

Construction of Polymerase Chain Reaction Lab



Group Number: 6015

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

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List of Abbreviations and Acronyms

PCR	Polymerase Chain Reaction
HIV	Human Immunodeficiency Virus
HCV	Hepatitis C Virus
HBV	Hepatitis B Virus
HAV	Hepatitis A Virus
COVID-19	Coronavirus diseases.
DNA	Deoxyribose Nucleic Acid
HESN	Health Electronic Surveillance Network
MOH	Ministry of Health
CCTV	Closed Circuit Television
LAN	Local Area Network
WAN	Wide Area Network
HVAC	Heating Ventilation Air Conditioner
WEQAYA	Public Health Authority
CAP	College of American Pathology
SCC	Saudi Construction Code
OBS	Organization Breakdown Structure
PMO	Project Management Office
EBP	Evidence Based Practice
PM	project managers
SWOT	Strength Weakness Opportunities Threats
IRMI	International Risk Management Institute
RCA	Root cause analysis
ACH	Air Change per hour

Abstract

The objective of this project is to study the viability of establishing healthcare diagnostic center and PCR testing center services for the early detection of HIV, HCV, HBV, HAV & COVID-19. PCR is useful in the investigation and diagnosis of a growing number of diseases. PCR is also used in forensics laboratories Launching healthcare diagnostic center & PCR testing center finds a wide application area in healthcare services facilities.

In this project, a case study of the establishing PCR testing center was carried out to determine the feasibility as business. Establishing PCR testing center involve a number of participants and stakeholders, their participation and commitment can have a major influence on the goals of establishing PCR testing center.

The project research provides a basis for the establishing PCR testing center emphasize the necessity and significance of tailoring the establishing healthcare diagnostic center to the unique features of the project and its context. PCR is now a common and often indispensable technique used in medical and biological research labs for a variety of applications.

The present paper is an attempt to review basics of PCR in relation to its methods, application and use.

Keywords: Healthcare, Diagnostic center, and PCR testing center services.

Introduction

PCR is the abbreviation for “polymerase chain reaction”. PCR is a way used for amplifying DNA. In April 1983, Kary Mullis stumbled throughout a manner that might make limitless numbers of copies of genes now referred to as PCR. Since then, PCR has come to be famous as a diagnostic device worldwide. The name “polymerase chain reaction” is derived from the deoxyribonucleic acid (DNA) polymerase used to increase a chunk of DNA via way of means of in vitro enzymatic replication.

PCR (Polymerase chain reaction) has now become the method of choice in early and accurate diagnosis of most infectious diseases, and has become an indispensable research tool. With this revolutionary, yet relatively inexpensive, molecular genetics technology, it is possible to generate millions of DNA copies from a single strand of DNA (WHO, 2016).

PCR has significantly helped in early commencement of specific interventions for disease control, and also plays a critical role in understanding disease epidemiology, thereby unravelling the transmission dynamics of the disease.

PCR has been notably changed and is broadly utilized in molecular biology, microbiology, genetics, diagnostics, and medical, forensic and environmental laboratories, except numerous different applications. PCR methodologies have certainly developed through the years from the engineering of thermostable polymerases and production of computerized thermocyclers to more modern virtual PCR (d-PCR) methodologies and related microfluidic gadgets for dealing with excessive-throughput PCR applications.

“Real-time” PCR has earned wider popularity because of the decreased danger of carryover infection and stepped forward sensitivity, rapidity and reproducibility. It is standard as the “gold standard” for analysis of numerous viruses, and quantification of viral load in medical samples – a trademark of energetic infection, sickness development and healing reaction to

antiviral drugs. The big financial funding required for “real-time” PCR instrumentation and reagents is a prime stumbling block for its habitual use in maximum diagnostic laboratories (WHO, 2016).

1.1 Strategy

While carrying out the plan, we will hold ourselves accountable to these five corporate strategic directions or commitments.

- Quality: Achieving the highest level of healthcare quality is essential to the vitality of our community. We can accept nothing less than creating a culture of clinical excellence where quality is integrated in everything we do.
- Customers: We are committed give better care to our customers. We will provide the resources to ensure that every healthcare service we offer is focused on meeting and exceeding the expectations of patients and their families in addition to our external customers, identified in the Laboratory scope of service.
- Community: We all aspire to live and work in a healthier community. As the region's largest privet healthcare provider, we recognize and embrace our role in improving the health and well-being of everyone in the community serve.
- Employees: Efficient manpower is the cornerstone in the success of any organization. People who bring their talent, insight, and knowledge to delivering exceptional healthcare must be valued, supported and appreciated. We are building a staff that will go the extra mile to work with each other in a cooperative spirit to provide outstanding service and top-quality care.
- Finance (Provider of cost-effective healthcare): As a private hospital seeking financial profits, a good finance department can make this goal achieved. The balance between providing a high-quality healthcare and the cost of this care is always disturbed. We shall aim at monitoring our costs to keep our prices easily accessible to any patient without altering the quality of service we are giving. Meanwhile, we shall invest more money in expansion of our project, which will in turn increase our income.

