can be compared with the tolerance to know how much the value is deviated from standards, here are some examples:
https://www.ease.io/14-metrics-every-quality-exec-should-monitor-how-to-calculate-them/

a. Cost of quality: This called the cost of conformity or the cost of appraisal, the true cost is the cost of good quality + the cost of poor quality, where:

- ○ Internal cost of good quality (COGQ) = In-process test + appraisal + prevention, Training
- ○ External cost of good quality (COGQ) = 3rd party inspection + customer witness+
- ○ Internal cost of poor quality (COPQ) = scrap+ rework + re-inspection +
- ○ External cost of poor quality (COPQ) = Defect reach customer + rejection + reputation +warranty correction +liability
- ○ Total cost of quality (COQ) = COGQ +COPQ

b. Cost of defects: This called nonconformance, there are 2 ways to look at defect, the 1st is Defective parts per million (DPPM), it is an interchangeably or defects per million (DPM), the 2nd is Defects per million opportunities (DPMO), which is more useful metric when looking at defects in sub- divisions which may have multiple opportunities for failure.

$$DPPM = \frac{Defective\ Parts}{Total\ Parts}\ X\ 1000$$

$$DPMO = \frac{Defective\ Parts}{Total\ Parts\ X\ number\ of\ defect\ opportunities\ per\ part}\ X\ number\ 1000$$

b. Cost of customer complaints: Customer claims is usually sent to a project after receiving the deliverables, a project must receive the claims and send them for fast solution not to harm the customer, and must make KPI' for the following cases :

- ○ Repentances similar errors,
- ○ Repentances different errors with the same customer,
- ○ Repentances of rejection over a specific period,
- ○ Number of resolved over the above period,
- ○ Warranty cost,

- o Defect cost,
- o Permanent record for KPI's,

c. **Cost scrap rate:** Scrap value Rate is the relationship between the total output & the scrap generated for each machine within a specific period (by using Ratio), the more closed period the accuracy the result will be to enable the concern to take corrective action where deviations raise.

$$Scrap\ Rate = \frac{Scrap\ Generated}{Total\ Ouputs}$$

d. **Cost of first period yield (FPY):** First period yield is a traditional method has been used to measure the effectiveness of process in projects, which means, the percentage of products manufactured correctly the first time through without rework as the customer has a bird eye on the first yield, see the following example and you can calculate the FPY cost, and the failure cost also,

$$Total\ process\ yield = FPY(A)\ X\ FPY(B)\ X\ FPY(C)\ X\ FPY(D)\ X\ FPY(E)$$

Total process yield = FPY (0.98) X FPY (0.90) X FPY (0.98) X FPY (.97) X FPY (0.99) = 0.89

Project	Unit Provided	Unit PASS	% PASS	FPY
A	500	490	0.98	
B	300	270	0.90	
C	420	410	0.98	0.83
D	360	350	0.97	
E	210	208	0.99	

e. **Overall Equipment Effectiveness (OEE):** It is the process of measuring of a project productivity and efficiency, calculated in simple terms as availability multiplied by performance and quality, the following explain the case,

$$Avaialabity = \frac{Total\ Time\ available - breakdowns - change\ over}{Total\ Time}$$

$$Performance = \frac{Total\ number\ of\ parts\ manufactured}{Available\ time\ X\ Production\ rate}$$

$$Quality = \frac{In - spesification\ parts}{Total\ parts\ manufactured}$$

f. **Delivery Metric:** It measures the vendor's ability to deliver the goods based on timely delivery as contractually call or based on Lead Time, to compute the metric, divide the number of on time deliveries by the total number of deliveries,

g. **Effectiveness Metric:** Effectiveness metric is the relationship between results obtained & capacity (by using ratio), the best way to do that is by achieving the results expected to higher profits,

h. **Efficiency Metric:** Efficiency metric is the relationship between results obtained & resources used (by using ratio), the best way to do that is by using the quantity minimum of resources to reduce the costs,

i. **Capacity Metric:** Capacity metric is the relationship between the amount that can be produced & the time for

this to occur (by using ratio), For example a project is capable to producing 100 Mt per day in average while it producing at presents 50 Mt per day---- Why?

j. Productivity Metric: Productivity metric is the relationship between the <u>amount that can be produced by (A) machine & the amount that can be produced (B) machine</u> at fixed time and resources (by using ratio), which is productive more?

k. Quality Metric: Quality metric is the relationship between <u>the total output & the outputs suitable and appropriate for use</u> (by using ratio), the targeted non-Conformity in relation with frequency of Non-Conformity occur for each machine or cable meters. etc.

l. Cost Metric: Other main KPI is being used in purchasing department is cost of product as part of the formula for calculating its sales price, when the unit cost increases above the average unit cost, it can cut into the profit margin of the product, purchasing department typically shall have contracted prices for certain goods and services, cost means the initial cost of the product , insurance coat, transportation cost , demurrage cost , and others ,   tracking cost variances from supplier to another helps companies understand and control their purchasing spend

1.3.3 Quality Checklists

Quality Checklist is a tool and technique used in quality management that is used to verify whether a set of required steps or action has been implemented or not, and whether a required item has been included or not, a quality checklist is created with reference to the acceptance criteria defined in the Baseline, it's help in identifying defects, and managing and controlling the quality of the deliverables. Thus, quality checklist is used as one of the <u>data gathering techniques</u> in managing and controlling the quality process,

Quality Check sheet is a tool and technique used in quality management that is known also as Tally Sheet, in a quality check sheet, the facts about a quality problem are mentioned in an organized way. Assume a defect is identified, then there will be information regarding, when did the defect occur, how long did it occur, where did it occur, cause of the defect, who is accountable to fix this defect, etc. All this information or facts are gathered, the same is done for other quality problems, then these facts shall be organized in a systematic manner, so that it can be helpful to perform inspections,
https://pmvidya.com/blog/quality-checklists-vs-quality-checksheets/

1.3.4 Process Improvement Plan

Process improvement plan is the process that a projects follow in order to make a change to some of the contents of the current Project Management Plan in order to improve the products or the services, or the results, by getting rid of the weaknesses or bottlenecks, business work to support improvement of intended objective, the change may be in occurs the inputs or tools & techniques, the change may be detailed as follows:

- o Process boundaries: Re-designing the process from A-Z , like change in schedule to reduce process of completion time, or change in procedures within a specific area,
- o Process configuration: Provides a graphic depiction of processes, with interfaces identified, and used to facilitate analysis such as the improve of the efficiency, effectiveness, optimization, and quality, and Reduce complication in business processes
- o Process metrics: Along with control limits, allows analysis of process efficiency, and Eliminate wasted efforts.
- o Targets for improved performance: Guide the process improvement activities within the limit of regulatory compliance.

The purpose of those process improvement plan is to document how the project team will analyze various processes, determine where improvements can be made, and implement improvement measures. A large part of project management methodology, process improvement is an iterative process that is performed throughout the project's lifetime.
https://project-management-knowledge.com/definitions/p/process-improvement-plan/

1.3.5 Project Documents Updates
Described in chapter (4) clauses # 3.3.5 + 4.3.3 +5.3.3
Described in chapter (5) clauses # 3.3.2+4.3.4+5.3.3+6.3.5
Described in chapter (6) clauses # 2.3.2+3.3.3+4.3.2+5.3.4+6.3.5
Described in chapter (7) clauses # 1.3.3+2.3.3+3.3.6
Described in chapter (8) clauses # 1.3.5+2.3.4+3.3.7

2. Preform Quality Assurance Process

Quality assurance (QA) is the process of making sure that everything (product + process) are done according to a specific and predefined standard, this is the one constant significant element exists in most companies as quality assurance is quite significant performs quality assurance is an executing process focuses on overall process improving the activities and processes that achieve product quality. The PMBOK is equally focused on improving the process in line with activities must have a positive effect on improving the quality of the products, and bringing about an overall reduction of cost.

Perform quality assurance is the process of auditing the quality requirements and the results from quality control measurements, to ensure appropriate quality standards and operational definitions are used, whereas, perform quality control is the process of monitoring and recording results of the executing the quality activities to assess performance and two recommends any necessary changes, the main inputs to the perform quality assurance process is the quality plan, and therefore this process which is an ongoing activity throughout the project cannot start until the quality plan has been created.
https://www.pm-primer.com/perform-quality-assurance/

2.1 Inputs

2.1.1 Project Management Plan
Described in chapter (4) clauses # 2.3.1 +3.1.1 + 4.1.1 + 5.1.1 +6.1.1
Described in chapter (5) clauses # 1.3.2 + 5.1.1+6.1.1
Described in chapter (6) clauses # 6.1.1
Described in chapter (7) clauses # 3.1.1
Described in chapter (8) clauses # 2.1.1+3.1.1

2.1.2 Quality Metrics
Described in chapter (8) clauses # 1.3.2+2.1.2+3.1.2

2.1.3 Work Performance Information
Described in chapter (4) clauses # 3.3.2 +5.1.2
Described in chapter (5) clauses # 6.3.1+6.1.2
Described in chapter (6) clauses # 6.1.3
Described in chapter (7) clauses # 3.1.3
Described in chapter (8) clauses # 2.1.3

2.1.4 Quality Control Measurements

Quality Control Measurement is the he process of auditing the quality requirements and the results from quality control measurements to ensure that appropriate quality standards and operational definitions are met, they are documented results of control quality activities, they should be captured in the format that was specified through the Plan Quality Management process, the quality of a product, service, results or process should always be checked, This is the reason why the quality control measurements are used by project managers to compare and to document the results of the control quality activities, the said quality control measurements shall analyzed , and evaluated the quality of the different processes involved in a project against the standards of the organization to validate the actual measurement and to determine the degree deviation to set it for correction,

It is crucial that they be captured in formats that are specified through the Plan Quality Management process. It is also important to take note that this particular document is also an important input for the Perform Quality Assurance. It is one of the inputs needed to generate change requests, project document updates, project management plan updates and the organizational process assets updates. This is to ensure that the quality standards, as well as operational definitions, are satisfied, by the way these standards shall be available for product, services, result, maintenance, calibration, safety, and,

https://projectvictor.com/knowledge-base/quality-control-measurements/

2.2   Tools and Techniques

2.2.1 Plan Quality Policy

The quality policy is an important document in the companies, actually the organizations are developing the quality policy to express the directives of top management regarding the quality of work and products, and top management is responsible for preparing, reviewing and maintaining the quality policy, the quality policy must be combined with goals, values , mission , norms of the organization , and it should be appropriate to the context of the organization , the quality policy must demonstrate the organization's commitment to continuous improvement, it must be communicated to all employees , and must be understood and applied throughout the organization, that the employees 'understanding of the quality policy is a true indication of the quality of leading the processes , and the quality of the products, service s or results, , in this occasion I am pleased to write the quality policy to may esteemed university as an example:

SELINUS UNIVERSITY OF SCIENCES AND LITERATURE

Quality Policy

1. Student Focus: Creating a comfortable study environment to our student
2. Employee Commitment: Inspiring our workers to embrace creative ideas
3. Process Approach: Focusing on how much the tasks are being performed effectively
4. Integrated System: Each part of our university is an integrated part to the process group
5. Strategic Approach: Achieving our goals based on large accreditation of our certificates
6. Continual Improvement: Hunting the bright minds to support the process of continuous development
7. Fact-based design making: Relying on confident information on decision- making
8. Communication: Fascinating communication process with quick response to people requirements

2.2.2 Quality Audit

ISO 9001-2015 defines quality audits as a systematic, independent and documented process for obtaining audit evidence and evaluating it objectively to determine the extent to which audit criteria are fulfilled. Internal audit called first-party audits is conducted on behalf of the company itself for management review and other internal purposes such as declaration of conformity. Second-party audit is conducted by parties having an interest in the company, such as customers, or by other persons on their behalf. Third-party audit is conducted by external and independent auditing organizations, such as SGS+ TUV+ UL, when two or more management systems are audited together, this is termed a combined audit. When two or more auditing organizations cooperate to audit a single audit, this is termed a joint audit.

The term systematic means the company must plan and document its system for audit periodically, and the company must have management support and resources behind it. Audit must be performed in an impartial manner, which requires auditors to have freedom from bias or other influences that could affect their objectivity. For example, having responsibility for the work, or a vested interest or shares in a supplier or third party company, they are assigned to audit. Audit conclusion shall be provided to the top management by the audit team after consideration of the audit objective, and all audit findings. The following are necessary acronyms acceptable in audit:

- Audit Criteria is a set of policies, procedures or requirements consider a baselines for auditors,
- Auditors are a team from within or from 2nd or 3rd party inspection are required to implement the audit,
- Audit Findings are the observations or mistakes acquire corrective action with evidence,
- Audit evidence is a statement of fact or other information which are relevant to the audit criteria and verifiable,
- Audit Plan is the annual arrangement for an audit,
- Audit Program is the process of putting the plan on action,
- Audit team is one or more auditors conducting an audit supported if needed by technical experts,
- Auditee: Organization being audited,
- Auditor is a person with the competence to conduct an audit,

Audit Based Assessment Criteria

| Objective | Standards | Cost | Quality | Scope | Procurement | Improvement |

2.2.3 Process Analysis

Process analysis is the discipline of examining processes that may be changed to align with enterprise objectives, most project managers are familiar with the traditional characteristics of a project, and products. The product is considered as a unique in most projects, create a product or service that may be change may change the project from one position to another, and uniqueness idea may bring uncertainty to the project, uncertainty will be at a highest point at the beginning of the project, and is reduced over the time. Assumptions can be made to help manage the uncertainty, but the result of the assumptions may unclear until later. When the processes are executed over and over the results become not unique at all but are repeated. The use of progressive elaboration for processes would be disorganized because processes are repeatable, they must be reshaped to approach to high-quality processes, by using improvement methods such as:

ttps://translate.google.com/#view=home&op=translate&sl=en&tl=ar&text=Determine%20the%20process%20to%20analyze%20it%20with%20the%20selection%20of%20a%20process%20or%20collection%20of%20processes%20that%20are%20the%20target%20for%20improvement.%0A%0A%0A%0A%20%0A%0A%0

- Efficiency: Costs is including labor, tools, and rework,
- Time: Time is considering the past time to execute all or part of the process,
- Quality of the result: The results without defects and within acceptable control limits,

Process Analysis is the discipline of examining processes that used to document, create, and improve the improvement processes is needed when processes no longer meet quality objectives, the process could be inefficient and takes too much time and produces unacceptable number of defects, or be imperfect, process analysis subject to process improvement, it is really a spiral process that repeats and overlaps steps as needed until the analysis is complete or when some deadline forces the analyst to move to the next step that are described here under:

- Selection of a processes that prioritize for analyzing,
- Processing team action
- Identifying the stakeholders,
- Collecting the information from the stakeholders,
- Identifying the process objectives,
- Identifying the metrics,
- Modeling the current process as is,
- Modeling the planned process to be
- Identifying the roots causes of defects,
- Determining alternatives of improvement,
- Make the business case for improvement,
- Plan and implement the improvement

2.3 Outputs

2.3.1 Organizational Process Assets (OPA)
Described in chapter (2) clauses # 4.2
Described in chapter (4) clauses #1.1.5 + 2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.3
 Described in chapter (5) clauses # 1.1.5+3.1.3+4.1.3+6.1.5
Described in chapter (6) clauses # 1.1.3+2.1.5+3.1.5+4.1.7+5.1.9+6.1.4+6.3.2
Described in chapter (7) clauses # 1.1.6+2.1.7+3.1.4+3.3.3
Described in chapter (8) clauses # 1.1.6+2.1.7+3.1.4+3.3.31.1.7+3.1.6

2.3.2 Change Requests
Described in chapter (4) clauses # 3.3.3 +4.3.1+5.1.3
Described in chapter (5) clauses # 5.3.2+6.3.3
Described in chapter (6) clauses # 6.3.3
Described in chapter (7) clauses # 3.3.4
Described in chapter (8) clauses # 2.3.2+3.3.5

2.3.3 Project Management Plan Updates
Described in chapter (4) clauses # 3.3.4 +4.3.2+5.3.2
Described in chapter (5) clauses # 6.3.4
Described in chapter (6) clauses # 6.3.4
Described in chapter (7) clauses # 3.3.5
Described in chapter (8) clauses # 2.3.3

2.3.4 Project Documents Updates
Described in chapter (4) clauses # 3.3.5 + 4.3.3 +5.3.3
Described in chapter (5) clauses # 3.3.2+4.3.4+5.3.3+6.3.5
Described in chapter (6) clauses # 2.3.2+3.3.3+4.3.2+5.3.4+6.3.5
Described in chapter (7) clauses # 1.3.3+2.3.3+3.3.6
Described in chapter (8) clauses # 1.3.5+2.3.4

3. Perform Quality Control Process

Quality control is a process intended to ensure that product quality undertaken to a defined set criteria to meet the requirements of the customers through the quality control process, the product quality shall be maintained, and the manufacturing defects shall be examined and controlled, quality control process can be used in all types of projects , it is a key component of a well-run projects, and helps to ensure the competence of a product, developing quality control processes allows the project to operate effectively, note the following 6 steps to ensure development of quality control process: https://www.score.org/blog/how-establish-quality-control-processes

- **Define project quality standard**: A project may have to meet the quality standards that may set by an external body such as the international trade, and may set by local body such as competent authorities, some sectors are developing their own quality standards for a specific eternal issue that shall be measurable, all these standard are to a combatant product to reach customer satisfaction, and ultimately to achieve profit,

- **Standard focus:** A project shall to prioritize the application of the quality standard that have direct impact on the product or services, for example if you are selling cosmetics you have to prioritize the focus on famous fashion with pretty shape, if you are producing biscuit you have to prioritize the focus on taste with pretty shape and sanitation,

- **Establish quality processes:** W. Edwards Deming, the founder of modern quality control, believed that well-designed processes lead to high-quality products and services. If you create good processes, continually measure the results of the processes, and work to consistently improve the process, your product or service will get better and better. Review a project results: Reviewing of applied process one –by one, reveals the deviation and lead them foe correction to meet the quality standards, so a project will inspire people to frequently review to deliver quality,

- **Review the results:** After the product, service, or result has been sold, a project should follow-up the suggestions and aspirations of customers and work to implement them as per the concept of Agile, this is a progressive elaboration to realize the high requirement of a product, and this is what we mint here, review your data regularly to the extent of meeting customers' expectation which is the prime objective of any project,

- **Get feedback:** Feedback is coming from internal and external sources, internal source may provide a vital suggestion on process and utilization, and some other notes attributes to operation quality, while the external feedback provide notes about your quality and competition trend and market behavior, so you can adjust your self,

- **Make improvement:** Once a project meets quality control standards, a project mustn't stop, but to continue progressive elaboration, as Kizen said, there's always a room for improvement, and making small changes can pay off in big way,

3.1 Inputs

3.1.1 Project Management Plan
Described in chapter (4) clauses # 2.3.1 +3.1.1 + 4.1.1 + 5.1.1 +6.1.1
Described in chapter (5) clauses # 1.3.2 + 5.1.1+6.1.1
Described in chapter (6) clauses # 6.3.4
Described in chapter (7) clauses # 3.3.5
Described in chapter (8) clauses # 2.3.3+3.3.6

3.1.2 Quality Metrics
Described in chapter (8) clauses # 2.3.3+3.3.6

3.1.3 Quality Checklists
Described in chapter (8) clauses # 1.3.3+3.1.3

3.1.4 Work Performance Measurements
Described in chapter (5) clauses # 4.3.1
Described in chapter (6) clauses # 6.3.1
Described in chapter (7) clauses # 3.3.1
Described in chapter (8) clauses # 3.1.4

3.1.5 Approved Change Requests
Described in chapter (4) clauses # 3.1.2
Described in chapter (8) clauses # 3.1.5

3.1.6 Deliverables
Described in chapter (4) clauses # 3.3.1
Described in chapter (8) clauses # 3.1.6

3.1.7 Organizational Process Assets (OPA)
Described in chapter (2) clauses # 4.2
Described in chapter (4) clauses # 1.1.5+2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.
Described in chapter (5) clauses # 1.1.5+3.1.3+4.1.3+6.1.5
Described in chapter (6) clauses # 1.1.3+2.1.5+3.1.5+4.1.7+5.1.9+6.1.4+6.3.2
Described in chapter (7) clauses # 1.1.6+2.1.7+3.1.4+3.3.3
Described in chapter (8) clauses #1.1.7+3.1.6

3.2 Tools and Techniques

3.2.1 Cause and Effect Diagrams

The cause-and-effect diagram is one of the effective ways to get to the identification of the causes of any problem regardless of its nature, this means it can be used to analyze a personal problem, industrial problem, a trade problem, or a service problem, and more others, this diagram has many names such as Ishikawa diagram+ F-Ishikawa diagram- + Herringbone diagram+ cause & effect diagram + Fishbone diagram. This diagram aims to decrease the reasons that may lead to solve the problem instead of limiting thinking in the traditional causes, this diagram allows to brainstorming to list the cusses of a specific problem and finally to exclude unreal causes and to test the balance expected causes one -by one to reach to the   real cusses that may be unexpected, also one of its benefits is that it forces everyone to think about the problem in depth rather than rushing to suggest solutions. The following is an example on customer claim. The "four MS" of cause-and-effect diagrams area:

- Manpower
- Machines
- Materials
- Methods
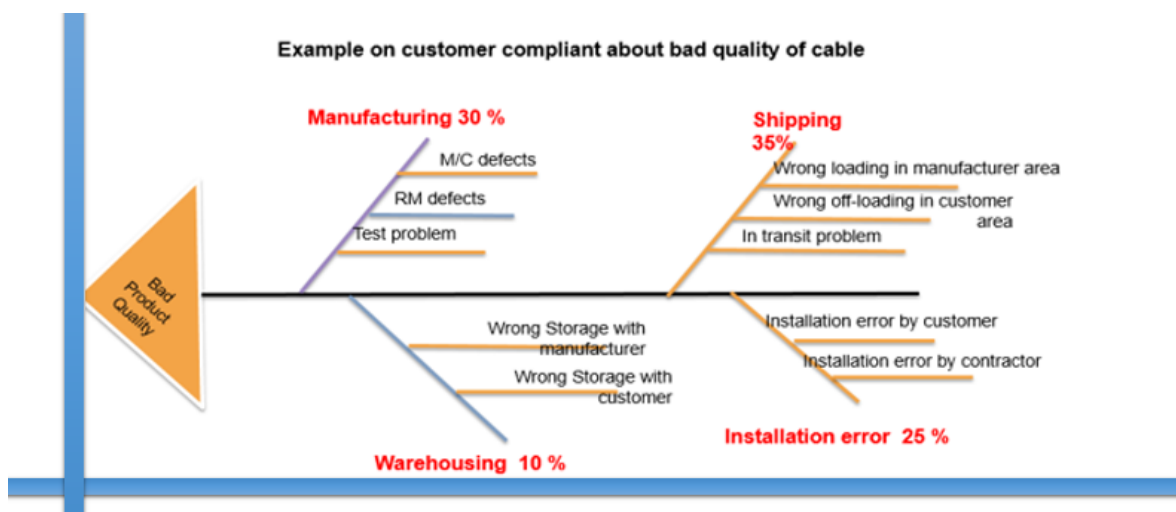
A fishbone diagram is a vital tool in identifying the root cause of a problem, although using this diagram is not time-

consuming, the benefits are enormous, this tool helps remove the root cause of the problem and develop an understanding among team members, using a fishbone diagram with a critical problem cannot spend much time on every small issue. https://pmstudycircle.com/2014/07/fishbone-cause-and-effect-or-ishikawa-diagram/
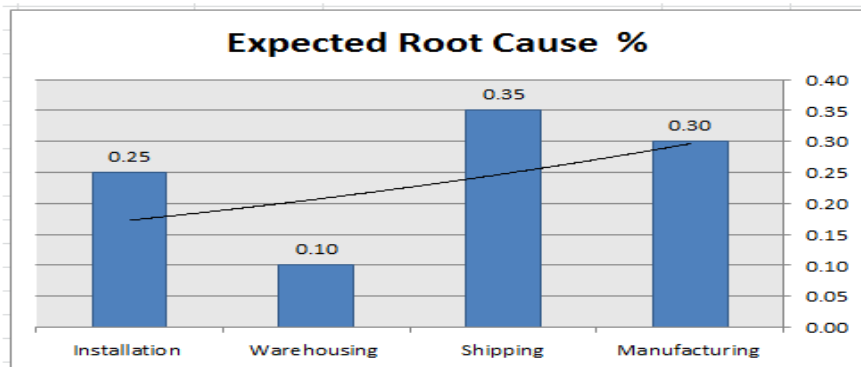
3.2.2 Control Charts

Described in chapter (8) clauses # 1.2.3+3.2.2
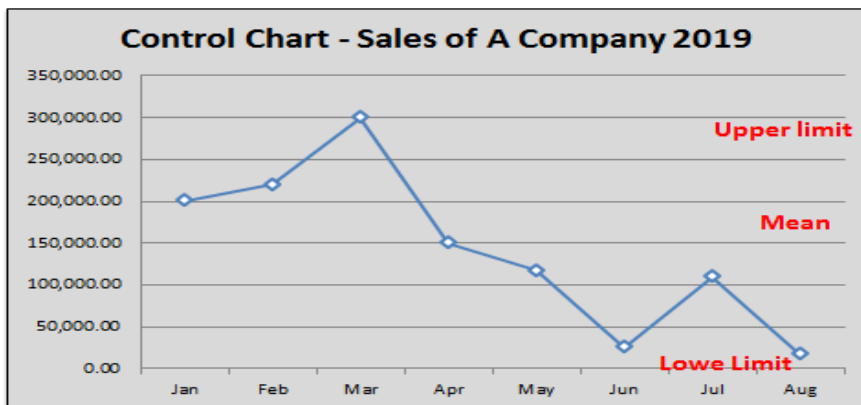
3.2.3 Histogram

A Histogram is the process of distribution the data in a graph to know the compatibility mode of the real data distribution, a histogram gives abundant information in a simple form, it enables us to understand the data distributed in real examples, and it enables us to analyze these data and reach important management decisions. The following table shows statistics distribution of COVIDE-19 which spread over the world at the beginning of March 2020. This painful example was used because it caused a humanitarian catastrophe that killed thousands of people over the world.
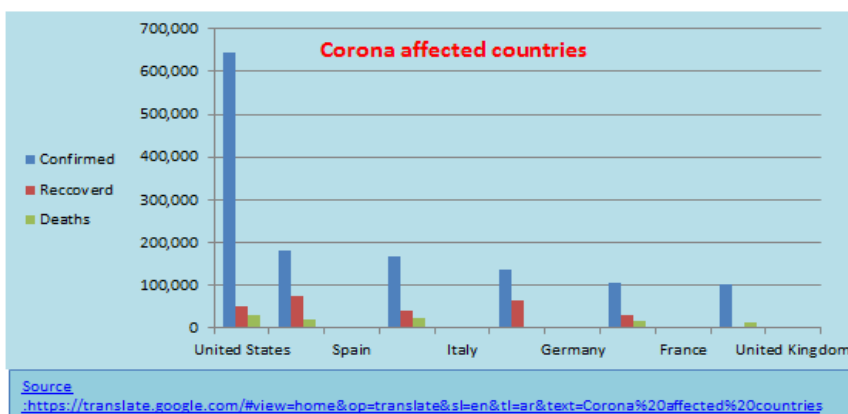
We have selected the 1st seven largest countries affected by this epidemic, hoping for a speedy recovery for all affected people in the world. Looking at the above diagram at a glance to fast note countries are which most affected by the epidemic, which countries recorded the highest cases of recovery, and which countries that have recorded the highest death rate, and what indicates a high or low cases of recovery and death, does it indicate the availability or the lack of medical capabilities in the seven countries, or the lack of response to this epidemic, or the inability to detect early, and what is the source of this epidemic , that has put to death the lives of many, the above Histogram shows we have many questions awaiting answers from the affected countries, so that these countries can address them now and prevent them in the future,

3.2.4 Flowcharting
Described in chapter (8) clauses # 1.2.7+3.2.3

3.2.5 Pareto Chart

A Pareto Chart is a graph that indicates the frequency of defects, as well as their cumulative impact. Pareto Chart is useful to line-out the defects to prioritize the greatest overall improvement, in order word it ranks the causes in terms of the extent of their influence on the problem in question. Let's assume a project receive compliant for bad quality of a product, a project manager has to find the root cause to solve the nonconformity which may be have many causes, a project manager can use Pareto chart to solve the nonconformity,
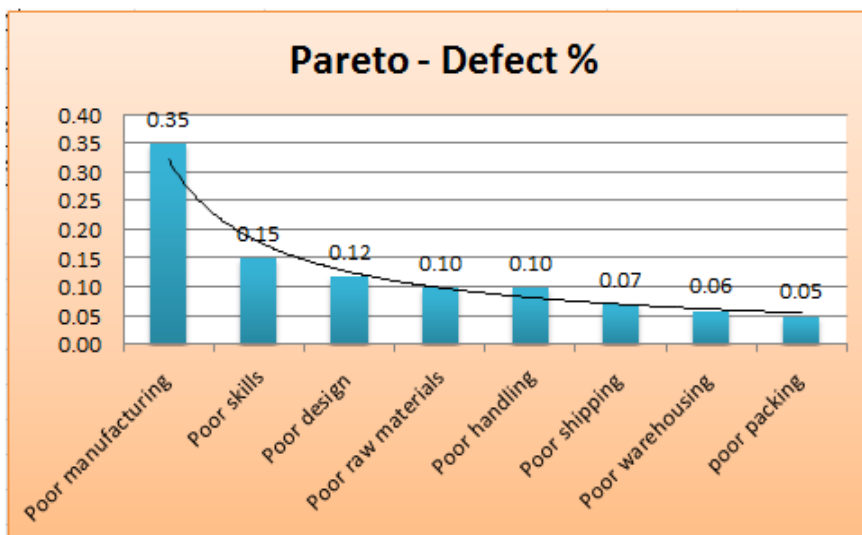
To draw Pareto curve, we have to determine the percentage of defects from each of these reasons, such as taking an appropriate time period and determining the number of defects from each reason. Then we determine the ratio of defects arising from each cause to the total number of defects, meaning that we determine the percentage of defects arising from each cause, then we rank the causes in terms of percentage of defects, starting with the largest and the lowest and so on , by a glance look you will get the case and you can prioritize the solution. In the above example, the sequence of causes is based on their importance in the diagram, so the project manager must search the reasons according to their sequence, and each of reason may have several causes that must be discussed to identify the root of the problem of the complaint that received from the customer,

3.2.6 Run Chart

A Run Chart and Control Chart is the process of plotting the data of a variable over time such as sales change over the time, production capacity over the time, errors occurs over the time, change management over the time, a project progress over the time, it is easy to draw, and easy to explained, but not vital to show if the process is in control or stable, and not quite useful for quality control, and it is defining the upper limits and lower limits , and the medium limit within the specified data ,
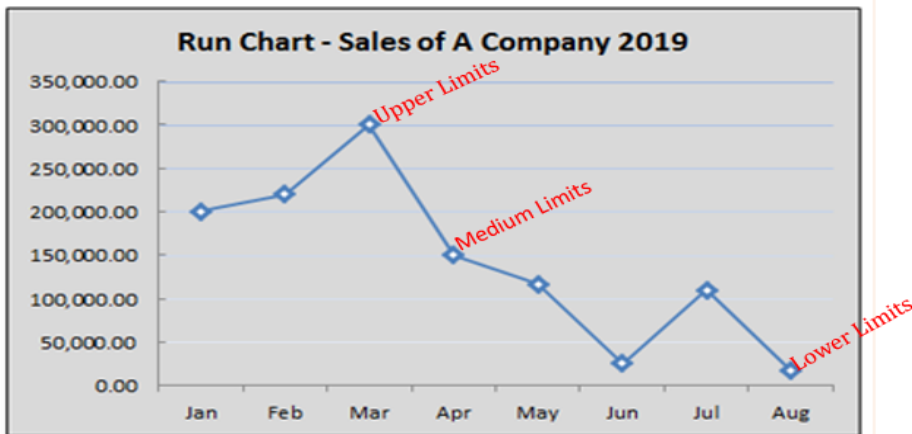
3.2.7 Scatter Diagram

A scatter diagram or a scatter plot a is the process of defining the relationship between 2 variables , and the range of correlation among them , the said diagram is known also as scatter plot or and a correlation chart, the more close the variables to the fitter line the more the relation is strong and named (positive correlation) , while the more far or scatter the variables from the fitter line the more the relation is weak and named (negative correlation) , a scatter diagram explores the relationship among dependent and independent variables. Let's assume the clothing merchant does an annual statistic about the winter clothing sale rates to know the strength of the relationship between lower temperatures and its impact on winter clothing sales, the merchant found strong relation or strong correlation, so he has to work on this strong correlation,
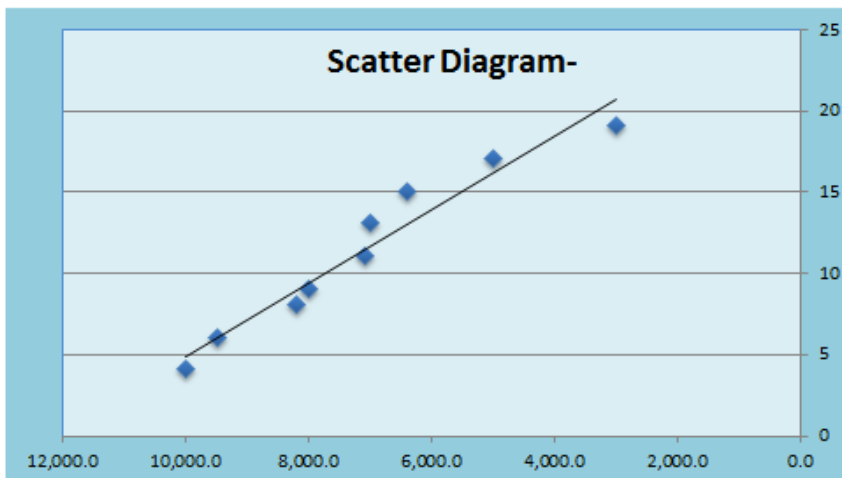
The Correlation between low temperatures and selling winter clothes is positive

3.2.8 Statistical Sampling
Described in chapter (8) clauses # 1.2.6+3.2.8

3.2.9 Inspection

Inspection is a word mention only one time in all ISO 9001-2015 as well as TQM. Inspection is the process of examining or measuring a product or a process to verify whether a product or a process are conforms to a project and customer requirements, it is mostly implemented base on the request of the customer (the buyer) , while Testing is a continuously process implemented by a project as integral part of it routine works, it classified to in-process test, and final test, while Audit is usually conducted at planned intervals to provide information on whether the quality management system (QMS) performs as plan call, this audit can be an internal audit (first party), or an external audit (second party or third party), and it can be a combined audit or a joint audit, these types of monitoring and controlling processes are applied to enable the business take the necessary corrective actions

without undue delay,

3.2.10 Approved Change Requests Review

Change Request is described in chapter (4+5+6+7) , and Approved Change Requests is described in chapter (4) clause # 3.1.2 , while Approved Change Requests Reviews is mentioned in chapter (8) as a process of for modifying a plan, document, work product, deliverable or artifact, a change is different from a defect but a defect repair is considered as a change, a change is any request for modifying a plan, document, work product, deliverable or artifact, to the change request review and approval , see the following steps :
https://www.pmbypm.com/pmp-change-management/

- Any new change shall be identified and recorded in the "log change"
- Change draws its strength from analysis in coordination with relevant customers and stakeholders,
- Change request is approved by initiator + reviewed by + stakeholders + awaiting CBB)
- Change Control Board (CCB) who accept the change after reviewed by,
- Change to be implemented and monitored by the execution authority after approval,

3.3 Outputs

3.3.1 Quality Control Measurements
Described in chapter (8) clauses # 2.1.4+3.3.1

3.3.2 Validation of Changes

Validation of changes is the process of making sure if change is required, necessary, documented, yield benefits, and accepted by CCB, or project manager, and customer "as required", we have to differentiate between Validation of change & Verified changes:

- Validation of change: To make sure about change necessity + benefit+ approved + intended to execution + change doesn't get done (awaiting approval)

- Verified changes: To make sure the approval is taken by CCB + customer + project manager as necessary + change get done + done correctly,

3.3.3 Validation of Deliverables

Validation of deliverables is the process of making sure if deliverables is required, necessary, documented, yield benefits, and accepted by CCB, or project manager, and customer "as required", we have to differentiate between Validation of deliverables & accepted deliverables:

- Validation of deliverables is the process of making that the product has gained final approval from the Quality Control Department (PASS), and wait for the customer's approval,

- Accepted changes is the process of making sure that the approval is from the customer is obtained , then we can say

change is verified , but (we can't say change validated)

3.3.4 Organizational Process Assets Updates
Described in chapter (5) clauses # 6.3.2
Described in chapter (8) clauses # 2.3.1+3.3.4

3.3.5 Change Requests
Described in chapter (4) clauses # 3.3.3 +4.3.1+5.1.3
Described in chapter (5) clauses # 5.3.2+6.3.3
Described in chapter (6) clauses # 6.3.3
Described in chapter (7) clauses # 3.3.4
Described in chapter (8) clauses # 2.3.2+3.3.5

3.3.6 Project Management Plan Updates
Described in chapter (4) clauses # 3.3.4 +4.3.2+5.3.2
Described in chapter (5) clauses # 6.3.4
Described in chapter (6) clauses # 6.3.4
Described in chapter (7) clauses # 3.3.5
Described in chapter (8) clauses # 2.3.3+3.3.6

3.3.7 Project Documents Updates
Described in chapter (4) clauses # 3.3.5 + 4.3.3 +5.3.3
Described in chapter (5) clauses # 3.3.2+4.3.4+5.3.3+6.3.5
Described in chapter (6) clauses # 2.3.2+3.3.3+4.3.2+5.3.4+6.3.5
Described in chapter (7) clauses # 1.3.3+2.3.3+3.3.6
Described in chapter (8) clauses # 1.3.5+2.3.4+3.3.7

Chapter (9)

Project Human Resources Management

Chapter (9)

Project Human Resources Management

Overview

Project human resource management describes the processes that help project managers and other managers to organize, and manage all the project stakeholders' expectations, and that explain how to make the most effective use of the people involved with the project, including all stakeholders, the project interested parties need to understand what enterprise environmental factors and organizational process assets can affect the outcome of the project. These processes interact with each other and with the processes in the other knowledge areas as well. Each process may involve effort from one or more individuals or groups of individuals based on the needs of the project. Although the processes are presented here as discrete elements with well-defined interfaces, in practice they may overlap and interact in ways not detailed here. Project human resources management objectives are to:

- Define the role of human resources for the sponsor, senior management and team members
- Developing the human resources plan, its inputs, tools, techniques and outputs
- Building and developing the project team, its inputs, tools, techniques and outputs,
- Define the project management authority and conflict management methods
- Developing the skills of the project team, the importance of some theories of motivation and leadership on human resource

1. Develop Human Resources Plan

Developing human resources plan helps organizations to align human resources to its strategy, it is an essential planning document built upon the organizations mission, vision, values and goals established in the strategic plan, its provide information on how the human resources function will support the goals and the strategies of the organization, it's also ensuring that human resources planning and practices are consistent, the ideal human resources plan outlines how the gaps between present and future capabilities will be addressed, enabling businesses to effectively pursue their company goals.

Developing a human resources plan is an important topic in most organizations because managers bear the responsibility to meet the expectations in the areas of corporate governance, policy transparency, accountability, and economic efficiency, and for organizations to succeed in these areas, they must have the right people, with the right skills, in the right place, and at the right time to implement the organizations' strategy in a sufficient degree of efficiency with the need to monitor the progress towards the goals, by having a successful management application of human resources, with adhere training policies and the development of skills, and the existence of career succession planning processes, and continuous risk assessment.

1.1 Inputs

1.1.1 Activity Resource Requirements
Described in chapter (6) clauses # 3.3.1+4.1.3+5.1.4
Described in chapter (9) clauses # 1.1.1

1.1.2 Enterprise Environmental Factors (EEF)

Described in chapter (2) clauses # 4.1
Described in chapter (4) clauses #1.1.4 + 2.1.3+ 3.1.3 + 4.1.3+5.1.4
Described in chapter (6) clauses # 1.1.2+3.1.4+4.1.6+5.1.8
Described in chapter (7) clauses # 1.1.5
Described in chapter (8) clauses # 1.1.6
Described in chapter (9) clauses # 1.1.2

1.1.3 Organizational Process Assets (OPA)

Described in chapter (2) clauses # 4.2
Described in chapter (4) clauses # 1.1.5+2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.
Described in chapter (5) clauses # 1.1.5+3.1.3+4.1.3+6.1.5
Described in chapter (6) clauses # 1.1.3+2.1.5+3.1.5+4.1.7+5.1.9+6.1.4+6.3.2
Described in chapter (7) clauses # 1.1.6+2.1.7+3.1.4+3.3.3
Described in chapter (8) clauses #1.1.7+3.1.6

1.2 Tools and Techniques

1.2.1 Organization Charts and Position

Organization Charts and Position is also called organigram or organogram, is a diagram that shows the structure of an organization and the relationships and relative ranks, its illustrate the relationships and chains of command within the organization, identified by employee names and titles and job positions are generally depicted in boxes or circles with lines linking them to other employees and departments, the following are the common charts:

a. Hierarchical-type charts: The Hierarchical-type chart is the traditional organization chart structure can be used to show positions and relationships in a graphic is top-down channels, it compresses three types of charts (OBS +WBS + RBS)

▪ **Organizational breakdown structure (OBS)** is arranged according to an organization's existing departments, units, or teams with the project activities or work packages listed under each department, for example sales department can see all of its project responsibilities by looking at its portion of the OBS. Furthermore,
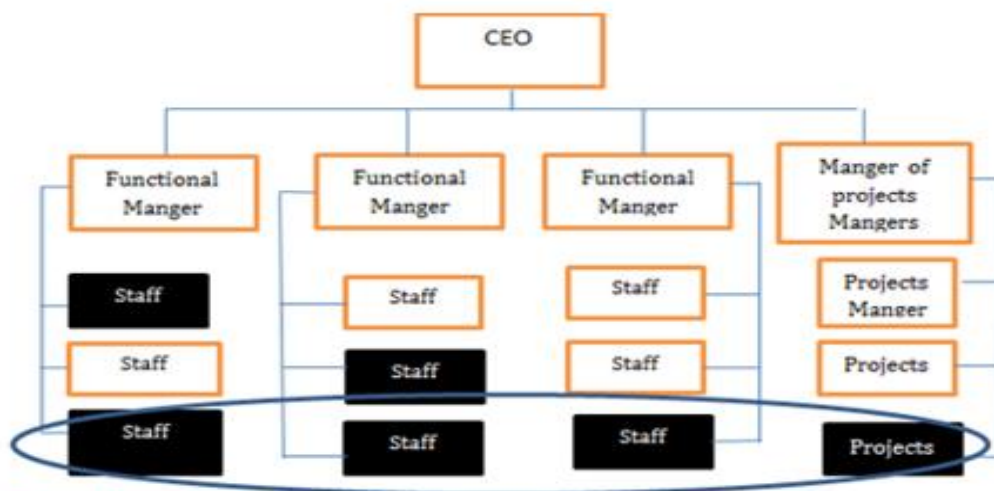
Strong Matrix Organization
*Black boxes represent the engaged in project activities (Power residues with project manager*

▪ **Work breakdown structures (WBS)** designed to show how project deliverables are broken down into work packages showing high-level areas of responsibility and showing a breakdown of project deliverables. While the resource breakdown structure is another hierarchical chart used to break down the project by types of resources RBS, for example a resource breakdown structure can depict all of the

▪ **Resource Breakdown Structure (RBS)** is a hierarchical model that is used to break down the resources structure into groups or parts to simplify the identification of resources needed in facilitating and completing a project, the term is refer to a particular hierarchal structure that is put into place for the purposes of illustrating and demonstrating the totality of the resources that current exist to the project team, and presenting this information in an organized fashion for easy recollection by all of those who may need it. The resources are broken down into categories as well as resource types that may be used in resource leveling schedules, as well as to those that may be used for purposes of identifying needs in regards to human resources and staffing . Described in chapter (5) clause # 3.3.2
https://project-management-knowledge.com/definitions/r/resource-breakdown-structure/.
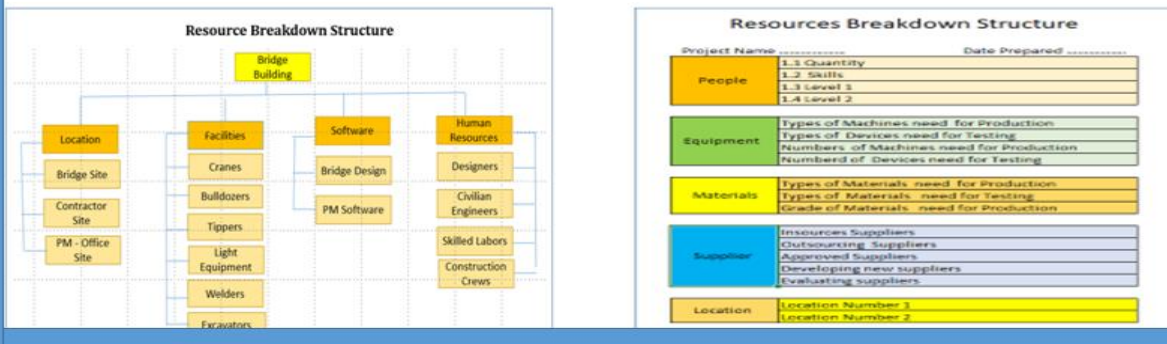
b. Matrix – based Chart: RACI / RAM is a project management and planning tool used to analyze and understand the relationships between data sets, Matrix charts compare two or more groups of elements or elements within a single group. They help project managers identify how information is related as well as the strength of those relationships. Project managers deal with a variety of processes, programs, and people, and with many variables that interact and affect the project path, it may be difficult to understand how the variables interact with each other and how they affect the results, so it is necessary to resort to matrix schemes that help to visualize and evaluate those relationships Complex so that they can make sound decisions and put projects on the right track. Matrix diagrams are especially helpful when trying to understand causal relationships or conducting quality function deployment (QFD) analysis. There is a Common applications of matrix analysis include:
https://www.lucidchart.com/blog/what-is-a-matrix-chart
Identifying the causes of problems
▪ Matching requirements with specifications
▪ Allocating resources based on need or competency
▪ Comparing possible solutions
▪ Identifying opportunities for improvement
▪ Reviewing how well requirements are met

RACI Chart	Person				
Tasks	Richard	Aseel	Tom	Tamara	Sonia
Market Survey	A	C		R	I
Collect the information	I	C	A		R
Inbound the information	C	I	R	A	
Analysis the data	R	A		C	1
Compare the data	1	C	A	R	
Get the result	1		A	C	R
Get feedback	C	R	A	I	
R = Responsible	A = Accountable		C= Consult		I = Inform

c. **Text –oriented formats:** Text –oriented formats are used when there is a significant amount of details to record, these are also called position description or role-responsibility, and authority of the resources, and they make great templates to use for future projects. Team members' responsibilities that require detailed descriptions can be specified in text-oriented formats. Text-oriented formats typically provide the following information:

- detailed descriptions of team member responsibilities. Usually in outline form.
- Also known as position descriptions and role-responsibility-authority forms

Text –oriented formats :Detailed description of the team member responsibilities , authorities are specified in text oriented formats	
Functions	Project Y
Role	
Responsibility	
Authority	
Competency	

1.2.2 Networking

Networking is the formal and informal interaction with others in an organization or entity or industry or any other business, networking is a way to improve project knowledge and access to the best human resources in terms of knowledge, specialized expertise and strong competence, networking is a constructive way to understand political and personal factors that will affect the effectiveness of various employment management options. For example, the proactive correspondence, lunch meetings, informal conversations, events participation, conferences and business seminars, networks can be a useful technology at the start of a project, it can also be an effective way to promote professional development of project management during project ignition up to project closer. There are a number of reasons why HR professionals should network. This include the following:

Networking include the following:

Ability to build reputation and credibility
Increased ability to do your job well
Gather advocates
Facilitate trust

1.2.3 Organizational Theory

Organizational theory is a set of interconnected concepts that study the behavior of individuals and groups within an organization, it studies the internal and external issues that impact the organizational behavior, the theory is based on the concept of synergy which means that the group can do more than the individual who works alone, organizational theories have very much impact on the success of many businesses, here are some theories:

Kaizen Theory

Tailchi Ohno formulated Kaizen theory in 1948. The word "kaizen" is a Japanese word that is divided into two parts (kai), which means change for the better, and the word "zen" means continuous. The concept of kaizen appeared in 1948 in Toyota Company, which was invented by Tailchi Ohno and applied in Japan after the 2nd global war in several sectors of industry, finance, profit institutions, governmental and non-governmental organizations in Japan during the period of Japanese reform, especially in the areas of education and education that aim to improve the individual as a whole. This philosophy focuses upon continuous improvements (step by step) of processes in manufacturing, engineering, supporting business process and management from the top to the bottom. Kaizen.

KAIZEN™ means improvement. Moreover, it means continuing improvement in personal life, home life, social life, and working life. When applied to the workplace KAIZEN™ means continuing improvement involving everyone – managers and workers alike." Masaaki Imai, Founder of Kaizen Institute. The Toyota Production System is known for kaizen, where all line personnel are expected to stop their moving production line in case of any abnormality and, along with their supervisor, suggest an improvement to resolve the abnormality which may initiate a kaizen. The cycle of kaizen activity can be defined as: "Plan → Do → Check → Act". This is also known as the Shewhart cycle, Deming cycle, or PDCA. https://en.wikipedia.org/wiki/Kaizen#Point_Kaizen

Objectives of Kaizen

- Cost reduction (waste of time + waste of efforts+ waste of money + waste of material)
- Time Reduction (unnecessary motion + unnecessary process + unnecessary activities +shortcut process)
- Quality increase (base on standards + norms + customers oriented + Agile with customers+ workself-dependent
- Mistake reduction (reduce nonconformity)

Benefits of Kaizen

- Widely applicable
- Teaches workers how to solve everyday problems themselves
- Faster delivery, lower costs, greater customer satisfaction
- Highly effective, transparent and result-oriented
- Team-based cross-functional, data-driven
- Optimization of the work environment and production +...)
- Continual small improvements add up to major benefits
- Redevelopment of the communication with other departments
- Increase employee's morale + job satisfaction + sense of responsibility
- Improve productivity + quality + use of capital + space utilization,

Principles of Kaizen

- Customer Orientation: A course of actions taken by a business to support customers,
- Total Quality Control: application of quality controls on business process group to meat quality,
- Quality Control Circles: is a small group of workers together to identifying, analyzing, solving matters,
- Suggestion System: A formalized mechanism encourages workers to contribute with constructive ideas.
- Automation: The use of a control systems for operating of machinery, processes to reduced human intervention.
- Work Discipline: The all way to correct the behavior of personnel and to create deficiencies among them
- TPM: The technical preventive maintenance system to improve the machines, equipment operating,
- KANBAN: A method of knowledge that balances demands of work with the available capacity for new work
- Quality Improvement: A approach to reduce of waste, rework, and losses in the production process
- Just-in-Time (JIT): An inventory strategy companies employ to increase efficiency and decrease waste by
- Zero Defects: A tool aimed to reduce defects and motivating people to prevent mistakes
- Productivity Improvement: A technique to increase efficiency, production output, and decrease the cost,
- New Product Development: The transformation of a market opportunity into a product available for sale,
- Small Group Activities: A Brainstorming techniques designed to stimulate creative thinking considering brainstorming is governed by 4 rules are: (no criticism+ free-wheeling welcomed +quantity is important, and

Time & Motion Theory

Fredrick Taylor formulated Time & Motion Theory in 1970, called for adoption of this theory rather than adopting random or intuitive ways, he pointed out that , all people are lazy by nature and not bearing responsibility , and they work to achieve their personal end only, and they are striving to aggravate their income only ,he assumed that, the common denominator between the workers and the organization is each party is strive to achieve his own interest only, he believes that the real stimulator to the worker is the economics motive, the harmony between workers (each party is looking for his own utility), based on his believe , Fredrick Taylor sets a group of rule thumbs to guide the workers to do their jobs govern by a specific motion and specific time such as:

- He designed the organizational structure base on operational link,
- He analysis each process to specific stages and specific movement,
- He set a certain limit time to accomplish each step of the job,
- He established accurate standards and norms as a Work Instructions to the workers,
- He voided out unnecessary movement in each step to reduce efforts and time,
- He ruled out all the repetitive actions or the double process.
- He imposed severe control on process which disturbed the workers,
- He links the wages with marginal productivity of the worker,
- He considered the more labors works the more wage shall deserve,
- Rewards are given only to the excellent productive people, but this may create struggles,
- Training the people of lower productivity, but in diverse result they shall punish,
- He focuses on perfect selection of workers to avoid sunk cost,
- He ignored the psychological factor impacts on worker's behavior,
- He voided criticism from all level of workers which frustrate them,

Despite of the elevated success the theory obtained because it is raised the productivity of the organizations, he faced many types of objections and discrepancies among the workers because he ignored their opinions , and he ignored their suggestions and their ambitions, he considered the workers as machines, and he considered the workers are stupid part in the organization and they should be punished for their mistakes ,even they should be punished for their ideas toward the work if they show willingness to change or to amend the manners of process applications, he believes that, the workers should not think but they shall do the work only based on working instructions designed by him,

Fredrick Taylor omitted the human factor, despite of the tremendous admiration gains from the side of socialist and researchers, and a positive response in the industrial field implementation whom furthering this theory, this theory is called the classical theory because it is considered the workers are working for economical ambitions only and the criticisms faced this theory opened the door widely to another research for new theories despite of temporary success recorded to this theory. Fredrick Taylor ignores the following human needs:

- He considered worker are not a part of organization, they shall work as a machines,
- He considers the workers mindless and stupid, so more suggestions shouldn't acceptable,
- He ignored the nature and ambitions of the workers and their needs,
- He ignored the contribution of workers in process,
- He ignored the worker's operational requirements as such as PPE.
- He ignored the physical conditions of the worker,
- He ignored the moral factor which is bearing high importance in motivations,
- He imposed hard control on the worker's movement.,
- He imposed hard close supervision and comprehensive systems of control
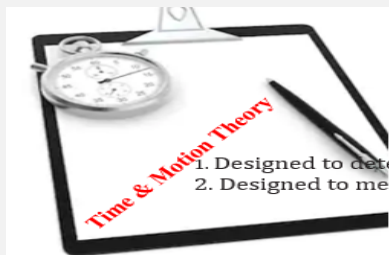
1. Designed to determine the best way to complete a respective job
2. Designed to measure how long it takes an average worker to complete a task at a normal pace

X Theory & Y Theory

Douglas McGregor formulated the X and Y theory in 1960, he suggesting two aspects of human behavior at work, one of which is negative, called as theory X and the other is positive and called as theory Y, according to McGregor, the perception of managers on the nature of individuals is based on various assumptions.

The dark side of the theory is pessimistic (Theory X)

- Average employees are mostly dislike work and tries to escape whenever possible,
- Average employees are mostly not part of organizational ambitions,
- Average employees are mostly dislikes responsibilities,
- Average employees are mostly not a part of organizational ambitions,
- Average employees are mostly works for economics issues only,
- Average employees are mostly resist and dislikes change,
- Many employees rank job security on top, and they have little or no ambitions,
- Many employees have no loyalty toward their job
- Average employee needs formal direction,
- Most employees must be persuaded, compelled, or warned with punishment
- Eye bird shall be imposed on employee,

The bright side of the theory is optimistic (Theory Y)

- Many employees can perceive their job as relaxing and normal,
- Many employees can be trusted if they trained well,
- Many employees are having the initiative if they found the opportunity,
- Many employees can work in spiral team in case of supporting,
- The people are a part of organizational ambitions if they are rewarded.
- Many employees can exercise their physical and mental efforts in an inherent manner in their jobs,
- Many employees can work with self-control if they are sincere to achieve the organizational objectives,
- Many employees may incur loyalty and commitment If the job is rewarding and satisfying them,
- Many employees can learn to admit and recognize the responsibility.
- Employees have skills and capabilities and their logical capabilities should be fully utilized to the interest of the work

Implications of Theory X and Theory Y

Quite a few organizations use Theory X today. Theory X encourages use of tight control and supervision. It implies that employees are reluctant to organizational changes. Thus, it does not encourage innovation. Many organizations are using Theory Y techniques. Theory Y implies that the managers should create and encourage a work environment which provides opportunities to employees to take initiative and self-direction. Employees should be given opportunities to contribute to organizational well-being. Theory Y encourages decentralization of authority, teamwork and participative decision making in an organization. Theory Y searches and discovers the ways in which an employee can make significant contributions in an organization. It harmonizes and matches employees' needs and aspirations with organizational needs and aspirations.

https://www.managementstudyguide.com/theory-x-y-motivation.htm

Theory of Motivation

William Ouchi the Japanese scientist formulated the Z theory in 1981, the theory is deemed one of the modern management theories that has achieved remarkable success. Ouchi put in his book the "Z Theory", and as a result Japanese companies achieved greater productivity than American companies. In fact, the social environment of the Japanese society is based on the principle of respect for the head of the family, and obeying his orders, while he is responsible for them and participates them in decision-making,

William Ouchi developed was born in a society fund of respect and loyalty to the family, and "theory Z" was born after a comparative study of American and Japanese management practices popularized during the Asian economic boom in the 1981s. William Ouchi identified various traits of Japanese leadership that formed the basis for a new leadership theory Z, his theory is developed beyond X& Y theory that blended the best of Eastern and Western management practices.

 The Theory Z reduced employee turnover, increased commitment, improved morale and job satisfaction, and dramatic increases in productivity.
https://studiousguy.com/william-ouchis-theory-z-of-leadership/

Z Theory Features

- Organization provides importance to long-term employment and job security, may reach 55 years,
- Collective decision-making process is an essential process,
- Proper accountability of work and responsibility of an individual,
- Evaluation of performance to be proper and consistent with promotion,
- Generalization the jobs overall people to get understanding of company operations,
- Replace job specialization as a key component of the theory,
- Slow promotion may reach to more than 10 years
- Demonstrate training and continual improvement of product and performance are the core of the model,
- Holistic concern for the workers and to their families,
- Informal control, ensure efficiency of operations,
- Individual responsibility for joint achievements concludes the theory,

Assumptions to hunt benefits

- Organizational strong philosophy: The workers must believe in the work they do and must be involved in each job gradually,
- Long-term employment: Developing the skills of workers for placing different position in the organization,
- Slow promotion: Promotion may take at least 10 years to develop skills efficiently,
- Consensus in decisions: The organization should encourage employees to participate in organizational decisions.
- Public employees: Employees may bear a greater responsibility when they understanding all aspects of the organization,
- keep the workers feel fun: The organization should show real concern for the happiness of its employees and their families,
- Individual responsibility: The organization recognizes individual contributions but always in the context of the team,
- Informal control: Employees are empowered to perform tasks the way they see fit, and management is far away, and there should be formal measures to assess the quality of work and performance.
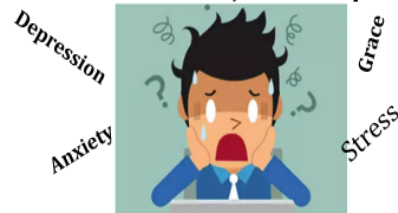
Stress + anxiety + grace + depression caused when we are livening to please others

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In fact, the world of management is full of administrative theories, which in its entirety look primarily to motivate organizations to increase marginal productivity for workers through many different, sometimes converging, methods. At the highest possible productivity, and some of them took a middle path, and in all cases the broader comprehensive view is to motivate workers and gain their satisfaction with the aim of increasing marginal productivity for organizations, and there are many theories that do not have room for mentioning them all and we are satisfied with mentioning the names of some of them:

Theories of Motivations

- Maslow Hierarchy of Needs Theory
- Herzberg's Hygiene Theory
- Expectancy Theory
- Achievement Theory
- Human Relationship Theory

Theories of Leadership

- Scientific Approach- formulated by Fredrick Taylor
- Situational and Contingencies Theory- formulated by
- Management by Objectives - MBO- formulated by Peter Drucker
- Bureaucratic theory- formulated by
- Neoclassical theory- formulated by
- Modern theory

Human Resources Roles

Sponsor	Senior Management	Project Team	Project Manger
Provide financial resources for project	Issuing the project charter (Project initiator	Provide inputs to planning	Legitimate
Funding the charter for the project imitator	Set Priorities among projects	Product Realization	Reward
Accepting to operate the project t	Set Priorities among the triple constraints	Resolve conflicts among people	Penalty
Accepting to operate the project t	Resolve conflicts in coordination of Sponsor if case	Review performance report	Expert
			Reference
			Representative

1.3 Outputs

1.3.1 Human Resource Plan

Described in chapter (7) clauses # 1.1.3
Described in chapter (9) clauses # 1.3.1

2. Acquire Project Team Process

Acquire Project Team is the process of confirming human resource availability and obtaining the team necessary to complete project team. The key benefit of the said process is to outlining and guiding the team selection and assignment to obtain a competent team to complete the project, the said process takes place within the execution process group, and therefore it focuses on the execution of the human resources plan by placing the right people with expertise, skills and qualifications working on the project within certain time frames. Since the project goes through multiple stages it is very likely that individuals with different skill sets will be required, and therefore the project team acquisition process will continue whenever there is a need to add new staff to the project. The Code of Ethics and professional behavior reminds us that project managers do not discriminate against others on the basis of gender, age, race, religion, disability, nationality .It is very important to accept others, coexist with them, recognize their rights and not distinguish between them except on the basis of their accomplishments,

2.1 Inputs

2.1.1 Project Management Plan
Described in chapter (4) clauses # 2.3.1 +3.1.1 + 4.1.1 + 5.1.1 +6.1.1
Described in chapter (5) clauses # 1.3.2 + 5.1.1+6.1.1
Described in chapter (6) clauses #6.1.1
Described in chapter (7) clauses #3.1.1
Described in chapter (8) clauses #2.1.1+3.1.1
Described in chapter (9) clauses #2.1.1

2.1.2 Enterprise Environmental Factors (EEF)

Described in chapter (2) clauses # 4.1
Described in chapter (4) clauses #1.1.4 + 2.1.3+ 3.1.3 + 4.1.3+5.1.4
 Described in chapter (6) clauses # 1.1.2+3.1.4+4.1.6+5.1.8
Described in chapter (7) clauses # 1.1.5
Described in chapter (8) clauses # 1.1.6
Described in chapter (9) clauses # 1.1.2

2.1.3 Organizational Process Assets (OPA)

Described in chapter (2) clauses # 4.2
Described in chapter (4) clauses # 1.1.5+2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.
Described in chapter (5) clauses # 1.1.5+3.1.3+4.1.3+6.1.5
Described in chapter (6) clauses # 1.1.3+2.1.5+3.1.5+4.1.7+5.1.9+6.1.4+6.3.2
Described in chapter (7) clauses # 1.1.6+2.1.7+3.1.4+3.3.3
Described in chapter (8) clauses #1.1.7+3.1.6

2.2 Tools and techniques

2.2.1   Pre-assignment

According to A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Fifth Edition, when project team members are selected in advance, they are considered pre-assigned. This situation can occur if the project is the result of specific people being identified as part of a competitive proposal, if the project is dependent upon the expertise of particular persons, or if some staff assignments are defined within the project charter.

 Pre-assignment is not considered as a project constraint, a project is anything that imposes any sort of a limitation on the project, such pre-assignments, pre-commit, pre-souring, and other situation imposed on the project is acceptable to the project sponsor, these situations may limit the project manager's options and resourcing decisions but not considered as a project competing constraint,

2.2.2   Negotiation

Negotiation is a strategic discussion that resolves an issue in a way that both parties find acceptable, it can take place between project manage and applicants or prospective employee, project manager and employee, buyers and sellers, governments of two or more countries. Negotiating is used to reduce debts, lower the sale price of a something, improve the conditions of a contract, or get a better deal on a house. In this paragraph we assume staff assignments are negotiated on a projects, the project management team may need to negotiate:

- The need to assign a specific people or a specialized human resources,
- The appropriately competent staff in the required time frame,
- The training that might require to the new staff,

- The roles and responsibilities shall be given to the new staff,
- The assessment of work performance of the new staff,
- The out sourcing with vendors,
- The contracts with customers,
- The legal and other requirements of the project,
- The deliverables and assign the process and resources needed,
- The policies and direction of the organization,
- The expansion to meet market demand,
- The exceptional performers requested,
- Any management change,

2.2.3 Acquisition

Resources are very important to implement the project, resources include all the types of machines, people, technology, property, and other materials needed to accomplish the project task, resources include the cost , time of delivery , and risks, resources can be obtained from internal and external sources through the procurement process, which includes selecting the appropriate suppliers and signing a contract with them to ensure the supply within specific conditions in advance if the supply is from outside the country, while obtaining the resources from within requires an agreement to specifically guarantee the level of service and ensuring the supply , supply might be raw materials, machines, maintenance contracts, consultants, logistical services, etc.

Acquisition in business is when one company purchases most or all of another company's shares to gain control of that company. Purchasing more than 50% of a target firm's stock and other assets allows the acquirer to make decisions about the newly acquired assets without the approval of the company's shareholders,
https://www.investopedia.com/terms/a/acquisition.asp

2.2.4 Virtual Team

A virtual team is a group of people who work together to achieve a common goal   but not in the same place, this team may represent a group of employees working in separate offices, or people working from their homes to communicate with others through advanced technological means of communication such as e-mail and video, audio, team viewer and other forms of communication, the virtual team has become more popular across the word specially distance studies,

Virtual team is an effective practice in very independent work like the writers, editors and graphic designers work remotely and can effectively work on their projects at home or separate from the rest of the team, and upon completion of their work they can get notes about the changes that should be made in designs with no need for physical presence .The virtual team model advantages:

- Lower office costs
- Greater availability of talent
- Retention of employees
- Lower employee costs
- Lower unnecessary meetings
- Lower travel time and cost,
- Increased productivity
- Access multiple markets

According to A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Fifth Edition. The use of virtual teams creates new possibilities when acquiring project team members. The virtual team model makes it possible to:

- Formulate team from the same organization that live in far apart geographical areas,
- Formulate team from all walk,
- Adding a specific expertise to the project team even though the expert is not in the same geographic area,
- Accessible working from home offices,
- Work may include people with movement restrictions or disabilities,
- The implementation of projects that were neglected due to travel expenses lay.

2.3 Outputs

2.3.1 Project Staff Assignment

According to A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Fifth Edition. The project is staffed when appropriate people have been assigned to the team. The documentation of these assignments can include a project team directory, memos to team members, and names inserted into other parts of the project management plan, such as project organization charts and schedules.

2.3.2 Resource Calendars
Described in chapter (6) clauses # 3.1.3+4.1.4+5.1.5
Described in chapter (7) clauses # 2.1.5
Described in chapter (9) clauses # 2.3.2

2.3.3 Project Management Plan Updates
Described in chapter (4) clauses # 3.3.4 +4.3.2+5.3.2
Described in chapter (5) clauses # 6.3.4
Described in chapter (6) clauses # 6.3.4
Described in chapter (7) clauses # 3.3.5
Described in chapter (8) clauses # 2.3.3+3.3.6
Described in chapter (9) clauses # 2.3.3

3. Develop Project Team Process

The development of the project team is a very important executive process whose main goal is to build the team and improve the competencies, and this process must start early in the project because it is well known that the performance of the team members is much better than the performance of individuals or small groups, because the performance of the team works push toward building Ideas, skills enhancement, raising competencies and thus motivating employees, reducing job turnover rates, and improvement in general. One of the secrets to the success of any project is the presence of the project manager with good skills in dealing with people and team building, and motivational results that lead to a high-performance team, the objective of developing a Project Team process may be:

Feelings of trust and improved cohesiveness
Ground rules for interaction
Enhanced resource availability
Functional managers becoming more involved

3.1 Inputs

3.1.1 Project Staff Assignment
Described in chapter (9) clauses # 2.3.1+3.1.1
3.1.2 Project Management Plan
Described in chapter (4) clauses # 2.3.1 +3.1.1 + 4.1.1 + 5.1.1 +6.1.1
Described in chapter (5) clauses # 1.3.2 + 5.1.1+6.1.1

Described in chapter (6) clauses # 6.1.1
Described in chapter (7) clauses # 3.1.1
Described in chapter (8) clauses # 2.1.1+3.1.1
Described in chapter (9) clauses # 2.1.1+3.1.2

3.1.3   Resource Calendars

Described in chapter (6) clauses # 3.1.3+4.1.4+5.1.5
Described in chapter (7) clauses # 2.1.5
Described in chapter (9) clauses # 2.3.2+3.1.3

3.2 Tools and Techniques

3.2.1   Interpersonal Skills

Interpersonal skills are the behaviors and tactics that a person uses to interact with others in a tactful manner, the term is used in business also and means "the employee's ability to work effectively with others through the ability to communicate, listen to the situation and deportation.

Interpersonal skills are often referred to a social intelligence, persons may depend on reading the signals received from others, they can be interpreting them accurately in order to form a response. Everyone has a personal style and an interpersonal style, but some are more successful than others. While interpersonal skills may be based in part on personality and instinct, interpersonal skills can be developed but they cannot be learned.

In many organizations, employees with strong interpersonal skills are valued for their pleasant demeanor and positive, solution-oriented attitude. These employees are seen as team players, who work well with others to achieve a goal. In more human terms, everyone likes being around them. See some of important interpersonal skills:

- Leadership abilities
- Influence others
- Good listener
- Good negotiator
- Good bargaining
- Full of confidence
- Read compliances

- Moderate resilience
- Can stimulus others
- Fast initiative
- Decision maker
- Gentle telecommunications
- Conflict Management
- General education

3.2.2   Training

Training is a broad term covering multiple kinds of employee learning, training helps employees learn specific knowledge or skills to improve performance in their current roles. Development is more expansive and focuses on employee growth and future performance, rather than an immediate job role. Training is the process of increasing the knowledge and skills of an employee for doing a particular job. It involves the development of skills that are usually necessary to perform a specific job. Its purpose is to bring about positive changes
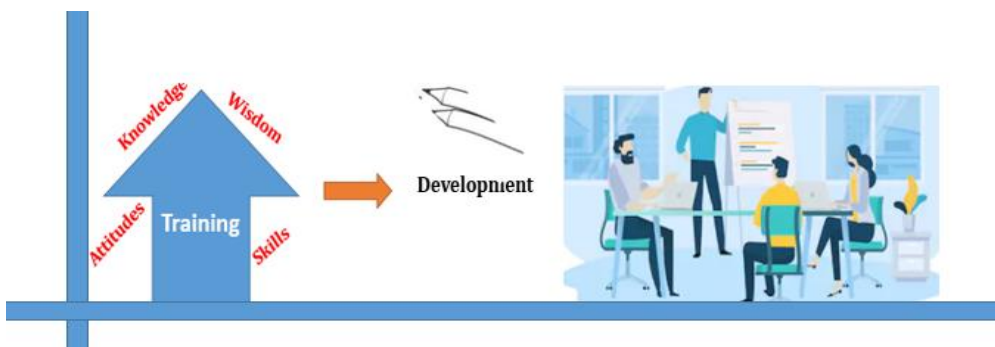
Examples on training captioned

- Technical Training: Aimed at teaching employees how a particular technology or a machine are operating and,
- Quality Training: Aimed at teaching employees how to faulty produce with perfect quality based on standards,
- Skills Training: Aimed at teaching employees how to perform their particular jobs,
- Team Training: Aimed at teaching employees how to establish a level of trust between team members,
- Soft Skills: Aimed at teaching employees how to welcoming each other, work time respect, organization retention,
- Professional Training: Aimed at teaching employees how to respond to change and regularly updated on matters,

Benefits of training

- increases the skills and knowledge, improve the attitude and increase wisdom,
- Improves the ability of time management,
- Improves the ability of cost management,
- Improves the ability of waste management,
- Improves the ability of sales management,
- Improves the ability of operation management,
- Improves the ability of customer satisfaction,
- Reduces the need to constantly supervision,
- Boosts morale,

3.2.3   Team -Building Activities

Forming a team takes time, and members often go through recognizable stages that built by the researcher Bruce Wayne Tuckman published "Tuckman's Stages" in 1965. It talked about the four stages of development all teams move through over time: forming, storming, norming, and performing. In 1977, Tuckman and doctoral student Mary Ann Jensen added a fifth stage called adjourning to make it the "five stages of team development. Stages of team development are described here under:
" https://www.teamwork.com/blog/the-5-stages-of-team-development-what-you-need-to-know/

- **Forming:** Formation stage is the 1st step on the road to **developing the team**, in this stage physical communication is conducted between the team members to share the knowledge, experiences and information that each of them have, and thus they form the first impressions on each other in terms of knowledge, information and capabilities, so they can form new integrated knowledge about what is the project, and what the project goal, and the team will work on, in fact they learn from each other until the idea is completed and integrated, then they start thinking about the role that each of them will play in creating a road map about how to work together, so this initial stage is considered the stage of team development. It is very much important for the team leader to be very clear about the composition of the team, their names, tasks, roles, and objectives, and their relationship to the project objectives   in   order   to   define   how   they   work   together   in   order   to   define   team   standards. https://www.projectsmart.co.uk/the-five-stages-of-team-development-a-case-study.php

- **Storming**: Storming stage is the 2nd step on the road of developing the team **ideas and improve collaboration** , this stage can't be avoided because it is the stage of building the project ideas based on common ideas from the integrated team member, the team members shall accept each other, and shall discuss the entire baselines beyond the project, it clearly that each member has different ideas than others that cause conflict within the team , the team leader must act as guidance to the team member , and teach them to accept each other and to learn from each other , and to listen to each other , and to respect differences and ideas , and not allowing any team member to control all conversations , the team leader shall facilitate the contributions of all team members , and must train some team members to be more assertive on assess the situation of conversation to the benefit of the project, the team leader must begin to transfer some decision-making to the team to allow them more independence, the conversation shall end with concessions lead differences to compromise and conflict resolution otherwise the project will fail. https://www.projectsmart.co.uk/the-five-stages-of-team-development-a-case-study.php

▪ **Norming:** Norming stage is the 3rd step on the road of developing the project **criteria and strengthen communication**, this stage can't be avoided also because it is the stage of building the common criteria of the project, the team is no longer focused on their individual ambitions , but they focus on developing the way of collaboration together as a team, the team are more responsible and all accepting each other, accepting their ideas, they are working on formulating the policies of the project as they have a clear mission statement, vison statement, quality objective, they understand their common responsibilities, they bear more responsibility, they think together and they work toward a common goal, the team members also start making significant progress on the project as they begin working together more effectively, and they are more involved in decision making and problem solving , they are greater self-direction and is able to resolve issues and conflict as a group, the team leader is no longer involve but still has the authority of for the functioning the planning , organizing , staffing and controlling the project works,

▪ **Performing:** Performance is the 4th step on the road to implementing the project at a **very high level and boost morale** , at this stage, the focus team focusing on reaching the goal as a coherent, interconnected and cooperative group to achieve the stated goal and to accomplishing the task, the members can make decisions and solve problems and conflicts quickly and effectively without stopping the progress of the project, the members are able to conduct change management together without relying on the team leader who has become the task of monitoring the team progress and progress of achievements, at this stage there is a possibility that the team returns to an earlier stage, but they can return more easily to this stage because they are capturing the project baselines and the features as the project structure is clear.

▪ **Deforming:** Deforming or adjourning is the 5th step on the road to **closing and chronicle** the project with documenting the results, that can be taken as a history to benchmarking with similar project, at this stage the project is coming to an end and the team members are moving off into different directions, and the stage looks at the team from the perspective of the well-being of the team rather than from the perspective of managing a team through the original four stages of team growth, the team leader should ensure that there is time for the team to celebrate the success of the project and capture best practices for future reference,
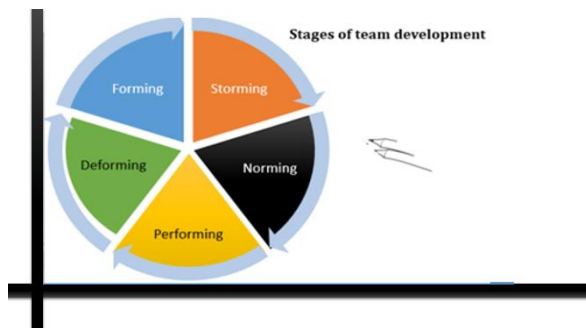
3.2.4 Ground Rules

Ground rules are the process of establishing a clear baselines regarding acceptable behavior by project team members, and establishing behavior code, and commitment guidelines to ward project goals, and rules of product realization, ground rules are etiquette allows team members to discover values that are important to one another and share responsibility for enforcing the rules once they are established, ground rules must be clear consistent, maintained , ground rules define a behavioral model which addresses how individuals treat each other, communicate, participate, cooperate, and support each other in joint activities,

Ground rules are created by people with diverse professional experiences and background have totally unique perspective on any issue, when a new team is assembled for any project, its vital for the success of that project, a list of ground rules is established as an example here under:

▪ Developing Strategic Plan of the project by studying technological and financial opportunities,
▪ Developing and enforcing the Quality Policy of the project,

- Developing and enforcing the Safety Policy of the project,
- Developing and enforcing the Values Statement of the project,
- Developing and enforcing the Vision Statement of the project,
- Developing and enforcing the Fiscal Policy of the project,
- Developing and enforcing the rules for continues improvement,
- Recognizing a specific system for product realization,
- Recognizing a specific system for profit realization,
- Developing the ethics code of treated people relations
- Deepening cooperation with clients, government and society and applying ethical business practices.
- Cultivating a climate for offering information and opinions and providing educational opportunities to the project,
- Obtaining profit by managing staff and establishing and accomplishing business objectives.
- Developing and enforcing procurement and production policies and practices, field and technical services,
- Contributes to team effort by accomplishing related results as needed.
- Maintain professional and technical knowledge by attending educational workshops, reviewing professional publications and measuring advanced practices

3.2.5   Co-location

Co-location is the process of placement a project team close to one another in order to improve communication, working relationships, and productivity, or to enhance their ability to perform as a team. Co-location is also a placement of several entities in a single location such as data center where projects can rent equipment, space, and bandwidth for computing services, known as colocation services Colocation, also referred to as "tight matrix," involves placing many or all of the most active project team members in the same physical location to enhance their ability to perform as a team. colocation can be temporary, such as at strategically important times during the project, or for the entire project. colocation strategies can include a team meeting room (sometimes called "war room"), places to post schedules, and other conveniences that enhance communication and a sense of community. While colocation is considered a good strategy, the use of virtual teams can bring benefits such as the use of more skilled resources, reduced costs, less travel, and relocation expenses and the proximity of team members to suppliers, customers, or other key stakeholders. According to a Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Fifth Edition,

3.2.6   Recognition and Rewards

Recognition and rewards are the process of confession and rewarding desirable behavior within the organization as well, recognizing the desirable behavior has become an integral part of organizational development, it is important to realize that a certain reward granted to any individual will not be effective unless it satisfies the need that that individual appreciates. Money is a tangible motivation that moves the feeling of people towards the achieving of organizational goals, the people will work for the organization goal and work to reduce the waste and to reduce the cost of the product and to raise the quality of the product, and thus to raise the competitiveness of the organization, and this is an added value in the favor of the organization, this is in the point of practice side , but in view of theoretical side , we explained the **Z** Theory of Motivation , which shows the importance of motivation in developing organizations and raising their competitive advantage between competitors. There are many theories that support this direction, such as the Human Relationship Theory, Kaizen theory, and many others,

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It is important that organizations work to develop a culture of appreciation, noting that money is seen as a tangible aspect of any reward system, but intangible rewards can be equal may be more effective from the financial side sometimes because it strengthens mutual feelings towards the organization and strengthens the belief in the need of the organization for the workers and their continued work with the organization throughout the project life cycle, which confirms their loyalty,

3.3 Outputs

3.3.1 Team Performance Assessment

Team Performance Assessment is the process of developing project team performance through training to raise the workers' skills, and education, team building, and colocation services, the project management team makes formal or informal assessments of the project team's effectiveness., Effective team development strategies and activities are expected to increase the team's performance, which increases the likelihood of meeting project objectives. Team performance assessment criteria should be determined by all appropriate parties and incorporated in the develop project team inputs. Progress evaporation is the point of continuous improvement of the project and people to the extent of product realization based on standardization,

Team Performance Assessment of a successful team is measured in terms of technical success according to agreed-upon project objectives (including quality levels), performance on project schedule (timely delivery), and performance on budget (finished within the limit of cost constraints). High-performance teams are characterized by these task-oriented and results-oriented outcomes. Key Performance Indicator (KPI's) may include many processes such as:

A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Fifth Edition

- Staff turnover,
- Staff effectiveness,
- Profit performance,
- Quality performance,
- Delivery rating,
- Coaching result achieving improvement,
- Competitiveness rating,

- Market share,
- Comparative advantages
- Absolute advantages,
- Achieving goals,
- Customer incremental purchases,
- Vendors performance,
- Newness on performing product and services,

3.3.2 Enterprise Environmental Factors (EEF)

Described in chapter (2) clauses # 4.1
Described in chapter (4) clauses #1.1.4 + 2.1.3+ 3.1.3 + 4.1.3+5.1.4
Described in chapter (6) clauses # 1.1.2+3.1.4+4.1.6+5.1.8
Described in chapter (7) clauses # 1.1.5
Described in chapter (8) clauses # 1.1.6
Described in chapter (9) clauses # 1.1.2

4. Mange Project Team Process

Manage Project Team is the process of tracking project team member performance, providing feedback, resolving issues, and managing changes to optimize project performance. Manages project team influences the team behavior, the team conflict, resolves issues, and appraises team performance to ensure that project works correctly according to the project management plan, projects are usually managed within a matrix organization, which means that the project manager does not have direct authority to manage the project, whereas the team members will usually provide their reports to their functional manager who will provide the project team with guidance and directions. Therefore human resource management is considered one of the most complex areas because of the nature of the business , the surrounding circumstances , the conditions of workers , the conditions of the organization may create unexpected situations of terminations , resignations and conflicts and instances of satisfaction and dissatisfaction , and some workers may continue and some may leave in critical and unplanned

conditions, this will have results that may not be calculated and may affect the organization's goals such as project schedule, budget or quality during the implementation of the project team management process. Therefore, the project manager must observe these cases while trying to keep the team working at optimum performance levels as the manager have the authority of legitimate, reward, penalty, expert, referent, representative,

4.1 Inputs

4.1.1 Project Staff Assignments
Described in chapter (9) clauses # 2.3.1+3.1.1+4.1.1

4.1.2 Project Management Plan
Described in chapter (4) clauses # 2.3.1 +3.1.1 + 4.1.1 + 5.1.1 +6.1.1
Described in chapter (5) clauses # 1.3.2 + 5.1.1+6.1.1
Described in chapter (6) clauses # 6.1.1
Described in chapter (7) clauses # 3.1.1
Described in chapter (8) clauses # 2.1.1+3.1.1
Described in chapter (9) clauses # 2.1.1+3.1.2 + 4.1.2

4.1.3 Team Performance Assessment
Described in chapter (9) clauses # 3.3.1+4.1.3
4.1.4 Work Performance Report
Described in chapter (4) clauses # 4.1.2
Described in chapter (9) clauses #4.1.4

4.1.5 Organizational Process Assets (OPA)

Described in chapter (2) clauses # 4.2
Described in chapter (4) clauses # 1.1.5+2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.
Described in chapter (5) clauses # 1.1.5+3.1.3+4.1.3+6.1.5
Described in chapter (6) clauses # 1.1.3+2.1.5+3.1.5+4.1.7+5.1.9+6.1.4+6.3.2
Described in chapter (7) clauses # 1.1.6+2.1.7+3.1.4+3.3.3
Described in chapter (8) clauses #1.1.7+3.1.6

4.2 Tools and Techniques

4.2.1 Observation and Conversation

Observation is a process for assessing the job performance of workers during and after carrying out the tasks, or a process for evaluating the performance of products, services and results during or after the establishment, evaluation is usually done from within the organization itself during the implementation of tasks or after completion on observation of something need change , and evaluation is also done by a third party inspection , so may he note something goes wrong , this called observation , so necessary steps shall be taken to correct the case,

Observations are very helpful in complex detailed processes where the end users who use the product have difficulty or reluctant to articulate their experience and requirements, observation is also known as "job shadowing." It is usually done externally by an observer who views a business expert performing a job. It can also be done by a "participant observer" who performs a process or procedure to experience how it is done to understand and uncover hidden requirements, described in chapter (5) clause # 2.2.7

Observations are very helpful in performing detailed processes especially when people who use the product encounter difficulty or are reluctant to express their own requirements. This is the reason why observations are also called job shadowing. It is done in different ways such as an observer viewing an expert performing a job or being an actual participant to perform a process to experience how things are done,
https://project-management-knowledge.com/definitions/o/observations/

4.2.2 Project Performance Appraisals

Project Performance appraisal is the process of appraisal something or someone, appraisal means a systematic review of employees and processes performance within organizations, performance appraisal can be done to get:

▪ **Appraisals of employees**

o   The feedback to employees regarding their performance and related status,
o   The strengths and weaknesses of employees to place right persons on right job, (understand the abilities)
o   The factors influencing working habits of the employees to direct it toward the interest of the organization,
o   The potential present in a person for further growth and development,
o   The training needs that incentive people to do better,
o   The necessary records for further reference,

▪ **Appraisals of processes**

o   The feedback to processes regarding their performance in term of quality,
o   The strengths and weaknesses of processes to place right processes in place of the week one,
o   The factors influencing appraisals process negatively and positively such as calibration of devices,
o   The potential environments affecting the process and the integration of the process,
o   The training needs on new technology to perform process better,
o   The necessary records for further reference,

Project performance appraisals depends on the length and complexity of the project, some researcher argue on annual performance reviews have been criticized as providing feedback too infrequently to be useful, and some critics argue performance reviews in general do more harm than good.