Business Strategy

Currently with insurance companies and MOH as our main clients, our business strategy is within economy of scale competing by lowering our prices in relation to the same category of competitor and this increases our growth revenue but decreases our profitability sharply without effect on the quality of health care. Nevertheless, when the operation becomes under pressure, the organization adapts a cost control strategy that affects the vital functions of operations.

1.1.1 Vision Statement

We strive to be the lead accredited laboratory in the region that provides the accurate result for better healthy decisions.

1.1.2 Mission Statement

To provide quality laboratory services inspection, verification, testing, certification in timely manner with the least error percentage.

1.1.3 Objective in a SMART Model:

1. Expand the Laboratory Services Provided by the end of 2022
2. Increase the patient Served in Laboratory by 15 % by the end of Jun 2022
3. Improve the Overall Patient Satisfaction
4. Increase the profit by 15% in comparison to last 2 years by the end of 2024
5. Establish a formal Process and receiving compiling analysis and tracking of patient complaints before the end of Jun 2022 and to ensure to have it at a very minimal rate less than 5% of the total patient population per month.

1.1.4 The Performance Measurement Indicators (Lead or Lag):

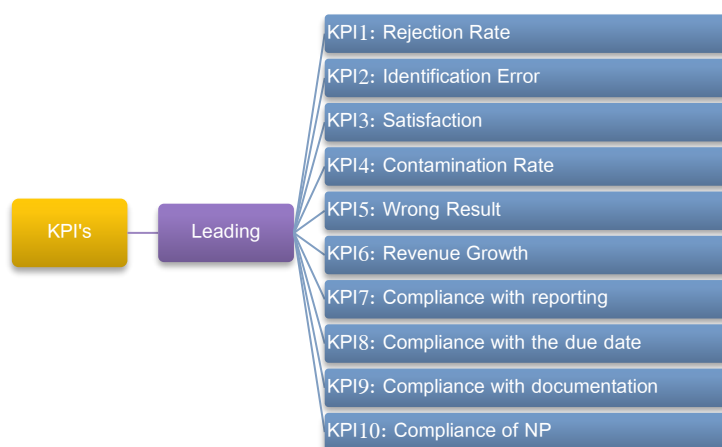


Figure 1 KPI's Lead or Lag

KPI 1: Rejection Laboratory Specimens Rate

Description: Sometimes tests cannot be performed in the laboratory if samples fall short of the quality, volume or other eligibility criteria. In these cases, the laboratory may need to reject the samples, and not carry out processing.

Unit	Benchmark	Polarity	Frequent	Target	Method
Percentage	0.28 %	Negative	Monthly	1 % or less	$\frac{\text{Number of Rejection Sample}}{\text{Total Number of Request}} \times 100$

KPI 2: Patient Identification Error in Patient Laboratory Specimen Rate

Description: Identification errors involve misidentification of a patient or a specimen. Identification errors can occur during any part of the test cycle; however, most occur in the preanalytic phase.

Unit	Benchmark	Polarity	Frequent	Target	Method
Percentage	6.5%	Negative	Monthly	0.5 %	$\frac{\text{Number of Identification Error}}{\text{Total Number of Request}} \times 100$

KPI 3: % Customer Satisfaction

Description: To measuring the quality in health care. Customer satisfaction affects clinical outcomes, customer retention, and medical malpractice claims.

Unit	Benchmark	Polarity	Frequent	Target	Method
Percentage	85 %	Positive	Quartary	100 %	$\frac{\text{Total No of Satisfied Customer}}{\text{Total No of Customer}} \times 100$

KPI 4: Sample Contamination Rate

Description: The retrospective sample contamination rate is calculated based on certain criteria. Sample is in direct exposure to air-borne contaminants and environmental changes due to changes in humidity levels, temperature or exposure to light.

Unit	Benchmark	Polarity	Frequent	Target	Method
Percentage	2 %	Negative	Monthly	2 %	$\frac{\text{Number of Contamination Sample}}{\text{Total Number of Sample}} \times 100$

KPI 5: HESN PLUS Wrong Result Entry Rate

Description: Human data entry can result in errors that ruin statistical results and conclusions as well as errors in the sample results.

Unit	Benchmark	Polarity	Frequent	Target	Method
Percentage	0.5 %	Negative	Monthly	1 %	$\frac{\text{Number of Identification Error}}{\text{Total Number of Request}} \times 100$

KPI 6: Revenue Growth Rate

Description: Refers to an increase in revenue over a period of time. In accounting

Unit	Benchmark	Polarity	Frequent	Target	Method
Percentage	–	Positive	Monthly	15 %	$\frac{\text{Current Period Revenue} - \text{Prior Period Revenue}}{\text{Prior Period Revenue}} \times 100$

KPI 7: % Compliance with reporting of the positive result to MOH

Description: Monitoring compliance with certification standards (MOH).