4.2.3 Conflict Management

Conflict management is the practices and mechanisms of recognizing, detect and dealing with conflicts and disputes that take place within the work environment between individuals and groups in sound and effective rational and balanced ways. Conflict management that is implemented in a business environment is usually affecting the communication among workers, problem-solving, negotiation, focus overall goals. Conflict management refers to the techniques that designed to reduce the negative impacts of conflict and enhance the positive outcomes for all parties, these techniques may base on the type of conflict and the causes of conflict, the sources of conflict such as:

Conflicts can occur between a group of people in the organization as a result of multiple reasons such as different goals, different directions, different expectations, and different philosophy among them, organizations usually work to resolve these conflicts in the best and early way before their negative impacts on the worker and the organization getting worse, the success of small organizations usually depends on the understanding of the workers to each other's,

Conflict is inevitable in the work environment as a result of internal and external reasons, or for competitive and

non-competitive reasons, the conflict may lead to many negative effects, such as a lack of communication between workers, that leads to a lack of knowledge of the course of events within the organization, that may affect the quality of works , and the cost of the works, conflict occurs but can be controlled if professionally managed, many strategies that can be followed to solve and manage the conflict in the organization such as:

https://translate.google.com/#view=home&op=translate&sl=en&tl=ar&text=Collaborating%20strategy%

- o Avoiding Conflict Strategy: Avoiding strategy means completely ignoring the conflict, and doing nothing that might be seen as rocking the boat, this feels safe for the individual but does not solve the problem, the problem may even get worse if left untreated.

- o Accommodating Conflict Strategy: Accommodating strategy means taking steps to satisfy the other party's concerns or demands at the expense of others needs or desires.

- o Compromising Conflict Strategy: Compromising strategy means finding an acceptable resolution that will party, but not entirely, satisfy the concerns of all parties involved.

- o Competing Conflict Strategy: Competing strategy means some people tries to satisfy their own desires at the expense of the other parties, this lead to frustration of the others parties.

- o Forcing Conflict Strategy: Forcing strategy means forcing one party to accept the solution towards another party, and may require concessions from that party.

- o Collaborating Strategy: Collaborating strategy means finding a solution that entirely satisfies the concerns of all involved parties, this lead to more satisfaction to most parties.

Each of the conflict resolution strategies above involves different degrees of assertiveness and cooperativeness. For example, while accommodating includes a high degree of cooperativeness and a low degree of assertiveness, competing consists of a low degree of cooperativeness and a high degree of assertiveness,

4.2.4 Issue Log

Issue log is a tool used for recording the project issues within the lifecycle of the project, or it is method that summarize the business problems with their sources and the ways of tracking and solving them. Issue log may include the important issues. Issue log is a great way to manage stakeholder expectations because they want to have written past solutions to refer to when needed in similar problems, stakeholders want to see a person who is working over all issues. Issue log incredible tool for solving issues arise in the course of managing the project team, it can be used to document and monitor who's responsible for resolving specific issue by a target date also,

4.2.5 Interpersonal Skills
Described in chapter (9) clauses #3.2.1+4.3.5

4.3 Outputs

4.3.1   Enterprise Environmental Factors Updates

It is the process of updating the Enterprise Environmental Factors (EEF) that described in the following chapters:

Described in chapter (2) clauses # 4.1
Described in chapter (4) clauses #1.1.4 + 2.1.3+ 3.1.3 + 4.1.3+5.1.4
 Described in chapter (6) clauses # 1.1.2+3.1.4+4.1.6+5.1.8
Described in chapter (7) clauses # 1.1.5
Described in chapter (8) clauses # 1.1.6
Described in chapter (9) clauses # 1.1.2

4.3.2   Organizational Process Assets Updates
Described in chapter (2) clauses # 2.5
Described in chapter (4) clauses # 6.3.2
Described in chapter (5) clauses # 6.3.2
Described in chapter (8) clauses # 2.3.1+3.3.4
Described in chapter (9) clauses # 4.3.2

4.3.3   Change Requests
Described in chapter (4) clauses # 3.3.3 +4.3.1+5.1.3
Described in chapter (5) clauses # 5.3.2+6.3.3
Described in chapter (6) clauses # 6.3.3
Described in chapter (7) clauses # 3.3.4
Described in chapter (8) clauses # 2.3.2+3.3.5
Described in chapter (9) clauses # 4.3.3

2.3.4   Project Management Plan Updates
Described in chapter (4) clauses # 3.3.4 +4.3.2+5.3.2
Described in chapter (5) clauses # 6.3.4
Described in chapter (6) clauses # 6.3.4
Described in chapter (7) clauses # 3.3.5
Described in chapter (8) clauses # 2.3.3+3.3.6
Described in chapter (9) clauses # 2.3.3 +2.3.4

Chapter (10)

Project Communication Management

Getting to Yes - Excellent Project Management

Chapter (10)

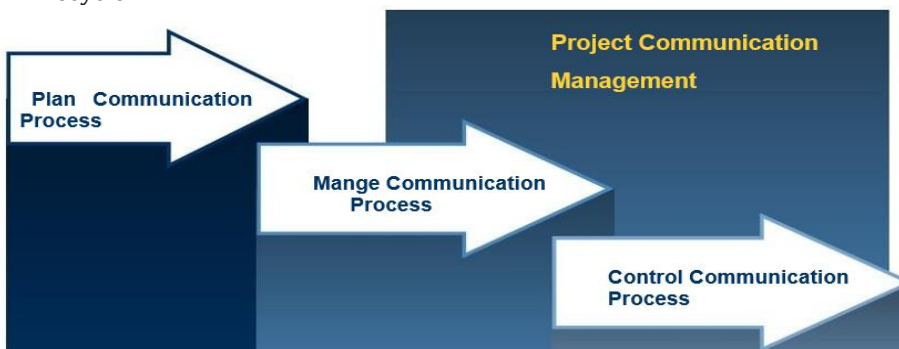# Project Communication Management

Overview

Communication management is one of the ten key knowledge areas in Project Management Institute (PMI). Communication management is effective communication when project considering the following factors:

- Timely and appropriate generation of the information.
- Timely and appropriate collection of the information.
- Timely and appropriate storage of the information.
- Timely and appropriate distribution of the information.
- Timely and appropriate retrieval of the information.
- Timely and appropriate disposition of the information.
- Timely and appropriate identifying and manage stakeholders.
- Reporting performance and nonconformity and barriers.
- Avoiding culture bias.
- Avoiding feelings incongruent with words.
- Avoiding repetition.
- Adoption of simplicity and relevance.
- Active listening + ask open ended questions that begin with who, how, why+ consider feelings + body language + attending skills +paraphrasing + summarization.

Communication forms	The best usable method
A formal written method	Signed - off project communication + complex issues+ communicating over distance + cultural + languages
An informal written method	Notes + E-mails
A formal verbal method	presentations + speeches
An informal verbal method	Conversation + meetings

Excellent communication is a critical component to the success of any project, and most project failures are due to communication failures. Communication management consists of 3 steps that help make sure the right message is sent, received, and understood by the right people. The 3 steps included in this area have changed over the years, but still in the current version of Project Management Institute.

- Create a communications plan: The plan shall be created across all of a project stakeholder and get the approval.
- Review a communications plan: The plan shall be reviewed and updated regularly to reflect changes management
- Control communications: It involves monitoring &controlling project communications throughout project lifecycle.

1. Plan Communication Management Process

Communication is one of ten key knowledge area, in other word it is one of most vital aspects of project management. The initial stage of plan communication management process is to identify stakeholders and their

responsibilities and their roles in the project. This planning process then determines the information and the methods that needs to be communicated through the project lifecycle. Mostly it is critical to communicate with all stakeholders and make sure the right people are getting the key information. However, many project managers have executed the technical work to perfection only to find out that stakeholders were not satisfied because communication was poor. Thus, project communication is sometimes more important than the technical work. Many project sins have been forgiven because of good communication, when a controversial project is being proposed, the solution is often communication with stakeholders.

Effective communication means that the information is provided in the right format, at the right time, to the right audience, with the right impact and providing only the information that is needed not more. In the opposite side , Ineffective planning of communications leads to many problems like; the delay in delivering the message or communicating the information to wrong audience, or inadequate communication with stakeholders and misunderstanding or misinterpretation of the sent message

All projects share the need to communicate project information, so inbounding and storage and out bounding the information shall make in an appropriate method <u>to retrieve</u> the information easily and fast, important considerations that may need to be taken into accounts including the following questions:

- *Who is need what information?*
- *Who is authorized to access that information?*
- *When they will need the information?*
- *Where the information should be stored?*
- *What format the information should be used to store it?*
- *How the information can be retrieved?*
- *What time zone, language barriers, and cross-cultural considerations need to be taken into account?*

The results of Communications Management process should be reviewed regularly throughout the project and revised as needed to ensure continued applicability.

1.1 Inputs

1.1.1 Project Management Plan
Described in chapter (4) clauses # 2.3.1 +3.1.1 + 4.1.1 + 5.1.1 +6.1.1
Described in chapter (5) clauses # 1.3.2 + 5.1.1+6.1.1
Described in chapter (6) clauses # 6.1.1
Described in chapter (10) clauses # 1.1.1

1.1.2 Stakeholder Register
Described in chapter (5) clauses # 2.1.2
Described in chapter (8) clauses # 1.1.2
Described in chapter (10) clauses # 1.1.2

1.1.3 Enterprise Environmental Factors (EEF)
Described in chapter (2) clauses # 4.1
Described in chapter (4) clauses #1.1.4 + 2.1.3+ 3.1.3 + 4.1.3+5.1.4
 Described in chapter (6) clauses # 1.1.2+3.1.4+4.1.6+5.1.8
Described in chapter (7) clauses # 1.1.5
Described in chapter (8) clauses # 1.1.6
Described in chapter (9) clauses # 1.1.2
Described in chapter (10) clauses # 1.1.3

1.1.4 Organizational Process Assets (OPA)
Described in chapter (2) clauses # 4.2
Described in chapter (4) clauses # 1.1.5+2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.
Described in chapter (5) clauses # 1.1.5+3.1.3+4.1.3+6.1.5

Described in chapter (6) clauses # 1.1.3+2.1.5+3.1.5+4.1.7+5.1.9+6.1.4+6.3.2
Described in chapter (7) clauses # 1.1.6+2.1.7+3.1.4+3.3.3
Described in chapter (8) clauses #1.1.7+3.1.6
Described in chapter (10) clauses #1.1.4

1.2 Tools and Techniques

1.2.1   Communication Requirement Analysis

Communication requirements analysis is one of the tools and techniques for the PMI process to plan the communications management. The analysis includes an evaluation of modes of communication, logistics and frequency, the roles and responsibilities of the stakeholders, internal and external communication. According to Project Management Institute. A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Fifth Edition; communication requirement analysis is a tool that determines the information that the stakeholder needs, the information can obtain from:

The project management requirements are usually defined by the type, format as well as the value of the information needed by the stakeholders. It is used to create the roles and responsibilities of the project team, stakeholders, and management. It can also be used to create the organizational chart. With this concept, the resources of the project are only spent on communication methods that ensure the success of the entire project.
https://project-management-knowledge.com/definitions/c/communication-requirements-analysis/

The communication channels (Lines) is very important in the analysis of communication requirement. The total number of the communication channels represents the number of the stakeholders. This allows project managers to have better control over the distribution of information that resulting in better communication planning.
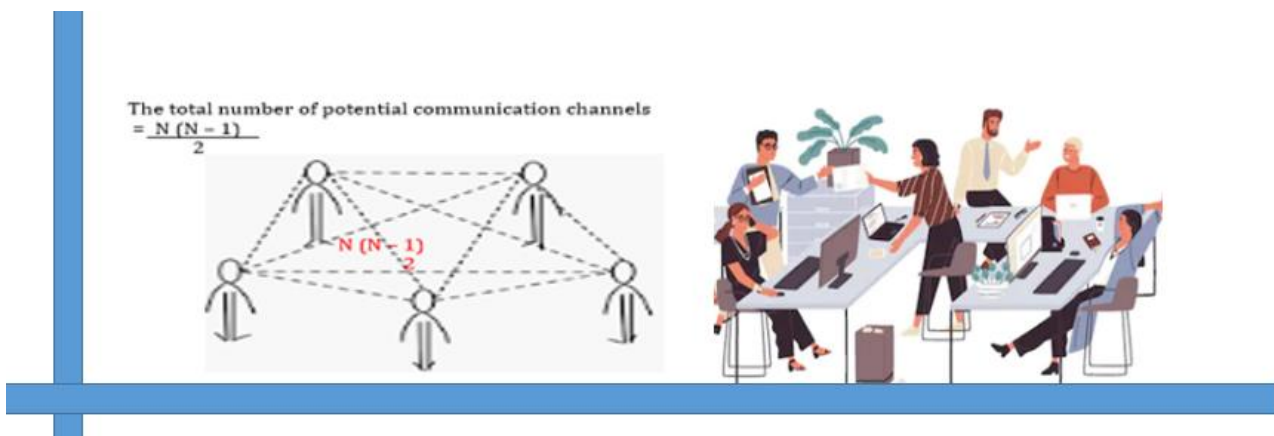
The total number of potential communication channels
$$= \frac{N(N-1)}{2}$$

The total number of potential communication channels = N (N – 1) ÷2, where n represents the number of stakeholders. For example, a project with 10 stakeholders has 15(10 – 1)/2 = 45 potential communication channels. As a result, a key component of planning the project's actual communications is to determine and limit who will communicate with whom and who will receive what information. Sources of information typically used to identify and define project communication requirements include, but are not limited to:

- Organizational charts,
- Project organization and stakeholder responsibility and roles,
- Disciplines, departments, and specialties involved in the project,
- Logistics of how many persons will be involved with the project and at which locations,
- Internal information needs (e.g., when communicating within organizations);
- External information needs (e.g., when communicating with the media, public, or contractors); and
- Stakeholder information and communication requirements from within the stakeholder register.

https://project-management-knowledge.com/definitions/c/communication-requirements-analysis/#:

1.2.2   Communication Technology

Communication technology is used to transfer information among project stakeholders, project team, project customers, and other interested parties, the technology used may vary significantly according to the nature of information needed, some may use the data base in hand, some may use meetings, teem-viewer, websites, publishers, magazines, and so on, selection of communication technology may relate to some factors that can affect the choice that are among alternatives such as:

- Nature of Message: The nature of message is a factor to be consider when selecting a mode of communication like confidential messages, private messages, important messages, normal messages, routine messages, and so on.

- Cost: The cost of sending a message is also a factor to be considered when selecting a mode of communication, and the result obtained should justify the expenditure.

- Record: The record is also a factor to be considered when selecting a mode of communication, if the record of the communication is important it should be written, otherwise oral communication is sufficient.

- Distance: Distance is also a factor to be considered when selecting a mode of communication, if the message is to be sent to a nearby place or somewhere at a long distance.

- Economic scale of organization: Organizational scale is also a factor to be considered when selecting a mode of communication, the large scale of business need mostly formal communication, while small scale business may use mostly oral communication,

- Technology Support: Technology is also a factor to be considered when selecting a mode of communication, technology supports both senders and recipient.

- Urgency of Message: Urgency of message is also a factor to be considered when selecting a mode of communication for sending the message on time.

- Secrecy of Message: Secrecy of Message is also a factor to be considered when selecting a mode of communication, if the message to be communicated is secret or confidential, such means are required to be adopted that can maintain secrecy. A telephone call can be overheard, an e-mail or fax may not be appropriate, and an office memo may be less confidential. In such cases, face-to-face talking may solve the problem.

- Safety: Safety is also a factor to be considered when selecting a mode of communication, the sender has to be careful about the safety of the message that would be sent by ordinary post or by registered post, or through courier or messenger, and,

- Relationship: The relationship between the sender and recipient is also a factor to be considered when selecting a mode of communication, as a message of private nature may require personal contact whereas formal relationship require official and conventional mode of communication.
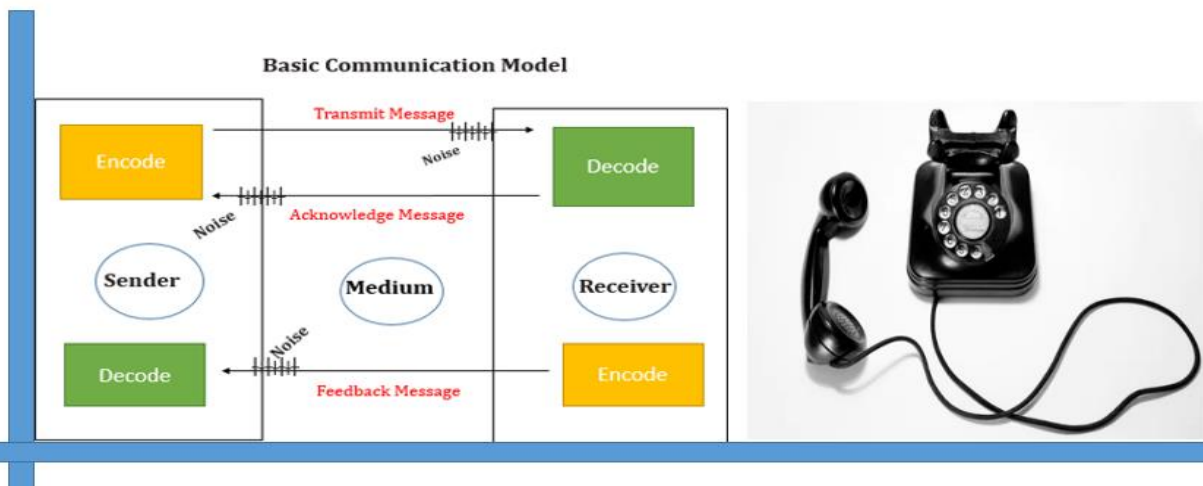
1.2.3 Communication Models

A model is widely used to depict any idea, thought or a concept in a simpler way through diagrams, pictorial representations etc. Models go a long way in making the understanding of any concept easy and clear. Through a model one can easily understand a process and draw conclusions from it. In simpler words a model makes the learning simple.
https://www.managementstudyguide.com/communication-models.htm

According to A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Fifth Edition, the communication models are conceptual models used to explain the communication process used to facilitate communications and the exchange of information that maybe vary from project to project, and also within different stages of the same project. A basic communication model are the process of sending and receiving messages or transferring information from one part (sender) to another (receiver) that shown in the following Figure . Medium is the technology medium includes the mode of communication, while noise includes any interference or barriers that might violate the delivery of the message. The components (elements) of the basic communication model are:

▪ Encode: It is the way of translating (Encoding) the ideas or thought into a language by the sender to be understood by the receiver,

▪ Transmit Message: This information shall be sent by the sender using communication channel (Medium). The transmission of this message may be compromised (violated) by various obstruction (stopping) such as distance, unfamiliar technology, inadequate infrastructure, cultural difference, and lack of background information, these obstructions are collectively termed as noise.

▪ Decode: The message is translated by the receiver back into meaningful thoughts or ideas.

▪ Acknowledge: Upon receipt of a message, the receiver may acknowledge receipt of the message but this does not necessarily mean agreement with or comprehension of the message.

▪ Feedback/Response: When the received message has been decoded and understood, the receiver encodes thoughts and ideas into a message and then transmits this message to the original sender.

The above components (elements) of the basic communication model shall be considered when project communications are discussed, but the model of communication based on the points mentioned in above paragraph in communication technology. The communication models are:

▪ Linear Model : It is a simple one way communication , the message flows in a straight line from sender to the receiver, with no feedback is expected as the only task that a receiver does here is to receive the message. Different models that follow linear model of communication are:

▪ Transactional Model: It is a communication between two people (sender and receiver) with expected feedback, both are known as communicators and both play equally important role in communication. Transactional model attribute communication to social reality, social relationship, culture context, emptions, and nonverbal feedback like body languages, gestures, senses. This model involved different models that follow transactional model of communication are:

▪ Interactive Model: It is as same as the transactional model, but interactive model is mostly used for new media like internet, the people in this model can respond to any mass communications like videos, news, and others, in this model, individuals can express their ideas, exchange views freely without editors, and may reach amazing results,

1.2.4 Communication Methods

Communication methods are used in project management and these include interactive, push and pull communication. All of these methods allow the project team leader to get the message across the organization as well as extract response from the stakeholders effectively, without the effective communication methods, it will be very difficult for the project to even move forward as the lack of communication methods will result in misunderstanding of the project goals and even conflict among the stakeholders.

▪ Interactive Communication: Two or more parties act over meeting, phone, calls, video, conferences, and others, in this method all stakeholders are involved in the communication and can respond to each other in real-time, this would include face-to-face meetings, video conferencing, phone calls, and messenger chats. These methods of communication are often used in projects and are more effective than other methods of communication.

Get your shutter finger at the ready

- Push communication: Sent out to specific people a letter, memo, reports, e-mails, faxes, and others, push communication is one of the effective communication methods in which information is distributed without any feedback from the recipients. For example, you may send meeting notes to people after a brainstorming workshop. Similarly, you may "push" information in the form of a report to project stakeholders to keep them satisfied or to Keep them informed,

Push communication

- Pull communication: People to have access some sources to obtain the required information in internet sites, electronic learning, pull communication is a uni-directional communication by providing all related stakeholders access to certain information anytime they need, pull communication is only suitable for information dissemination that is not urgent nor critical, if the intended recipients do not read the information, little or no effect on the project would be resulted.

Pull communication

1.2.5   Meeting
Described in chapter (4) clauses # 6.2.2
Described in chapter (5) clauses #1.2.4
Described in chapter (10) clauses #1.2.5 + 3.2.3

1.3 Outputs

1.3.1 Communication Management Plan

The communication management plan is the written document that outlines, highlights, and details the communications needs and expectations for the whole project, it is also including the specific parties who are responsible for each format of communication that is important to the stakeholder. Communication management plan identifies **what** the important information will be communicated to stakeholders throughout the project, and **how** the important information will be communicated, and **who** will be receiving the communication, and **when** the communication will be receiving, and **how** often the communication is expected. But <u>have you determined what you are going to tell your stakeholders at each stage of the project?</u> This question shall be answered when you are formulating your project communication plan, Poor communication contributes to project failure, and therefore, it could spell massive financial loss to the company. At the opposite end of the spectrum, high-performing businesses communicate more frequently and do so more effectively than their low-performing counterparts.
https://www.lucidchart.com/blog/project-management-communication-plan

**Why communication management plan is important?**

- It includes written documentation about stakeholders and their roles used as reference.
- It includes the all types of information that needed to be shared with stakeholders
- It includes the frequency that each stakeholder would like to receive information
- It includes the when stakeholders will receive updates
- It includes the methods used to communicate
- Increases stakeholders' visibility into the project and its status
- Provide the opportunity for stakeholders to give feedback, that help you detect issues early that decrease wasted work
- Increases productivity during meetings or eliminates them altogether
- project to be completed successfully and on time
- give lesson on how to create an effective communication plan.

How to make a project management communication plan?

- Set a communication goal: Your communication Goal may to keep your stakeholders updated on the project status or even to keep stakeholders mindful of the project's benefits so they'll continue to advocate for it.

- Identify stakeholders: Most projects have many stakeholders with different levels of interest and influence on the project, you will need to identify the stakeholders that you will list the stakeholder you will communicate.

- Determine frequency of communication: List how often you will send out each type of communication (daily, weekly, monthly), or each milestone like on delivery + on project progress + when inflation goes up + on interstate fluctuation, In addition to including this information on your project management communications plan, make sure to schedule communication frequency on your calendar or into your task management software.

- Determine who provides communication updates: Most often, this task will fall on the project manager, but if not, the owner of a specific update needs to be clearly identified in your communications plan.

- Identify communication methods: May methods are being used in communications, considering the right method is depending on what your stakeholders are most likely to see or attend, your main purpose of your communication plan is to get the right eyes on the right information, and how you will communicate them, the communication method you choose may also depend on the information you need to deliver. see some methods may use:

- Interactive Communications: such as meetings, seminars, Surveys, visits to locations, and
- Push communications: such as status report and what time frequency, phone call, what-up, and
- Pull communication: searching in your software, internet, and

Communication Plan Example 2020

Stakeholder Name	Report Name	Frequency	Method	Attachment	Communicator Name	Priority
A	Production Report	Monthly	Email	Gantt Chart	A	High
B	Waste Report	Semi Annual	Visit	Sigma analysis	B	High
C	Deliverables Report	Weekly	Conf. call	Gantt Chart	C	Medium
D	Local Sales Report	Fortnightly		Gantt Chart	D	Medium
E	Export Sales Report	Daily		Gantt Chart	E	High
F	PESTLE Report	Annuals	In-person meeting	Explanation	F	Low
G	NCR's Status	On Request		Mitta analysis	G	Low
H	Market Study	On Change Request	Team meeting	Pie Diagram	H	High
I	Business case	Annuals	Team meeting	Explanation	I	Medium
J	Customer Satisfaction	As Required	Email	Histograms	J	Low
K	Inventory Status	Semi Annual	Conf. call	Histograms	K	High
L	Annual inventory	Daily		Histograms	L	Medium
M	Progressive Elaboration	Monthly	Conf. call	Explanation	M	Low

What should you do if your project changes?

Every business faces changes over the lifecycle, no any business is exempted from change, change request fast respond from the stakeholders, so they will change the scope or they will face scope creep, the wise management will make fast change in project management plan + project communication plan, and should be distributed to everyone in project team and all the stakeholders involved and:

Don't Bargen over position

1.3.2   Project Documents Updates
Described in chapter (4) clauses # 3.3.5 + 4.3.3 +5.3.3
Described in chapter (5) clauses # 3.3.2+4.3.4+5.3.3+6.3.5
Described in chapter (6) clauses # 2.3.2+3.3.3+4.3.2+5.3.4+6.3.5
Described in chapter (7) clauses # 1.3.3+2.3.3+3.3.6
Described in chapter (8) clauses # 1.3.5+2.3.4+3.3.7
Described in chapter (10) clauses # 1.3.2

2. Manage Communications Management Process

The management of communications is a process of creating, gathering, disseminating, storing and retrieving of project information based on the established communication management plan. The key benefit of the said process in project management is that it allows efficient communication flow among the entire stakeholders and allows the project managers to relay the information to the stakeholders and also make the right decisions based on these information.

2.1 Inputs

2.1.1   Communication Management Plan
Described in chapter (10) clauses # 1.3.1+2.1.1

2.1.2   Work Performance Reports

Described in chapter (4) clauses # 4.1.2
Described in chapter (9) clauses # 4.1.4
Described in chapter (10) clauses # 2.1.2

2.1.3   Enterprise Environmental Factors (EEF)
Described in chapter (2) clauses # 4.1
Described in chapter (4) clauses #1.1.4 + 2.1.3+ 3.1.3 + 4.1.3+5.1.4
 Described in chapter (6) clauses # 1.1.2+3.1.4+4.1.6+5.1.8
Described in chapter (7) clauses # 1.1.5
Described in chapter (8) clauses # 1.1.6
Described in chapter (9) clauses # 1.1.2
Described in chapter (10) clauses # 1.1.3

2.1.4   Organizational Process Assets (OPA)
  Described in chapter (2) clauses # 4.2
Described in chapter (4) clauses # 1.1.5+2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.
Described in chapter (5) clauses # 1.1.5+3.1.3+4.1.3+6.1.5
Described in chapter (6) clauses # 1.1.3+2.1.5+3.1.5+4.1.7+5.1.9+6.1.4+6.3.2
Described in chapter (7) clauses # 1.1.6+2.1.7+3.1.4+3.3.3
Described in chapter (8) clauses #1.1.7+3.1.6
Described in chapter (10) clauses #1.1.4+2.3.4

2.2 Tools and Techniques

2.2.1   Communication Technology
Described in chapter (10) clauses # 1.2.2 + 2.2.1

2.2.2   Communication Models
Described in chapter (10) clauses # 1.2.3 +2.2.2

2.2.3   Communication Methods
Described in chapter (10) clauses # 1.2.3 +2.2.2

2.2.4   Project Management Information System (PMIS)
Described in chapter (3) clauses # 3
Described in chapter (4) clauses # 3.2.2
Described in chapter (10) clauses # 2.2.4

2.2.5   Work Performance Reporting
Described in chapter (4) clauses # 4.1.2
Described in chapter (9) clauses # 4.1.4
Described in chapter (10) clauses # 2.1.2+2.2.5

2.3 Outputs

2.3.1 Project Communications

According to A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Fifth Edition; Project communication management is the process that involve the activities that are required for creating distributing , receiving the information, and acknowledge the receipt ,in addition to understood the message theme by the right people . Project communications may include performance reports, deliverables status, schedule progress, and cost incurred. Project communications can vary significantly and are influenced by factors such as, but not limited to, the urgency and impact of the message, its method of delivery, and level of confidentiality. project communication theme was described in the following chapters:

Organizational Communications and Style: describer in chapter (2) figure # 3
Communication Requirement Analysis: describer in chapter (10) figure # 1.2.1
Communication Technology: describer in chapter (10) figure # 1.2.2
Communication Models: describer in chapter (2) figure # 1.2.3
Communication Methods: describer in chapter (10) figure # 1.2.4
Communications Management Plan: describer in chapter (10) figure # 1.3.1

2.3.2 Project Management Plan Updates

Described in chapter (4) clause # 3.3.4 +4.3.2+5.3.2
Described in chapter (5) clause# 6.3.4
Described in chapter (6) clause # 6.3.4
Described in chapter (7) clause # 3.3.5
Described in chapter (8) clause # 2.3.3+3.3.6
Described in chapter (9) clause # 2.3.3 +2.3.4
Described in chapter (10) clause # 1.3.2 + 2.3.2

2.3.3 Project Documents Updates
Described in chapter (4) clause #3.3.5 + 4.3.3 +5.3.3
Described in chapter (5) clause# 3.3.2+4.3.4+5.3.3+6.3.5
Described in chapter (6) clause #2.3.2+3.3.3+4.3.2+5.3.4+6.3.5
Described in chapter (7) clause # 1.3.3+2.3.3+3.3.6
Described in chapter (8) clause # 1.3.5+2.3.4+3.3.7
Described in chapter (10) clause # 1.3.2 + 2.3.2

2.3.4 Organizational Process Assets (OPA)
Described in chapter (2) clauses # 4.2
Described in chapter (4) clauses # 1.1.5+2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.
Described in chapter (5) clauses # 1.1.5+3.1.3+4.1.3+6.1.5
Described in chapter (6) clauses # 1.1.3+2.1.5+3.1.5+4.1.7+5.1.9+6.1.4+6.3.2
Described in chapter (7) clauses # 1.1.6+2.1.7+3.1.4+3.3.3
Described in chapter (8) clauses #1.1.7+3.1.6
Described in chapter (10) clauses #1.1.4

3. Control Communications Management Process

Control Communications is the process of controlling and monitoring the communication over all the project life cycle , so that the information requirements of all project stakeholders shall be satisfied. The key benefit of this process is to ensure required stakeholders receive the necessary information to successfully accomplish their portion of the project process. without effective communication, an organization simply cannot function , in another word; decision-making, planning, coordination or any other function of management communication is a very significant part of them all. The same is also true for the function of controlling. So, Communication is omnipresent in all aspects and functions of management.

https://www.toppr.com/guides/fundamentals-of-economics-and-management/controlling/importance-of-communication-in-control/

It is important to take note that the control communications deal with different pieces of project communication which include personnel performance feedback reports, progress on schedule, information related to new baseline and costs status and forecast. Moreover, different communication activities are also involved in control communications which include internal, formal, official, oral and vertical reports.

This particular process triggers iterations in the manage communication processes or plan communications management. Different elements in communication can trigger immediate revisions. Control communications are also involved in the different inputs for communication such as stakeholder communication requirements, the time frame of frequency, deliverable status, progress report, issue log, work data performance and just about anything that needs to be communicated to the rest of the stakeholders of the project. With this particular process, the information will help stakeholders as well as the project manager to make the best decisions based on the types and amount of information that they have

https://project-management-knowledge.com/definitions/c/control-communications/

3.1 Inputs

3.1.1 Project Management Plan
Described in chapter (4) clauses # 2.3.1 +3.1.1 + 4.1.1 + 5.1.1 +6.1.1
Described in chapter (5) clauses # 1.3.2 + 5.1.1+6.1.1
Described in chapter (6) clauses # 6.1.1
Described in chapter (7) clauses #3.1.1
Described in chapter (8) clauses #2.1.1+3.1.1
Described in chapter (9) clauses #2.1.1+3.1.2 + 4.1.2
Described in chapter (10) clauses #1.1.1+3.1.1

3.1.2 Project Communications
Described in chapter (10) clauses # 2.3.1+3.1.2

3.1.3 Issue Log
Described in chapter (9) clauses # 4.3.4
Described in chapter (10) clauses # 3.1.1

2.3.4 Organizational Process Assets (OPA)
Described in chapter (2) clauses # 4.2
Described in chapter (4) clauses # 1.1.5+2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.
Described in chapter (5) clauses # 1.1.5+3.1.3+4.1.3+6.1.5
Described in chapter (6) clauses # 1.1.3+2.1.5+3.1.5+4.1.7+5.1.9+6.1.4+6.3.2
Described in chapter (7) clauses # 1.1.6+2.1.7+3.1.4+3.3.3
Described in chapter (8) clauses #1.1.7+3.1.6
Described in chapter (10) clauses #1.1.4+2.3.4

3.2 Tools and Techniques

3.2.1 Project Information Management System (PIMS)
Described in chapter (3) clauses # 3
Described in chapter (4) clauses # 3.2.2
Described in chapter (10) clauses # 2.2.4 + 3.2.1

3.2.2 Expert Value Judgment
Described in chapter (4) clauses # 1.2.1 +2.2.1 + 3.2.1+ 4.2.1 +5.2.1+6.2.1
Described in chapter (5) clauses #1.2.1+3.2.1
Described in chapter (6) clauses # 1.2.3+3.2.1+4.2.1
Described in chapter (7) clauses #1.2.1+2.2.3
Described in chapter (10) clauses # 3.2.2

3.2.3 Meetings
Described in chapter (4) clauses # 6.2.2
Described in chapter (5) clauses #1.2.4
Described in chapter (10) clauses #1.2.5 + 3.2.3

3.3 Outputs

3.3.1 Work performance information
Described in chapter (4) clauses # 3.3.2 +5.1.2
Described in chapter (5) clauses # 6.3.1+6.1.3
Described in chapter (6) clauses # 6.1.3
Described in chapter (7) clauses # 3.1.3
Described in chapter (8) clauses # 2.1.3
Described in chapter (10) clauses # 2.3.3

3.3.2 Change requests
Described in chapter (4) clauses # 3.3.3 +4.3.1+5.1.3
Described in chapter (5) clauses # 5.3.2+6.3.3
Described in chapter (6) clauses # 6.3.3
Described in chapter (7) clauses # 3.3.4
Described in chapter (8) clauses # 2.3.2+3.3.5
Described in chapter (9) clauses # 4.3.3
Described in chapter (10) clauses # 3.3.2

3.3.3 Project Management Plan Updates
Described in chapter (4) clause # 3.3.4 +4.3.2+5.3.2
Described in chapter (5) clause# 6.3.4
Described in chapter (6) clause # 6.3.4
Described in chapter (7) clause # 3.3.5
Described in chapter (8) clause # 2.3.3+3.3.6
Described in chapter (9) clause # 2.3.3 +2.3.4
Described in chapter (10) clause # 1.3.2 + 2.3.2 +3.3.3

3.3.4 Project Documents Updates
Described in chapter (4) clause # 3.3.4 +4.3.2+5.3.2
Described in chapter (5) clause# 6.3.4
Described in chapter (6) clause # 6.3.4
Described in chapter (7) clause # 3.3.5
Described in chapter (8) clause # 2.3.3+3.3.6
Described in chapter (9) clause # 2.3.3 +2.3.4

Described in chapter (10) clause # 1.3.2 + 2.3.2 +3.3.4

3.3.5   Organizational Process Assets Updates

Described in chapter (2) clause # 2.5

Described in chapter (4) clause #6.3.2

Described in chapter (5) clause # 6.3.2

 Described in chapter (8) clause # 2.3.1+3.3.4

 Described in chapter (9) clause # 4.3.2

Described in chapter (10) clause # 3.3.5

Chapter (11)

Project Risk Management

Chapter (11)

Project Risk Management

As know from the earlier chapters, project management is the application of knowledge, skills, tools, and techniques to project activities to meet the project objectives. Risk management is part of project management plan, it has been defined as, the application of systematic process identifying, analyzing, assessing, responding and controlling project potential risks that threat projects from wide variety of sources such as

- Financial Uncertainty: Like financial markets, financial obligation, tax, and others.
- Legal Liabilities: Like fiscal liabilities, obligations to implementation, EMS, and others.
- Project Failures: Like working process, procedures, contracting, injures, changes, and others.
- Strategic Management Errors: Like unfortunate events, natural causes, disasters, and others

Risk management is an ongoing process that continues through the life of a project cycle . It includes processes for risk management planning, identification, analysis, monitoring and control. Many of these processes are updated throughout the project lifecycle as new risks can be identified at any time. The key objective of risk management is to decrease the probability and the impact of events that may harm the project. On the other hand, <u>any event that could have a positive impact should be considered as an opportunity,</u>

Risks can be classified as negative events considered as Risks (Threat) with negative consequences, while positive events are considered as (Opportunities). Risk management solution avoiding the risks using preventive actions, and reducing the negative effect or probability of threat, and transferring all or part of the threat to another part, and may overturning the potential or actual consequences of a particular threat to opposite side as opportunities if possible, risk management solution secure mitigation risks and risks cost as it is the top priority to digitized projects. The following Project Risk Management processes are used in this process group:

1. Plan Risk Management Process

Plan Risk Management Process is seeing what could go wrong, because there is no way to plan for all risks, however identifying the major ones to include likelihood and impact, can increase chances of project success. It involves analyzing schedule, scope determination, budgeting and identifying pitfalls through lessons learned to:
https://erau.instructure.com/eportfolios/8791/Planning_Process_Group/111_Plan_Risk_Management

- Identify, qualitfy, evaluate, and mange risks,
- Plan for known and unknown risks

- Control the identified risks for triggers or a change in the severity,
- Stay alter for new risks,
- Recognized and respond to the positive and negative potential risks,

The identification of risk normally starts before the project is initiated, and the number of risks increase as the project matures through the lifecycle. When a risk is identified, it's first assessed to ascertain the probability of occurring, and the degree of impact to the project schedule, scope, cost, and quality of the deliverables, and the project has to prioritize the response. Risk events may impact only one category, while others may impact the project in multiple categories. The probability of occurrence, and the number of categories may be impacted , and the degree of influences (high, medium, low) , and the sources of risks are based on the nature of the project, and on the surrounding environment, the response priority is based on the severity of the risk on the project lifecycle, anyhow . All identifiable risks should be entered into <u>a risk register, and documented as a risk statement.</u>

Risk is an uncertain event or condition that, if it occurs, has a positive or negative effect on one or more project objectives such as scope, schedule, cost, and quality, risk may have one or more causes, and may have one or more impacts on people, processes, technology, and resources, risks are events that could occur on unknown time because of this uncertainty, risk requires serious preparation plan in order to manage them efficient. Before start in the said subject we are forced to define some vocabularies about risks:

- Business Risk: Inherent chances for either profit or loss associated with a particular endeavor,
- Insurable risk: A particular type of risk, which can be covered by an insurance policy,
- Qualitative Risk analysis: Conditions prioritizes their effects on project effects,
- Quantitative Risk analysis: Estimating risks implication and sequences on project objectives,
- Residual Risk: Risk that remains after risk responses have been implemented,
- Risk acceptance: Strategic response to a risk that project team decided not to change the plan to deal with it,
- Risk avoidance: Strategic response to protect the project objectives from its impact,
- Risk Mitigation: The act of revising the scope, budget, schedule, quality with no impact on project objectives,
- Probability Risk: The degree to which risk event is likely to occur,
- Risk transference: The act of revising shifting the impact of risk to a third party like insurance,
- Constraint: The applicable restriction that will affect the performance of the project,
- Uncertainty: The possibility that event may occur which will impact the project either favorably or unfavorably,
- Contingencies: The Uncertainty of occurrence, chance occurrence, thing incident to another,
- Probability & impact matrix: A common way to determine whether a risk is considered low, moderate, or high,
- Checklist: A tool bearing a list of risks might be occurring on a project to identify the response process,
- Triggers warning signs: Indications that a risk has occurred or is about to occur,

1.1 Inputs

1.1.1 Project Scope Statement
Described in chapter (5) clause # 3.3.1+4.1.1
 Described in chapter (6) clause # 2.1.4+4.1.5+5.1.7
Described in chapter (11) clause # 1.1.1

1.1.2 Cost Management Plan

Cost management plan is the outline of the project's estimation, allocation and control of costs for the required resources to complete all project activities. The project's cost plan configuration is one of the most essential parts of a project's planning phase, and effectively serves as a safety net that guarantees that project cost is kept within the limits of the budget. The cost management plan in general terms analyzes how the project costs will be planned, funded and controlled. Other says cost management plan is the process of establishing policies, procedures, and documentation   for planning, managing,   expanding   and   controlling project   costs.   There   will   be several project resources in a project and several different types of materials will be needed, there might be necessary tool and equipment as well. Cost management is sometimes also known by its more specific sub-task

names, like spend management, cost transparency and cost accounting. Cost management plan is typically made up of four processes:

https://www.google.com/search?q=project+cost+management+plan&oq=Cost+Management+Plan&aqs=chrome.1.69i57j0l7.14292j0j7&sourceid=chrome&ie=UTF-8

▪ Resources Planning: Resources are the twin (Fiscal & Human) or the (land, labor, capital, management, entrepreneurs), in practical word the project shall identify it resources such as (raw materials, operating facilities testing facilities, team work, building vehicles, safety and risk requirements. The following tips may help to identify the right resources for right operating:

o Identify your capital + funding technique,
o Identify what work is required and what you have,
o Identify the qualitative + qualitative raw materials at you own (Stores),
o Identify the qualitative + qualitative is required and what you have,
o Identify your operation needs (operating facilities + Testing facilities + Maintenance system + calibration+ Vehicles, and),
o Book your requirements,

▪ Cost Estimation : Cost estimation is the process of forecasting the financial and other resources needed to complete a project within a defined scope. Project manager considers Cost Estimation of each element in the project, and calculates a total amount that determines a project's budget, initial cost estimate can determine whether an organization beyond the budget or ahead of the budget. The estimate can be a factor in defining the project's scope. If the cost estimation comes in too high, an organization may decide to pare down the project to fit what they can afford. (It is also required to begin securing funding for the project.) Once the project is in motion, the cost estimate is used to manage all of its affiliated costs in order to keep the project on budget.

▪ Budgeting: A budget is a tool that managers use to plan and control the use of scarce resources, it's is a plan showing the company's objectives and how management intends to acquire and use resources to attain those objectives. Time and money are scarce resources to all individuals and organizations, the efficient use of these resources requires planning. Planning and Control to ensure that plans actually are carried out. The budgeting process involves planning for future profitability because earning a reasonable return on resources used is a primary company objective. A company must devise some method to deal with the uncertainty of the future.

▪ Cost Control: Cost Control is concerned with measuring variances from the cost baseline and taking effective corrective action to achieve minimum cost overruns. Procedures are applied to monitor expenditures and performance against the progress of a project. All changes to the cost baseline need to be recorded and the expected final total costs are continuously forecasted. When actual cost information becomes available, an important part of cost control is to explain what is causing the variance from the cost baseline. Based on this analysis, corrective action might be required to avoid cost overruns.
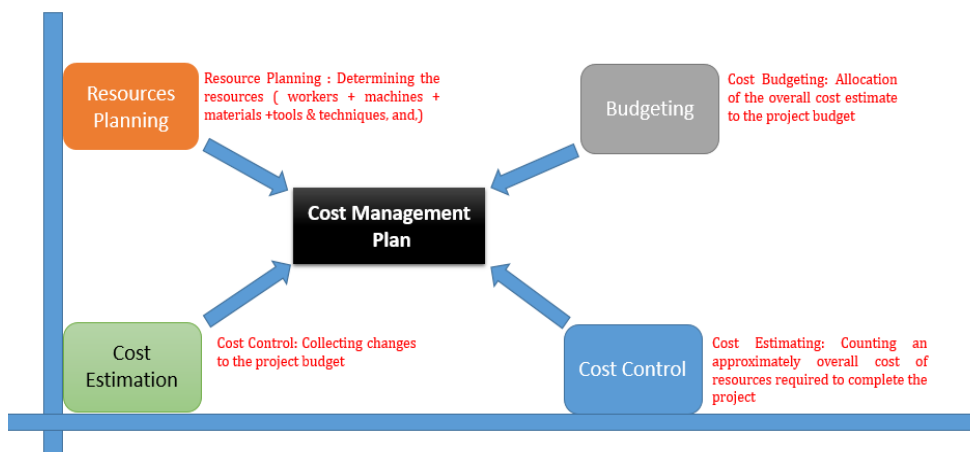
1.1.3   Schedule Management Plan

Schedule Management Plan is the process of establishing the policies, procedures, and documentation for planning, developing, managing, executing and controlling the project schedule. In other words, schedule management plan process aims to ensure the timely completion of a project, it's provides guidance and direction on how the project schedule will be managed throughout the project. Once the activities are determined, and resources that will be performing these activities and the durations of the activities are estimated. Then, the overall project schedule is constituted. Remember here project actual values will differ from the planned ones, and once there is a deviation in the project schedule, necessary corrective and preventive actions must be taken to get back on track. Schedule management plan process provides this guidance as necessary. The following element shall include in the Schedule Management Plan,
https://blog.masterofproject.com/plan-schedule-management-process/

▪   Scheduling Methodology: Using a critical path method is helpful in the schedule management plan process to determine the project duration, and this must be documented in the schedule management plan,

▪   Scheduling Software: Using a software is helpful in the schedule management plan process to determine the project duration, and this must be documented in the schedule management plan,

▪   Schedule Baseline: Using schedule baseline is helps to check whether the project is going as planned and whether the project deadline will be met, and this must be documented in the schedule management plan

▪   Performance Measures: Using performance measures is helpful in the schedule management plan process to identify variances early and in order to check whether the project is going as planned and whether the agreed deadline will be met during the plan schedule management process, a performance measurement must be done, and how to do this, frequency, methods that will be used when measuring, and this must be documented in the schedule management plan,

▪   Schedule Variances: Using schedule variances is helpful in the schedule management plan process to acquire and assign additional resources when there will be a schedule variance specially if there is contingency budget, and this must be documented in the schedule management plan,

▪   Variance Thresholds: Using variance thresholds is helpful in the schedule management plan process to know whether a project is behind the schedule or ahead of the schedule, and the variance threshold defines when there should be a corrective action taken, and this must be documented in the schedule management plan

▪   Schedule Change Control: Using schedule change control is helpful in the schedule management plan process specially when there is an approved change request, or when there is a variance, existing schedule usually needs an update, of how to change the schedule and its procedures, and this must be documented in the schedule management plan,

▪   Measure Schedule Performance: Using Measure schedule performance is helpful in the schedule management plan process to know the physical implementation is accord with seclude, the metrics must be defined and the period of using them, and this must be documented in the schedule management plan,

▪   Guidelines: Using guidelines on how estimates should be stated is helpful in the schedule management plan process to ensure coherent estimation and reporting after activities are determined and resources are assigned, effort estimation takes place, and this must be documented in the schedule management plan,

▪   Histogram: Using of histograms is helpful in the schedule management plan process to fast understanding the performance, these diagram may like chart, bar, activity list, network diagrams or what are the other types of reports that you will use for schedule reporting, and this must be documented in the schedule management plan,

Schedule management plan process is the first process of time management, once it is created by a project team accurately, a project is working at a solid path and ensuring the completion of the project on time.

1.1.4   Communication Management Plan
Described in chapter (10) clause # 1.3.1+2.1.1

Described in chapter (11) clause # 1.1.4

1.1.5   Enterprise Environmental Factors (EEF)
Described in chapter (2) clauses # 4.1
Described in chapter (4) clauses #1.1.4 + 2.1.3+ 3.1.3 + 4.1.3+5.1.4
 Described in chapter (6) clauses # 1.1.2+3.1.4+4.1.6+5.1.8
Described in chapter (7) clauses # 1.1.5
Described in chapter (8) clauses # 1.1.6
Described in chapter (9) clauses # 1.1.2
Described in chapter (10) clauses # 1.1.3
Described in chapter (11) clauses # 1.1.4

1.1.6   Organizational Process Assets (OPA)
 Described in chapter (2) clauses # 4.2
 Described in chapter (4) clauses # 1.1.5+2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.
 Described in chapter (5) clauses # 1.1.5+3.1.3+4.1.3+6.1.5
 Described in chapter (6) clauses # 1.1.3+2.1.5+3.1.5+4.1.7+5.1.9+6.1.4+6.3.2
 Described in chapter (7) clauses # 1.1.6+2.1.7+3.1.4+3.3.3
 Described in chapter (8) clauses #1.1.7+3.1.6
 Described in chapter (10) clauses #1.1.4+2.3.4
Described in chapter (11) clauses # 1.1.5

1.2 Tools and Techniques

1.2.1   Planning meeting and Analysis
Described in chapter (4) clauses # 5.2.2 under the title "Change Control Meetings"
Described in chapter (4) clauses # 6.22 under the title "Meetings"
Described in chapter (5) clauses # 1.2.4 under the title "Meetings"
Described in chapter (10) clauses # 1.2.5 + 3.2.3 under the title "Meetings"
Described in chapter (11) clauses # 1.2.1 under the title "Planning Meeting and Analysis

Project meeting is crucial issue to discuss the whole issues related to developing the risk management plan, the meeting shall be leaded by a person who has enough experiences in field, meeting shall include the following inputs:

- Costs
- Team leader
- Team members
- Organizational requirement.
- Legal Requirements
- Assumed requirements
- PESTEL analysis

- Out sourcing
- Risk categories that have impact on the project
- Risk sources
- Quantitative analysis
- Quantitative analysis
- Risk checklist
- Market behavior

1.3 Outputs

1.3.1   Risk Management Plan

Risk management is a process that allows individual risk events and overall risk to be understood and managed proactively, optimizing success by minimizing threats and maximizing opportunities. All projects, programs, and portfolios are inherently risky because they are unique, constrained, based on assumptions, performed by people and subject to external influences.
https://www.projectengineer.net/how-to-identify-project-risk/

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In addition to the above explanation , a risk management plan is a document that a project manager prepares to foresee risks, estimate impacts, and define responses to risks. It also contains a risk assessment matrix. The risk management plan contains an analysis of likely risks with both high and low impact, as well as mitigation strategies to help the project avoid being derailed should common problems arise. Risk management plans should be periodically reviewed by the project team to avoid having the analysis become stale and not reflective of actual potential project risks. there are four potential responses to risk with numerous variations on the specific terms used to name these response options. How to respond and how to manage risk, have a look to the following Figure:

https://www.projectengineer.net/5-risk-response-strategies/
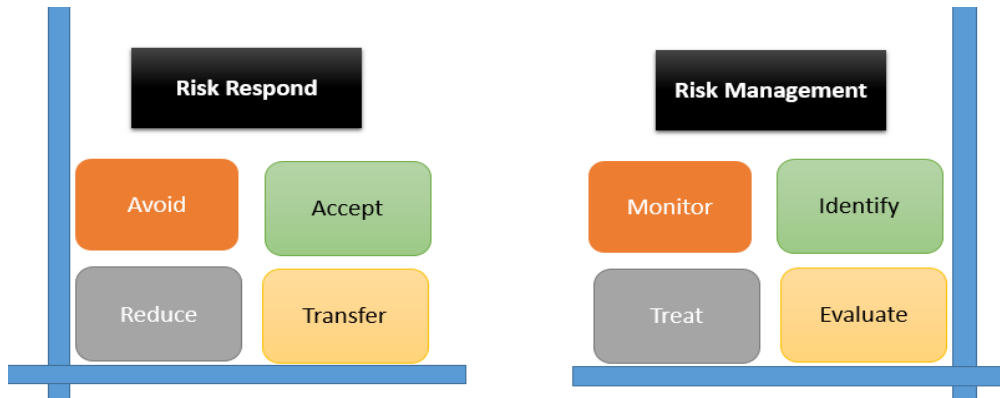
Risks can affect the achievement of objectives either positively or negatively. Risk includes both opportunities and threats, and both should be managed through the risk management process. The project management plan provides baseline or current state of risk-affected areas including scope, schedule, and cost. There are many different techniques that can be used to identify project risks such as:

- Checklists: A way of collecting on checklist of the common risks that may have negative impact on the project. The checklist will allow you to quickly realize which risks are the most important and in which circumstances they apply, it is also providing the prioritization of respond,

- Lessons Learned: It's a highly visible record of problems encountered, mistakes made, and what the project manager should do differently in future projects. When you're starting a new project and you spend a few minutes reading that, how can your project go wrong?

- Experts Value Judgment: Expert have the management knowledge better than the people are being in the work, the witnesses may case a like. Expert value judgment is often used to assess the inputs used to develop the project charter. Expert value judgment is applied to all technical and management details during this process, such expertise is provided by any group or individual with specialized knowledge or training,

- Documentation Review: Documentation is best history or background about risk occurred, many project risks can be identified by reviewing the project's technical details, backgrounds on the project team, and other data

- SWOT Analysis: A Strengths-Weaknesses-Opportunities-Threats analysis will assist in drawing out the risks inherent in the project, it allows the project to see the project from the perspective of the competitive environment with other industry players.

- Brainstorming: It is an excellent methodology for gathering ideas from different cultures to identify potential risks

- Delphi Technique: The Delphi Technique to develop knowledge among participants by sharing all of the answers anonymously with the whole group. Upon seeing the opinions of the others, they are allowed to revise their original opinions. After several rounds a consensus should emerge.

- Assumptions Analysis: Every project contains certain underlying assumptions upon which its business case is built. Identifying these assumptions, and analyzing their reliability, can result in the identification of new risks.

▪ Diagrams drawing: Drawing out a simple decision network for the major turning points within a project can yield the important risks.

2. Identify Risks Process

Risk is any uncertain event or condition that might affect a project, not all risks are negative. For example, finding easier way to do a job, or finding new lower prices in market, or change a project technology are may include risks, but they named an opportunity, but it's still handled just like a risk. Risks can be classified as a Negative Events considered as Risks (threat) with negative consequences, while Positive Events are considered as (opportunities) with positive consequences. Many risks types can create adverse consequences for the organization, and risk solutions can create positive consequences for the organization.

Risk identification is an iterative process because of many sources may yield risk, the project team shall review the program scope, cost estimates, schedule (to include evaluation of the critical path), technical maturity, key performance parameters, performance challenges, stakeholder expectations vs. current plan, external and internal dependencies, implementation challenges, integration, interoperability, supportability, supply-chain vulnerabilities, ability to handle threats, cost deviations, test event expectations, safety, security, and more. In addition, historical data from similar projects, stakeholder interviews, and risk lists provide valuable insight into areas for consideration of risk.

https://www.mitre.org/publications/systems-engineering-guide/acquisition-systems-engineering/risk-management/risk-identification

2.1 Inputs

2.1.1   Risk Management Plan
Described in chapter (11) clauses # 1.3.1 + 2.1.1

2.1.2   Activity Cost Estimates
Described in chapter (7) clauses # 1.3.1 + 2.1.1
Described in chapter (11) clauses # 2.1.2

2.1.3   Activity Duration Estimates
Described in chapter (6) clauses # 4.3.1+5.1.6
Described in chapter (11) clauses # 2.1.3

2.1.4   Scope Baseline
Described in chapter (5) clauses # 4.3.3
Described in chapter (6) clauses # 1.1.1
Described in chapter (7) clauses # 1.1.1+2.1.3
Described in chapter (8) clauses # 1.1.1
Described in chapter (11) clauses # 2.1.4

2.1.5   Stakeholder Register
Described in chapter (5) clauses # 2.1.2
Described in chapter (8) clauses # 1.1.2
Described in chapter (10) clauses # 1.1.2
Described in chapter (11) clauses # 2.1.5

2.1.6   Cost Management Plan
Described in chapter (11) clauses # 1.1.2 + 2.1.6

2.1.7   Schedule Management Plan
Described in chapter (11) clauses # 1.1.3 + 2.17

2.1.8   Quality management plan
Described in chapter (5) clauses # 1.1.2
Described in chapter (8) clauses # 1.3.1
Described in chapter (11) clauses # 2.1.8

2.1.9   Project Documents

▪ Business Case: it is a formal, written argument intended to convince a decision maker to approve some kind of action. A well-crafted business case explores all feasible approaches to a given problem and enables business owners to select the option that best serves the organization. This guide explains the format and content of a business case document and the processes involved in its creation

▪ Project Charter: It is a short document that refers to more detailed documents such as a new offering request or a proposal, In initiative for Policy Dialogue (IPD), this document is known as the project charter. In customer relationship management (CRM), it is known as the project definition report. Both IPD and CRM require this document as part of the project management process.

▪ Project Management Plan: It is a formal, approved document that defines how the project is executed, monitored, and controlled. It may be a summary or a detailed document and may include baselines, subsidiary management plans, and other planning documents

▪ Project Schedule: It is a document that outlines what work needs to be done, the order in which it needs to be done, what resources are required, how they will be distributed, and how long different parts of the work will take.

▪ Project RAID Log: It is a tool that allows project managers to track risks, actions, issues, and decisions. The RAID log template helps you organize information so it's easy to reference during meetings and project audits. As all project managers know, even the best-laid plans can go awry:

▪ Project Status Reports: It is one method of addressing the importance of project communication. Project status reporting is a regular, formalized report on project progress against the project plan. Its purpose is to effectively and efficiently communicate project status at regular intervals to project stakeholders

▪ Project Budget Tracker: It is a different sort of document – it includes less text, and a lot more numbers. However, it helps to have a text-y document to go with the calculations that sets out information about contracts, procurement and the financial processes you're expected to follow

2.1.10 Enterprise Environmental Factors (EEF)
Described in chapter (2) clauses # 4.1
Described in chapter (4) clauses #1.1.4 + 2.1.3+ 3.1.3 + 4.1.3+5.1.4
Described in chapter (6) clauses # 1.1.2+3.1.4+4.1.6+5.1.8
Described in chapter (7) clauses # 1.1.5
Described in chapter (8) clauses # 1.1.6
Described in chapter (9) clauses # 1.1.2
Described in chapter (10) clauses # 1.1.3
Described in chapter (11) clauses # 1.1.4+2.1.10

2.1.11 Organizational Process Assets (OPA)
Described in chapter (2) clauses # 4.2
Described in chapter (4) clauses # 1.1.5+2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.
Described in chapter (5) clauses # 1.1.5+3.1.3+4.1.3+6.1.5
Described in chapter (6) clauses # 1.1.3+2.1.5+3.1.5+4.1.7+5.1.9+6.1.4+6.3.2
Described in chapter (7) clauses # 1.1.6+2.1.7+3.1.4+3.3.3
Described in chapter (8) clauses #1.1.7+3.1.6
Described in chapter (10) clauses #1.1.4+2.3.4
Described in chapter (11) clauses # 1.1.5+2.1.11

2.2 Tools and Techniques

2.2.1 Documentation Review

Documentation reviews is carried out for getting ideas on risks that may be existing or foreseen or hidden in the project. Documentation reviews involve reviewing the project documentation, including plans, assumptions, project files, and other information in order to identify areas of inconsistency or lack of clarity. The documentation is comprehensively reviewed for completeness, accuracy and consistency. Missing, inaccurate or incomplete information and inconsistencies can be indicators of risks in the project, the documents that could be reviewed include, but not limited to: https://www.justgetpmp.com/2012/02/documentation-reviews-to-identify.html

- Project charter
- Project scope statement
- Work Breakdown Structure (WBS)
- Project schedule

- Cost estimates
- Procurement plan
- Assumptions log
- Risk register

2.2.2 Information Gathering Techniques

Many techniques are available for gathering requirements. each has value in certain circumstances, and in many cases, you need multiple techniques to gain a complete picture from a diverse set of clients and stakeholders, here's are some of the approaches but not limited to: https://www.techrepublic.com/blog/10-things/10-techniques-for-gathering-requirements/

- Interviews: The most common technique for gathering requirements is to sit down with the clients and ask them what they need. The discussion should be planned out ahead of time based on the type of requirements you're looking for. There are many good ways to plan the interview, but generally you want to ask open-ended questions to get the interviewee to start talking and then ask probing questions to uncover requirements.

- Group interviews: Group interviews are similar to the one-on-one interview, except that more than one person is being interviewed -- usually two to four. These interviews work well when everyone is at the same level or has the same role. Group interviews require more preparation and more formality to get the information you want from all the participants. You can uncover a richer set of requirements in a shorter period of time if you can keep the group focused.

- Facilitated sessions: In a facilitated session, you bring a larger group (five or more) together for a common purpose. In this case, you are trying to gather a set of common requirements from the group in a faster manner than if you were to interview each of them separately.

- Joint application development: JAD sessions are similar to general facilitated sessions. However, the group typically stays in the session until the session objectives are completed. For a requirements JAD session, the participants stay in session until a complete set of requirements is documented and agreed to.

- Questionnaires: Questionnaires are much more informal, and they are good tools to gather requirements from stakeholders in remote locations or those who will have only minor input into the overall requirements. Questionnaires can also be used when you have to gather input from dozens, hundreds, or thousands of people.

- Prototyping: Prototyping is a relatively modern technique for gathering requirements. In this approach, you gather preliminary requirements that you use to build an initial version of the solution -- a prototype. You show this to the client, who then gives you additional requirements. You change the application and cycle around with the client again. This repetitive process continues until the product meets the critical mass of business needs or for an agreed number of iterations.

2.2.3 Checklist Analysis

Checklist analysis can be used by team members who have relatively less experience in similar projects. But the project manager has to understand that it is impossible to build an exhaustive checklist. So, care should be taken to also explore risks that do not appear on the checklist, because even highly similar projects will have their own, unique and different risks. There are numerous ways to identify risks. Project managers may want to use a

combination of these techniques. For example, the project team may review a checklist in one of their weekly meetings and review assumptions in a subsequent meeting. Here are seven of my favorite risk identification techniques:

https://projectriskcoach.com/7-ways-to-identify-risks/
https://www.justgetpmp.com/2012/02/checklist-analysis-is-one-of-tools-and.html

▪ Interviews: This technique is design to select the key stakeholders to plan an interviews, and to define specific questions to attain the expected results with documenting the interviews events,

▪ Brainstorming: This technique is design to get the collective offered alternatives and to ranking them according to the weight, and to use the best one with collective opinion,

▪ Project Objectives: This technique is design to decide the most significant risks related to the project objective where the objective may be having specific schedule, budget, quality, scope, and,

▪ Project Tasks: This technique is design to decide the most significant risks related to the project tasks such as requirements, coding, testing, training, implementation, resources, and,

▪ Checklists: This technique is design to see if the project has a list of the most common risks that might be occurring on a project, and to identify the response process,

▪ Assumption Analysis: This technique is design to define the Body of Knowledge as a sources of knowledge like the stakeholders, experts, the assumption on risk identified shall be documented and associated risks,

▪ Cause & Effect Diagrams: This technique is design to help identify causes and impacts that trigger the risks, this method is powerful to define the causes and impact of potential risks , and can address the methods to reduce or eliminate them,

▪ Nominal Group Technique (NGT): This technique is design to encourage contributions from everyone and facilitates quick agreement on the relative importance of issues, problems, or solutions. Team members begin by writing down their ideas, then selecting which idea they feel is best

▪ Affinity Diagram: This technique was created in the 1960s by Japanese anthropologist Jiro Kawakit, it is used to organize a large amount of ideas and data which are often results after brainstorming. This particular method is a great way to create mind maps and it is used to sort an unorganized list to stimulate the creation of a general idea. In another word it is use to generate, organize, and consolidate information related to a product, process, complex issue, or problem. After generating ideas, group them according to their affinity, or similarity. This idea creation method taps a team's creativity and intuition.
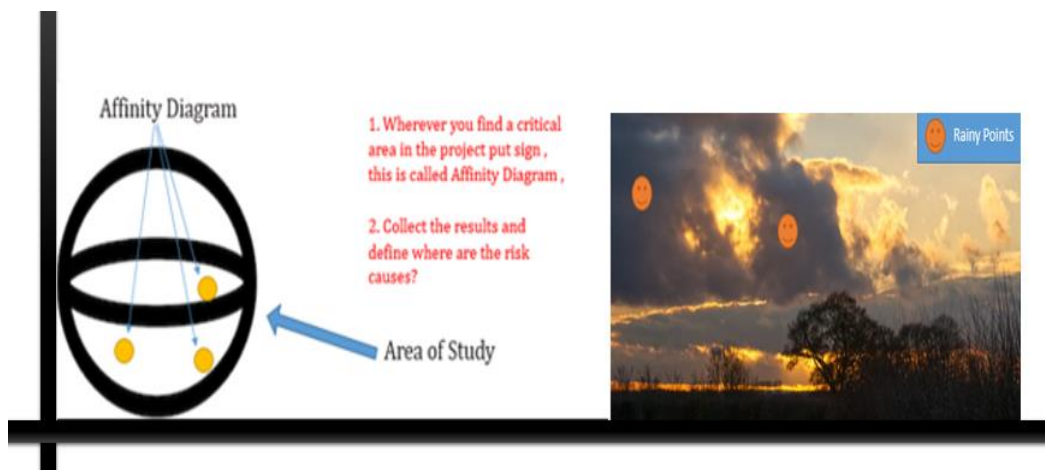
2.2.4   Assumption Analysis

A project management requires planners to identify all assumptions being made in the project planning stage as a means of risk reduction. Each assumption is then analyzed to determine its accuracy and to identify all potential project risks if the assumption if later found to be inaccurate, assumptions are tools/ technique used for the Risk

identification process." Assumptions analysis is one of the tools and techniques of Identify Risks process. This analysis explores the validity of all the assumptions that are identified and documented during the project planning processes. Assumptions analysis can assist a program environment tremendously by altering the focus from risks to assumptions.

Other says assumption is what you believe to be true. These are anticipated events or circumstances that are expected during your project's life cycle. You make assumptions based on your experience or the information available on hand. Assumptions may not end up being true. Sometimes, they can be false and it may affect your project. This adds risk to the project, take the following examples as assumption:

- We assume to get the all the resources we need,
- We assume to during the rainy season, cheap labor will be available.
- We assume to face very little risk on marketing
- We assume our team members have all the required skills.
- We assume our client will be from within
- We assume to sell off all our assumed product,
- We assume our competitor will not affect our trade,
- We assume to change our brand to keep on track,
- We assume our project will not face cost risk,

2.2.5   Diagramming Techniques

Diagramming techniques, also called risk diagram techniques, is a method to present different information with logical linkages. This allows stakeholders to understand the information easily. Identifying risks is a crucial element in assessment, prevention, and correction for Project Management. Diagramming those risks is a fast and reliable technique to fully flesh out risks, both potential and actual. Let's breakdown three diagramming techniques used in Project Management, they are:

- **Ishikawa Diagrams:** It called "Ishikawa Diagrams Fishbone Diagram + Cause and Effect Diagram, commonly used in quality defect prevention, it's also very useful in Risk Identification. Fundamentally, it breaks down into successive layers, root causes that could contribute to a prescribed effect + risk+ outcome.

Example on customer compliant about bad quality of cable
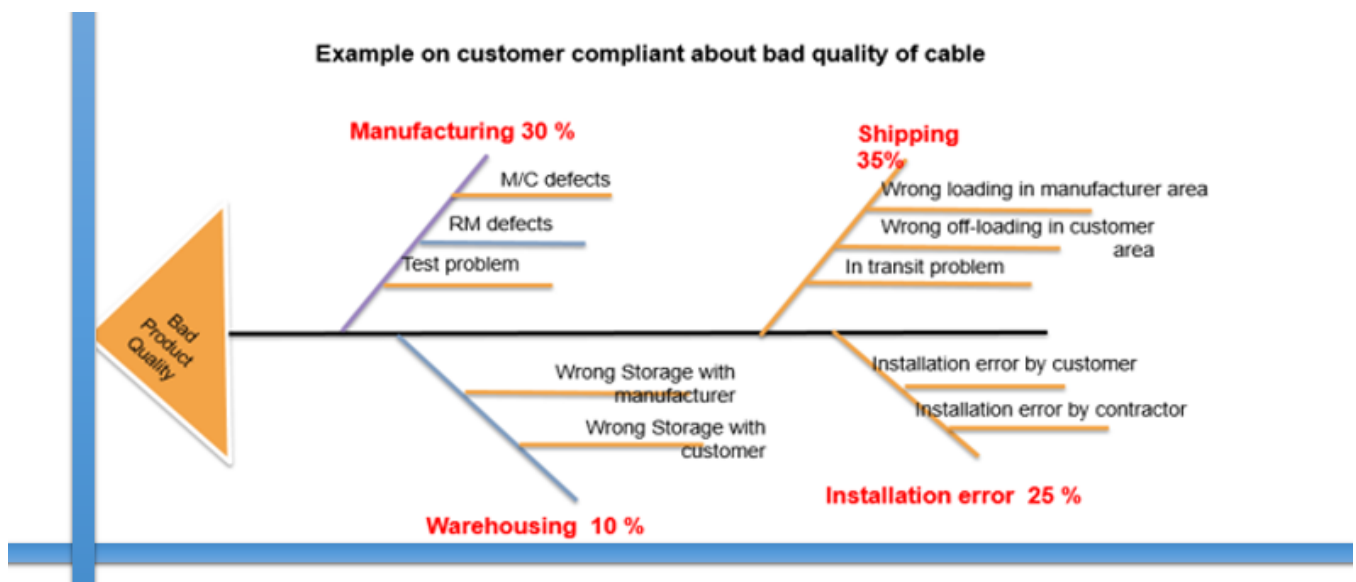
- **Process Flow Diagram:** The Process Flow Diagram maps out the general flow of processes and equipment. Most commonly used in chemical and industrial process to help display the relationship between interdepartmental activities, + major pieces of equipment, the PFD is also very helpful in identifying risks. While mostly used to establish relationships between major pieces of a large process, the PFD can also be used in granular

settings due its efficacy in relationship establishment. It is a process of drawing all activities and how they relate to each other in addition to setting priorities in the flow processes. Yes
https://project-management.com/diagramming-techniques-to-identify-risks/

Process Flow Diagram (General)
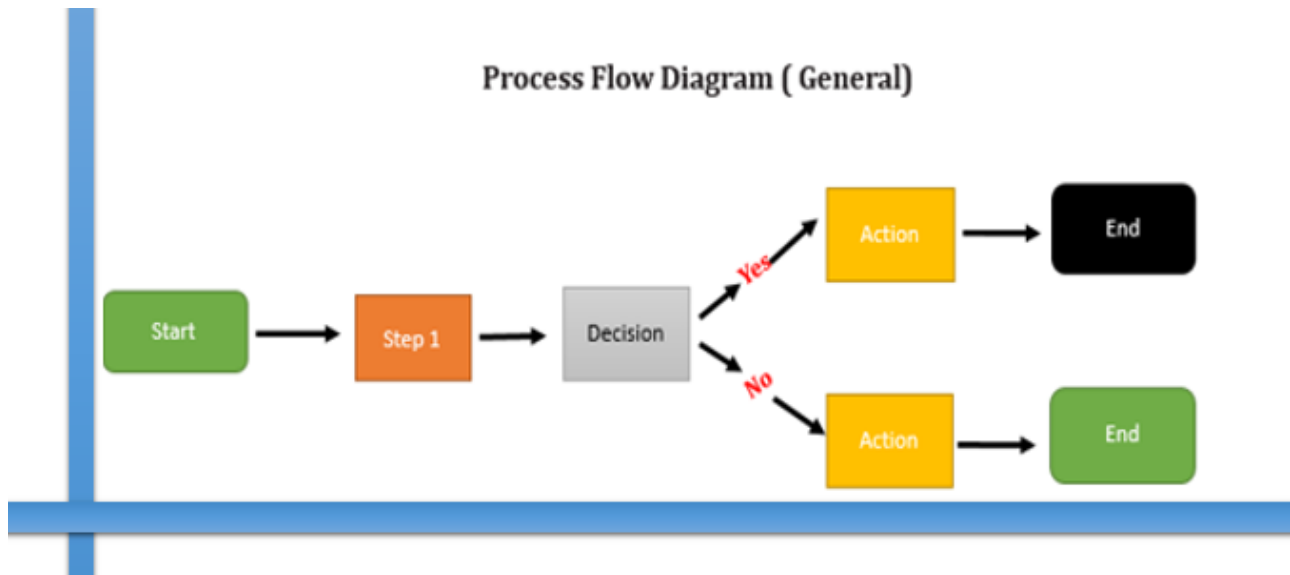
- Influence Diagrams: The influence diagrams are graphical representations of situations showing causal influences, time ordering of events, and other relationships among variables and outcomes. They usually represent decisions with rectangles; chance events or uncertainties with ovals or circles; calculated or fixed inputs and outputs with rounded rectangles, and outcomes or values with triangles

Influence Diagrams

2.2.6   Perform SWOT Analysis

SWOT analysis is a strategic planning system that organizations use to identify and improve various internal business functions and their resulting external outcomes. SWOT Model also is an acronym of Strengths & Weakness+ Opportunities & Threat that acts as a powerful tool during the strategic planning process. A SWOT analysis is often performed to help identify the strengths and weaknesses of a business, as well as identify any

opportunities and threats that could arise, the said model can lead Time Management to the right direction at a project goals. *Weakness appears from within while threat comes from outer, and the Assumption: Goals are identified by the portfolio*

	Strength	Weakness	Act to
Internal	Availability of Strategic Plan	Lack of Experiences	
	Sufficient Resources	New Sales Team	Build on your strengths
	High operation Capacity	Lack of high capacity	Eliminate weaknesses
	Qualified Staff	No promotion	
External	**Opportunities**	**Threats**	**Act to**
	Expansion to Sought African Market	Competitors	
	Complying with Competitors	Government Legislation	
		Closed Boarders	Take advantage of available opportunities
		Out sourcing	Recognize potential threat
		High Energy Price	

2.2.7 Expert Value Judgment

Described in chapter (4) clauses # 1.2.1 +2.2.1 + 3.2.1+ 4.2.1 +5.2.1+6.2.1
Described in chapter (5) clauses #1.2.1+3.2.1
Described in chapter (6) clauses # 1.2.3+3.2.1+4.2.1
Described in chapter (7) clauses #1.2.1+2.2.3
Described in chapter (10) clauses # 3.2.2
Described in chapter (11) clauses # 2.2.7

2.3 Outputs

2.3.1 Risk Register

Described in chapter (1) clauses # 6.1.8
Described in chapter (3) clauses # 6.7
Described in chapter (7) clauses # 1.1.4
Described in chapter (8) clauses # 1.1.5
Described in chapter (11) clauses # 2.3.1

3. Perform Qualitative Risk Analysis Process

A qualitative risk analysis is the process of prioritizing individual project risks for further analysis or action by assessing their probability and impact as well as other characteristics. Risks will be scored based on their probability or likelihood of occurring and their impact on project objectives. A qualitative risk analysis will include the appropriate categorization of the risks, either source-based or effect-based. Risk probability and impact assessment is one of the Tools and techniques to perform qualitative risk analysis, in this process, the risks shall be identified and evaluated in terms of the expected likelihood of their occurring and how severity have impact and when is expected to happened, the characteristics of qualitative analysis are:

Qualitative Risk Analysis	Quantitative Risk Analysis
▪ Quick and easy	▪ Requires more time
▪ Subjective	▪ Objective
▪ Always performed	▪ Optional
▪ Used to evaluate individual risks	▪ Used to evaluate overall project risk
	▪ Provides more detailed information for go/no go decisions and response plans
	▪ Used to develop contingency reserves

3.1 Inputs

3.1.1 Risk Register

Described in chapter (1) clauses # 6.1.8

Described in chapter (3) clauses # 6.7
Described in chapter (7) clauses # 1.1.4
Described in chapter (8) clauses # 1.1.5
Described in chapter (11) clauses # 2.3.1 +3.1.1

3.1.2   Risk Management Plan
Described in chapter (11) clauses # 1.3.1 + 2.1.1 + 3.1.2

3.1.3   Project Scope Statement
Described in chapter (5) clauses # 3.3.1+4.1.1
Described in chapter (6) clauses # 2.1.4+4.1.5+5.1.7
Described in chapter (11) clauses # 1.1.1 + 3.1.3

3.1.4   Organizational Process Assets (OPA)
Described in chapter (2) clauses # 4.2
Described in chapter (4) clauses # 1.1.5+2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.
Described in chapter (5) clauses # 1.1.5+3.1.3+4.1.3+6.1.5
Described in chapter (6) clauses # 1.1.3+2.1.5+3.1.5+4.1.7+5.1.9+6.1.4+6.3.2
Described in chapter (7) clauses # 1.1.6+2.1.7+3.1.4+3.3.3
Described in chapter (8) clauses #1.1.7+3.1.6
Described in chapter (10) clauses #1.1.4+2.3.4
Described in chapter (11) clauses # 1.1.5+2.1.11+3.1.4

3.2 Tools and Techniques

3.2.1   Risk probability and Impact assessment

Risk Probability and Impact Assessment provides the project with the initial risk + rating + sources + probability + impact + severity + Estimated monetary value (EMV) for each risk that we have identified so far, the said EMV determines the threats + opportunity raised from risks:

Event	Probability(%)	Impact (Value)	EMV (Value)	Risk Type
A	10%	8,000.00	+800.00	**Opportunity**
B	15%	17,000.00	-2550.0	Threat
C	5%	60,000.00	-3000 .0	Threat
D	70%	25,000.00	+17500.0	**Opportunity**
F	35%	75,000.00	-26250.00	Threat

 Project objectives if the risk were to materialize, the project shall care about the value of (EMV) for both Opportunities + Threats, the project objectives will be mostly worried about the triangular constraints of Cost + Quality+ Schedule + Scope Creep.

▪   **Risk Probability** is the determination of the likelihood of a risk occurring. This likelihood can be based on historical project information, does the risk typically occur? Or the likelihood of risks can come from interviews or meetings with individuals who would have knowledge of the probability of risks occurring. When determining the probability of a risk occurring , it is often given a score such as given in the suggested below Risk checklist,

▪   **Impact Assessment** is the evaluation of the impact of a risk if it were to occur. If the risk would to occur would it be catastrophic to the project or a minor inconvenience? An impact assessment is generally conducted in meetings or in interviews with individuals who have the appropriate knowledge to evaluate the impact of a risk. Upon completion of an impact assessment, ,it is often given a score such as given in the suggested below Risk checklist,

3.2.2 Probability and Impact Matrix

A Probability and Impact Matrix is a visual representation of the results from Risk Probability and Impact Assessments used to perform qualitative risk analysis. It is a component of the risk management plan. The matrix is a table that shows the probability of potential risks crossed by the severity of the impact on the objectives as given in the suggested below Risk checklist in the column of "Risk Aspects". Probability and Impact Matrix uses the combination of probability and impact scores of individual risks and ranks/ prioritizes them for easy handling of the risks. In other words, the probability and impact matrix helps to determine which risks need detailed risk response plans. It is vital to understand the priority for each risk as it allows the project team to appreciate the relative importance of each risk.

http://www.justgetpmp.com/2012/02/probability-and-impact-matrix.html

3.2.3 Risk Data Quality Assessment

Risk data quality assessment is a technique that is used to determine the risks that are necessary for risk management to deal with, and that determine the accuracy, reliability, integrity, and trusted data or information concerning the risk. This technique focuses on making sure that the information we are using to perform the risk analysis activities is unbiased also conducting risk analysis, using poor quality data may give useless information, if we cannot trust our data or information, we can't trust the findings that were made based on that data or information,

Risk Checklist

At what risk rate action has to be taken?