Unit	Benchmark	Polarity	Frequent	Target	Method
Percentage	–	Positive	Monthly	100 %	$\frac{\text{Number of reporting}}{\text{Total Number of Compliance}} \times 100$

KPI 8: % Compliance with the Due Date of Construction

Description:

Unit	Benchmark	Polarity	Frequent	Target	Method
Percentage	–	Positive	Monthly	100 %	

KPI 9: % Compliance with Documentation of Negative Pressure Checklist

Description:

Unit	Benchmark	Polarity	Frequent	Target	Method
Percentage	–	Positive	Monthly	95 %	

KPI 8: % Compliance of negative pressure room with monitoring**Description:** (Temperature, Humidity, Pressure, ACH)

Unit	Benchmark	Polarity	Frequent	Target	Method
Percentage	–	Positive	Monthly	100 %	

Table 1: KPIs Card

1.1.5 The Project Charter Model:

Project Title:	Establishing a new PCR Laboratory	Project Number:	
Location:	In Madina	Revision Date:	
Project Manager:	Eng. Samir Asad		
Project Objective		Project Scope	
To provide Healthcare facilities and diagnostics for the patients in and around Madina		Work to include the following: - Redesign of current structure for PCR Laboratory in the premises of Dr. Hamid Suleiman Al- Ahmadi Hospital, Medina - Approximate Site Area = 180 Sq m - Approximate Building Area = 12000 Sq m - All sites are to be developed by filling, compaction, and grading to the required elevation. - Site is to be provided with services such as portable water supply, sewage, drainage System, Power and lighting, Telecommunication, CCTV, LAN, WAN, Public Address System, HVAC, fire detection, fire protection system	
Project Justification			
Due to pandemic breakdown status Covid19 there is special requirement due to travel in and outside without PCR test. This project will be helpful for the local residents and the visitor for Umra & Hajj Pilgrim			
Stakeholders (External and Internal)			
- Project Sponsor - Project Manager - Procurement Department - IT Department - HR Department - Infection Control Department - Laboratory Department - Finance Department - Operation Department - Engineering Department - Insurance Department			
		Studies	
		Surveys: Existing condition as-built survey will be carried out during design task	
		Standards	
		WEQAYA, CAP, MOH & SCC	
		Project Constraints	

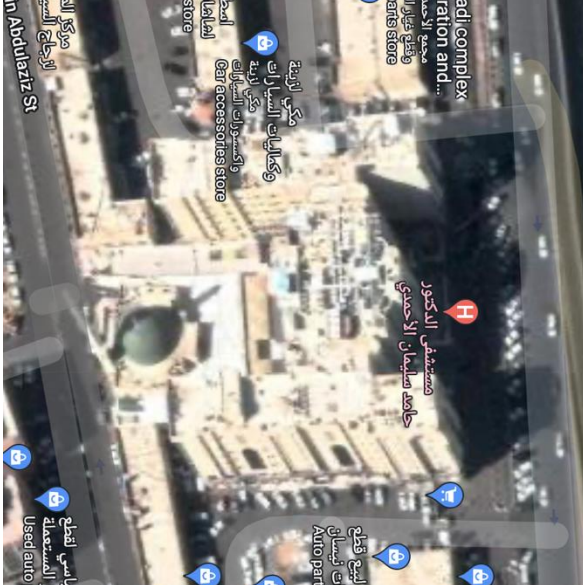
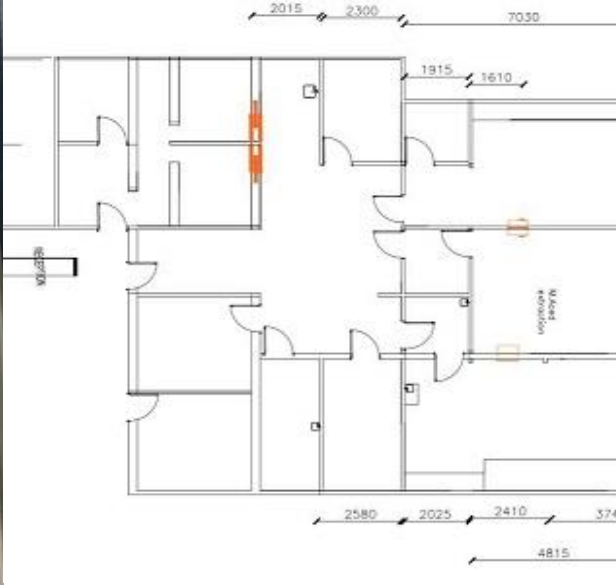
- Ministry of Health - Construction Company - Saudi Electrical Company - Saudi Telecom Company - National Water Company - Customers - Suppliers	Availability of infrastructure Designs														
<table border="1"> <thead> <tr> <th colspan="2">Schedule/ Cost Estimate</th></tr> </thead> <tbody> <tr> <td>Organization Breakdown Structure (OBS)</td><td>Projectized</td></tr> <tr> <td>Starting Design:</td><td>01 Feb 2022</td></tr> <tr> <td>Complete Design:</td><td>28 Feb 2022</td></tr> <tr> <td>Award:</td><td>15 March 2022</td></tr> <tr> <td>Construction Complete:</td><td>15 June 2022</td></tr> <tr> <td>Preliminary Cost Estimate (±15%) in SAR:</td><td>1,100,000</td></tr> </tbody> </table>	Schedule/ Cost Estimate		Organization Breakdown Structure (OBS)	Projectized	Starting Design:	01 Feb 2022	Complete Design:	28 Feb 2022	Award:	15 March 2022	Construction Complete:	15 June 2022	Preliminary Cost Estimate (±15%) in SAR:	1,100,000	Project Risk Assessment Timely Construction commitment of Infrastructure by Private Sector in the premises of Dr. Hamid Suleiman Al Ahmadi Hospital, Medina Third-Party Approvals As-built information of existing utilities; waterline, power lines in the area not available (delays the design) Safety issues during demolition and uploading of construction materials and gypsum board for the walls and floors and HVAC and electrical work during the hospital work hours.
Schedule/ Cost Estimate															
Organization Breakdown Structure (OBS)	Projectized														
Starting Design:	01 Feb 2022														
Complete Design:	28 Feb 2022														
Award:	15 March 2022														
Construction Complete:	15 June 2022														
Preliminary Cost Estimate (±15%) in SAR:	1,100,000														
Project Sponsor	Project Interfaces														
Dr. Hamid Suleiman Al Ahmadi Co.	Private Sector Projects														
 Figure 2 Lab location	 Figure 3 Building Plan														