SN	Risk Aspects	Action to be taken	Severity (in General)					Probability/Likelihood					Risk Rank	Action — Risk is				Risk Aspects	
			0 Insignificant	1 Minor	2 Moderate	3 Critical	4 Serious	0 Unlikely	1 Seldom	2 Casual	3 Likely	4 Definite	Equal S X P	Accepted 0-4	Avoided 5-8	Reduced 9-12	Transferred 13-16	Open	Controlled
1	Staff shortage	Work breakdown structure (WBS); Avoide Exhausting People; Safe people health; Reduce turnover; Ask for new people				X			X				3	X					Yes
2	Inability to keep up with evolution	Attracting talent; Use factored RM; Benchmarking with others; Integration of work to reduce cost; Understand Market behavior(quality); Use of technology					X		1				4	X					Yes
3	Scope Creep	Communication with sales; Ask for change request; Define your new requirements; Define the new cost + time with cost				X				X			6		X				Yes
4	Process Failure	Focus on employee knowledge; Define your new requirements; Select the correct process; Make Trial; Benchmarking others					X		1				4	X					Yes
5	Production Failure	Focus on employee knowledge; Communication with QC as required; Communication with MA as required; Communication with PU as required; Work Agile (Customer validation)					4		1				4	X					Yes
6	Inability to compete	Reduce waste; Use alternative RM; Moderate Inventory Leveling; Reduce work time & cost; Reduce Human Error; Reduce m/c breakdown; Work Agile (Customer validation)					X				X		8		X				Yes
7	Customer complains	Communication with SA as required; Incur legal liability on your products; Work Agile (Customer validation); Solving to the extent of conformity				X					X		6		X				Fyes

Risk Management team may ask some questions like:

- Is the data and the information is credible?
- Is the data and the information used of high quality level requirements?
- Is the data and the information accurate enough to deal with?
- Is the risk itself understood properly?
- Is the risk source understood properly?
- Is the risk solvable?

In case the data and information are not credible or accurate or reliable, then our analysis will be incorrect, and the project team will have to go back and gather additional data and information in order to make the answer to the above questions to accurate , the team has to ensure that they have all the data and information they need in order to conduct an efficient risk analysis. In some cases, the cost or effort that needs to be spent in order to fix data quality issues could be far too much if we compare it with the impact the risk could have if it materializes. In such cases, the risk management team could evaluate the benefits versus the cost of uncertainty and take a judgment call. Only in those cases where the benefits outweigh the cost will we take up additional effort.

http://getpmpcertified.blogspot.com/2013/01/risk-data-quality-assessment.html

3.2.4   Risk Categorization

- **Risk** categorization is process of classifying the organization of risks based on their sources, to determine the areas of the project that are the most exposed to the effects of risks or uncertainties such as:

o Internal Risks: They are the risks identified from the internal sources of the project, they can be identified easily inside the organization, and can be easily controlled by project team, by accepting or avoiding, or reducing or transferring their impacts on the organization,

o External Risks: They are the risks identified from the external sources of the project, they can be identified by a comprehensive study, external risks, unlike internal or strategic risks, are largely out of the control of an organization. this article points out that organizations can still manage external risks by generating ideas about the type and magnitude of external events that could happen, these risk can be controlled by accepting or avoiding, or reducing or transferring their impacts on the organization,

o Strategic Risks: they are the risks identified by advisory board, or by centralized risk management group, or potentially involving senior management, or by an internal network of risk managers dispersed throughout the organization, these risk may have significant impact on the project, and can be controlled by a risk management structure team, these risk can be controlled by accepting or avoiding, or reducing or transferring their impacts on the organization,

- **Risk** categorization is process of classifying the organization of risks based on the project economic of scale, or according to the organization economic size, some project may identify risk based on a common set of project risk categories such as:

o   Project Schedule,
o   Project Cost,
o   Project Quality,
o   Project Scope,

- **Risk** categorization is identified by many ways based on project managers who are managing a software development project such as:

o   Requirements
o   Design
o   Coding
o   Testing
o   Implementation
o   Control

- **Risk** categorization is identified by many ways based on project managers who are managing a project with intensive capital investment that easily affected by internal and external issues, they use another set of categories is called PESTLE, which are described in chapter (2) _under the tile Organizational Influences on project Lifecycle,_

o   Political
o   Economic
o   Social
o   Technological
o   Legal
o   Environmental

3.2.5   Risk Urgency Assessment

Risk urgency assessment is a project management process that reviews and determines the timing of actions that need to happen sooner than the other risk items. The purpose of this particular type of risk assessment is that it identifies the near term risks. The purpose of this risk urgency assessment technique is to identify near term risks, the project has to determine which risk has to be considered urgent or prior to others or to consider that require an immediate action. The purpose of this particular type of risk assessment is that it identifies the near term risks. This means that it allows project managers to identify which risks should be considered urgent or requires their immediate attention. There are different factors that can help project managers identify near-term risks to effectively carry out risk urgency assessment. Below are the many factors that characterize the near-term risks.

https://www.google.com/search?q=Risk+Urgency+Assessment&oq=Risk+Urgency+Assessment&aqs=chrome..69i57j0l7.9878j0j7&sourceid=chrome&ie=UTF-8
https://project-management-knowledge.com/definitions/r/risk-urgency-assessment/#:~:text=The%20risk%20urgency%20assessment%20is,identifies%20the%20near%20term%20risks.

- Time available: The project management team needs a certain amount of time to implement responses and the responses are useful only if they are implemented within a certain time frame.
- Warning signs of risks: The warning signs of risks are also called risk triggers. They can help the risk management team identify if a certain risk requires urgent responses. Some risks allow small response window for the risk management team while some require a large window.
- Risk rating score: This is the numeric rating based on the impact and probability of risk. This means that risks with higher scores are risks that may occur soon.

3.2.6   Expert Value Judgment
Described in chapter (4) clauses # 1.2.1 +2.2.1 + 3.2.1+ 4.2.1 +5.2.1+6.2.1

Described in chapter (5) clauses #1.2.1+3.2.1
Described in chapter (6) clauses # 1.2.3+3.2.1+4.2.1
Described in chapter (7) clauses #1.2.1+2.2.3
Described in chapter (10) clauses # 3.2.2
Described in chapter (11) clauses # 2.2.7 +3.2.6

3.3 Outputs

3.3.1   Risk Register Updates

It is the process of   identifying any new risks, assessing old risks, and determining and implementing appropriate response strategies, in order to manage the impact of risks on the project. This domain task is focused on using the risk register and the documented planned risk responses to determine whether they are still correct and appropriate and whether there are any new risks that need to be added and assessed, and ensuring that risks are being monitored and controlled proactively. The risk management plan provides guidance on how and how frequently these activities are to be carried out. The project manager will take responsibility for determining the appropriate application of:

https://www.oreilly.com/library/view/pmp-rapid-review/9780735668348/ch04s04.html

- Risks descriptions,
- Risks sources,
- Triggers (symptoms and warning signs),
- Risk owners and assigned responsibilities,
- Outputs of qualitative and quantitative analysis,
- Response strategies,
- Actions taken if risk occurs,
- Results from qualitative and quantitative risk analysis,
- Primary and secondary responses for each risk,
- Residual or left over risks respond strategy,
- Secondary risks or the new risks resulting from implementation of risk response,
- Risk budget,
- Contingency plan,
- Fallback plans,
- Reserves for time and cost,
- Risks grouped by categories,
- Risks requiring near-term response,
- Risks requiring additional analysis and response,
- Low priority risks to watch Trends in results,

Source: PMP Exam Pre Boot Camp

4. Perform Quantitative Risk Analysis Process

A quantitative risk analysis is a numeric evaluation and further analysis of the highest priority risks during a which a numerical or quantitative rating is assigned in order to develop a probabilistic analysis of the project. In order to implement a quantitative risk analysis, you will need high-quality data, a well-developed project model, and a prioritized lists of project risks (usually from performing a qualitative risk analysis. A quantitative analysis:

- Quantifies the possible outcomes for the project and assesses the probability of achieving specific project objectives
- Provides a quantitative approach to making decisions when there is uncertainty
- Creates realistic and achievable cost, schedule or scope targets

4.1 Inputs

4.1.1   Risk Register

Described in chapter (1) clauses # 6.1.8
Described in chapter (3) clauses # 6.7
Described in chapter (7) clauses # 1.1.4

Described in chapter (8) clauses # 1.1.5
Described in chapter (11) clauses # 2.3.1 +3.1.1+4.1.1

4.1.2   Risk Management Plan
Described in chapter (11) clauses # 1.3.1 + 2.1.1 + 3.1.2 + 4.1.2

4.1.3   Cost Management Plan
Described in chapter (11) clauses # 1.1.2 + 2.1.6 +4.1.3

4.1.4   Schedule Management Plan
Described in chapter (11) clauses # 1.1.3 + 2.17 +4.1.4

4.1.5   Organizational Process Assets (OPA)
Described in chapter (2) clauses # 4.2
Described in chapter (4) clauses # 1.1.5+2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.
Described in chapter (5) clauses # 1.1.5+3.1.3+4.1.3+6.1.5
Described in chapter (6) clauses # 1.1.3+2.1.5+3.1.5+4.1.7+5.1.9+6.1.4+6.3.2
Described in chapter (7) clauses # 1.1.6+2.1.7+3.1.4+3.3.3
Described in chapter (8) clauses #1.1.7+3.1.6
Described in chapter (10) clauses #1.1.4+2.3.4
Described in chapter (11) clauses # 1.1.5+2.1.11+3.1.4 + 4.1.5

4.2 Tools and Techniques

4.2.1   Data Gathering and representation Techniques

A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition has grouped most of the tools and techniques in a logical way, by their purpose as here under:
https://www.pmdrill.com/data-gathering-techniques-pmp/

- Data gathering techniques
- Data analysis techniques
- Data representation techniques
- Decision-making techniques
- Communication skills
- Interpersonal and team skill

A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition has grouped Data gathering techniques that are used to collect data and information from a variety of sources, they are grouped as here under:

- Benchmarking: It is a technique by which an organization compares its actual or planned practices with other organizations,
- Brainstorming: It is a technique used to identify a list of ideas by holding a group with creative discussion,
- Check sheets: It is a technique use to collect data about a potential problem to quantify defects by type or location or by cause,
- Checklists: It is a technique used to remind the workers by points, questions, action required, helps to complete the process
- Focus groups: It is a technique used generate ideas of experts and stakeholders to respond to specific features of matters,
- Interview: It is a technique used to identify the requirements of thing considered mater like, risks constraints, criteria, needs,
- Market research: It is a technique used to determine the market conditions, requirements, market capacity, technology, and,
- Questionnaires and surveys: It is a technique used to collect & analysis data and information about the features of something,

▪ Statistical sampling: It is a technique used when total test of each item during quality is expensive , Sampling reduces the cost

Example on Matrix of Process and Data Gathering Techniques

SL	Identify risk source	Benchmarking	Brainstorming	Check sheets	Focus groups	Interviews	Market research	Questionnaires + surveys	Statistical sampling
1	Identify risk severity	✓			✓				
2	Develop quality Plan		✓						✓
3	Develop emergency plan	✓	✓	✓	✓				
4	Identify stakeholder needs		✓		✓		✓	✓	
5	Plan interested Parties expectations			✓					
6	Define scope creep						✓	✓	
7	contract adjustment		✓		✓		✓		
8	Agile cost to the project	✓			✓				
9	Amendment of quality plan	✓			✓				
10	Preparing safety Management system	✓	✓	✓					✓
11	Need to new workers and experts		✓			✓			✓

4.2.2 Quantitative Risk Analysis and Modeling Techniques

A quantitative risk analysis and modeling technique used to help determine which risks have the most potential influence on the project. It does this by assigned a projected value to the risks that have been ranked already by the previous process such as the Perform Qualitative Risk Analysis It examines the extent to which the uncertainty of each project element affects the objective being examined when all other uncertain element

▪ Expected Monetary Value (EMV) analysis. A statistical technique that calculates the average outcome when the future includes scenarios that may or may not happen. A common use of this technique is within decision tree analysis. Risk Probability and Impact Assessment provides the project with the initial risk + rating + sources + probability + impact + severity + Estimated monetary value (EMV) for each risk that we have identified so far, the said EMV determines the threats + opportunity raised from risks. Project objectives if the risk were to materialize, the project shall care about the value of (EMV) for both Opportunities + Threats, the project objectives will be mostly worried about the triangular constraints of Cost + Quality+ Schedule + Scope Creep.

https://www.dummies.com/careers/project-management/pmp-certification/quantitative-risk-analysis-scenarios-modeling-and-simulations-for-the-pmp-certification-exam/

Event	Probability(%)	Impact (Value)	EMV (Value)	Risk Type
A	10%	8,000.00	+800.00	**Opportunity**
B	15%	17,000.00	-2550.0	Threat
C	5%	60,000.00	-3000 .0	Threat
D	70%	25,000.00	+17500.0	**Opportunity**
F	35%	75,000.00	-26250.00	Threat

Simulation: it is the process that illustrate the uncertainties of risks at a detailed level into their potential impact on objectives that are expressed at the level of the total project, it is usually expressed as a probability distribution of possible costs or durations at a detailed work level, and are typically performed by using Monte Carlo analysis, it may use some steps like:

o Define the most estimates of optimistic, pessimistic, and most likely for each work package and enter them into the software,
o Enter the number of iterations you want the software to run and use reasonable numbers,
o Run the simulation as the software takes random amounts from the range of duration estimates for each work package,
o Analyze the information, as the data show the likelihood and find how much time you need to achieve high confidence,
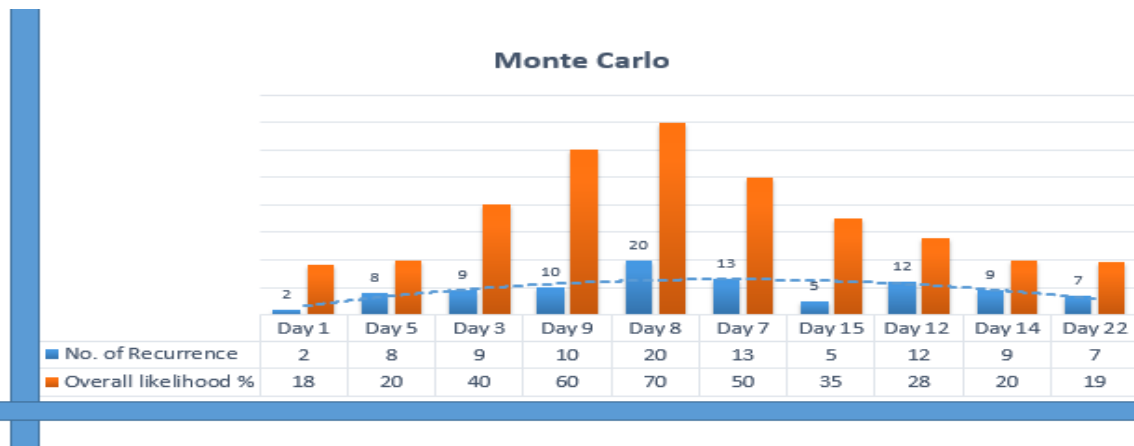
▪ **Decision Tree Analysis:** A decision tree is a map of the possible outcomes of a series of related choices. It allows an individual or organization to weigh possible actions against one another based on their costs, probabilities, and benefits. The map can be used either to drive informal discussion or to map out an algorithm that predicts the best choice mathematically, the map is usually starts with a single node and branches into some possible outcomes, each outcome leads to additional nodes, which branch off into other possibilities that shape a map or tree, https://www.edureka.co/blog/decision-trees/
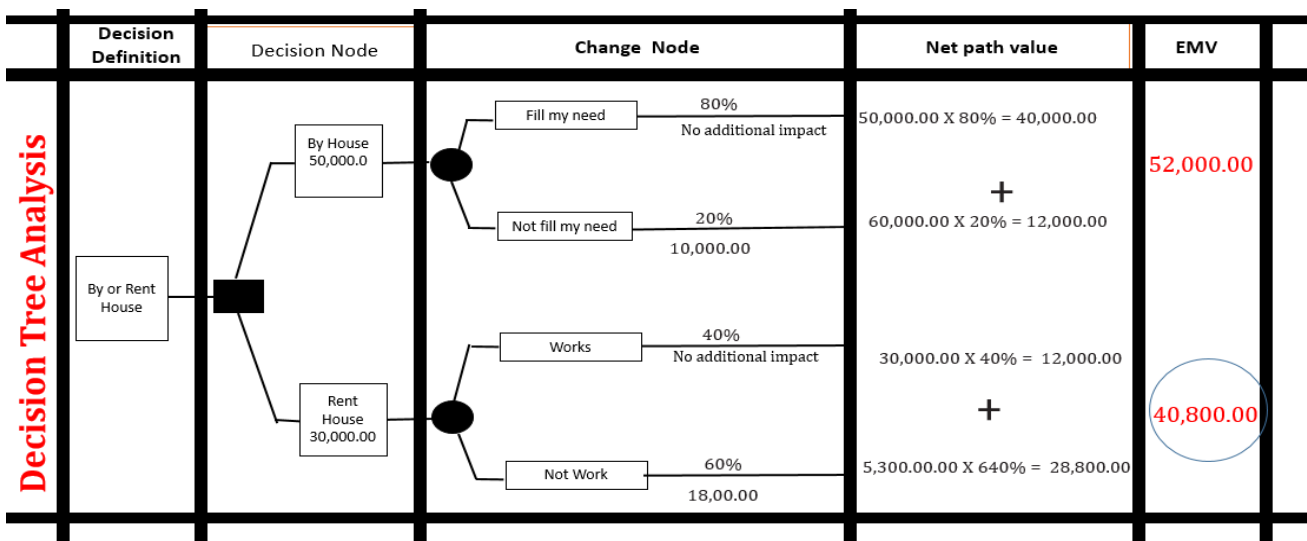
4.2.3   Expert Value Judgment
Described in chapter (4) clauses # 1.2.1 +2.2.1 + 3.2.1+ 4.2.1 +5.2.1+6.2.1
Described in chapter (5) clauses #1.2.1+3.2.1
Described in chapter (6) clauses # 1.2.3+3.2.1+4.2.1
Described in chapter (7) clauses #1.2.1+2.2.3
Described in chapter (10) clauses # 3.2.2
Described in chapter (11) clauses # 2.2.7 +3.2.6 + 2.2.4+4.2.3

4.3 Outputs

4.3.1   Project Document Updates
Described in chapter (4) clause #3.3.5 + 4.3.3 +5.3.3
Described in chapter (5) clause# 3.3.2+4.3.4+5.3.3+6.3.5
Described in chapter (6) clause #2.3.2+3.3.3+4.3.2+5.3.4+6.3.5
Described in chapter (7) clause # 1.3.3+2.3.3+3.3.6
Described in chapter (8) clause # 1.3.5+2.3.4+3.3.7

Described in chapter (10) clause # 1.3.2 + 2.3.3 +3.3.4
Described in chapter (11) clause #4.3.1

5. Plan Risk Responses Process

Plan Risk Responses is the process of developing options and actions to enhance opportunities and to reduce threats to project objectives. The key benefit of this process is that it addresses the risks by their priority, inserting resources and activities into the budget, schedule and project management plan as needed. The said process builds upon the information gathered from the previous four process steps:
https://www.pm-primer.com/plan-risk-responses-process/

- Plan risk management which describes how risk management will be implemented via the risk management plan
- Identify risks along with their causes and responses and goes on to set up the risk register
- Perform quantitative risk analysis which ranks and prior advises the risks
- Perform quantitative risk analysis which sets a quantified value to the ranked risks usually in terms of cost or time

5.1 Inputs

5.1.1 Risk Register
Described in chapter (1) clauses # 6.1.8
Described in chapter (3) clauses # 6.7
Described in chapter (7) clauses # 1.1.4
Described in chapter (8) clauses # 1.1.5
Described in chapter (11) clauses # 2.3.1 +3.1.1+4.1.1+5.1.1

5.1.2 Risk Management Plan
Described in chapter (11) clauses # 1.3.1 + 2.1.1 + 3.1.2 + 4.1.2 +5.1.2

5.2 Tools and Techniques

5.2.1 Strategies for Negative Risks or Threats

- **Avoidance Risk** : Avoidance risk is the 1st risk response strategy a project can consider, when a project chooses the avoidance option, it is closing off any possibility that the risk will pose a threat to a project , a project will often choose this option if the risk will impact employee safety, violates the law or poses a threat to the project's existence, so, quitting a particular action or opting to not start it at all is one option for responding to risk , avoidance may be include halting production line, selling a part of assets, or halting some sort of expansion. Avoidance is not always the practical option, as McKinsey reported that projects who exercise the avoidance option too much can end up because it is works below risk appetite, and this will squander reasonable opportunities to grow,
https://www.erminsightsbycarol.com/risk-response-strategies/

- **Reducing Risk**: Reducing risk is the 2nd risk response strategy a project can consider, when a project chooses the reducing option, it is not closing off any possibility that the risk will pose a threat to a project , but reducing the possibility of occurrence and brings the risk within a project tolerance level, reducing risks is reducing the likelihood or impact of a loss when the risk is slightly higher than the appetite, For example when you get in a car, you put on your seatbelt, this action will not reduce the risk of an accident, but it can reduce the negative impact of the accident, meantime , the common strategy of reduce risks is the financial one when they request two signatures of checks that exceed a certain amount, and technically, that preventive maintenance of machines may contribute to reduce risks, and from the marketing point of view the competitive advantage may contribute to reduce risks, and from profitability side measuring financial ratios, especially the return on investment may contribute to reduce risks,

- **Transferring Risk**: Transferring risk is the 3nd risk response strategy a project can consider, when a project chooses the transferring option, it is eliminating or reducing the risk not closing off any possibility of occurrence, but rather delegate or transfer it to a third-party ,the two most common example of transferring risk is the purchasing of insurance on fire , or on health insurance , or insurance on life , or insurance on personal loans, and so on , in the case of an insurance policy, the risk is transferred to the insurance company in exchange for a price, or premium. For example when you get in a car, you put on your

seatbelt, this action will not reduce the risk of an accident, but it can reduce the negative impact of the accident, on the other hand, purchasing insurance for a building doesn't reduce the risk of a fire, but instead provides a financial protection in the event one occurs. The important point is, transferring the risk only kicks in post-event. Indemnification provisions are common in construction and service job contracts, rental contracts, purchase order agreements, lease agreements, consulting agreements and,

- **Accepting Risk:** Accepting risk is the 4th risk response strategy a project can consider, when a project chooses the accepting option, it is accepting the risk as is and do nothing against it , this risk response strategy is often used for risks with a low likelihood of occurring or that would have a low impact on a project, but if its happen, a project already have a budget reserves set aside to deal with suck risks, the common risk in this paragraph is the risk that have nature of distance future occurrence, most of project accept all risks that fall into the accept category. Generally, for risks a project reduces, a project still accepting a part that is within its risk tolerance level, and for risks a project transfers to insurance policy, a project still accepting a part that relates to its monthly premiums and deductible.
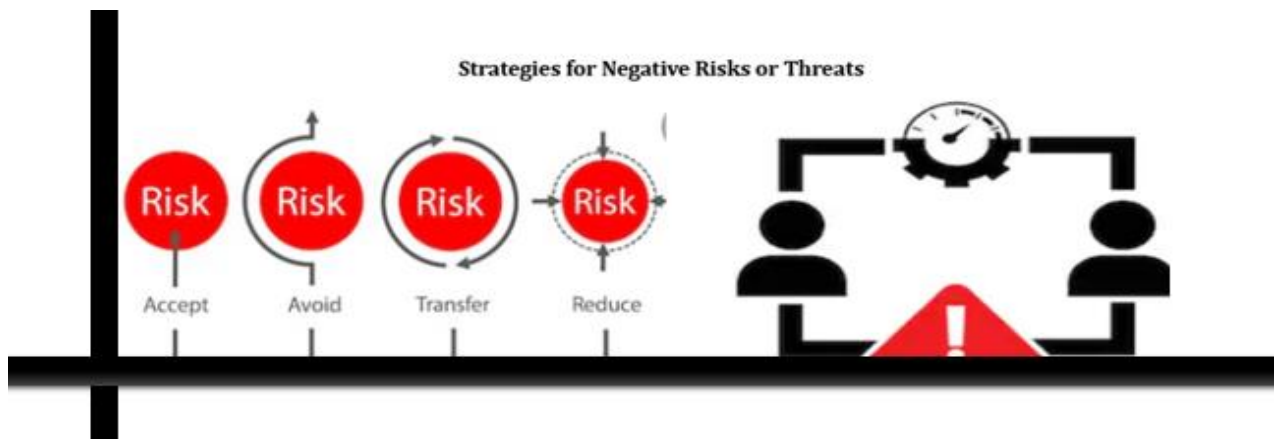
5.2.2 Strategies for Positive Risks or Opportunities

- Cost Risk: In case of poor cost estimating accuracy lead to escalation of project costs causes scope creep,
- Schedule Risk: In case activities take longer than expected time will increase cost, delay of deliverables, possible loss , and,
- Performance Risk: In case the project fails to produce results consistent with project specifications is a risk,
- Governance Risk: It's related to management performance with regard to ethics, community oversight and company reputation,
- Strategic Risks: It is related to errors in strategy, such as choosing a technology that can't be made to work,
- Operational Risk: It is related to poor operating process controls, procurement, testing, inspection, delivery, and,
- Market Risks: It's may include competition risk, foreign exchange risk, interest rate risk, liquidity risk, credit risks, changes risk,
- Legal Risks: It's related to legal obligations such as contract risks and litigation brought against the organization,
- Majeure condition Risk: It's related to external hazards like storms, floods, earthquakes, vandalism, terrorism, labor strikes, civil unrest, disorder, disease outbreaks, and

5.2.3 Contingent Response Strategy

A contingent response strategy is developed in advance and designed to be used only if the risk event occurs. As with a fallback plan, the contingent response strategy is a critical communication tool to ensure that all team members know what actions to be taken when a specified risk happen. Risk management may not always involve taking proactive action. Certain risks may be more appropriate for a contingent response strategy, designed to only be implemented if the risk event occurs. If the primary response is ineffective, a fallback plan, also developed in advance, may be implemented,

https://www.pmlearningsolutions.com/blog/fallback-plan-versus-contingent-response-strategy-pmp-concept-33#:~:text=A%20contingent%20response%20strategy%20is,the%20specified%20risk%20event%20occurs.

Contingent response plan + fallback plan are developed to associate with certain identified risks. Both are planned and developed in advance to fast respond to if the risk event occurs ,

5.2.4   Expert Value Judgment
Described in chapter (4) clauses # 1.2.1 +2.2.1 + 3.2.1+ 4.2.1 +5.2.1+6.2.1
Described in chapter (5) clauses #1.2.1+3.2.1
Described in chapter (6) clauses # 1.2.3+3.2.1+4.2.1
Described in chapter (7) clauses #1.2.1+2.2.3
Described in chapter (10) clauses # 3.2.2
Described in chapter (11) clauses # 2.2.7 +3.2.6 + 2.2.4

5.3 Outputs

5.3.1   Risk Register Updates
Described in chapter (11) clauses # 2.2.7 +3.2.6 + 2.2.4 + 5.3.1

5.3.2   Risk Related Contract Decisions

Risk-related contract decisions are related to the strategy of transferring risk to a third party, and this requires a contractual agreement with the said third party such insurance, this type of decision nor acquire a specific plan, but contractually agreed,

5.3.2 Project Management Plan Updates
Described in chapter (4) clause # 3.3.4 +4.3.2+5.3.2
Described in chapter (5) clause# 6.3.4
Described in chapter (6) clause #6.3.4
Described in chapter (7) clause # 3.3.5
Described in chapter (8) clause # 2.3.3+3.3.6
Described in chapter (9) clause # 2.3.3
Described in chapter (10) clause #1.3.2 +2.3.2+ 3.3.3+2.3.2+3.3.3+5.3.2
Described in chapter (11) clause # 5.3.3

5.3.3   Project Documents Updates
Described in chapter (4) clause #3.3.5 + 4.3.3 +5.3.3
Described in chapter (5) clause# 3.3.2+4.3.4+5.3.3+6.3.5
Described in chapter (6) clause #2.3.2+3.3.3+4.3.2+5.3.4+6.3.5
Described in chapter (7) clause # 1.3.3+2.3.3+3.3.6
Described in chapter (8) clause # 1.3.5+2.3.4+3.3.7
Described in chapter (10) clause # 1.3.2 + 3.3.3 +2.3.2 +3.3.3+5.3.3
Described in chapter (11) clause # 5.3.4 + 5.3.3

6. Monitor and Control Risk Process

 Monitor and Control Risk process involves implementing response plan, tracking and monitoring the identified risks, in addition to identifying and responding to the secondary risks (new risks) when they occur, and improving the risk management process, and keep track of about how your risk responses are performing against the plan as well as the place where secondary risks (new risks) to the project are managed. Risks can have negative and positive impacts on project objectives. Positive risks are taken by the project because its potential benefits exceed the traditional approach. Negative risks are negatively affect the cost of the project or its schedule. However , the purpose of monitoring and controlling risks process is to get the following benefits:

- Ensuring the efficiency of control on risks that have direct impact on project objective,
- Ensuring the efficiency of control on the qualitative and quantitative risks and prevent the probability of occurrence,
- Ensuring the availability of fallback plan to respond to the sudden risks may appear,
- Implement a continuous process for identifying, qualifying, quantifying, and responding to secondary risks,
- Keep the project objective stands with required plan,

6.1 Inputs

6.1.1   Risk Register
Described in chapter (1) clauses # 6.1.8
Described in chapter (3) clauses # 6.7
Described in chapter (7) clauses # 1.1.4
Described in chapter (8) clauses # 1.1.5
Described in chapter (11) clauses # 2.3.1 +3.1.1+4.1.1+5.1.1+6.1.1

6.1.2   Project Management Plan
Described in chapter (4) clauses # 2.3.1 +3.1.1 + 4.1.1 + 5.1.1 +6.1.1
Described in chapter (5) clauses # 1.3.2 + 5.1.1+6.1.1
Described in chapter (6) clauses # 6.1.1
Described in chapter (7) clauses #3.1.1
Described in chapter (8) clauses #2.1.1+3.1.1
Described in chapter (9) clauses #2.1.1+3.1.2 + 4.1.2
Described in chapter (10) clauses #1.1.1+3.1.1
Described in chapter (11) clauses #6.1.2

6.1.3   Work Performance Information

Described in chapter (5) clauses # 3.3.2 +5.1.2
Described in chapter (6) clauses # 6.3.1+6.1.3
Described in chapter (7) clauses # 3.1.3
Described in chapter (8) clauses # 2.1.3
Described in chapter (10) clauses # 3.3.1
Described in chapter (11) clauses # 6.1.3

6.1.4   Work Performance Reports

Described in chapter (4) clauses # 4.1.2
Described in chapter (9) clauses # 4.1.4
Described in chapter (10) clauses # 2.1.2 + 2.2.5
Described in chapter (11) clauses # 6.1.4 + 6.1.4

6.2 Tools and Techniques

6.2.1   Risk Reassessment

Risk reassessment involves identifying the secondary risks (new risks) and reassessing current ones. It is also involved in closing risks that are outdated (treated) and no longer threatening to the project. Project risk reassessments should be regularly scheduled. The amount and detail of repetition that are appropriate depends on how the project progresses relative to its objective. Risk reassessment is processing due to risk change and their impact is changing also, and might have a great impacts than originally thought as more facts are discovered. Reassessment of risks should be a regular activity performed by everyone involved on the project. Monitor the risk register, including those risks that have low scores, and risk triggers. You should also monitor the risk responses that have been implemented for their effectiveness in dealing with risk. Risk reassessment shall include the following subjects that described in this chapter under the following subjects:

▪ Risk Probability and Impact Assessment   - clause # 6.2.1
▪ Risk Data Quality Assessment- clauses # 6.2.3
▪ Risk Urgency Assessment- clauses # 6.2.5

6.2.2   Risk Audits

Risk audit is the process of examination and documentation of the identified risks, and measuring the degree of response to identified risks. When risk audit performed, it is important to examine the risk responses to determine if they are effective in handling the root causes. It is also necessary to document the output of the audit as it serves as a reference for the entire project. Risk audit is iterative process because risks are change according to many issues. The main idea of interactive risk audit is become more proactive process are dealing with risks also. The project manager is the key individual who is responsible for making sure that the risk audit is performed at the appropriate frequency. The frequency of conducting this project management tool is defined in the risk management plan. This means that it can be included during management review meetings or randomly.
The management functions are subject to risk audit, and the organization can benefit from having risk internal and external audit to secure:

▪ The efficiency of project management plan,
▪ The efficiency of risk quality policy,
▪ The efficiency of Internal Audit Plan, that serve as a reference to the future Internal Audit Plan
▪ The efficiency of Internal Audit Program, and the coverage area by audits,
▪ The efficiency of solving the finding in the Finding statement,
▪ The efficiency of Corrective action + Preventive action,
▪ The efficiency of Preventing reoccurrence of solved risks,
▪ The risks are being monitored and managed appropriately,
▪ The correct quantitative analysis techniques are being used,

- Addressing secondary risks,
- The competence of audit team who assess the identified risks,
- Black swan events are adequately managed and controlled,
- Applying the highest level objective that address key risks,
- A fresh look to keep pace with organizational change,
- The policies actually provide the coverage expected
- Progressive elaboration,

Risks Audit Tools
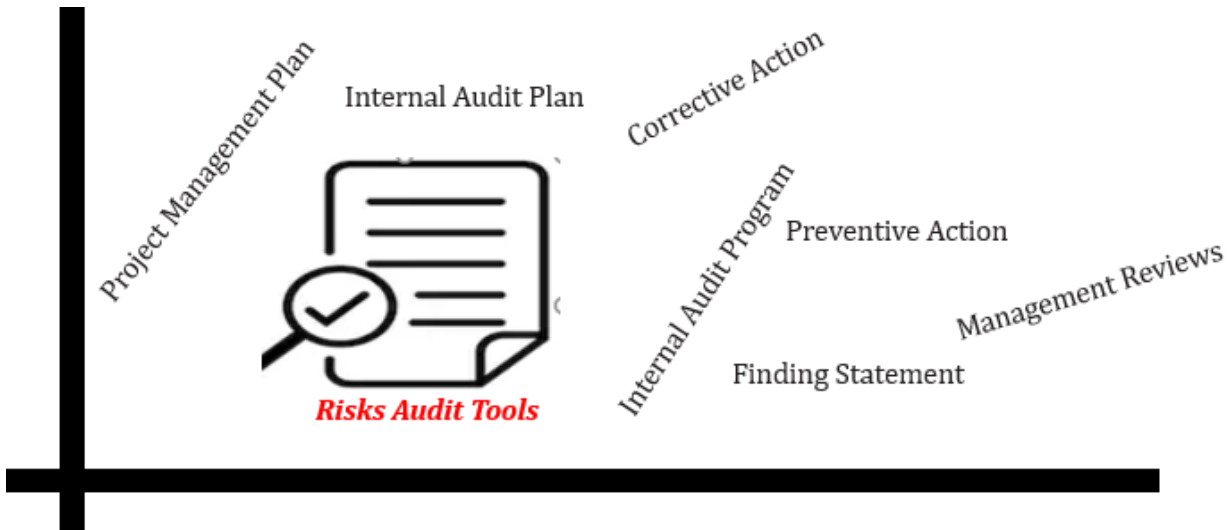
6.2.3   Variance and Trend Analysis

Described in chapter (5) clauses # 6.2.1
Described in chapter (6) clauses # 6.2.2
Described in chapter (7) clauses # 3.2.5
Described in chapter (11) clauses # 6.2.3 under the title of Variance and Trend Analysis not Variance Analysis

6.2.4   Technical Performance Measurement (TPM)

Technical performance measures are tools that show how well a system is satisfying its requirements or meeting its goals, its provide evaluation of the product and the process through design, implementation and test. Source: Technical Performance Measures Jim Oakes, Rick Botta and Terry Bahill BAE SYSTEMS San Diego, CA

- **The usage of Technical Performance Measurement (TPMs)**
- o In forecasting the values that planned to be achieved,
- o To provide an idea when comparing actual performance with planned performance,
- o To provide an early prediction of issues that require management attention,
- o To Provide support to assess change impact,
- o To support options of design reviews,

- **The Characteristics of Technical Performance Measurement (TPMs)**
- o TPMs is important and relevant to high level events,
- o TPMs is easy to measure + to control the measured parameter
- o TPMs performance is expected to improve time + cost + quality + scope creep,
- o TPMs is important if the risks exceed the threshold,
- o TPMs is important when the corrective action must be known,
- o TPMs is tailored for high level objectives,
- o TPMs shall be documented,

- **The creation of criteria requirements for Technical Performance Measurement (TPMs)**
- o Prioritize requirement that have high level impact on mission achievement + customer satisfaction + cost + Time,

- o Prioritize requirement that have high level desired performance that improve time +quality + deliverables,
- o Prioritize requirement that have high level desired performance on controls,
- o Prioritize requirement that less than 1% of requirements should have TPMs.

- ▪ **The most common examples on Technical Performance Measurement (TPMs)**

- o Reliability
- o Power required
- o Weight
- o Throughput (Productivity)
- o Human Factors
- o Response time
- o Complexity
- o Availability
- o Accuracy
- o Speed

- ▪ **The collection Technical Performance Measurement (TPMs)**

- o TPMs require quantitative data to evaluate the likelihood of satisfying the system requirements
- o Gathering such data can be expensive
- o just the high priority requirements required TPMs.
- o As a rule of thumb, less than 1% of requirements should have TPMs.
- o A TPM's values change with time, hopefully getting closer and closer to the goal
- o TPMs are linked to a requirement, have quantitative values and a risk level The big picture
- o Program manager's tradeoff cost, schedule and technical performance of a system
- o Cost and schedule are often tracked with an earned value system
- o TPMs give managers a way to track technical performance
- o Managers can adjust cost and schedule per TPM forecasts

6.2.5   Reserve Analysis
Described in chapter (6) clauses # 4.2.6
Described in chapter (7) clauses # 1.2.6+2.2.2
Described in chapter (11) clauses # 6.2.5

6.2.6   Status Meetings
Described in chapter (4) clauses # 6.2.2
Described in chapter (5) clauses # 1.2.4
Described in chapter (10) clauses # 1.2.5+3.2.3
Described in chapter (10) clauses # 6.2.6

6.3 Outputs

6.3.1   Risk Register Updates
Described in chapter (11) clauses # 2.2.7 +3.2.6 + 2.2.4 + 5.3.1

6.3.2   Organizational Process Assets Updates
Described in chapter (2) clause # 2.5
Described in chapter (4) clause #6.3.2
Described in chapter (5) clause # 6.3.2
Described in chapter (8) clause # 2.3.1+3.3.4
Described in chapter (9) clause # 4.3.2
Described in chapter (10) clause # 3.3.5

Described in chapter (11) clause # 6.3.2

6.3.3   Change Requests
Described in chapter (4) clauses # 3.3.3 +4.3.1+5.1.3
Described in chapter (5) clauses # 5.3.2+6.3.3
Described in chapter (6) clauses # 6.3.3
Described in chapter (7) clauses # 3.3.4
Described in chapter (8) clauses # 2.3.2+3.3.5
Described in chapter (9) clauses # 4.3.3
Described in chapter (10) clauses # 3.3.2
Described in chapter (11) clauses # 6.3.3

6.3.4   5.3.2 Project Management Plan Updates
Described in chapter (4) clause # 3.3.4 +4.3.2+5.3.2
Described in chapter (5) clause# 6.3.4
Described in chapter (6) clause #6.3.4
Described in chapter (7) clause # 3.3.5
Described in chapter (8) clause # 2.3.3+3.3.6
Described in chapter (9) clause # 2.3.3
Described in chapter (10) clause #1.3.2 +2.3.2+ 3.3.3+2.3.2+3.3.3+5.3.2
Described in chapter (11) clause # 5.3.3+6.3.4

6.3.5   Project Documents Updates
Described in chapter (4) clause #3.3.5 + 4.3.3 +5.3.3
Described in chapter (5) clause# 3.3.2+4.3.4+5.3.3+6.3.5
Described in chapter (6) clause #2.3.2+3.3.3+4.3.2+5.3.4+6.3.5
Described in chapter (7) clause # 1.3.3+2.3.3+3.3.6
Described in chapter (8) clause # 1.3.5+2.3.4+3.3.7
Described in chapter (10) clause # 1.3.2 + 3.3.3 +2.3.2 +3.3.3+5.3.3
Described in chapter (11) clause # 5.3.4 + 5.3.3

Chapter (12)

Project Procurement Management Process

Getting to Yes - Excellent Project Management

Chapter (12)

Project procurement Management

Project procurement management is an agreement with outside suppliers (vendors + seller + provider) in order to obtain or purchase goods, services, or result from outside the project team, the project can be either the supplier or purchaser (buyer) of the products, services, or results. Project Procurement Management shall be continually collaborating between the supplier and the purchaser. Procurement is the acquisition of goods, services or works from an external source. It is favorable that the goods, services, or works are appropriate and that they are procured at the best possible cost to meet the needs of the purchaser in terms of quality and quantity, time, and location. Organizations require procurement for many reasons:

https://pmstudycircle.com/2013/12/types-of-procurement-contracts-used-in-project-management/

- They don't have the expertise to complete a certain job.
- They are busy with other responsibilities.
- Procurement is cheaper than doing it yourself.

to keep things clear we have to define:

- A vendor is offering goods or services or result,
- A purchaser is buying goods or services or results,
- A contract outlines terms of agreement between the vendor + the purchaser,
- A contract is a legal, binding document.
- Technical Term of Delivery (TTD) is the contract conditions,
- Contact most condition (Cost + Quality + Delivery Time + continuity)

Project Procurement Management includes the contract management and change control processes required to develop and administer contracts or purchase orders issued by authorized project team members. Project Procurement Management also includes administering any contract issued by an outside organization (the buyer) that is acquiring the project from the performing organization (the seller), and administering contractual obligations placed on the project team by the contract. The relationship between the vendor and purchaser shall be contractually agreed, and shall be implemented and shall be document by the force of the contract, in implementation the following documents shall be at the surface of the table:

- Material specification (standards) shall be with the buyer to work with,
- Three quotations at least in pure completion market,
- Purchase order from the purchaser,
- Payment condition (L/C, telex transfer, cash, and) are a binding documents,
- Technical Term of Delivery (TTD)

Element of contract shall be known well to project team which are (capacity + confederation + offer + legal purpose +Acceptance), management and change control processes required to develop and administer contracts or purchase orders issued by authorized project team members Project Procurement Management also includes controlling any contract issued by an outside organization (the buyer) that is acquiring deliverables from the project from the performing authority , Project Manager's Role in Procurement Contracts are not limited to:

- Understand the contract and tailor the contract to the project needs as appropriate,
- Protect the project by defining the scope baseline and ensuring that the work can be done with high level documentation,
- Identify risks associated with the contract,
- Protect the relationship with among the interested parties,
- Adjust the project schedule to include enough time for the procurement process,
- Ensure that changes follow the contract terms and the integrated change control process,
- Majeure The contract must include force majeure conditions that may occur to prevent conflicts,

1. Plan Procurement Process

Plan procurement management is the processes that secure work-run, by providing the resources of material, or services or results to run the project from outside the organization (outsourcing). The said plan shall include the process that securing and monitoring of contracts needed in those regards. The procurement plan provides a guidance of documenting project procurement decisions, and specifying the approach, and identifying potential vendor, the key benefit of this process is that it determines whether to acquire inside support or outside support, and how to get it , and how much support will be needed.

Plan procurements determines which components of services of a project will need to be performed or made internally, at which of those will need to be procured for an external source, once this has been decided the project manager will determine the appropriate types of contracts that will need to be used on the project, by the way a project may have several subcontractors and the services may be used in one or more phases of the project, so any of the procurement processes may need to be performed several times throughout the project

1.1 Inputs

1.1.1 Scope Baseline
Described in chapter (5) clauses # 4.3.3
Described in chapter (6) clauses # 1.1.1
Described in chapter (7) clauses # 1.1.1+2.1.3
Described in chapter (8) clauses #1.1.1
Described in chapter (11) clauses #2.1.4
Described in chapter (12) clauses #1.1.1

1.1.2 Requirements Documentation
Described in chapter (5) clauses # 2.3.1+3.1.2+4.1.2+5.1.2+6.1.3
Described in chapter (12) clauses # 1.1.2

1.1.3 Teaming Agreement

A teaming agreement is a contract between two or more parties named "Team Members" work to regulate the rights and obligations of each party against others, where one of them pursues a tender or contract with a third party based on a contact named "Prime Contract", or agreement between two or more entities to act together based on a contract named " prime contractor" for submitting a joint bid, quote, or proposal, a teaming agreement shall be flexible , and sharing the resources in clear clauses within the Team Members, for more calcification we can present some common terms and conditions expected to be included in the Teaming Agreement:

- Confidentiality: None of the team members has the right to disclose confidential information to whom out of the agreement,

- Dispute Resolution: Determination the laws + legislation governing the dispute settlement among teem members,

- Intellectual property: Determining the form of intellectual property that was created during the term of the agreement, and determining the father of intellectual property, and determining how to assign it or license it to a certain party,

- Liability: Determining the liability of losses + damages among team members in relation to goods & services provided, and determining liability of compensation in a manner that does not infringe intellectual property rights,

- Leadership: Determining the party who controls the contracting process and how is communication to be regulated,

- Management: Determining representatives from each team member to follow the implementation of the contractor, and determining the documentation necessary to prove good implementation, and determining the legal environmental commitment,

- Non-fraud: Non is entitled to submitting offers individually to the third party, and both parties must act in good faith and abide by the provisions of the agreement

- Parties Relationship: The relationship between the contractor and the sub-contractor shall be worked at the principal of agent and contractor,

- Resource Sharing: Determining the property owner, and the human and financial resources must be provided by team members in order to bid for the base contract, and determining if the other team member have a license to use these resources,

1.1.4 Risk Register
Described in chapter (1) clauses # 6.1.8
Described in chapter (3) clauses # 6.7
Described in chapter (7) clauses # 1.1.4
Described in chapter (8) clauses # 1.1.5
Described in chapter (11) clauses # 2.3.1 +3.1.1+4.1.1+5.1.1+6.1.1
Described in chapter (12) clauses # 1.1.4

1.1.5 Risk Related Contract Decisions
Described in chapter (11) clauses # 5.3.2
Described in chapter (12) clauses # 1.1.5

1.1.6 Activity Resource Requirements
Described in chapter (6) clauses # 3.3.1+4.1.3+5.1.4
Described in chapter (9) clauses # 1.1.1
Described in chapter (12) clauses # 1.1.6

1.1.7 Project Schedule
Described in chapter (6) clauses # 5.3.1 +6.1.2
Described in chapter (7) clauses # 1.1.2+2.1.4
Described in chapter (12) clauses # 1.1.7

1.1.8 Activity Cost Estimates
Described in chapter (7) clauses # 1.3.1+2.1.1
Described in chapter (11) clauses # 2.1.2
Described in chapter (12) clauses # 1.1.5

1.1.9 Cost Performance Baseline
Described in chapter (7) clauses # 2.3.1
Described in chapter (8) clauses # 1.1.3
Described in chapter (12) clauses # 1.1.9

1.1.10 Enterprise Environmental Factors (EEF)

Described in chapter (2) clauses # 4.1
Described in chapter (4) clauses #1.1.4 + 2.1.3+ 3.1.3 + 4.1.3+5.1.4
 Described in chapter (6) clauses # 1.1.2+3.1.4+4.1.6+5.1.8
Described in chapter (7) clauses # 1.1.5
Described in chapter (8) clauses # 1.1.6
Described in chapter (9) clauses # 1.1.2
Described in chapter (10) clauses # 1.1.3
Described in chapter (11) clauses # 1.1.4+2.1.10
Described in chapter (12) clauses # 1.1.10

1.1.11 Organizational Process Assets (OPA)

Described in chapter (2) clauses # 4.2
Described in chapter (4) clauses # 1.1.5+2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.3
Described in chapter (5) clauses # 1.1.5+3.1.3+4.1.3+6.1.5
Described in chapter (6) clauses # 1.1.3+2.1.5+3.1.5+4.1.7+5.1.9+6.1.4+6.3.2
Described in chapter (7) clauses # 1.1.6+2.1.7+3.1.4+3.3.3
Described in chapter (8) clauses #1.1.7+3.1.6
Described in chapter (12) clauses # 1.1.11

1.2 Tools and Techniques

1.2.1 Make- or- By Analysis

A make-or-buy analysis is the very first tool and technique that is used in project management procurement or in-house manufacturing. Project team member shall identify if the project can produce a specific item in-house by the project team facilities, or should just be purchased from an external supplier (outsourcing). The decision of manufacturing or purchasing is based on the Make-or-Buy Analysis. The following most important concepts mentioned here under represent the Decisive answer to decide:
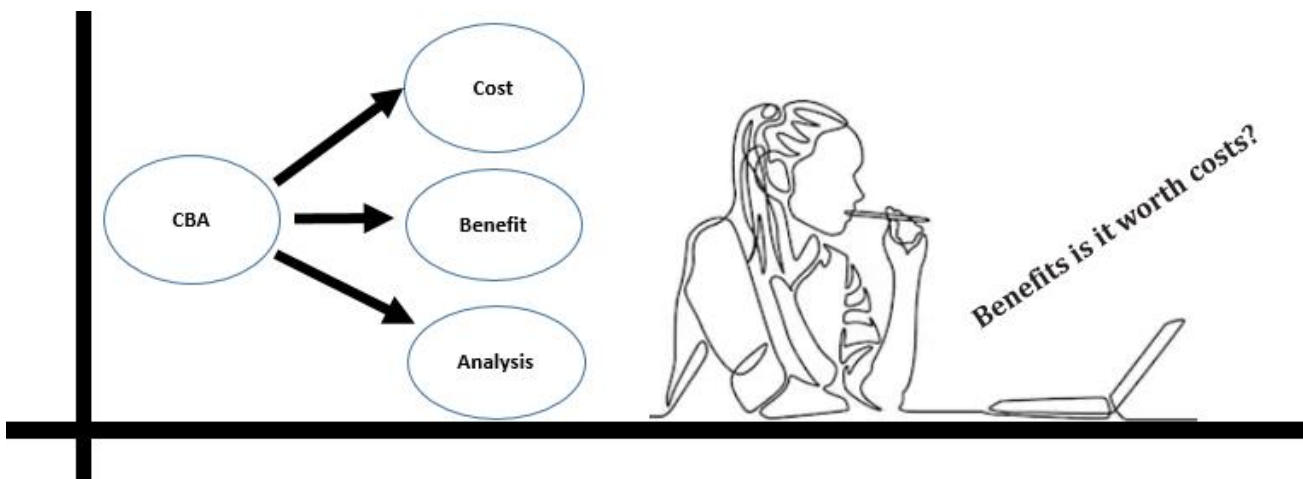
■ **Analyze Costs:** Project team member shall analysis the comprehensive cost of manufacturing vs. the comprehensive cost of purchasing of a specific item and to compare the cost. So, you need to consider the cost types:

- o Direct cost: These costs are those directly linked to doing the work of the project, such as hiring specialized contractors, buying software licenses or commissioning new building, and,

- o Indirect cost: These costs are those not linked to doing the work of the project, but are linked with the continuity of doing business overall , such as heating, lighting, office space rental, and,

- o Fixed cost: These costs are those not linked to how long your project goes on for, or everything that is a one-off charge, such as fees, the pay for one-time advertising, the paying for a day of Agile consultancy to help you start the project up the best way,

- o Variable cost: These costs that change with the length of your project, such as the pay for staff salaries, the cost of maintenance, and

- o Sunk cost: These are costs that have already been incurred or paid, but considered as" Loss", they could be made up of any of the types of cost above but the point is that they have happened, these cost may paid for wrong action or wrong estimation or wrong decision, it is necessary to worry about,

- ▪ **Analyze time:** Project team member shall analysis the amount of time is needed to produce in-house rather than purchasing, for example:

- o Does your project have determined how much time it takes to produce this work in-house?
- o Do you have the time to do it in-house?
- o What would your team members be postponing if they decide this work in-house?

- ▪ **Analyze existing skills**: Project team member shall analysis the availability of quantitative and qualitative skills that can work to do the task with their in-house resources, and shall analyze the need for training or the need for new expert temporary or permanent for raising competencies, and

- ▪ **Analyze existing resources:** Project team member shall analysis the availability of resources, such as machines, testing devices, organizational process assets (OPA), the availability of inputs such as raw materials and the cost of shipping and storage, and

- ▪ **Analyze quality:** Project team member shall analysis shall benchmark their product quality with similar products, and shall understand the need for developing the product that made in-house to keep up with the development in the markets

- ▪ **Analyze risk:** Project team member shall analysis the expected benefits from in-house manufacturing vs. purchasing from outside (Outsourcing), analyzing risk should ask some questions such as:

- o Will this be a once off requirement?
- o Will it provide any additional benefits- training, upskilling opportunities etc.?
- o Are there any security/confidentiality risks in outsourcing?
- o Do we have the time to do in-house manufacturing?
- o Can we provide the necessary resource at a glance?
- o Do we need close monitoring and controls?
- o Will our quality well really grade and have effect?
- o What extent of risky in-house manufacturing?
- o Is it easy to treat risks (avoid, transfer, accept, reduce)?
- o Do life-cycle costs like maintenance costs from supplier?
- o What do we own if we outsource of intellectual property and do in-house manufacturing?

1.2.2 Expert Value Judgment
Described in chapter (4) clauses # 1.2.1 +2.2.1 + 3.2.1+ 4.2.1 +5.2.1+6.2.1
Described in chapter (5) clauses #1.2.1+3.2.1
Described in chapter (6) clauses # 1.2.3+3.2.1+4.2.1
Described in chapter (7) clauses #1.2.1+2.2.3
Described in chapter (10) clauses # 3.2.2
Described in chapter (11) clauses # 2.2.7 +3.2.6 + 4.2.3 + 2.2.4

Described in chapter (12) clauses # 1.2.2

1.2.3 Contract Types

A contract is a binding agreement between a buyer and a seller. The purchase contract is key to the relationship between seller and buyer because it provides a clear framework for how they will deal with each other. Purchasing exchange between the sellers + the buyers + the manufacturers + the contractors will creates new productive entities in which the principle of specialization prevails in production field, and push the development process forward, and adds new projects + new job opportunities + makes obtaining products easier + faster with + increases job opportunities + push economic development forward,

Base on the above, the procurement departments is important in any project for its effective role in communicating, negotiating and providing goods and services at competitive prices within the limit of contracts that preserve the rights of all parties, and raise the level of commercial relations between nations, the most relation need contract between parties, so the following types of contracts are the most common in use:

https://pmstudycircle.com/2013/12/types-of-procurement-contracts-used-in-project-management/

Contract Types

- Fixed-Price Contract (lump-sum contract)
  - Firm-Fixed-Price contract (FFP)
  - Fixed Price Incentive Fee contract (FPIF)
  - Fixed Price with Economic Price Adjustment Contract (FP-EPA)
- Cost Reimbursable Contract (Cost Plus Contract)
  - Cost Plus Fixed Fee (CPFF)
  - Cost Plus Incentive Fee (CPIF)
  - Cost Plus Award Fee (CPAF)
  - Cost Plus Percentage of Cost (CPPC)
- Time and Materials Contract
  - a hybrid of Fixed-Price +
  - Cost Reimbursable contracts

▪ **Fixed-Price Contract:** A Fixed-Price contract (lump-sum contract) is use when the scope of the project work is fixed. Once the contract is signed, the seller is contractually bound to complete the task within the agreed price and time, and no price change is expected, and the seller will bear most risk because the price has become non-negotiable unless the scope of the project work changes, this type of contracts is suitable for controlling costs and scope creep, scope creep is a costly matter to both parties, but once it is happened , then the contract shall to amended because the prices or and the TTD will subject to amendment also, as   the contractors are usually getting the contract by bidding the lowest price and then try to generate extra revenue at any opportunity such as an added scope. From the beginning both parties must be sure in defining the scope as detailed as possible to prevent struggle because the binding contract is turnkey procurement contracts with Fixed-Price. Fixed-Price contracts are three 3 categories:

o **Firm Fixed-Price Contract (FFP):** This is a binding contract to the seller, the seller has to complete the job within an agreed term & condition of the contract such the price + time+ quality + quantity+ others, the seller is responsible for any risks or increase in production cost or the increase in sunk cost at his part . A Firm-Fixed-Price contract is mostly used in government + semi-government + when the scope of project work is defined with high detail. This contract is easy to float and receive bids, and it is evaluated on a cost basis, which is fairly quick. In case the seller bears the risk or the cost become higher as a result of scope not clearly detailed, then the struggle will appear and both of them seller and buyer will between the hammer and anvil. Example: The contractor has to install the machines of A factory within 6 months at 20,000 USD,

o **Fixed-Price Incentive Fee Contract (FPIF):** This is a binding contract to the seller but it is flexible with seller performance, here the seller may receive an incentive if they perform well, the said incentive may lower the risk and the cost incurred by the seller, the well performance is connected with quality + time+ better design performance + more safety. Example, the seller can get 2% on purchases if he advances the product before binding time,

o **Fixed-Price with Economic Price Adjustment Contracts (FP-EPA):** This type of contract is flexible with economic fluctuations; the project can use a Fixed-Price with Economic Price Adjustment Contract when the agreement will take many years. This contract has a special provision that protects the seller from inflation. Example, purchasing contracts of pure copper for manufacturing cables with long contract consider inflation fluctuation increases by **0.5** % based on **Customer** Price **Index after** a certain period,

▪ **Cost Reimbursable Contract:** A Cost Reimbursable Contract (Cost Disbursable Contract) mostly include incentive clauses where if the seller meets or exceeds selected project objectives, such as schedule targets or total cost, then the seller receives from the buyer an incentive or bonus payment. Cost plus fixed fee (CPFF) contract. Projects can use a such contract when there is uncertainty in the scope, or if the risk is higher, that is why all cost during the entire project duration will be charged to the buyer and the buyer has to reimburse this cost to the seller. Here the seller is risk free because of the buyers usually carry the bigger risk as the total cost is uncertain. Cost Reimbursable Contract are three **4** categories**:**

o **Cost Plus Fixed Fee Contract (CPFF):** This type of contract is a specific type of contract wherein the contractor is paid for the normal expenses for a project, plus an additional fixed fee for their services. These allow the contractor to collect a profit on the project, and they encourage economic production in various industries. This type of contract can be used when both the contractor and the owner agree that the contractor is entitled to a fee in addition to the project expenses. There may be various reasons for this agreement, but cost-plus contracts should also spell out the basic reasons that the contractor is entitled to the fee. There should also be provisions addressing what legal consequences should follow if the fee provisions aren't upheld. https://www.legalmatch.com/law-library/article/cost-plus-fixed-fee-contracts.html

o **Cost Plus Incentive Fee Contract (CPIF):** This Type of contract in which the buyer reimburses the contractor for the contractor's allowable costs (as defined by the contract) and the seller earns its earns fee (profit) if it meets defined performance or cost criteria such as a specifies a target cost + target fee + minimum fee+, maximum fee, + fee adjustment formula, in this type of contract the seller will be reimbursed for all costs plus an incentive fee based upon achieving certain performance objectives mentioned in the contract. Example: If the project is completed within the budget, the seller will receive 10% of the savings

o **Cost Plus Award Fee (CPAF):** This Type of contract is a contract that allows the seller to be reimbursed for the costs of performing the work and earn an additional amount for excellent performance. The amount of this fee is determined by an evaluation according to criteria stated in the contract, and it is generally nonnegotiable, because the performance criteria is defined and included in the contract and the fee determination is based solely on the determination of seller performance by the buyer and is usually not subject to appeals. Contract value = actual costs + buyer-defined performance fee. Example: If the seller completes the task by meeting or exceeding quality standards based on their performance, the buyer may give an award up to 5,000 USD

o **Cost Plus Percentage of Cost (CPPC):** This Type of contract is one that is structured to pay the contractor his actual costs incurred on the contract plus a fixed percent for profit or overhead (that is not audited/adjusted) and which is applied to actual costs incurred. Buyers often do not prefer this type of contract because the seller might artificially increase the costs to earn a higher profit. Example: Total cost plus 15% of the cost as a fee to the contractor,

▪ **Time and Materials Contract:** This type of contract is a hybrid of Fixed-Price + Cost Reimbursable contracts. Here, the both parties share the risk. The project can use this type of contracts when the deliverable is "labor hours." Here, the project manager will state the required qualifications and experience to the seller who will provide the staff. This contract is used to hire experts or outside support. In this contract, the buyer can specify the hourly rate with a "not-to-exceed" limit. Example:

You will pay a technician 20 USD per hour.

1.3 Outputs

1.3.1 Procurement Management Plan

A Procurement Management plan is the process of establishing Roles & Responsibilities of procurement to follow, these roles & responsibilities may be overlap over of the cycle of the project, the key activities of the said process may include ; managing the schedule + controlling the budget and its documentation + Setting potential risks + controlling the contracts + coordinating procurement advices with experts + preparing the statement of work (SOW) on contracting process . The key components of Procurement Management plan may be not limited to:

a) **Vendor Management:** Vendor is   the businesses or /and individuals that provide goods and services to an entity are considered as vendors. The organization could work with a few dozens or different vendors with different contracts' terms and conditions, vendor management includes:

- Maintaining old suppliers,
- Adding new the vendors into the "Approved Vendor List" is based on their performance,
- Deleting vendors from "Approved Vendor List" once they announce no longer supplying + no longer reliable + rating reduced,
- Provide alternate vendor as possible for the same item, this if any exception is required

b) **Vendors Assessment:** It is the process of assessing the competence of the vendors based on Quality Rating + Delivery Rating + Cost Rating as detailed here under:

- Quality Rating (QR): It is as essential KPIs that help to improve the Quality as well as the continuity of Quality Supply, as the poor quality may affect project objective negatively+ adding additional costs to the project, so we consecrate KPI's measurement to meet or exceed the project requirements. This would base on the quality performance of vendors. For example, the percentage of rejection + the percentage of defect + percentage of continuity short supply + percentage of unsatisfactory, and,

- Delivery Rating: It is an essential KPIs that help to improve the continuity of accepted delivery, the late of delivery may affect supply chain and may affect early delivery and may results in higher inventory + increase expiry Date + increase operational costs + getting materials delay affect strategic supply chain + increase risks on project objective, + increase storage cost. Whereas the qualitied delivery rating increase procurement contract efficiency + reduces the numbers of errors + early deliver means early starts + purchase order accuracy + affecting deliverables positively,

- Cost Rating: It is an essential KPIs that help to improve procurement processes, using this KPI, may help to establish strategies to save cost may charge on a project, cost savings by increasing the percentage of managed spend within the total spend, this KPI measures the percentage of managed spend compared to the total spend when buying external products and services for the project. In organizations with centralized procurement spend can be calculated and cost savings can be achieved in multiple ways:

c) **Mange contracts:** A contract is the agreement between a buyers and sellers base on identified terms and condition among them, a contract shall be bounded with Type of Agreement, Fixed-Price Contract as detailed above + Cost Reimbursable Contract as detailed above+ Time and Materials Contract as detailed above. Contract needs to be drafted, negotiated and signed, but these are just 3 essential elements of Contract Lifecycle Management, but to make the contract works as intended, remember about the following steps that make the project in the safe side**:**

- Contract Request: It is the process of describing a project needs; usually, as all project want to buy something or sell something or start a project. The challenge is to make the request process simple and intuitive, but the challenge is to collect, the right amount + the complete + the accurate information quickly, regardless if this is a complex purchase order or a simple Non-Disclosure Agreement (NDA), to establish positive affairs among buyer and seller and to go award to next step steady.

- Contract Drafting: It is the process of create a new contract you probably need to draft one or more documents based on approved clauses, contracts are not risky equal + not important equal. creation of documents is usually handled by contract

professionals or experts, but in more standard and repetitive cases, a business may prefer a fast self-service option for creating their own contracts. Five of the most important terms that you should include when drafting a contract in order to make your next vendor relationship a successful: https://www.contractworks.com/blog/5-key-contract-management-procurement-terms

✓ Determination of Goods and Services: It is the most important term of all, this section specifies exactly which goods and services the vendor will provide you. To avoid confusion and miscommunication later on, this description should be as specific as possible

✓ Determination of Prices and Payment: Once you determine the costs of the goods & services you have to determine payment condition (cash, checks, credit cards, bank transfers) + receiving condition + receiving responsible authority + payments due + payment volume (lump sum or in installments) + penalties for late payments, and

✓ Confidentiality and Proprietary Information: it is very important to protect yourself, because you will ultimately own the products that are created as a result of the partnership,

✓ First, decide who. If you want to retain control, then specify that your business will take ownership of all intellectual property created during the provision of goods and services, and the sensitive or confidential data on hand that must be shared with the vendor, take steps to protect yourself as much as possible. The contract should include a clause that forbids sharing this information with third parties or using it for other purposes.

▪ Limitation of liability : Usually every contract includes a variety of "disclaimers" that limit the parties' ability to file a legal claim against each other or recover compensation. Some suppliers want to limit any additional costs after supplying their products, so you must ensure that the terms of the contract do not prevent you from claiming damages in the event of gross misconduct, such as fraud + gross negligence + damage +shortage, and

▪ Breaches and Remediation: It is very much important to plan ahead for what happens if either party decides to break the terms of the contract. If the relationship will be long-term and ongoing, then many contracts include the ability for either party to terminate "without cause," after a certain amount of time and with an appropriate notification in advance. be careful and include the five terms above in your vendor contracts will be highly important in order to satisfy both parties and lessen the risk of a lengthy legal battle

d) **Contract Negotiation:** Contract negotiation is the process in which the parties iron out the details of the contract before committing the terms to writing. Parties attempt to negotiate terms that are favorable to themselves. In negotiation each party assesses the risk or benefit of including a particular term, that is why negotiation is common in contract management, because negotiation creates a balance in bearing potential risks. We can say the following tips:

▪ **Contract Approval:** Any project have its Internal Approval Matrix depending on risk + cost + scope + quality + process nature + contract type + resources + who must approve each contract. This matrix, known to all the stakeholders is usually embedded into a workflow process which prevents the release of documents while an approval task is pending. This step is usually a bottleneck of the process so make sure you create a tailored approval workflow, including parallel and serial approvals to keep decisions moving in a rapid pace. A common mistake is to set the approval tiers too high as many parts review and sign such as members + managers+ general manager + CEO+,), this won't keep decisions moving in a rapid pace.

▪ **Signing the Contract**: Each party must sign the final agreement to close any deal, this may achieved by a wet signature on a paper document or by e-signature, whatever the signature way , the documentation and the support document must be kept in safe place and easy retrieval,

▪ **Compliance with the contract:** All parties must abide by the implementation of the terms of the contract because it is a binding document for all of them under the law. Failure to meet performance, payment, reporting, or security obligation is likely to result in a contractual breach, with the risk of termination and exposure to potentially large obligations. Worse yet, failure to comply with contractual and regulatory compliance can cause serious brand damage. https://www.clm4you.com/8-essential-steps-of-contract-management-process/

▪ **Contract Maintenance:** Beyond compliance, an organization must manage the rights, renewals, amendments, and relationships defined in its contract portfolio. Automation can show a real value here; automated tracking and alerts can eliminate the high cost of missing an important right or contract renewal. More and more companies are now trying to implement effective vendor management but to be able to achieve this, contractual data must be linked to contract performance data and external reference databases. https://www.clm4you.com/8-essential-steps-of-contract-management-process/

▪ **Contract Improvement:** When evidence is available from all the above mentioned steps, the organization can implement contract management. As for high performance contract teams, the goal should be to create a continuous feedback loop between the contract portfolio and business performance. If the data shows that a particular negotiation problem is time-consuming but does not make a measurable difference in reducing risk or performance, the organization may amend the rules of the game to fix those issues quickly. https://www.clm4you.com/8-essential-steps-of-contract-management-process/

e) **Project Risk Management:** Risk management is absolutely critical to the development, maintenance, and eventual effectiveness of the project budgets. In fact, all projects carry risks that could threaten the project's completion or schedule, and it's the role of the project manager to identify the ones that pertain to the procurement process. These risks could include things like vendor conflicts, unrealistic schedules, idealistic cost expectations, potential shipping delays, and a vendor's inability to meet deadlines or perform up to standards, risk may include:

▪ Risk Management Planning: Assign resources needed and estimates their costs and include in a project budget
▪ Risk Response Planning: Develop alternatives to reduce risk threats and include their cost in a project budget
▪ Risk Identification: Determines risks and risk triggers that might have impact include their cost in a project budget
▪ Risk Qualitative & Quantitative Analysis: Analyze & estimate the potential cost of risks included in a project budget
▪ Risk Monitoring and Control: Track risks and residual risks and identify new risks and consider their cost in budget

f) **Identify Constraints :**It helps to try and identify any project constraints before starting the project to avoid getting blindsided by unforeseen limitations during execution. Once this list is complete it can be looked at throughout the project phases. Constraints related to procurements include cost, scope, limited resources and technical specifications. Almost all contracts and procurements operate within an environment of many constraints and assumptions. These can include:

▪ Legal
▪ Standards and specifications
▪ External stakeholders
▪ Schedule constraints
▪ Budget assumptions
▪ Geographical restrictions
▪ Physical constraints (height, width, opening sizes. etc.)
▪ Ground conditions
▪ Air quality
▪ Data quality
▪ Security

As you can see, there are many factors to consider before a procurement management plan is finalized. A strong procurement management plan will translate into a strong procurement process,

g) **Legal Jurisdiction:** The proper legal jurisdiction of the project should be explicitly stated in the procurement management plan and translated into the contract documents. Major legal issues should be addressed up front within the procurement management plan. For example, a bridge project over a wetland area may require major environmental requirements and regulatory review. Although the strategy to obtain environmental permits might involve more than purely the minimum legal requirements (relationships, monitoring wells, etc.) the minimum legal requirements should be addressed within the procurement management plan to ensure that all stakeholders are aware of them and acting accordingly

h) **Payment:** Payment methods should be described within the procurement management plan. Most contracts are paid on a progress of deliverables, and buyers payment continues up to a certain point in a periodical base (partially) until completion, but this can lead to conflicts in spite of all of the work going smoothly, when the contractors feel they have completed the most work than an inspected, this may be gives them credit for asking their credits,

i) **Define Costs:** In this step, it's important to outline exactly how the costs associated with the project will be determined. For most procurements, a request for proposal (RFP) will be issued, Once those have been figured out, it is likely that a request for proposal will be issued, with the needs outlined and requesting bids from suppliers. Be thorough and note everything required. The suppliers will come back with their cost for products or services they will provide

1.3.2 Procurement Statement of Work (SOW)

A statement of work is a document employed in the field of project management with narrative description of deliverables and timelines for a vendor providing deliverables to the customers, it is a formal document and must be agreed upon by all parties involved. The SOW must contain an appropriate level of detail so all parties clearly understand what work is required, the duration of the work involved, what the deliverables are, and how is acceptable. This part should provide a general description of the project as well as highlight the project's background and what is to be gained by the project. SOW often accompanies a request for proposal (RFP). SOW shall provide background is necessary for bidding vendors. SOW is usually created as a part of a contract, Project managers should pay enough attention to make SOW clear to all stakeholders to avoid disputes in on deliverables, budgets, or timelines. SOW is descripted in chapter # (4) clause # 1.1.1

1.3.3 Make- or- By Decision

A make-or-buy decision is the very important tool and technique that is used in project management procurement or in-house manufacturing. Project team member shall identify if the project can produce a specific item in-house by the project team facilities, or should just be purchased from an external supplier (outsourcing). The decision of manufacturing or purchasing is based on the Make-or-Buy Analysis that was mentioned above. Decision of manufacturing is typically taken when the project that has manufactured a part or product, or else considerably modified it, is having issues with current suppliers, or has reduce capacity or demand variation, there is a deficiency in the performance of some value chain activities, because the value chain is a complete set of tasks (design + manufacturing + marketing + product distribution), https://www.cleverism.com/make-or-buy-decision-step-by-step-guide/

A make-or-buy decision refers to the expenses associated with product development in addition to expenses associated with buying the product. The evaluation should include qualitative and quantitative factors. It should also separate relevant expenses from irrelevant ones and consider only the former. The study should also look at the availability of the product and its quality under each of the two situations.

- **Factors favoring purchase from outside (outsourcing)**

o   Vendors know-how and research are more than what the buyer owns,
o   Limited facilities for a manufacture or inadequate capacity
o   Lack of expertise
o   Small-volume needs
o   Purchasing cost is less than manufacturing,
o   Willingness to keep a many sources to secure sustainability,
o   Item not necessary to the firm's strategy
o   Brand preference
o   Inventory and procurement considerations

- **Factors favoring in-house manufacture**

o   Utilization of internal facilities,
o   Willingness to activate interdepartmental actives integration,
o   Willingness to improve quality control over manufacturing,
o   Willingness to improve design process over manufacturing,
o   Willingness to reduce direct cost + indirect cost + snuck cost,
o   Willingness to support social community,

- o Design secrecy is necessary to protect proprietary technology
- o Privileged political, environmental, or social reasons
- o sovereignty of Monopoly in foreign markets
- o Lacking of reliable vendors,
- o Weak supply from abroad
- o Ensure continuity of supplies closely
- o Willingness to reduce transportation cost, risk, lead time, and warehousing,
- o Exploiting the local production capacity instead of remaining idle
- o Willingness to keep up a stable workforce when sales is idle,

1.3.4 Procurement Documents

Procurement is a formal process with legal implications, and the information shared between the buyer and seller need to be articulate documentation, and shared in a formal manner in documented format such as the following types of documents:

▪ **Request for Information (RFI):** A Request for Information is a business document used to collect the information about the market behavior + the capabilities of possible contractors + the benchmarking among competitors + the benchmarking between standards in the industry+ the opportunities that support the project + risks that have impact on the project objective+ others. Responses to this document can help the contracting or potential customers to adjust their requirements and scope of work before generating a request for proposal, and others. bhttps://www.profolus.com/topics/types-of-procurement-documents/

▪ **Request for Proposal (RFP):** A Request for Proposal is a procurement document generated and issued to solicit proposals from possible contractors. This document specifies what the potential customers are looking for. It also sets expectations by establishing criteria for evaluating the proposals provided by interested contractors or bidders. It is also including a Statement of Work (SOW) that detailed the requirements of the potential customers, and may include the Request for Quotation (RFI), and the technical Term of Delivery (TTD), and others. https://www.profolus.com/topics/types-of-procurement-documents/

▪ **Request for Quotation (RFQ):** A Request for Quotation is a formal document used to specify the requirements of certain purchases and requesting for a price quotation. It is used for standard purchases such maintenance equipment or raw materials or services or result. It is providing the specification of the items to be purchased and requesting for a quotation. The seller will submit a price quotation and other terms in response to a RFQ. https://www.knowledgehut.com/tutorials/project-management/procurement-documents

▪ **Invitation for Bid (IFB):** An invitation for a bid is a formal document used for inviting potential bidders to come and participate in the bidding process in a certain project . https://www.knowledgehut.com/tutorials/project-management/procurement-documents

▪ **Request for Bid (RFB):** A Request for Bid is used to solicit financial bids for specified purchases from a selected pool of suppliers.

▪ **Purchase Order (PO):** A purchase order is a commercial document and first official offer issued by a buyer to a seller indicating types, quantities, and agreed prices for products or services to be delivered in the future. The advantage to the buyer is the ability to place an order without immediate payment. Each PO has a unique number associated with it that helps both buyer and seller track delivery and payment. A blanket PO is a commitment to buy products or services on an ongoing basis, until a certain maximum is reached.

▪ **Statement of Work (SOW):** A Statement of Work is a document that provides a detailed description of the requirements of the potential customers, and it discusses the roles and responsibilities of the contractor by listing and defining involved activities, deliverables, and timelines. The said document can be used as a supporting document to the contract or agreement, because its include r a comprehensive detail of the terms & condition of the contract, so it is legally binding, this document is described in chapter # (4) clause 1.1.1. https://www.knowledgehut.com/tutorials/project-management/procurement-documents

▪ **Contract or Agreement:** A Contract or agreement are a mutual agreement between the buyer and the seller. A legal binding contract will have an offer, an acceptance + sufficient consideration for the both the buyer and

seller. The contract once finalized will include the detailed statement of work (SOW) and other terms and conditions of agreement.
https://www.knowledgehut.com/tutorials/project-management/procurement-documents

1.3.5 Source Selection Criteria

Source selection criteria are often considered as a part of the procurement documents. Such criteria that are developed and used to assess seller proposals whether it is subjective or objective. Selection criteria may be limited to only the purchase price if the procurement item is readily available from a number of acceptable sellers. Purchase price in this context includes both the cost of the item and all ancillary expenses such as delivery. Other selection criteria can be identified and documented to support an assessment for more complex products, services, or results. Some possible source selection criteria are :
Source: Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Fifth Edition

- Understanding of need: Does the seller's proposal address the procurement statement of work (SOW)?
- Overall cost of life-cycle: Does the selected seller can produce at a lowest total cost (purchase cost + operating cost)?
- Technical capability: Does the seller have, or can have the reasonable technical skills + knowledge needed?
- Risk: Does the statement of works included a % of risk, and how much the % assigned to the selected seller?
- Management approach: Does the seller have or can have the ability to develop management policies and procedures?
- Technical approach: Does the seller have or can have a technical tools & technique that give reasonable solutions on time?
- Warranty: Does the seller have the ability to provide warranty against his products, and what period?
- Financial capacity: Does the seller have, or can have the reasonable financial resources to face new conditions?
- Production capacity and interest. Does the seller have the capacity and interest to meet potential future requirements?
- Social responsibility: Does the seller have a plan or activity to support social committees' charities?
- Past performance: Does the seller have a honorable history of achievements with customers?
- References: Does the seller have work experience and compliance with contractual requirements, provide evidence?
- Intellectual property rights. Does the seller assert intellectual property rights in his work processes?
- Proprietary rights: Does the seller asset proprietary rights in his work processes?
- Environment: Does the seller have past history of obligation toward environment?
- Safety: Does the seller have past history of obligation toward people safety?

1.3.6 Change Requests
Described in chapter (4) clauses #3.3.3 +4.3.1+5.1.3
Described in chapter (54) clauses #5.3.2+6.3.3
Described in chapter (6) clauses #6.3.3
Described in chapter (7) clauses #3.3.4
Described in chapter (8) clauses #2.3.2+3.3.5
Described in chapter (9) clauses # 4.3.3
Described in chapter (10) clauses #3.3.2
Described in chapter (12) clauses #1.3.6

2. Conduct Procurements Process

Conduct Procurements process is the obtaining of seller responses, selecting a seller (who is providing or delivering the goods or services to the buyer), and awarding a contract. In this process the team will receive bids or proposals and will apply previously defined evaluation criteria, as applicable, to select one or more sellers who are both qualified to perform the work and acceptable as a seller. Selecting sellers is the process where sellers are chosen based on the responses that have been made to requests by the buyer. The sellers' responses are filtered through evaluation criteria that are selected by the buyer, and the final award, which may go to one or several sellers. The key benefit of this process is that it provides alignment of internal and external stakeholder expectations through the established agreements. The project manager may fill either or both of the above roles to do the activities that need to take place during the conduct procurements process which are:

- Issue the bid package to potential Sellers
- Hold bidder conferences
- Evaluate potential seller proposals

- Select the winning seller proposal

On major procurement items, the overall process of requesting responses from sellers and evaluating sellers' responses can be repeated. A short list of qualified sellers can be established based on a preliminary proposal, more detailed evaluation can then be conducted based on specific and comprehensive requirements document requested from the sellers on the short list.

Inputs	Tools & Technique	Outputs
Procurement	Bidder Conferences	Select Sellers
Management Plan	Proposal Evaluation	Procurement Award
Procurement Document	Techniques	Resources Calendar
Package	Independent Estimate	Change Requests
Source Selecting Criteria	Procurement	Procurement Management Plan
Qualified Seller List	Negotiation	Updates
Seller Proposal	Expert Value Judgment	Project Documents
Project Documents	Advertising	Updates
Make- or -By -Decision	Internal Search	
Teaming Agreements		
Organizational Process		
Source: https://www.gristprojectmanagement.us/guide/conduct-procurements.html		

2.1 Inputs

2.1.1 Project Management Plan
Described in chapter (4) clauses # 2.3.1 +3.1.1 + 4.1.1 + 5.1.1 +6.1.1
Described in chapter (5) clauses # 1.3.2 + 5.1.1+6.1.1
Described in chapter (6) clauses # 6.1.1
Described in chapter (7) clauses #3.1.1
Described in chapter (8) clauses #2.1.1+3.1.1
Described in chapter (9) clauses #2.1.1+3.1.2 + 4.1.2
Described in chapter (10) clauses #1.1.1+3.1.1
Described in chapter (11) clauses #6.1.2
Described in chapter (12) clauses # 2.1.1

2.1.2 Procurement Documents
Described in chapter (12) clauses # 1.3.4+2.1.2

2.1.3 Source Selection Criteria
Described in chapter (12) clauses # 1.3.5+2.1.3

2.1.4 Qualified Seller List

Prequalified seller list is a list of past approved vendors, named also (Approved Vender List), this list is updated periodically according to the Procurement Control process outcomes because sellers could be disqualified and removed from the list based on their performance. Companies typically assess the vendors base on Quality Rating + Cost Rating + Delivery Rating, that are explained in details in the procurement Management Plan in this chapter (12) clause # 1.3.1

A system for the evaluation of vendors and their performance is important to support an effective purchasing function. Factors to consider for inclusion in the evaluation are:

- Timeliness of deliveries
- Service availability

- Completeness and accuracy of order
- Quality of products or services received

Example: Qualified Seller List

SN	Vendor Name	Products Rating	Timely Supply Accepted %	Quality Rating Accepted %	Cost Rating	Total %	Delivery Rating Accepted %	Remarks
1	A	High						Accepted
2	B	Low						Accepted
3	C	Medium						Accepted
4	D	High						Accepted
5	E	Medium						Accepted
6	F	Low						Remove from list
7	G	Low						Need Review
8	H	High						Remove from list
9	I	Low						Accepted
10	K	Medium						Need Review

2.1.5 Seller Proposal

Seller proposal is a formal response from sellers to a request for proposal or other procurement document specifying the price terms + delivery terms + technical terms of delivery (TTD) + payment terms + product specification+ product standards + MSDS + MPDS+ seller capacity + obligation to environment, and others as continually agreed, this would bind the seller to perform the resulting agreement within the project management. Expert value judgement may be used in evaluating seller proposals. The evaluation of proposals may be accomplished by a multi-discipline review team with expertise in each of the areas covered by the procurement documents and proposed contract within the project management. Stakeholders may interrupt in evaluation also as a buyer intended such as:

- Team member
- Sponsor
- Customers
- Competitors
- shareholders

The key benefit of this process is that, it provides alignment of internal and external stakeholder expectation, This process has inputs and outputs, wherein seller proposals are under the inputs category of the project management. Expert judgement is often used to assess the inputs to and outputs from this process. Expert purchasing judgement can also be used to develop or modify the criteria that will be used to evaluate seller proposals.

https://project-management-knowledge.com/definitions/s/seller-proposal/#:~:text=Seller%20proposal%20is%20a%20formal,seller%20to%20perform%20the%20resulting

2.1.6 Project Documents
Described in chapter (11) clauses #2.19
Described in chapter (12) clauses # 2.16

2.1.7 Make -or-By – Decisions
Described in chapter (12) clauses # 1.3.3 +2.1.7

2.1.8 Teaming Agreement
Described in chapter (12) clauses # 1.1.3 +2.1.8

2.1.9 Organizational Process Assets (OPA)

Described in chapter (2) clauses # 4.2
Described in chapter (4) clauses # 1.1.5+2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.3
Described in chapter (5) clauses # 1.1.5+3.1.3+4.1.3+6.1.5
Described in chapter (6) clauses # 1.1.3+2.1.5+3.1.5+4.1.7+5.1.9+6.1.4+6.3.2
Described in chapter (7) clauses # 1.1.6+2.1.7+3.1.4+3.3.3
Described in chapter (8) clauses #1.1.7+3.1.6
Described in chapter (12) clauses # 1.1.11 + 2.1.9

2.2 Tools and Techniques

2.2.1 Bidder Conferences

A bidder conference or vendor conference or a seller conference or a contractor conference or, is a meeting held by a buyer to discuss a possible purchase with multiple potential suppliers. The bidder conference allows sellers to make inquiries to gather information to use to prepare a bid. It also helps ensure that all bidders have access to the same information before the submission of proposals or bids. It is a process of selecting vendors that can provide the goods and services to a particular project. His would emphasize that, the potential vendors have a common understanding of the procurement requirements and that no potential sellers get special treatment from the buyer.