Table 2 Project Charter

1.2 Governance, Structure, and Process

A uniform hierarchy of operations refers to an organizational structure. It specifies how groups should be divided, coordinated, and directed. It also identifies the roles and responsibilities necessary to realize an organization's goals and vision. Organizational structures are not fixed in stone; they change depending on the size, demands, and philosophy of the company.

1.2.1 Organizational Structure for the Teams and Units of the Project

In the Field of Construction, the functional type of organizational structure is the most effective in the fulfillment of the project. We need key personnel to execute the task and below is the proposed organizational structure necessary in the performance of the Work, including lines of authority, responsibility and communication, and division of responsibilities

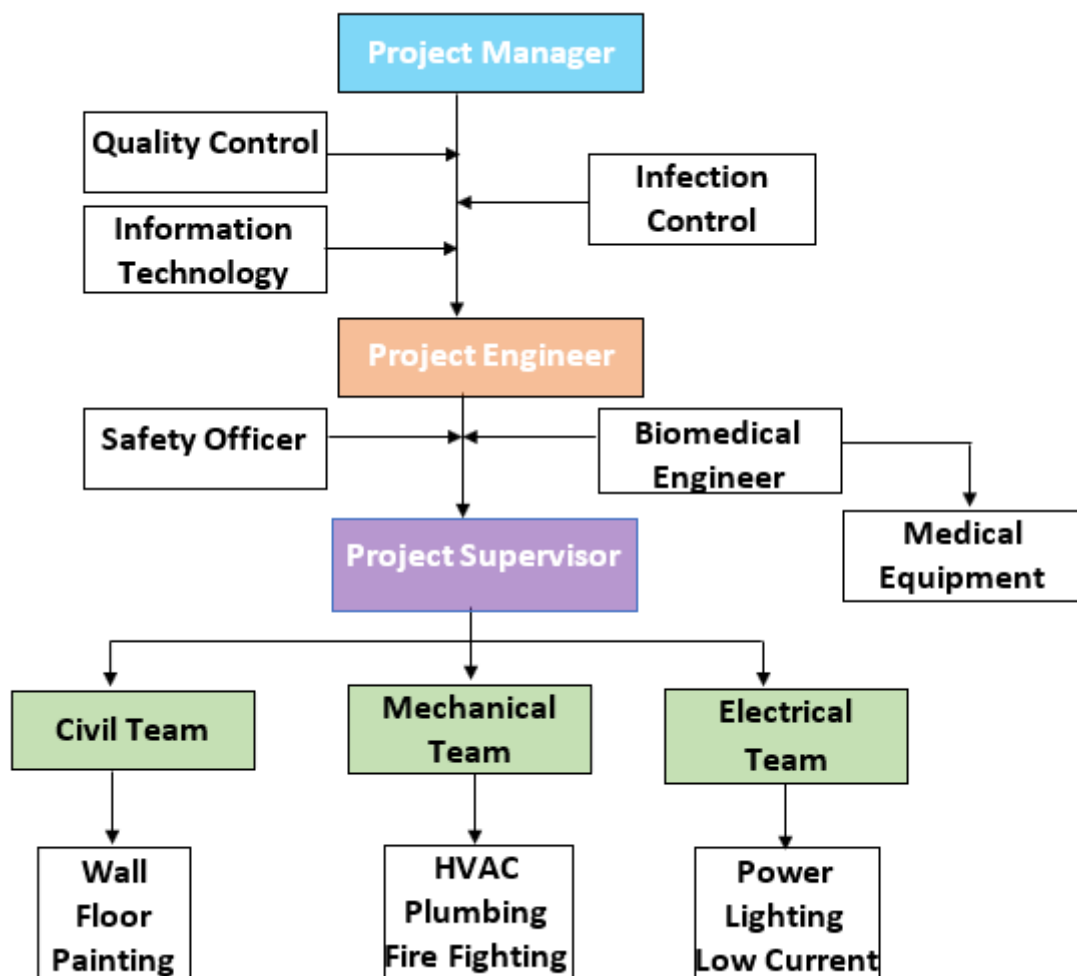


Figure 4: Organizational Structure

1.2.2 The Practical and scientific bases adopted in developing the structure.

When choosing an organizational structure, certain features should not be overlooked. The key elements that contribute to a proper organizational structure are as follows:

Degree of alignment with organizational objectives

- Accountability assignment
- Delegation of Capabilities
- Simplicity of Design
- Physical locations

In the design of an organizational structure, it is important to know the specifics of the organization before formulating the structure. Organizational structure may be centralized or decentralized. Traditionally, structures of the organization have been designed with a centralized leadership thereby having a defined chain of command. In the development of an organizational structure, the practical basis to be considered is a common purpose, coordinated effort, division of labor, and the hierarchy of authority. Its common purpose unifies members of the organization thru a common understanding of what is the vision and mission of the organization, its values, and strategies.

Patient pathway

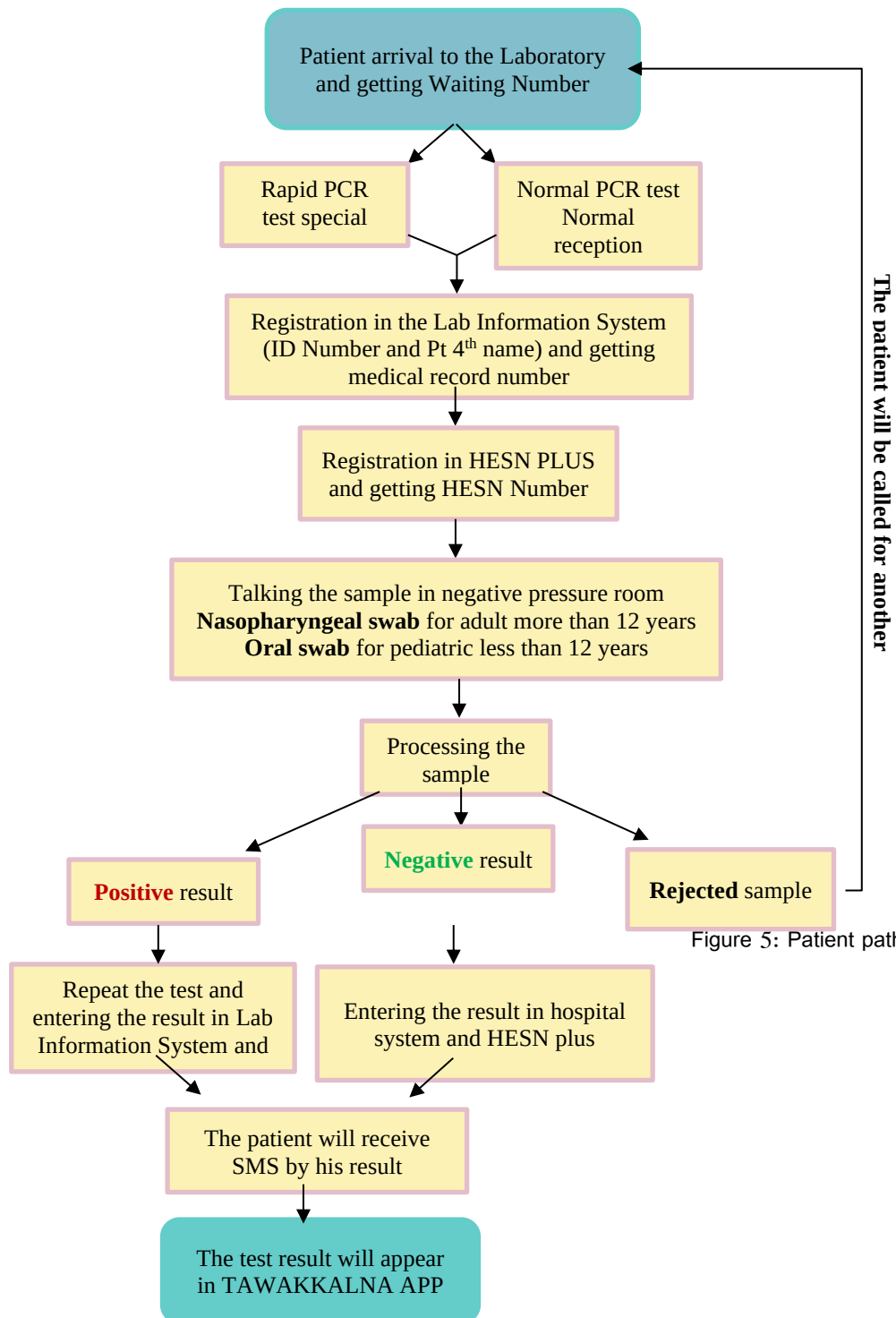


Figure 5: Patient pathway

Swab Pathway

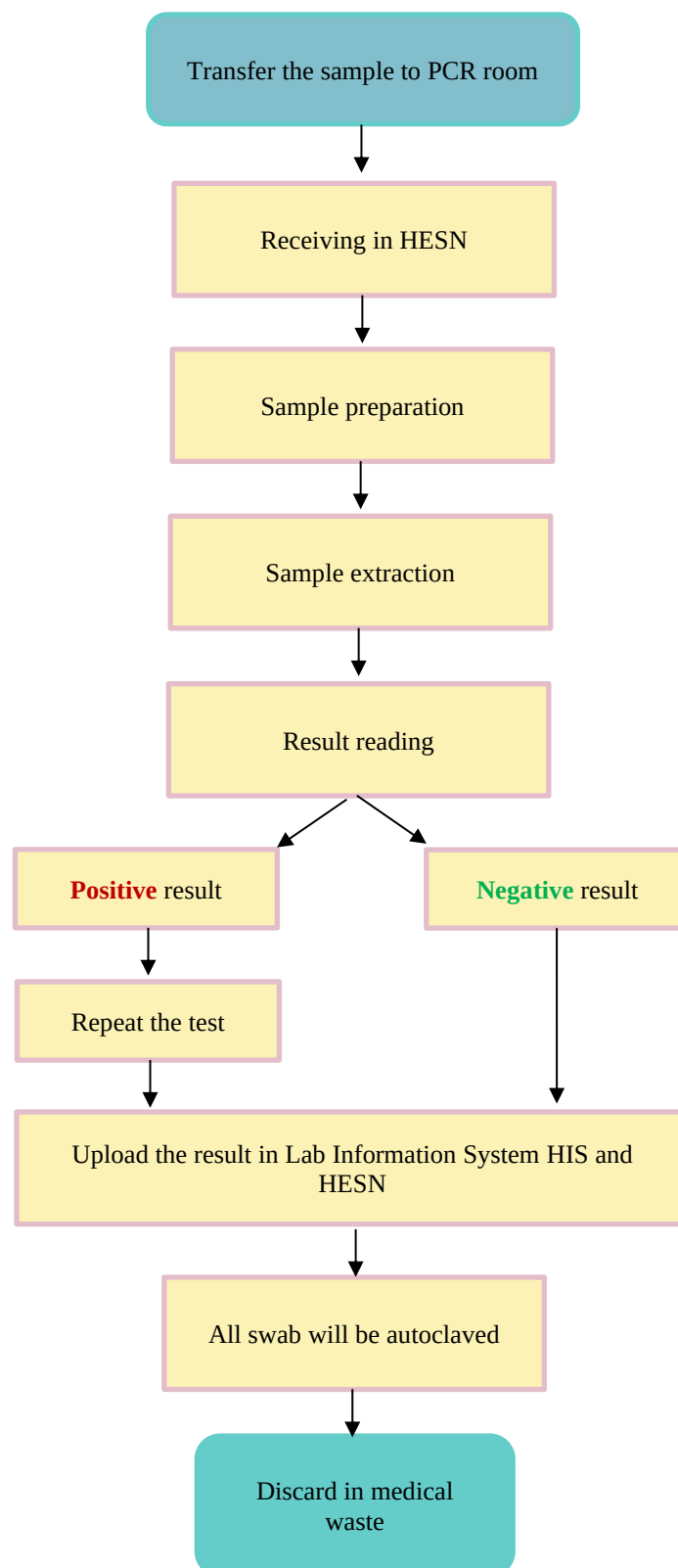
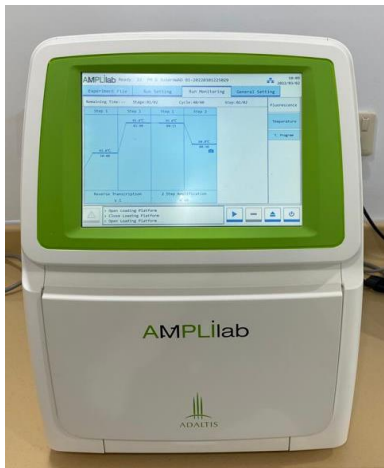


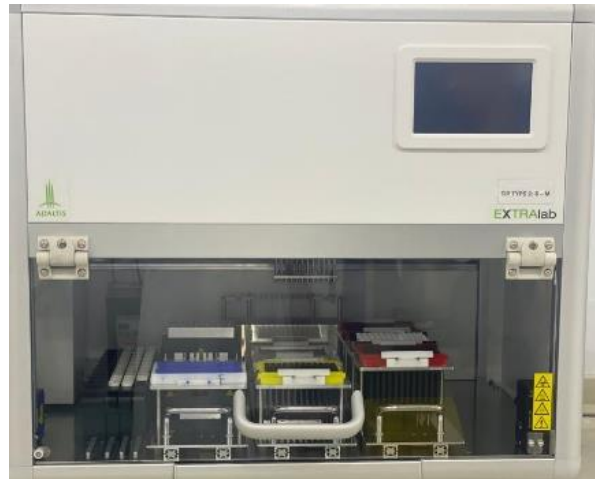
Figure 6: Swab Pathway

MACHINES USED FOR CONDUCTING MOLECULAR TEST



AMPLILAB

Figure 7: AMPILAB



EXTRALAB

Figure 8: Extra Lab

G. REAGENT PREPARATION AND ANALYZED SAMPLES

1. Preparation of serum (plasma) samples.

Plasma or serum must be placed into a separate tube within 6 hours after blood collection.