The potential bidders are invited to a public meeting wherein the stakeholders and the project manager will discuss what they want from the vendor. The potential sellers are then allowed to ask questions to the project manager. The purpose of the bidder conference is to make sure that the potential sellers have the same information from the project which they can use to prepare their proposals. This information may include the overview of the organization, qualification of the bidder, the scope of the project, minimum requirements and the deliverables. The solicited proposals from all prospective sellers will be submitted to the project manager who will conduct the procurement process.
https://translate.google.com/#view=home&op=translate&sl=en&tl=ar&text=wherein

2.2.2 Proposal Evaluation Techniques

A proposal evaluation technique is the process of reviewing the proposals given by the seller to support the contract award decisions of the buyer, or it is the process of obtaining the responses from the seller including the buyer selection which seller is deserve the contract, these techniques can be used with intensive capital projects while in simple projects such process is not necessary. When it comes to complex procurement, the selection of the proposal will be based on the responses of the seller following a weighted criteria set by the buyer. A formal evaluation review process follows that defined

by the procurement policy of the buyer. There will be an evaluation committee that will submit a selection for the approval of the management before any awarding,
https://projectvictor.com/knowledge-base/proposal-evaluation-techniques/

2.2.3 Independent Estimate

Independent Estimate is a project management process that uses an external estimator (the third party) or uses an internal estimator (from within) to collect and analyze information that received from the bidder (Seller). Analyzing of the information is to predict the cost and schedule of purchasing something to the project. Significant differences in cost estimates can be an indication that the procurement statement of work (SOW) was deficient, ambiguous, or that the potential seller either misunderstood or failed to respond to the procurement statement of work. Independent estimation benefit is not limited to:
https://www.qsm.com/consulting/independent-estimate

- Provide estimation of cost & schedule, that lead project members to better understanding of contract feasibility,
- Develop the best cost, the schedule and the potential risk that lead to save money and get to the market quickly
- Negotiate from a position of strength that put the buyer in position of win-win principle,
- Quickly assess practical alternatives within a short period that give decision makers practical result

2.2.4 Expert Value Judgment
Described in chapter (4) clauses # 1.2.1 +2.2.1 + 3.2.1+ 4.2.1 +5.2.1+6.2.1
Described in chapter (5) clauses #1.2.1+3.2.1
Described in chapter (6) clauses # 1.2.3+3.2.1+4.2.1
Described in chapter (7) clauses #1.2.1+2.2.3
Described in chapter (10) clauses # 3.2.2
Described in chapter (11) clauses # 2.2.7 +3.2.6 + 4.2.3 + 2.2.4
Described in chapter (12) clauses # 1.2.2 + 2.2.4

2.2.5 Advertising

Advertising is a mean of showing sellers' products, specifications, quantities and prices for the purpose of selling, as it is a way to solicit commercial offers for the purpose of purchasing from competitors at preferential prices and at best delivery time, and at a best quality, projects that prefer to buy from abroad work to attract the largest possible number of sellers to study their products characteristics. The sellers as well as the buyers are using advertising in aim of buying and selling,

Advertising is done in local newspapers, outside newspapers, magazines, social media, television, the Internet and others. Some organizations use online resources to communicate orders to the vendor community. Some government jurisdictions require public announcement of certain types of procurement items, and most government jurisdictions require public advertising or online publication of government contracts on hold. Advertising means are also used to buy stocks and bonds and place them to the Initial Public Offering (IPO),

2.2.6 Internet Search

Most people who are using a search engine are doing it for the purpose of scientific research + information trade + communication with internal and external entities or individuals + entertainment + others. People how are looking for answers or at least to data with which to make a decision. They are looking to find a site to fulfill a specific purpose as the internet is full of useful information. It is also the number one way that people find out about new products, services or even just new websites.

2.2.7 Procurement Negotiation

Negotiation is communication between two or more parties with the desired outcome of reaching a mutually satisfactory agreement, in procurement people go through to create favorable terms as part of a new supplier contract. This can involve negotiating different terms with an existing supplier when a contract is renewed, or discussing terms from scratch with a brand new vendor,
https://translate.google.com/#view=home&op=translate&sl=en&tl=ar&text=consensus%20statement

- Costs: To reduce the cost of acquisition by obtaining a lower price,
- Value: To create value added to the contract such as improving the lead time,
- Performance: To improve performance of the purchases t by using KPIs,
- Conflict: To resolve disputes by reaching consensus statement,
- The problem: To resolve a problem by open discussion,
- Quality: To achieve the highest quality and reduce nonconformities,
- Agreement: To reach an agreement that satisfies all parties,

2.3 Tools and Techniques

2.3.1 Selected Sellers

The selected sellers are those who have been selected to be in a competitive range based upon the outcome of the proposal or bid evaluation, and those who have negotiated a draft contract that will become the actual contract once award is done, and those who have been selected to provide a contracted set of products or services or results. To select one or more sellers who are both qualified and acceptable as a seller you may work with many factors such the price rating, quality rating, delivery rating, but remember that the lowest the price is unnecessary mean the cost is less, because the seller may give lower price but with no ability to timely delivery, or with no ability to continuity supply. Usually the professional buyers keep-up with various sources for products, services or results that have critical nature, to mitigate risks that can be associated with issues with one seller rather than other,
Source: *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Fifth Edition*

2.3.2 Procurement Contract Award

Procurement contract award is the process of formally notifying a tenderer that they have been selected as the supplier for a particular contract. Once the seller is informed about Procurement Contract Award decision, the contract must be signed by both parties, so that the terms and conditions of the contract is binding on both parties, because the contract is a legally binding agreement for both parties that binds the seller to provide the specified products, services or results, and obliges the buyer to compensate the seller. A contract is a legal relationship that is subject to treatment in the courts. The main components of the agreement document differ, but may include the following:

- Deliverables
- Schedule baseline
- Performance reporting
- Performance Period
- Performance bonds
- Roles and responsibilities
- Seller's place of performance
- Pricing of individual items
- Payment terms
- Place of delivery (Destination)
- Inspection criteria (Standards)

- Warranty over each item or together
- Product support
- Limitation of liability
- Fees and retainer
- Penalties
- Incentives
- Insurance type
- Subordinate (subcontractor) approvals
- Change request reasons and handling
- Termination of a contract clause and alternative
- Alternative Dispute Resolution methods (ADR)

2.3.3 Resource Calendars
Described in chapter (6) clauses # 3.1.3+4.1.4+5.1.5
Described in chapter (7) clauses #2.1.5
Described in chapter (9) clauses #2.3.2
Described in chapter (12) clauses # 2.3.3

2.3.4 Change Request
Described in chapter (4) clauses #3.3.3 +4.3.1+5.1.3
Described in chapter (54) clauses #5.3.2+6.3.3
Described in chapter (6) clauses #6.3.3
Described in chapter (7) clauses #3.3.4
Described in chapter (8) clauses #2.3.2+3.3.5
Described in chapter (9) clauses # 4.3.3
Described in chapter (10) clauses #3.3.2
Described in chapter (12) clauses #1.3.6 + 2.3.4

2.3.5 Project Management Plan Updates
Described in chapter (4) clause # 3.3.4 +4.3.2+5.3.2
Described in chapter (5) clause# 6.3.4
Described in chapter (6) clause # 6.3.4
Described in chapter (7) clause # 3.3.5
Described in chapter (8) clause # 2.3.3+3.3.6
Described in chapter (9) clause # 2.3.3
Described in chapter (10) clause # 1.3.2 + 2.3.3 +3.3.2
Described in chapter (11) clause # 5.3.3 +6.3.4
Described in chapter (12) clause # 2.3.5

2.3.6 Project Documents Updates
Described in chapter (4) clause #3.3.5 + 4.3.3 +5.3.3
Described in chapter (5) clause# 3.3.2+4.3.4+5.3.3+6.3.5
Described in chapter (6) clause #2.3.2+3.3.3+4.3.2+5.3.4+6.3.5
Described in chapter (7) clause # 1.3.3+2.3.3+3.3.6
Described in chapter (8) clause # 1.3.5+2.3.4+3.3.7
Described in chapter (10) clause # 1.3.2 + 2.3.3 +3.3.4
Described in chapter (11) clause # 5.3.4
Described in chapter (12) clause # 2.3.6

3. Administer Procurement Process

The Administer Procurements process is the process of managing, organizing, and monitoring the vendor's performance and ensuring that all requirements of the contract are met based on good relationship among the seller and the buyer, and makes changes and corrections as needed as both are

two parties act with one contract, each are acting in their own way to administer the purchase contract for similar purposes. Both parties work to fulfill their contractual obligations, knowing that their contractual rights are protected by law. The procurement management process ensures that the seller's performance meets the purchasing requirements and that the buyer acts according to the terms of the contract. Contract administration includes delivery terms + payment processing + managing the early termination of a contract (for cause, for convenience or for default). Several key project management processes are used to help accomplish these aims

- Direct and manage project execution
- Report performance
- Perform quality control
- Perform integrated change control
- Monitor and control risks

3.1 Inputs

3.1.1 Procurement Documents
Described in chapter (12) clause # 1.3.4 + 3.1.1

3.1.2 Project Management Plan
Described in chapter (4) clauses # 2.3.1 +3.1.1 + 4.1.1 + 5.1.1 +6.1.1
Described in chapter (5) clauses # 1.3.2 + 5.1.1+6.1.1
Described in chapter (6) clauses # 6.1.1
Described in chapter (7) clauses #3.1.1
Described in chapter (8) clauses #2.1.1+3.1.1
Described in chapter (9) clauses #2.1.1+3.1.2 + 4.1.2
Described in chapter (10) clauses #1.1.1+3.1.1
Described in chapter (11) clauses #6.1.2
Described in chapter (12) clauses # 2.1.1+3.1.2

3.1.3 Contract
Contract is described in chapter (4) clauses #1.1.3 + chapter (7) clauses #2.16 + chapter (12) clauses #3.13
Control Charts is described in chapter (8) clauses #1.2.3+3.2.2
Contract Types is described in chapter (12) clauses #1.2.3

3.1.4 Work Performance Reports
Described in chapter (4) clauses #4.1.2
Described in chapter (9) clauses # 4.1.4
Described in chapter (10) clauses # 2.1.2 +2.2.5
Described in chapter (11) clauses # 6.1.4
Described in chapter (12) clauses # 3.1.4

3.1.5   Approved Change Requests
Described in chapter (4) clauses #3.1.2
Described in chapter (8) clauses # 3.1.5
Described in chapter (12) clauses # 3.1.5

3.1.6   Work Performance Information
Described in chapter (4) clauses #3.3.2 +5.1.2
Described in chapter (5) clauses #6.3.1+6.1.3
Described in chapter (6) clauses #6.1.3
Described in chapter (7) clauses #3.1.3
Described in chapter (8) clauses #2.1.3
Described in chapter (10) clauses #3.3.1

Described in chapter (11) clauses #6.1.3
Described in chapter (12) clauses #3.1.6

3.2 Tools and Techniques

3.2.1 Contract Change Control System

A contract change control system is the process change request is allowed to be analyzed or approved or rejected, in case the change request is allowed, the change on contract may be modified. It includes the paperwork, tracking systems, dispute resolution procedures, and approval levels necessary for authorizing changes. The contract change control system should be integrated with the overall change control system such as:

Contact change system that includes:

- Change request shall be analyzed and shall be approved or declined,
- Contract may be modified based on agreement among the buyer and the seller,
- The impact of change on cost + quality + time + scope must be analyzed,
- The impact on process and machine utilization must be analyzed,
- The change must not wide, baggy, loose and continues,
- The change must be formally made,
- The change must be controlled
- The change must be documented,
- The change should not cause loss to any of both parties (win to win),

Performance reporting that includes:

- Reporting change efficiency on application,
- Reporting non-conformity to correct them,
- Reporting the impact on process,
- Reporting the impact on project objectives,
- Reporting the incurred additional cost
- Reporting the impact on quality + cost + schedule,

Payment system that includes:

- Payment is usually implemented in accordance with the procurement contract terms and conditions,
- Appropriate review shall be conducted on change before pay
- Boost your payment with support documents,
- All support document shall be approved before payment,
- Pay on due course of time,
- Update both the payment schedules and requests information

Contract change reasons that include:

- **Majeure Condition**: Majeure Condition may be required a **Mandatory Changes** that may be include; the respond to change in legislation + the respond to change in applicable laws+ the respond to spread of disease like COVID- 19 + the respond to the closing boarders in war, However the mandatory change is required to respond to a specific majeure condition, this response may surround the interests of the both seller and the buyer,

- **Emergency Conditions**: Emergency Conditions may be required an **Emergency Changes** that may be include; the respond to people safety + the respond to environmental issues + the respond to change technology + the respond to change market demand. However, the emergency change is required to respond to a specific emergency condition, this response may surround the interests of the both seller and the buyer also,

- **Work conditions:** Work conditions may be required a **Permissive Changes** that may be include; the request for new services + the request for newness + the request for new design + the request for additional value added, the request for better

quality + the request for lowering cost + the request for improving the schedule against new payment. However, the Permissive Changes is required to respond to a specific work condition, this response may surround the interests of the both seller and the buyer also,

changes often bring increased costs and responsibilities in which Dispute is appear between the sellers and the buyers, the buyers naturally want service providers to absorb the cost of changes, while the sellers will seek to pass through those cost increases to customers.To avoid delay in the supply chain during disputes arising due to a change, the buyer must ensure that disputes do not affect the supply chain by binding the seller to a condition of supply continuity in the contract, whether the change is mandatory or emergency, because disputes arise due to increased cost and liability, which must be resolved in a way that guarantees the rights of collecting parties.

3.2.2   Procurement Performance Reviews

Procurement performance reviews involve reviewing the documents prepared by the seller and buyer inspections. It also involves doing quality audits and inspections that are conducted while the seller is executing work increase the confidence. Reviewing the following factors will measure the competence of Procurement Performance:

▪ **Reduce Procurement Cycle Time:** It is defined as, the time consumed from placing a requisition to receiving the deliverables. Decreasing the cycle time is an effective process to cut procurement costs. Automating the procurement process with sellers can significantly reduce the time it takes to receive the ordered product. Here are some ways to reduce procurement cycle time:

▪ Reduce the time of formalities + Get the Purchase Requisitions (PR) identified quickly,
▪ Reduce the time of formalities + Get the Purchase Order (PO) approved quickly,
▪ Control the past open purchase orders(PO) + Get them closed quickly,
▪ Provide seller with self-service portals to enable them access to their own receivables (invoices)

▪ **Assess Sellers Performance:** It is defined as, the monitoring and controlling the competence of sellers, this may also include to moderate stock leveling, make the sellers' respond to your emergences requisitions as a buyer. Here are some ways to assess Sellers' performance:

o   Assess delivery lead times,
o   Assess communication time lags,
o   lead times the quality of the products provided,

o   Access pricing competitiveness,

o   Access the frequency of price changes,
o   Access the compliance to contract terms & condition,
o   Access alternatives of emergencies,
o   Access number of rejected orders,

▪ **Spend under management**: It is defined as the volume of spending on services related procurement that are managed by the procurement department, which calculated as Total spend in procurement ÷ the total company-wide spend over the same period of time. On the another hand, the best definition of spend under management to achieve the most effective metric is to equate it to "strategically managed spend." that involves some measures such as:
https://www.greycampus.com/opencampus/project-management-professional/control-procurements

o   Defining spending trend, and which seller is the most spend chance,
o   Categorize spending analysis considering the most impactful sellers,
o   Reviewing the initiative procurement vs. the catalogs   procurement process to know your position with sellers,
o   Reviewing the contracts with enough lead time + scope + alternative solutions with the team responsible for the product
o   Evaluating purchases performance with clearly defined metrics such as savings, cycle times value added to your project,
o   Working with your end-user teams to understand where you can bring value to their purchase decisions,

▪ **Cost Savings:** It is defined as a fundamental and pivotal metric used to measure the success of the procurement functions. Cost savings is sounds simple, but how are projects successfully reducing costs, follow the following techniques:

- o Investing in digital technology,
- o Automation procurement process,
- o Integrating sellers' self-service,
- o Adding mobile requisitions techniques and adding automation approvals,
- o Using guided buying catalogs and Punch Out Tool,

- ▪ **Percentage of Purchase Orders (PO):** It is the most and pivotal important sellers weight measure. When a majority purchases are routine / intuitive contract- based, then the prices are typically lower, services are mostly higher, and errors are frequent are less. Whereas, when a majority purchased are catalog - based the seller are decentralizing the requisitions process not as same as routine purchases. In time of perching until receiving the following documents shall be controlled to get best assessment percentage on purchase orders:

- o Matching shipping documents (Delivery Note) with actual receipts,
- o Matching shipping documents (Invoices) with written costs in the purchase contract,
- o Matching shipping documents (Total pay) against the received invoices,
- o Matching shipping documents (Purchase Order TTD) with actual receipts schedule,
- o Matching shipping documents (Test Certificates) with the quality of the purchases supplied to the buyer,
- o Matching shipping documents (MSDS) is applicable to the contact, and the purchases safety regulation is considered,
- o Matching shipping documents (MTDS) is applicable on applications on machines,
- o Matching shipping documents (MPDS) is applicable on application on machines,
- o Matching shipping documents (Legal Obligation) as contractually agreed,

Based on the above points, the buyer can measure the sellers' performance by using the KPI's measures to access and compare sellers vs. others, to keep them or to delete them from Qualified List (Approved Vendor List),

3.2.3   Inspection
Described in chapter (5) clauses # 5.2.1
Described in chapter (8) clauses # 3.2.9
Described in chapter (12) clauses # 3.2.3

3.2.4   Quality Audit
Described in chapter (8) clauses # 2.2.2
Described in chapter (12) clauses # 3.2.4

3.2.5   Work Performance Reports
Described in chapter (4) clauses #4.1.2
Described in chapter (9) clauses # 4.1.4
Described in chapter (10) clauses # 2.1.2 +2.2.5
Described in chapter (11) clauses # 6.1.4
Described in chapter (12) clauses # 3.1.4+3.2.4 +3.2.5

3.2.6   Payment System

Payment is a system that provides payment for the products and services rendered by the seller against contract, seller is typically processed by the accounts payable system of the buyer after certification of satisfactory work by an authorized person on the project team. Payment is usually implemented in accordance with the procurement contract terms and conditions. Appropriate review shall be conducted on change before payment. Support document shall reinforce payment. All support document shall be approved before payment. Payment shall make on due course of time; the buyer shall update the sellers account. Bank reconciliation accounts shall be reviewed. The proper implementation of the payments system, along with the other tools of control procurement, can lead to different outputs such as change request, work performance information, and project document updates.
https://accdiscussion.com/acc22100.html

- **Payment Types**

  o   Payment in Advance: It refers to a payment that is made before the supplier's invoice date as an obligation to a company after the purchase of goods and services.

  o   Documentary Collection: It a trade transaction where an exporter assigns the job of collecting payment for goods to their bank. The shipped document gets mailed to an importer's bank with comprehensive instructions for payment.

  o   Open Accounts: It is the process of a seller shipping goods with documents sent to a buyer upon an agreement to make payments at a later date based on the seller's invoice

  o   Letter of Credit: It is a formal guarantee by a bank for payments to be made to a company based on specified financial conditions.

- **Letter of Credit (L/C) Types**

  o   **Revocable/Irrevocable L/C:** The bank in association with the buyer must clearly mention if the L/C is revocable or irrevocable, in the event that it is not mentioned, the L/C is considered as irrevocable. Under the revocable credit, the applicant and the bank have the right to cancel or amend the L/C without prior notice to the seller, but before the documents are submitted by the beneficiary (seller), once the L/C amended, then the seller may bear a heavy risk (loss) , especially if they manufactured the product with special specifications to the initiator of the L/C, and the seller may unable to dispose such product to the market. Therefore, this type of credit is risky high and not acceptable to seller, as there is no guarantee of receiving the prices of their products, the bank who opened the irrevocable L/C is undertaking not to change, or to cancel or to amend, or modify the L/C unless obtaining the approval of the remaining parties of the L/C, so this good practice for both parties,

  o   **Confirmed L/C:** The notified bank undertaking to the seller to pay the value of the L/C as contractually agreed , once the seller completed the deliverables to the buyer, the seller obtains two guarantees for the pay from the bank who initiate the L/C and from the bank who notified , usually the bank who notified about the L/C takes several factors into consideration before adding its reinforcement to the seller such as ; the value of the L/C, the relationship among the two banks, knowledge of the beneficiary (seller), the political and economic conditions in the country of the bank who initiate the L/C , the agreements is signed by the two banks, and it must be explicitly stated whether the L/C is confirmed, otherwise it is considered unconfirmed.

  o   **Partial shipment L/C:** The seller is allowed partial shipment as contractually agreed, the notified bank gives the seller (exporter) the right to withdraw the value of the credit in split payments according to the value of partial shipment. The buyer (applicant) who initiated the L/C has the right to determine the number of shipments and whether they are equal or not, and the date of the shipments. If no shipment is sent within the specified period, the approval for this shipment and the remaining shipments in the L/C is invalidated. The benefits of the partial credit give the seller the elasticity to ship the product according to his capabilities + according to the availability of transportation means + prevent long storage + it's also save part of the buyer's money for the following shipments, but within the specified in the L/C,

  o   **Redeveloped (Revolving) L/C:** The L/C is renewed automatically at the same value + for the same period + for several cycles within the L/C period. For example, if a buyer wishes to import products worth 1000,000.00 USD over a period of 10 months, then it is not in his interest to open a single L/C in the amount of 1000,000.00 USD, and to seize large cash securities, it may be agreed with the seller to initiate Revolving L/C in the amount of 100,000.00 USD that is renewed monthly for a period of 10 months, in this case the seller (exporter) can sell his product first-hand + no need to store inventory for a long time   , while the buyer (importer) is able to pay the value of each shipment as received + he saves the costs of storage + ensures the continuity of importing at the same prices agreed upon in advance + he can stop import when the condition surrounding his business is change . The said L/C is vital when the need for raw materials is continually required + he can check shipping quality gradually,

  o   **Advance Payment L/C:** It called also a Red Clause L/C, it is the credit in which one of its conditions stipulates that the buyer (importer) must pay in advance a specific value to the seller (exporter), so he can manufacture the product required in the documentary credit, the credit does not become effective until the buyer receives (corresponding letter of guarantee by the same value and by the same currency) and accepts this guarantee. The approval of the down payment is called the red condition credit, the advance payment (down payment) is written in red color to distinguish it from the rest of the approval conditions,

o **Transferable Letter of Credit :**This type of L/C is the most use in commercial trade , once the seller submits the shipping documents to the bank (notified bank), which show that the products have been shipped to the buyer, and once the documents are complete and the documents are complied with the terms of payment of the L/C, the bank (notified bank), shall pay the value of the product to the seller within five working days from the date of document received, or pay the balance value of the credit in assumption of advance payment is made by the buyer , ultimately the buyer shall charge the full value of the products + the interstate,

o **Back to Back Letter of Credit**: In the event that the seller wants to transfer the credit to others, especially if the credit is not transferable, another credit can be opened to that third party under the same conditions as the original credit, with the possibility of changing the amount of the credit and its validity period.

3.2.7 Claim Administration

Contracts include a set of technical terms of delivery (TTD) that must be followed by the seller and the buyer, contracts govern the relationship between the seller and the buyer, contracts are protected by law . Some differences may be appearing in time of manufacturing + shipping + in quality + in scope creep, these changes arise when both buyers and sellers do not agree that a change has occurred during the creation of the contract. The contested changes are also referred to disputes, appeals or claims. So managing contract is very important in project management, in such cases, the complaints will prevail between the two parties, so, claims administration is part of contract procurement and part of contract administration.

The disputed on changes are those changes that required by any of the two parties when the buyer and seller are unable to reach an agreement regarding the possibility of change, or the possibility of compensation on changes. Administration the contract shall be over all the life cycle of the contract according to the terms of the contract. If the parties do not resolve the issue of disputed changes, they may have to be dealt with in accordance with (Alternative Dispute Resolution (ADR), as stipulated in the contract. Negotiation is the best way to solve or settle all disputes and disagreements. Remember the contracts is usually involving arbitration clauses that can be invoked before or after the closure of the contract.

3.2.8 Records Management System

Records Management includes many different captioned such as:
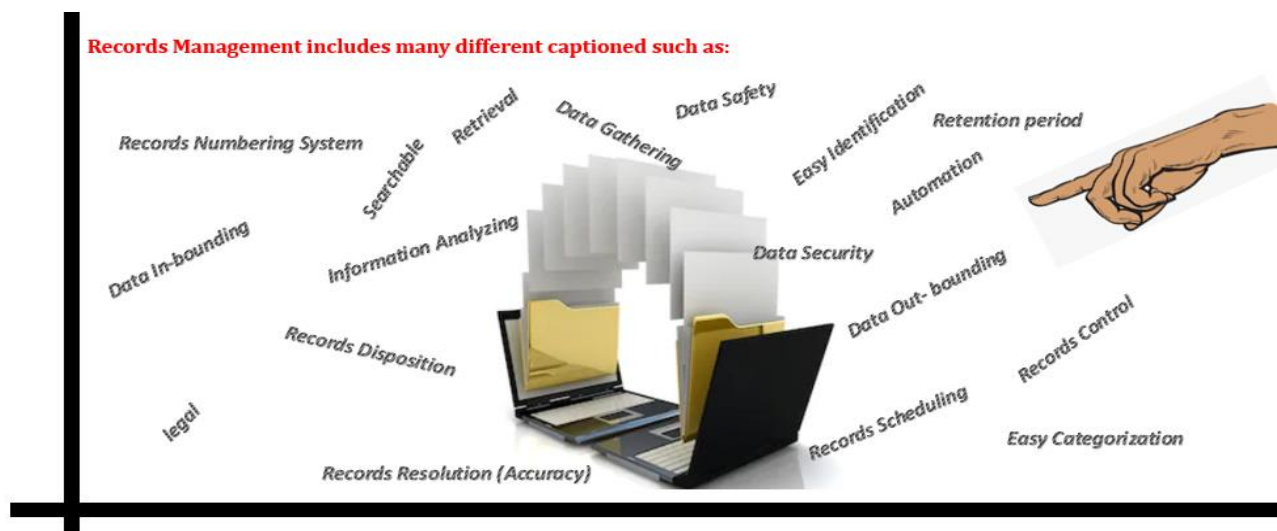
Records Management system (RMS) is the management of records for an organization throughout the records-life cycle. The activities in this management include the systematic and efficient control of the creation, maintenance, and destruction of the records along with the business transactions associated with them. Organizations create, retain, and preserve records so that they can be used. If a user cannot locate a document, it might as well not exist. As such, an effective records management program should have in place systems—manual or automated—that can locate and retrieve records in a reliable and timely fashion to meet the needs of users.

https://www.google.com/search?q=Records+Management+System&oq=Records+Management+System&aqs=chrome.0.69i59j0l4j69i60l3.7559j0j7&sourceid=chrome&ie=UTF-8

3.3 Outputs

3.3.1   Procurement Documents
Described in chapter (12) clauses # 1.3.4 + 3.1.1 + 3.3.1

3.3.2   Organizational Process Assets Updates
Described in chapter (2) clause # 2.5
Described in chapter (4) clause #6.3.2
Described in chapter (5) clause # 6.3.2
 Described in chapter (8) clause # 2.3.1+3.3.4
 Described in chapter (9) clause # 4.3.2
Described in chapter (10) clause # 3.3.5
Described in chapter (11) clause # 6.3.2
Described in chapter (12) clause # 3.3.2

3.3.3   Change Requests
Described in chapter (4) clauses # 3.3.3 +4.3.1+5.1.3
Described in chapter (5) clauses # 5.3.2+6.3.3
Described in chapter (6) clauses # 6.3.3
Described in chapter (7) clauses # 3.3.4
Described in chapter (8) clauses # 2.3.2+3.3.5
Described in chapter (9) clauses # 4.3.3
Described in chapter (10) clauses # 3.3.2
Described in chapter (11) clauses # 6.3.3
Described in chapter (12) clause # 1.3.6 + 2.3.4 + 3.3.3

3.3.4   Project Management Plan Updates
Described in chapter (4) clause # 3.3.4 +4.3.2+5.3.2
Described in chapter (5) clause# 6.3.4
Described in chapter (6) clause #6.3.4
Described in chapter (7) clause # 3.3.5
Described in chapter (8) clause # 2.3.3+3.3.6
Described in chapter (9) clause # 2.3.3
Described in chapter (10) clause # 2.3.2
Described in chapter (11) clause # 5.3.3 + 6.3.4 +2.3.5

4. Close Procurement Process

Close Procurements Process is the completing procurement for all project activities, this may include, closing claims files + closing the account of debtors + closing the nonconformities + closing the received of inventory + closing the compensation that are refunded + closing the accounts reconciliation with sellers+ updating records to reflect final results + archiving such information for future use .The key benefit of these processes is that it documents agreements and related documentation for future reference. Procurement is closed when a contract is completed or when a contract is terminated, all procurements must be closed out, no matter the circumstances under which cause the stop or termination or complete the contract, the following point are reviewed carefully in procurement department:
https://www.greycampus.com/opencampus/project-management-professional/close-procurements

- Product Verification: Ensuring all work get done and satisfactorily,
- Negotiated Settlement: Ensuring all claims + purchase orders + compensation + dispute are closed,
- Financial Closure: Ensuring accounts are closed with debtors,
- Procurement Audit: Ensuring all contracts are closed with clear and complete support documents,
- Updates Records: Ensuring of all records of the project are complete updated,
- Lessons Learned: Ensuring lessons learned lead the project for success,

▪ Procurement File: Ensuring all support document are retained like contract+ PO + changes request + shipping documents, and

4.1 Inputs

4.1.1 Project Management Plan
Described in chapter (4) clauses # 2.3.1 +3.1.1 + 4.1.1 + 5.1.1 +6.1.1
Described in chapter (5) clauses # 1.3.2 + 5.1.1+6.1.1
Described in chapter (6) clauses # 6.1.1
Described in chapter (7) clauses #3.1.1
Described in chapter (8) clauses #2.1.1+3.1.1
Described in chapter (9) clauses #2.1.1+3.1.2 + 4.1.2
Described in chapter (10) clauses #1.1.1+3.1.1
Described in chapter (11) clauses #6.1.2
Described in chapter (12) clauses # 2.1.1+3.1.2 +4.1.1

4.1.2 Procurement Documents
Described in chapter (12) clauses # 1.3.4 + 3.1.1 + 3.3.1 +4.1.2

4.2 Tools and Techniques

4.2.1 Procurement Audit

Procurement Audits is the process of reviewing contracts and contracting processes for completeness, accuracy, and effectiveness by using the best Tools and methodology its procedures, its documents, its properties, its budgets, its expenses and its level of completion. Procurement Audits is a part of a quality audit that is structured as independent process to determine if project activities comply with organizational and project policies, processes, and procedures. A checklist for purchasing is a helpful tool to ensure a smooth procurement process, which entails all relevant steps. Unexpected issues due to neglected aspects during the process can lead to extensive costs, legal issues, and delays of deliverables, the following steps are usually are considered prior to Audits:

▪ **Holding Meetings:** Meetings with all concern in the procurement department is a first step towards improving of the entire procurement management system, in this meeting, the discussion will focus on the internal process system and its impact on other departments, the second step will focus on the discussing the file of developing new suppliers while preserving current suppliers, in addition to evaluating current suppliers, the third step i will focus on leveling of raw materials stock based on internal and external issues,

▪ **Prioritize the Procurement System:** It is assumed that the previous meeting has identified for us the challenges that face or may face the procurement department, through the listening to the opinions of the attendees. The importance of that meeting comes in determining the priorities that work on it requires, such as the priorities of purchasing a material instead of another, or determining alternatives to purchasing due to high Prices, or addressing the lack of suppliers, or addressing the prevail monopoly problems, or new technology may save money, or new customer entry may need more production capacity, and others, that is why the meeting with the managers comes into project plate , and why is it a vital step to scrutiny or audit,

▪ **Review Procedures :** The auditors carefully review the set of written procedures related to procurement department, to see the extent of their understanding , and the extent of exact implementation, the smoothness of these procedures, the extent of their interconnectedness with each other, the extent of their impact on the cost and on the project scope and the quality of operations, and the extent of their relevance to other departments in order to enhance complementary of performance between different departments, this also includes reviewing the quality policy and reviewing the quality objectives and their suitability to the current pace and that may provide new opportunities that push the procurement process forward at the lowest possible costs with respect to the high quality,

▪ **Purchasing Forms :** The auditors carefully review the set of written forms , first is the purchase orders (PO) , the auditors will check the PO elements to ensure all elements are required and complete + to ensure all section of the said PO is properly filled out + the support document if their data comply with each other's and serially connected + the invoices related to the

said PO also valid + the data inbounded into software , and retrieve the information is classified as well as standard call,

j) **Approved Vendors List:** The auditors carefully review the procurement process, and review their performance of vendors, the first step to review is the Approved Vendors List (Qualified Vendors). Every company has a process of putting vendors on an approved list that comes from the assessment of vendors over the project life cycle that is described in procurement Management plan in chapter (12) part (b), It is the process of assessing the competence of the vendors based on:

- o   Quality Rating (QR),
- o   Delivery Rating (DR),
- o   Cost Rating (CR),

▪   **Compile Your findings:** The auditors carefully review the finding statement, which includes some of Non-conformities', or observation , or opportunities for improvement . corrective action may be required over all or some findings, this will help managers address them right away, project team suggestions is sought on how to improve or fix problems as well.

▪   **Final Report:** The auditors carefully write the final report to the top management, that report includes; corrective action made + corrective action still pending + the opportunities for improvement + observation that are the suggestions of the auditors + the integration among the interdepartmental activities,

4.2.2   Negotiation Settlement

Negotiation is widely defined as a discussion or bargaining to reach an agreement in commercial transactions. Negotiation is considered one of the most important and interesting activities undertaken by buyers. Negotiating between buyer and seller requires knowledge of market conditions and requires the ability to negotiate the best possible deals with suppliers. Negotiation means the difference between success and failure, and in order to be effective in procurement, negotiation must be used in its wider context as knowledge + interest + analysis + review + planning + decision-making process in the agreement or disagreement between the seller and the buyer, these agreements and settlements include all aspects of transactions are focus on the following points:
https://procurementmanagement.pressbooks.com/chapter/settlement-of-disputes/

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

Prices
Purchase order Price
Volume Discount
Price Breakdown
Pricing Review Period
Payment Terms
Purchase Currency
Exchange Rate Terms
Payment of Taxes

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

Transaction
Delivery Terms
Shipping Documents
Loading and Unloading
Requirements and guidelines
Damage in Transit
Third party Inspection

Support
Technical Support
Information Sharing
Spare Parts
Training
Contact points
Material Warranty

Good negotiation may achieve:

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

Different types of negotiation

▪ **Positional Negotiation:** Here the negotiation is seen as <u>a situation of opposition or conflict</u> in which each party consider the other party as an enemy, this negotiation may start and end with *no moral significance, this type* demand concession as a condition of the relationship lasting, this position of negotiation more close to hard negotiation,

▪ **Principal Negotiation:** Here the negotiation is seen as <u>a situation of concession</u> in which one or two parties look to settlement , this negotiation may start and end with *moral significance*, it is used in a single-source position or alliance so that the two parties begin negotiation by agreeing on certain principles through joint planning to grow together (win –win), this position of negotiation more close to soft negotiation,

▪ **BATNA Negotiation:** It's called "Best Alternative to Negotiate Agreement", + "Bottom Line Negotiation" + "Reservation Point", all these vocabularies explain <u>the point with most advantageous (profitable) for the negotiator</u>. The negotiator must be careful not to reveal his reservation point or BATNA to the other party because the final settlement is unlikely to vary much from that point. All negotiation settlements are judged in light of the other alternatives that were existed earlier.

▪ **Negotiator Position**: It is the time to shape the offer with the whole details. The sellers should think carefully about whether the stated procurement requirements accurately reflect all key client interests, buyers typically want to be treated with respect, be seen by their clients as having done a good job, this will keep relation stand up,

▪ **Interest Focus:** Interest is the unspoken motive that underlies any particular negotiating position. It is unlikely that the primary interests of the negotiator will be explicitly spoken. Sharing the core interests behind the situation may shift the negotiator's authority towards the other party plate, that may lead to reduce the outcome. The negotiator shall play the role of the investigator to discern the interest of the other side through a series of open -ended questions. In order to reach a negotiated agreement using principled negotiation, a negotiator shall focus on the primary interests of the other side, not the stated position.

▪ **Needs**: Needs are the outcomes that the negotiator must obtains in order to reach a successful result to the negotiation, it is important to the success of negations,

▪ **Wants**: Wants re the outcomes that the negotiator would like to obtain. Wants can also be exchangeable because they are not as critical to achieve a successful result, it may be use as concessions to the other party during a negotiation.

4.2.3 Records Management System
Described in chapter (12) clauses # 3.2.8 + 4.2.3

4.3 Outputs

4.3.1 Closed Procurements

Procurement is necessary for any organization because it's provide goods and services from outside sources. outsourcing contract when a buyer is unable to create a product alone, outsourcing can be more cost-effective for the buyer. Procurements are closed when the contract expires ,completed, or terminated before the work is completed, the close procurements is a part of Closing Process Group. All procurements must be closed out, no matter the circumstances under which they stop, are terminated, or are completed. procurement is completed in sequence but operations can also overlap according to the project management needs. But once the resources are purchased,

It is necessary to close the purchases and keep the necessary documentation of the work flow starting from contracts, agreements, purchase orders, shipping documents, invoices, customer accounts, and others, and consider them as future references, as well as it's include various administrative tasks such as finalizing open claims and updating records and archiving them for future use. It is important to note that the expired procurement addresses every contract that applies to the project phase and thus if there are many contracts involved, the close purchase will only be applicable to a particular contract.

4.3.2 Organizational Process Assets Updates

Described in chapter (2) clause # 2.5
Described in chapter (4) clause #6.3.2
Described in chapter (5) clause # 6.3.2
 Described in chapter (8) clause # 2.3.1+3.3.4
 Described in chapter (9) clause # 4.3.2
Described in chapter (10) clause # 3.3.5
Described in chapter (11) clause # 6.3.2
Described in chapter (12) clause # 3.3.2 +4.3.2

Chapter (13)

Stakeholders Management Process

Chapter 13

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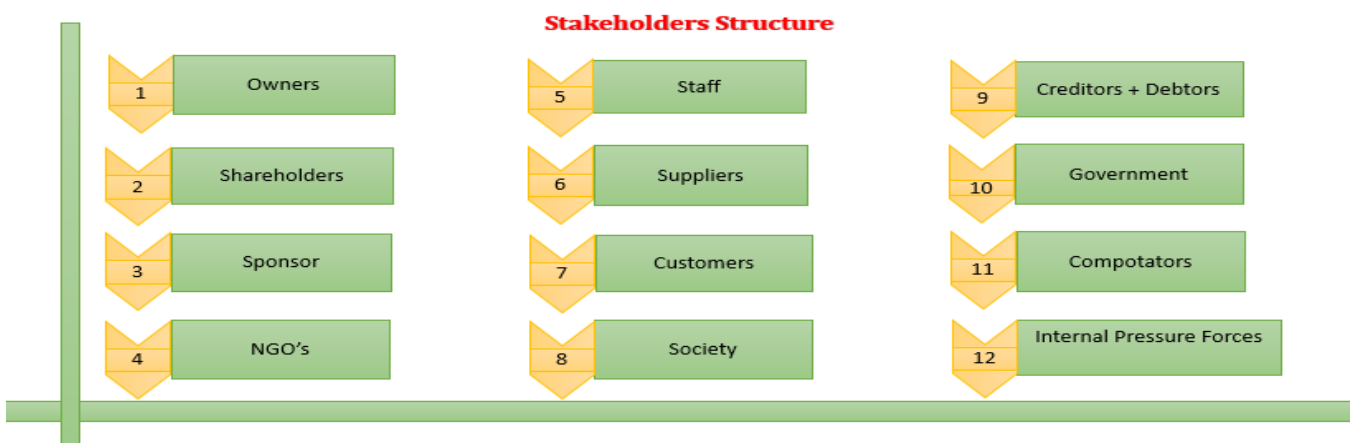| 4	4.1	Inputs	Page No.
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Stakeholder Management

Stakeholders may be some individuals, groups, entities, organizations, or competent authorities who may affect or may be affected by, or perceive itself to be affected by the decisions or activities, or projects' results. Stakeholders are either directly involved in the project or have interests that may be affected by the project's outcome, this would include normally the members of a project team, project managers, project sponsors, executives, customers, users. Project management plan shall define the needs and expectations of the stakeholders to lead the projects for success,

Stakeholder management is the process of maintaining, organizing good relationships with stakeholders or (interested parties) who may the most influence project work or be influenced by project work. Communicating the stakeholders by the right way can play a vital role in keeping them on the right path. The right path may require a process of construction a Team –Building Activities (forming + storming + norming + performing) to maintain constructive relationships with them, the process helps a business move toward its stated goals by keeping existing stakeholders satisfied.

Stakeholder management required to identify <u>the key stakeholders, and how to assess their power, influence and interest, and get them to do what you want</u> by mapping their interest +their influence+ their power + their engagement, with clear idea of the benefits that a project can gain. Stakeholders are important for a project success , because they perceive themselves the sponsor of the project , so the project's mangers shall pay more attention to their need and expectations , the importance of stakeholder's lies in the fact that they have different levels of duties and authorities when contributing on a project , they may detract from the success of the project, either actively or passively, so project managers shall remain with them during the whole time of project's life cycle to keep them informed about project's progress, project manager shall understand the consciously identification of the stakeholder during the project life cycle bring the interest to the project for workers . The following is a stakeholders' structure:

https://www.thebalancecareers.com/project-governance-basics-4126578
https://www.invensislearning.com/resources/pmp/who-are-project-stakeholders-and-why-are-they-important-for-a-project

Stakeholders Structure

1 Owners	5 Staff	9 Creditors + Debtors
2 Shareholders	6 Suppliers	10 Government
3 Sponsor	7 Customers	11 Compotators
4 NGO's	8 Society	12 Internal Pressure Forces

▪ **Owner:** The owner is an individual, group, entity, organization, or society who provide the project by the entire required resources, they have direct impact in the progress on the portfolio and the project and program, they mostly have a positive influence on the project.

▪ **Shareholders:** A Stakeholder is an individual, group, entity, organization, or society who holds minimum on stock or more stocks in a given company or mutual fund to make them a partial owner. Shareholders usually receive declared dividends if the company is doing well and succeeds. They are entitled to vote on some matters related to the company and be elected to take a seat on the board of directors.

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- **Sponsor:** A sponsor is an individual, group, entity, organization, or society who owns the project, the sponsor is the reason for the presence of the project, but they don't manage the day-to-day operations of a project, they are above the project managers in the hierarchy structure, sponsors provide support to the project, and liable to assess the project success, they may act as a CEO's of the project only not as owner.

- **NGO's:** NGO's are an individual, group, entity, organization, or society, who functions independently, they are part of the private sector, and also called the business sector, NGOs, they sometimes called civil societies, and they are organized on community, national and international levels to serve specific social or political purposes, and are cooperative, rather than commercial, in nature, they are a profitable entities like, BASIC+ ISO+ UL + Third Party Inspector, + consultant offices ,and others,

- **Staff:** They are the employment in a company or in entity or anywhere such as manager + supervisors + officers + helpers + team work + etc. Staff are paid for their work but they don't need to work full time to be considered as staff,

- **Suppliers:** Suppliers are also called vendor + sellers +providers + manufactures, they may be individual, group, entity, or organization who provide products, services, or result to others, based on those others requirements, they are either internal or external enter into a contractual agreement to provide services or resources (outsourcing) necessary for the project.

- **Customers:** Customers are also called client, they may be individual, group, entity, or organization who buy the deliverables (products, services, or result), they are either internal or external enter into a contractual agreement to buy (procure + purchase) deliverables necessary for their project, customer buy the deliverables for direct sale or to use the deliverables for production inputs as intermit materials,

- **Society:** Society: A community is a group of interacting people who live in a common place, the word is often used to refer to an organized group that has common values attributed to social cohesion within a common geographical location in larger social units of the family. The word can also refer to civil society, national society, or global community, they have their direct and indirect influence in the businesses,

- **Creditors + Debtors:** A creditor or lender is an individual, group, entity, organization, or society how own money, property or services to be given to others in assumption of return by the same or more value. In case the 1st party has provided some property or service to the 2nd party under the assumption that the second party will return, then the 2nd party is frequently called a debtor or borrower. The 1st party is called the creditor, which is the lender of money or property or services,

- **Government:** Government is a public sector is named also the state sector, it is the part of the economy composed of both public services and public enterprises, and it has an influences on projects run by many faces, like (Fiscal Policy + Monetary Policy + Word Trade + Environment+ Safety+ Labor Court + Legislation+ Regulations + etc.)

- **Competitors:** Competitor are an individual, group, entity, organization, or society, who are selling the same type of product or service as your project did, they may be internal or external. They can compete over your prices and quality, and over your proposition values of the product, services or result, the competitors can affect each other through pure competition. Pure competition will subject the prices to the factors of supply and demand,

- **Internal Pressure Forces**: Internal Pressure Forces is one type of illegal practice, as an interference paths are identified, namely in-band & out- band, and it is described how band behavior the people forces manager to recruit some which is not fit to a certain position, this type of behavior is commonly active in LDC's, this behavior takes away the rights of others, this type of behavior is mostly stands in LDC's countries,

1. Identify Stakeholders Process

Identify Stakeholders is the first process of the Project Communications Management Knowledge Area, and part of the Initiating process group. This process involves identifying and documenting all the stakeholders on the project, including their interests, impact, and potential negative influences on the project. The identifying stakeholder process starts when the project begins. You should start this process as soon as the sponsor approves the charter as early as possible, and engaging them effectively and regularly throughout the project you can ensure that you don't miss any vital information and that they support your project, rather than block it. To start the with project team , the following question are very much important to identify stakeholders:
https://www.oreilly.com/library/view/pmp-project-.

- Who is affected positively and negatively by the project?
- Who has the power to make the project succeed or fail?
- Who makes the decisions about money?
- Who are the suppliers?
- Who are the end users?
- Who has influence over other stakeholders?
- Who could solve potential problems with the project?
- Who is in charge of assigning or procuring resources or facilities?
- Who has specialist skills which are crucial to the project?

1.1 Inputs

1.1.1 Project Charter
Described in chapter (3) clause # 1
Described in chapter (4) clause # 1.3.1+ 2.1.1
Described in chapter (5) clause # 1.1.1+2.1.1 +3.1.1
Described in chapter (13) clause # 1.1.1

1.1.2 Project Documents
Described in chapter (11) clause #2.1.9
Described in chapter (12) clause #2.1.6
Described in chapter (13) clause #1.1.2

1.1.3 Enterprise Environmental Factors (EEF)
Described in chapter (2) clauses # 4.1
Described in chapter (4) clauses #1.1.4 + 2.1.3+ 3.1.3 + 4.1.3+5.1.4
 Described in chapter (6) clauses # 1.1.2+3.1.4+4.1.6+5.1.8
Described in chapter (7) clauses # 1.1.5
Described in chapter (8) clauses # 1.1.6
Described in chapter (9) clauses # 1.1.2
Described in chapter (10) clauses # 1.1.3
Described in chapter (11) clauses # 1.1.4+2.1.10
Described in chapter (12) clauses # 1.1.10
Described in chapter (13) clauses # 1.1.3

1.1.4 Organizational Process Assets (OPA)
Described in chapter (2) clauses # 4.2
Described in chapter (4) clauses # 1.1.5+2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.3
Described in chapter (5) clauses # 1.1.5+3.1.3+4.1.3+6.1.5
Described in chapter (6) clauses # 1.1.3+2.1.5+3.1.5+4.1.7+5.1.9+6.1.4+6.3.2
Described in chapter (7) clauses # 1.1.6+2.1.7+3.1.4+3.3.3
Described in chapter (8) clauses #1.1.7+3.1.6
Described in chapter (12) clauses # 1.1.11
Described in chapter (13) clauses # 1.1.4

2. Tools and Techniques

2.1.1 Stakeholder Analysis

Stakeholders may be some individuals, groups, entities, organizations, or competent authorities who may affect or may be affected by, or perceive itself to be affected by the decisions or activities, or projects' results. Stakeholders are either directly involved in the project or have interests that may be affected by the project's outcome, this would include normally the members of a project team, project managers, project sponsors, executives, customers,

users. Project management plan shall define the needs and expectations of the stakeholders to lead the projects for success,

A stakeholder analysis is a process of identifying these people before the project begins; grouping them according to their levels of participation, interest, and influence in the project; and determining how best to involve and communicate each of these stakeholder groups throughout. A project can analysis the stakeholders to the following benefits:

▪ **Getting a project Configuration:** You can get stakeholder opinions to help define your project at an early stage. These stakeholders are likely to support you, and their contributions can also improve the quality of your project.

▪ **Getting Resources:** Powerful stakeholders can be used to gain more resources, such as experts, money and studies that increase the likelihood of your projects' success.

▪ **Building Understanding:** Communicating with stakeholders early enable them to understand your project that you intend to bring into existence, and to understand the expected results of this project, so that they can provide support and assistance.

▪ **Project progress:** Understanding stakeholders means that you can know their needs and expectations, and you can predict their reactions to your project as it develops, this allows you to plan actions that are most likely to gain their support.

Internal Interested Parties (Stakeholders)	External Interested Parties (Stakeholders)
▪ Stakeholder	▪ External Competitors
▪ Sponsor	▪ Subcontractors
▪ Organizational team	▪ Government
▪ Customer	▪ External customers
▪ End User	▪ Supplier (vendors +seller)
▪ Suppliers (vendor + seller)	▪ 3rd Party Inspection
▪ Internal competitor	▪ Local community
▪ Internal pressure forces	▪ Media
▪ Labor unions	▪ NGO's

2.1.2 Expert Value Judgment
Described in chapter (4) clauses # 1.2.1 +2.2.1 + 3.2.1+ 4.2.1 +5.2.1+6.2.1
Described in chapter (5) clauses #1.2.1+3.2.1
Described in chapter (6) clauses # 1.2.3+3.2.1+4.2.1
Described in chapter (7) clauses #1.2.1+2.2.3
Described in chapter (10) clauses # 3.2.2
Described in chapter (11) clauses # 2.2.7 +3.2.6 + 4.2.3 + 2.2.4
Described in chapter (12) clauses # 1.2.2 + 2.2.4
Described in chapter (13) clauses # 1.2.2

3.1 Outputs

3.1.1 Stakeholder Register
Described in chapter (5) clauses # 2.12
Described in chapter (8) clauses # 1.1.2
Described in chapter (10) clauses # 1.1.2
Described in chapter (11) clauses # 2.1.5
Described in chapter (13) clauses # 1.3.1

3.1.2 Stakeholder Management Strategy

Stakeholder Management Strategy is the process of identifying, analyzing, communicating, engagement of stakeholders, and documenting the approach that taken to increase support and decrease negative impacts of

stakeholders throughout the life of the project. The strategy shall identify the key stakeholders along with the level of power and influence they have on the project. In order to effectively manage your stakeholders, you need to have a good stakeholder management strategy. To lead project to success you must manage your stakeholders (*to make them happy*) according to their requirements and expectations. A good stakeholder management strategy can help you fulfilling your stakeholders' requirements. Developing a stakeholder management strategy is a three-step process that are:

Stakeholders identification: Stakeholders can be identified through brainstorming sessions that may identify the people, the organizations, or the bodies who are affected by the project and who have influence or authority over the project, or have an interest in the success or failure of the project. The strategy work begins through communication and interaction with these people, organizations or bodies to know their orientation,

▪ **Stakeholders Classification:** There are many stakeholders and their requirements are many and different, developing a strategy for each individual will be very difficult, therefore, the best solution is to classify them according to their <u>requirements, strength or influence</u>, and then the strategy is planned to manage this classification efficiently. Although some influential stakeholders require their own strategy, this is not common. The mentioned classification process will help you to categorize them according to one of the following models:
https://pmstudycircle.com/2012/06/stakeholder-analysis-stakeholder-management-strategy/

▪ Power and interest: Grouping stakeholders according to their power and their interest on the project → as per the grid stakeholders' attributes are high-power or low-power and high-interest or low-interest.

▪ Power and influence: Here, you group stakeholders as per their power and influence on the project→ as per the grid stakeholders' attributes are high-power or low-power and high-interest or low-interest.

▪ Influence and impact: Here, you classify stakeholders based on their influence and impact on the project→ as per the grid stakeholders as follows: high-influence or low-influence, high-impact or low-impact.

▪ Power, urgency, and legitimacy: Many experts call this the Salience Model. Unlike others, this model uses three parameters to classify stakeholders: power, urgency, and legitimacy.

As known; Nothing is constant and everything is changeable, and stakeholders' conditions may change, and their requirements may change, and their interest may change, their needs and wants may change, so we say that the right strategy is the one that monitors the stakeholders that you have, you never know when the stakeholder will become low power or so high power, or when they become effective or ineffective and vice versa. Here are a few benefits of the stakeholder management strategy:

▪ To Keeps stakeholders satisfied.
▪ Avoids scope creep,
▪ Receive full cooperation from the stakeholders with minimal obstruction.
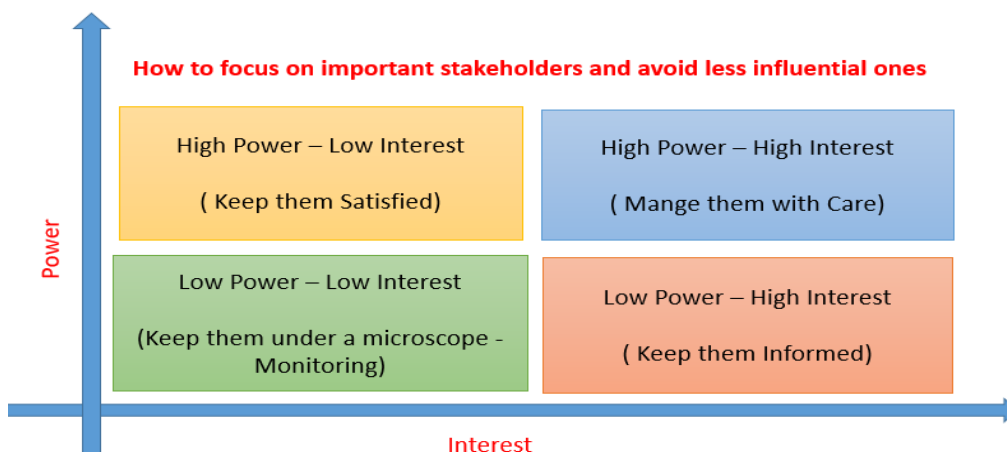
2. Plan Stakeholders Engagement Prccess

Stakeholder Engagement: Stakeholder engagement is the process by which an organization involves people who may be affected by the decisions it makes or can influence the implementation of its decisions. Stakeholder engagement means practicing interactive work with stakeholders in the project and influencing them to achieve the general benefit of the project. The more the project's supporters are aware of the importance of the project, the more successful the project will be, because the stakeholders have their requirements, expectations, perceptions and personal agenda that will affect the project's work and directions and affect results that can be achieved, therefore, successful stakeholder engagement is a vital requirement for professional project management,
https://www.projectmanagementdocs.com/template/project-initiation/stakeholder-management-strategy/#ixzz6Z30YaSnB

2.1 Outputs

2.1.1 Project Management Plan
Described in chapter (4) clauses # 2.3.1 +3.1.1 + 4.1.1 + 5.1.1 +6.1.1
Described in chapter (5) clauses # 1.3.2 + 5.1.1+6.1.1
Described in chapter (6) clauses # 6.1.1
Described in chapter (7) clauses #3.1.1
Described in chapter (8) clauses #2.1.1+3.1.1
Described in chapter (9) clauses #2.1.1+3.1.2 + 4.1.2
Described in chapter (10) clauses #1.1.1+3.1.1
Described in chapter (11) clauses #6.1.2
Described in chapter (12) clauses # 2.1.1+3.1.2 +4.1.1
Described in chapter (13) clauses # 2.2.1

2.1.2 Project Documents
Described in chapter (11) clause #2.1.9
Described in chapter (12) clause #2.1.6
Described in chapter (13) clause #1.1.2 + 2.1.2

2.1.3 Enterprise Environmental Factors (EEF)
Described in chapter (2) clauses # 4.1
Described in chapter (4) clauses #1.1.4 + 2.1.3+ 3.1.3 + 4.1.3+5.1.4
 Described in chapter (6) clauses # 1.1.2+3.1.4+4.1.6+5.1.8
Described in chapter (7) clauses # 1.1.5
Described in chapter (8) clauses # 1.1.6
Described in chapter (9) clauses # 1.1.2
Described in chapter (10) clauses # 1.1.3
Described in chapter (11) clauses # 1.1.4+2.1.10
Described in chapter (12) clauses # 1.1.10
Described in chapter (13) clauses # 1.1.3

2.1.4 Organizational Process Assets (OPA)
Described in chapter (2) clauses # 4.2
Described in chapter (4) clauses # 1.1.5+2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.3
Described in chapter (5) clauses # 1.1.5+3.1.3+4.1.3+6.1.5
Described in chapter (6) clauses # 1.1.3+2.1.5+3.1.5+4.1.7+5.1.9+6.1.4+6.3.2
Described in chapter (7) clauses # 1.1.6+2.1.7+3.1.4+3.3.3
Described in chapter (8) clauses #1.1.7+3.1.6
Described in chapter (12) clauses # 1.1.11
Described in chapter (13) clauses # 1.1.4 +2.1.4

2.2 Tools and Techniques

2.2.1 Expert Value Judgment
Described in chapter (4) clauses # 1.2.1 +2.2.1 + 3.2.1+ 4.2.1 +5.2.1+6.2.1
Described in chapter (5) clauses #1.2.1+3.2.1
Described in chapter (6) clauses # 1.2.3+3.2.1+4.2.1
Described in chapter (7) clauses #1.2.1+2.2.3
Described in chapter (10) clauses # 3.2.2
Described in chapter (11) clauses # 2.2.7 +3.2.6 + 4.2.3 + 2.2.4
Described in chapter (12) clauses # 1.2.2 + 2.2.4
Described in chapter (13) clauses # 1.2.2 + 2.2.1

2.2.2 Data Gathering and Representation Technique
Described in chapter (11) clauses # 4.2.1
Described in chapter (13) clauses # 2.2.2

2.2.3 Data Analysis
Described in chapter (5) clauses # 1.2.2
Described in chapter (13) clauses # 2.2.3

2.2.4 Group Decision Making Techniques
Described in chapter (5) clauses # 2.25
Described in chapter (13) clauses # 2.2.4

2.2.5 Meetings
Described in chapter (4) clauses # 3.2.2
Described in chapter (5) clauses # 1.2.4
Described in chapter (10) clauses # 1.2.5 + 3.2.3
Described in chapter (11) clauses # 6.2.6
Described in chapter (13) clauses # 2.2.5

2.3 Outputs

2.3.1 Change Request
Described in chapter (4) clauses # 3.3.3 +4.3.1+5.1.3
Described in chapter (5) clauses # 5.3.2+6.3.3
Described in chapter (6) clauses # 6.3.3
Described in chapter (7) clauses # 3.3.4
Described in
chapter (8) clauses # 2.3.2+3.3.5
Described in chapter (9) clauses # 4.3.3
Described in chapter (10) clauses # 3.3.2
Described in chapter (11) clauses # 6.3.3
Described in chapter (12) clause # 1.3.6 + 2.3.4 + 3.3.3
Described in chapter (13) clause # 2.3.1

2.3.2 Project Management Plan Updates
Described in chapter (4) clause # 3.3.4 +4.3.2+5.3.2
Described in chapter (5) clause# 6.3.4
Described in chapter (6) clause # 6.3.4
Described in chapter (7) clause # 3.3.5
Described in chapter (8) clause # 2.3.3+3.3.6
Described in chapter (9) clause # 2.3.3

Described in chapter (10) clause # 1.3.2 + 2.3.3 +3.3.2
Described in chapter (11) clause # 5.3.3 +6.3.4
Described in chapter (12) clause # 2.3.5 +3.3.4
Described in chapter (13) clause # 2.3.2

2.3.3 Project Documents Updates
Described in chapter (4) clause #3.3.5 + 4.3.3 +5.3.3
Described in chapter (5) clause# 3.3.2+4.3.4+5.3.3+6.3.5
Described in chapter (6) clause #2.3.2+3.3.3+4.3.2+5.3.4+6.3.5
Described in chapter (7) clause # 1.3.3+2.3.3+3.3.6
Described in chapter (8) clause # 1.3.5+2.3.4+3.3.7
Described in chapter (10) clause # 1.3.2 + 2.3.3 +3.3.4
Described in chapter (11) clause # 5.3.4
Described in chapter (12) clause # 2.3.6
Described in chapter (13) clause # 2.3.3

3. Manage Stakeholder Engagement Process

Manage Stakeholder Engagement is the process of communicating and working with stakeholders to meet their needs, expectations, wants, and address the issues once they occur, and foster appropriate stakeholder engagement in project activities throughout the project life cycle. The key benefit of this process is that it allows the project manager to increase support and minimize resistance from stakeholders, significantly increasing the chances to achieve project success. It is also a common understanding that this process is all about ensuring that misunderstandings don't develop between stakeholders as the project progresses. Some of the things that you would do to ensure misunderstandings don't develop are,
A Guide to the Project Management Body of Knowledge (PMBOK® Guide), Fifth Edition

- Involve stakeholders in project decision-making,
- Understand stakeholder needs, expectations and wants,
- Taking stakeholders into account so as not to implement project orientations
- Understand the reasons behind the opposition and resistance that arise from the stakeholders,
- Focus on important stakeholders and avoid less influential ones,

3.1 Inputs

3.1.1 Project Management Plan
Described in chapter (4) clauses # 2.3.1 +3.1.1 + 4.1.1 + 5.1.1 +6.1.1
Described in chapter (5) clauses # 1.3.2 + 5.1.1+6.1.1
Described in chapter (6) clauses # 6.1.1
Described in chapter (7) clauses #3.1.1
Described in chapter (8) clauses #2.1.1+3.1.1

Described in chapter (9) clauses #2.1.1+3.1.2 + 4.1.2
Described in chapter (10) clauses #1.1.1+3.1.1
Described in chapter (11) clauses #6.1.2
Described in chapter (12) clauses # 2.1.1+3.1.2 +4.1.1
Described in chapter (13) clauses # 2.2.1 +3.1.1

3.1.2 Project Documents
Described in chapter (11) clause #2.1.9
Described in chapter (12) clause #2.1.6
Described in chapter (13) clause #1.1.2 + 2.1.2 + 3.1.2

3.1.3 Enterprise Environmental Factors (EEF)
Described in chapter (2) clauses # 4.1
Described in chapter (4) clauses #1.1.4 + 2.1.3+ 3.1.3 + 4.1.3+5.1.4
 Described in chapter (6) clauses # 1.1.2+3.1.4+4.1.6+5.1.8
Described in chapter (7) clauses # 1.1.5
Described in chapter (8) clauses # 1.1.6
Described in chapter (9) clauses # 1.1.2
Described in chapter (10) clauses # 1.1.3
Described in chapter (11) clauses # 1.1.4+2.1.10
Described in chapter (12) clauses # 1.1.10
Described in chapter (13) clauses # 1.1.3 + 3.1.3

3.1.4 Organizational Process Assets (OPA)
Described in chapter (2) clauses # 4.2
Described in chapter (4) clauses # 1.1.5+2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.3
Described in chapter (5) clauses # 1.1.5+3.1.3+4.1.3+6.1.5
Described in chapter (6) clauses # 1.1.3+2.1.5+3.1.5+4.1.7+5.1.9+6.1.4+6.3.2
Described in chapter (7) clauses # 1.1.6+2.1.7+3.1.4+3.3.3
Described in chapter (8) clauses #1.1.7+3.1.6
Described in chapter (12) clauses # 1.1.11
Described in chapter (13) clauses # 1.1.4 +2.1.4 +3.1.4

3.2 Tools and Techniques

3.2.1 Expert Value Judgment
Described in chapter (4) clauses # 1.2.1 +2.2.1 + 3.2.1+ 4.2.1 +5.2.1+6.2.1
Described in chapter (5) clauses #1.2.1+3.2.1
Described in chapter (6) clauses # 1.2.3+3.2.1+4.2.1
Described in chapter (7) clauses #1.2.1+2.2.3
Described in chapter (10) clauses # 3.2.2
Described in chapter (11) clauses # 2.2.7 +3.2.6 + 4.2.3 + 2.2.4
Described in chapter (12) clauses # 1.2.2 + 2.2.4
Described in chapter (13) clauses # 1.2.2 + 2.2.1+ 3.2.1

3.2.2 Communication Skills

In addition to what mentioned in chapter (10), Communication is the act of transferring data, information, and message from one place to another, or from person to another, or from group to another. Every communication involves at least one sender, a message and a recipient. Developing strong communication skills is essential in all aspects of life, in terms of project management, strong communication skills play an important role in developing and rehabilitating the employees, improving operations and improving work outcomes.
https://blog.smarp.com/top-5-communication-skills-and-how-to-improve-them

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When the project becomes more complex, communication with people, bodies, institutions, and other stakeholders must be more detailed to ensure that we reach all stakeholders with whom we must communicate to achieve success ,and when we plan to communicate in advance, we do the following:

- Improve overall communication effectiveness,
- Improve frequency and quality,
- Involving individuals in the initiative through open communication,
- Engaging stakeholders in communications by enabling more effective two-way talks

In the business world, many employers believe that proper internal communications can greatly increase employee productivity. Although there is always a chance for a lack of understanding which may cause conflicts and frustrations in personal or professional life in relationships with others, skillful communication may achieve the following points, with regards to the following Figure:

- The political life :Facilitating understanding at the international level and promoting an atmosphere of understanding
- Economic life: Increase investment and growth rate + improve intra-trade and politics + good attach with vital markets,
- Social life: Create strong bonds in the workplace + bring innovative solutions و
- Technological life style: Increase knowledge and increase attachment to technology
- Environmental life style :Facilitate the work environment in terms of communication and engagement
- Legitimate life style: Deepening the common understanding of the importance of the rule of legislation
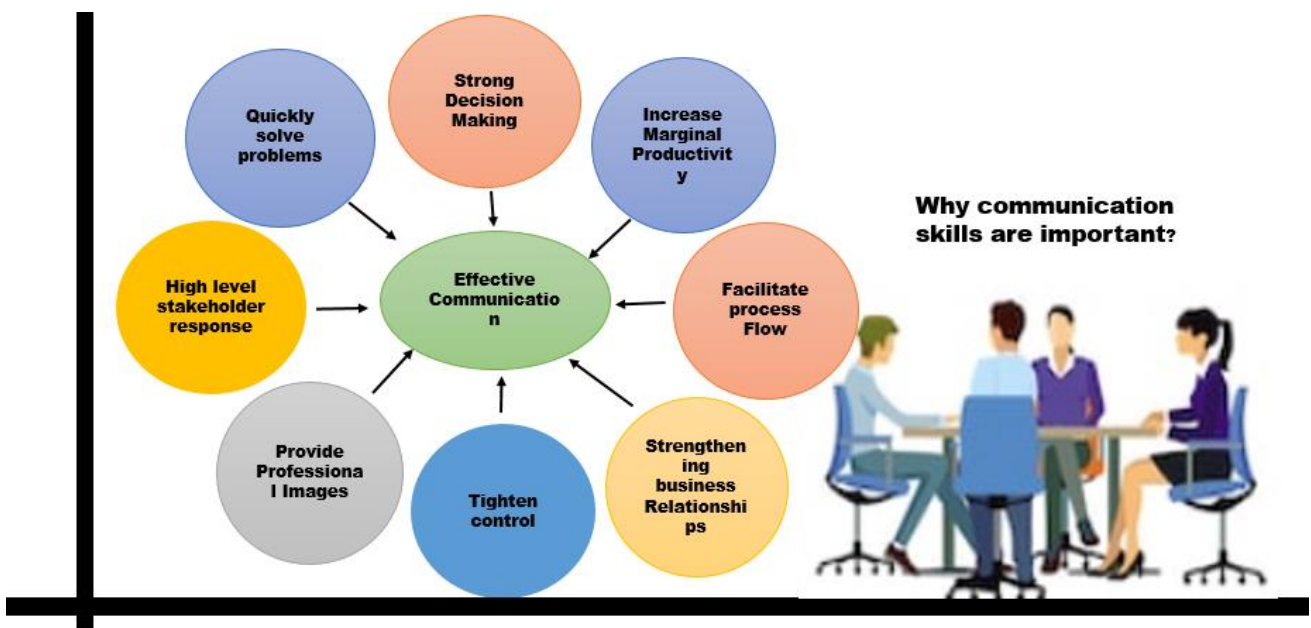
Workers in a field in business field receive and send massive amounts of data, information, and messages, receiving this momentum of data, information, and messages, requires multiple levels of understanding, analysis, perception and processing, and just sharing communication with others leads to understanding the feelings behind the communication, and the reading between the lines as well. That is why successful communication can deepen the relationships in personal life and in business lifecycle, and developing communication skills can help us avoid conflicts and compromises and help make better decisions. Skillful g communication starts and end successfully when you apply the following methods:

https://blog.smarp.com/top-5-communication-skills-and-how-to-improve-them

- Listen sympathetically: Empathy is the ability to understand the feelings and the beliefs of others, meaning that you put yourself in the shoes of the speaker, or in other words try to see things from the perspective of others by accepting what you hear instead of trying to "fix things and solve the problem", because good listening may enable us to accept the reasons why someone feels or thinks the way they do, regardless of whether or not we agree with them.

▪ Start talking: Speak: After carefully listening to what the other party is saying, you should start the conversation with focus and speak with specific and sequential points, do not let the opportunity pass and rely on free communication through other means. Face speech is the best way to get closer and understand others.

▪ Prepare what you will say: If you have an important meeting in which you must make a decision, then take the time to collect your ideas, and classify them in the form of points to be presented according to their importance, share your work team with the ideas you will present, and try not to talk about topics in which you may be the loser, Try to research points that add value to your work, and don't leave dust on your table or unresolved points,

▪ Be ready for different answers :As you speak, put yourself in the place of the person who will listen to you, because feelings will be related to the idea that he is a master and that he wants to achieve something, try to take a balanced approach (middle) so that it is easier for you to defend your point of view and to be ready to stand up for any potential disagreements, because no one can predict with certainty how the other will react, try to improve your chances of having a successful conversation by anticipating answers and negative inquiries. So it can be difficult for your listeners to discover you when you are not ready.

3.2.3 Interpersonal Skills
Described in chapter (9) clauses # 3.2.1+4.3.5
Described in chapter (13) clauses #3.2.3

3.2.4 Ground Rules
Described in chapter (9) clauses # 3.2.4
Described in chapter (13) clauses # 3.2.4

3.2.5 Meetings
Described in chapter (4) clauses # 3.2.2
Described in chapter (5) clauses # 1.2.4
Described in chapter (10) clauses # 1.2.5 + 3.2.3
Described in chapter (11) clauses # 6.2.6
Described in chapter (13) clauses # 2.2.5 +3.2.5

3.3 Outputs

3.3.1 Change Request

Described in chapter (4) clauses # 3.3.3 +4.3.1+5.1.3
Described in chapter (5) clauses # 5.3.2+6.3.3
Described in chapter (6) clauses # 6.3.3
Described in chapter (7) clauses # 3.3.4
Described in chapter (8) clauses # 2.3.2+3.3.5
Described in chapter (9) clauses # 4.3.3
Described in chapter (10) clauses # 3.3.2
Described in chapter (11) clauses # 6.3.3
Described in chapter (12) clause # 1.3.6 + 2.3.4 + 3.3.3
Described in chapter (13) clause # 2.3.1 + 3.3.1

3.3.2 Project Management Plan Updates
Described in chapter (4) clause # 3.3.4 +4.3.2+5.3.2
Described in chapter (5) clause# 6.3.4
Described in chapter (6) clause # 6.3.4
Described in chapter (7) clause # 3.3.5
Described in chapter (8) clause # 2.3.3+3.3.6
Described in chapter (9) clause # 2.3.3
Described in chapter (10) clause # 1.3.2 + 2.3.3 +3.3.2
Described in chapter (11) clause # 5.3.3 +6.3.4
Described in chapter (12) clause # 2.3.5 +3.3.4

Described in chapter (13) clause # 2.3.2 + 3.3.2+4.3.3

3.3.3 Project Documents Updates
Described in chapter (4) clause #3.3.5 + 4.3.3 +5.3.3
Described in chapter (5) clause# 3.3.2+4.3.4+5.3.3+6.3.5
Described in chapter (6) clause #2.3.2+3.3.3+4.3.2+5.3.4+6.3.5
Described in chapter (7) clause # 1.3.3+2.3.3+3.3.6
Described in chapter (8) clause # 1.3.5+2.3.4+3.3.7
Described in chapter (10) clause # 1.3.2 + 2.3.3 +3.3.4
Described in chapter (11) clause # 5.3.4
Described in chapter (12) clause # 2.3.6
Described in chapter (13) clause # 2.3.3 +3.3.3 +4.3.4

4. Monitor Stakeholder Engagement Process

4.1 Inputs

4.1.1 Project Management Plan
Described in chapter (4) clauses # 2.3.1 +3.1.1 + 4.1.1 + 5.1.1 +6.1.1
Described in chapter (5) clauses # 1.3.2 + 5.1.1+6.1.1
Described in chapter (6) clauses # 6.1.1
Described in chapter (7) clauses #3.1.1
Described in chapter (8) clauses #2.1.1+3.1.1
Described in chapter (9) clauses #2.1.1+3.1.2 + 4.1.2
Described in chapter (10) clauses #1.1.1+3.1.1
Described in chapter (11) clauses #6.1.2
Described in chapter (12) clauses # 2.1.1+3.1.2 +4.1.1
Described in chapter (13) clauses # 2.2.1 +3.1.1+4.1.1

4.1.2 Project Documents
Described in chapter (11) clause #2.1.9
Described in chapter (12) clause #2.1.6
Described in chapter (13) clause #1.1.2 + 2.1.2 + 3.1.2 + 4.1.2

4.1.3   Work Performance Information
Described in chapter (4) clauses #3.3.2 +5.1.2
Described in chapter (5) clauses #6.3.1+6.1.3
Described in chapter (6) clauses #6.1.3
Described in chapter (7) clauses #3.1.3
Described in chapter (8) clauses #2.1.3
Described in chapter (10) clauses #3.3.1
Described in chapter (11) clauses #6.1.3
Described in chapter (12) clauses #3.1.6
Described in chapter (13) clauses #4.13

4.1.4   Enterprise Environmental Factors (EEF)
Described in chapter (2) clauses # 4.1
Described in chapter (4) clauses #1.1.4 + 2.1.3+ 3.1.3 + 4.1.3+5.1.4
 Described in chapter (6) clauses # 1.1.2+3.1.4+4.1.6+5.1.8
Described in chapter (7) clauses # 1.1.5
Described in chapter (8) clauses # 1.1.6
Described in chapter (9) clauses # 1.1.2
Described in chapter (10) clauses # 1.1.3

Described in chapter (11) clauses # 1.1.4+2.1.10
Described in chapter (12) clauses # 1.1.10
Described in chapter (13) clauses # 1.1.3 + 3.1.3 + 3.1.4

4.1.5   Organizational Process Assets (OPA)

Described in chapter (2) clauses # 4.2
Described in chapter (4) clauses # 1.1.5+2.1.4 + 3.1.4 + 4.1.4+5.1.5+6.1.3
Described in chapter (5) clauses # 1.1.5+3.1.3+4.1.3+6.1.5
Described in chapter (6) clauses # 1.1.3+2.1.5+3.1.5+4.1.7+5.1.9+6.1.4+6.3.2
Described in chapter (7) clauses # 1.1.6+2.1.7+3.1.4+3.3.3
Described in chapter (8) clauses #1.1.7+3.1.6
Described in chapter (12) clauses # 1.1.11
Described in chapter (13) clauses # 1.1.4 +2.1.4 +3.1.4 +4.1.5

4.2 Tools and Techniques
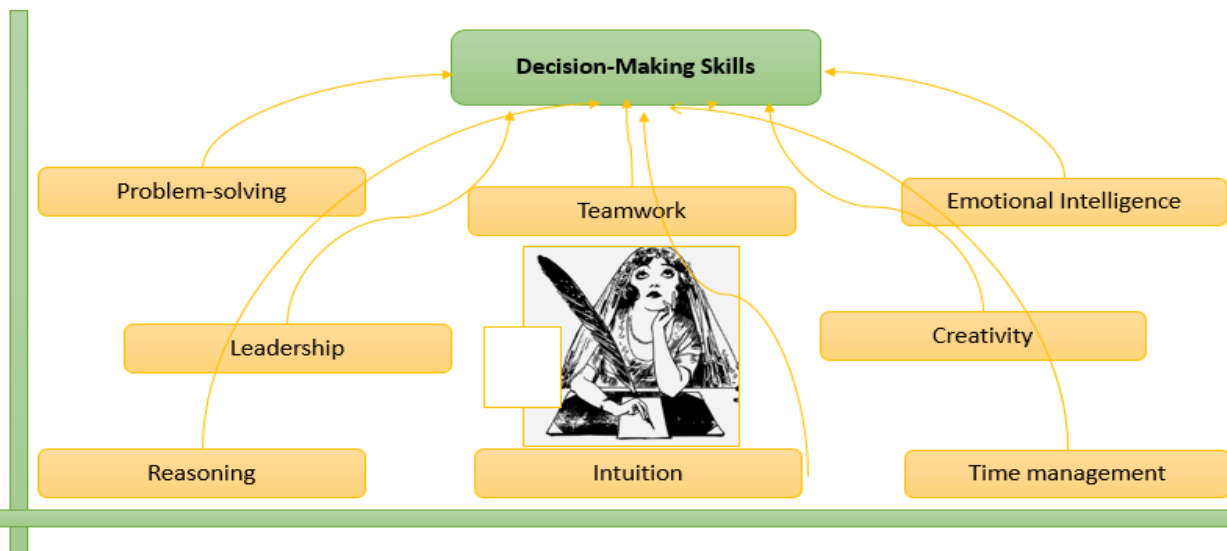
4.2.1   Data Analysis

Described in chapter (5) clauses #1.2.2
Described in chapter (13) clauses # 2.2.3 +4.2.1

4.2.2   Decision Making

Decision Making is the process of deciding about something important, especially in a group of people or in an organization, while a Group Decision Making Techniques is a process to generate as many suggestions as possible toward developing new ideas, and final decision, the following steps allows to generate the useful ideas that lead for rational decision making.

Decision-making skills:

Decision making Process:

- Define the problem, challenge, or opportunity.
- Generate an array of possible solutions or responses.
- Evaluate the costs and benefits, or pros and cons, associated with each option.
- Select a solution or response.
- Implement the option chosen.
- Assess the impact of the decision and modify the course of action as needed

Decision making Process:

- Define the problem, challenge, or opportunity.
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- Evaluate the costs and benefits, or pros and cons, associated with each option.
- Select a solution or response.
- Implement the option chosen.
- Assess the impact of the decision and modify the course of action as needed

4.2.3   Data Gathering and Representation Technique
Described in chapter (11) clauses # 4.2.1
Described in chapter (14) clauses #2.2.2 +2.2.5 +4.2.3

4.2.4   Communication Skills
Described in chapter (13) clauses # 3.2.2 + 4.24

4.2.5   Interpersonal Skills
Described in chapter (9) clauses #3.2.1+4.3.5
Described in chapter (13) clauses # 3.2.3 +4.2.5

4.2.6   Meetings
Described in chapter (4) clauses # 6.2.2
Described in chapter (5) clauses # 1.2.4
Described in chapter (10) clauses # 1.2.5 + 3.2.3
Described in chapter (11) clauses # 6.2.6
Described in chapter (13) clauses # 2.2.5 +3.2.5 +4.2.6

4.3   Outputs

4.3.1   Work Performance Information
Described in chapter (4) clauses #3.3.2 +5.1.2
Described in chapter (5) clauses #6.3.1+6.1.3
Described in chapter (6) clauses #6.1.3
Described in chapter (7) clauses #3.1.3
Described in chapter (8) clauses #2.1.3
Described in chapter (10) clauses #3.3.1
Described in chapter (11) clauses #6.1.3
Described in chapter (12) clauses #3.1.6
Described in chapter (13) clauses #4.1.3 +4.3.1

4.3.2   Change Request
Described in chapter (4) clauses # 3.3.3 +4.3.1+5.1.3
Described in chapter (5) clauses # 5.3.2+6.3.3
Described in chapter (6) clauses # 6.3.3
Described in chapter (7) clauses # 3.3.4
Described in chapter (8) clauses # 2.3.2+3.3.5
Described in chapter (9) clauses # 4.3.3
Described in chapter (10) clauses # 3.3.2
Described in chapter (11) clauses # 6.3.3
Described in chapter (12) clause # 1.3.6 + 2.3.4 + 3.3.3
Described in chapter (13) clause # 2.3.1 + 3.3.1+4.3.2

4.3.3   Project Management Plan Updates
Described in chapter (4) clause # 3.3.4 +4.3.2+5.3.2

Described in chapter (5) clause# 6.3.4
Described in chapter (6) clause # 6.3.4
Described in chapter (7) clause # 3.3.5
Described in chapter (8) clause # 2.3.3+3.3.6
Described in chapter (9) clause # 2.3.3
Described in chapter (10) clause # 1.3.2 + 2.3.3 +3.3.2
Described in chapter (11) clause # 5.3.3 +6.3.4
Described in chapter (12) clause # 2.3.5 +3.3.4
Described in chapter (13) clause # 2.3.2 + 3.3.2 +4.3.3

4.3.4   Project Documents Updates

Described in chapter (4) clause #3.3.5 + 4.3.3 +5.3.3
Described in chapter (5) clause# 3.3.2+4.3.4+5.3.3+6.3.5
Described in chapter (6) clause #2.3.2+3.3.3+4.3.2+5.3.4+6.3.5
Described in chapter (7) clause # 1.3.3+2.3.3+3.3.6
Described in chapter (8) clause # 1.3.5+2.3.4+3.3.7
Described in chapter (10) clause # 1.3.2 + 2.3.3 +3.3.4
Described in chapter (11) clause # 5.3.4
Described in chapter (12) clause # 2.3.6
Described in chapter (13) clause # 2.3.3 +3.3.3 +4.3.4

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