Transport and store samples:

- up to 2 hours at 18...25°C;
- up to 24 hours at 2...8°C;
- up to 1 month at minus 18...60°C.

Repeated freezing and thawing is not allowed!

Serum and blood plasma samples must be centrifuged at 13000 rpm for 5 min at room temperature 18...25°C before use.

To perform analysis 100 µL of blood serum (plasma) prepared with EDTA as anticoagulant is required.

Attention! Analysis of heparinized plasma samples is not allowed.

2. Preparation of leukocyte blood fraction.

Blood cells (leukocyte fraction of whole blood, leukocytic pellicle) should be taken after centrifugation of whole blood and removal of plasma. Using the filter tip carefully collect leukocyte cell mass from the surface of the cell sediment in the volume of 0.2 mL, and transfer to a sterile 1.5-2.0 mL test tube.

Transportation and storage of samples:

- up to 24 hours at 2...8°C;
- up to 1 month at minus 18...60°C.

Repeated freezing and thawing is not allowed!

3. Preparation cerebrospinal fluid samples.

Cerebrospinal fluid are ready for analysis.

Transportation and storage of samples:

- up to 2 hours at 18...25°C;
- up to 24 hours at 2...8°C;
- up to 2 weeks at minus 18...60°C.

4. Preparation of urine samples.

Collect the first portion of morning urine in a clean collection cup with leakproof lid. Transfer 1.5-2.0 mL of urine into a test tube, then centrifuge at 3000 rpm for 3 min. Remove the supernatant without touching the sediment. Use the resulting cell pellet for isolation of nucleic acids.

Transportation and storage of samples of urine cell pellet:

- up to 2 hours at 18...25°C;
- up to 24 hours at 2...8°C;
- up to 2 weeks at minus 18...60°C.

5. Preparation of biopsy material and faeces samples.

Prepare biopsy material and faeces samples according the procedures described in national methodological guidelines.

1.2.3 The Project's Office Model

A PMO is a group, either an internal department or an external company that sets, maintains, and ensures project management methodology, best practices, and standards throughout an organization. It supports managing shared resources across all projects administered by the PMO and provides coaching, mentoring, training, and oversight. It keeps best practices, project direction, and project direction all from a central location. It ensures that company procedures, practices, and activities are carried out correctly on schedule, on budget, and in the same manner. A PMO exists to assure project and program success, which is crucial because projects and programs are how enterprises provide value.

In the execution of the PCR Laboratory Project as a Project Manager, the best model to be used is Supportive Project Management. I believed this type is very effective to carry out the project in a human and professional manner as the project manager oversees the team members in the project management office and takes responsibility for the quality and value of each project under its care. This involves collaboration with project managers and reporting to the executive staff of the organization .It collects all projects in an organization, supplies best practices, templates, training, but with a low degree of control. As a Project Manager, it is necessary to provide support even to the lowest member of the organization.

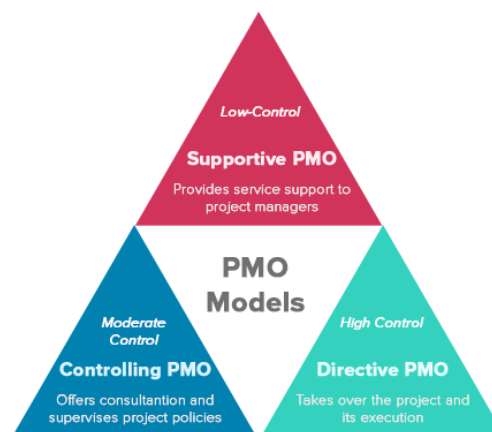


Figure 9: PMO office Model

2.1 Compliance, Standard and Regulations

2.1.1 Check Compliance Model:

The compliance model is a structured way of understanding and improving client compliance. It helps us to understand the factors that influence client behavior and to apply the most appropriate compliance strategy.

Client behavior is influenced by business, industry, technology and data, sociological, economic and psychological factors.



Figure 10: Client Behavior

The compliance model shows a continuum of client attitudes towards compliance. At the base of the continuum, clients have the desired attitude of being 'willing to do the right thing'. At the other extreme, clients have decided not to comply – choosing to evade or opt out of the tax system. The compliance model also summarizes the different sorts of support and intervention that we may need to provide to collect the required revenue. The model suggests that the ATO has the ability to influence client behavior through our response and interaction.

Compliance is attained by defining roles, assigning outcomes and cardinalities to results as well as by establishing states with conditions and activities for results categories. Roles

determine individuals' rights and access. This process is set using software and is the basis of your project. Team members take on roles, carry out tasks and produce results. The project control panel gives an overview of the states of activities as well as results being produced.

Traceability is a prerequisite for compliance in a project – it enables participants to retain an overview of what happens with each result

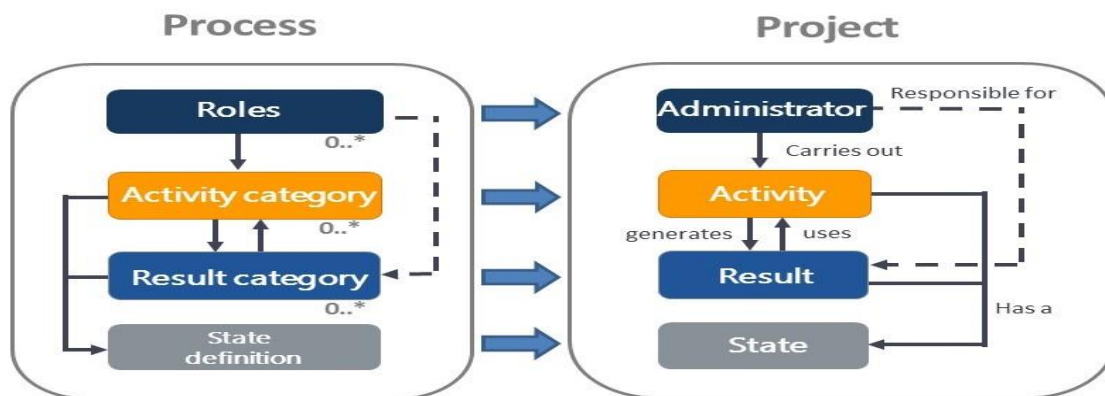


Figure 11 Process & Project

Compliance Model				
Project Name: Construction of PCR Lab		Owner: Dr. Hamid Suleiman Al Ahmadi Co.		Main Contractor:
Date	Day	Ref. 1		
No.	Goal / Deliverable	Responsible	Compliant (Yes/No/NA)	Remarks
1	List of lessons learned	PMO	Yes	
2	Project closure document	PMO	Yes	
3	Budget Closure memo	PMO	Yes	
4	Final project status reports	PMO	Yes	
5	Supply contracts and process	PMO	Yes	
6	Engineering report	PMO	NA	
7	Summary disposal equipment and material	PMO	Yes	

Table 3 Check Compliance Model

2.1.2 Check List model for the four stages of the project (Start– Plan– Achieve– Close)

- **Start Phase**

The following checklist serves as of the start of the project and must be completed as the phase closed by the Project Manager. This document emphasizes that the output of the section will allow the project to start smoothly.

Start Phase			
Description	Yes	No	Comments
Have project objectives been defined and are they clear?			
Has a project sponsor been identified?			
Has a project customer been identified who will sign off the requirement and accept the delivery?			
Has an issues escalation mechanism been identified?			
Has an ultimate authority been identified who can make the final say on project continuation?			
Has the Project Manager been identified?			
Has a Business Analyst been identified?			
Has Core Team been identified?			
Has a Business Case been developed and approved by the authority?			
Has the project been prioritized?			
Have Business Requirements been completed and sign-off?			
Have Deliverables been defined clearly?			
Has Acceptance Criteria been established for each Deliverable?			
Has Project Management Methodology been identified?			
Has Risk been assessed?			
Have Risk Mitigation Strategies been defined?			
Has a Contingency Reserve been established?			
Have business functions been identified?			
Has the Project interface been identified/documented?			

Have business processes impacted by the project been identified?			
Has the Project Budget been approved?			
Has a Project Deadline (Completion Date) been established?			
Have interdependencies between other projects been identified?			

Table 4 Start Phase

- **Plan Phase**

The planning phase shows the road map to establish the PCR Test Center. This includes the development of the scope, schedule, and time of the entire project. The planning team must complete this phase and make sure that all the below checklists are completed on time to allow the project to start creation.

Plan Phase			
Description	Yes	No	Comments
Have you organized a project kick-off meeting			
Does the project team need any training?			
Are you comfortable with the skill level of the project team?			
Do you need a project management plan?			
Do you have enough contingency or buffer in the budget and schedule?			
Is there a vendor contract involved in the project?			
Have all the project components been estimated?			
Do you have a detailed project schedule drafted?			
Do you need a work breakdown structure?			
Have you created a baseline for the project plan?			
Is the project team comfortable with the project schedule?			
Do you have clearly defined the milestones for the project?			
How do you plan to track project progress?			
Have the team left plans and public holidays been factored into the project plan?			
Do you have a resource plan for the duration of the project?			

Do you need to hire additional resources for the project? If yes, has the hiring process been kicked off?			
Have you factored in the resourcing costs in the plan?			
Are you aware of the SMEs required for the project?			
Is your project schedule detailed enough for the project team to understand the tasks?			
Is there a quality assurance plan for the project?			

Table 5 Plan Phase

- **Achieve phase**

This phase is where the deliverables of the project are realized by the project creating team.

The project manager will need to communicate the deliverable in a proper way to get support from the stakeholders.

Achieve Phase			
Description	Yes	No	Comments
Has the project scope been finalized by the stakeholders?			
Have the business requirements been finalized and signed off?			
Is the team aware of the project deliverables?			
Have all the hardware and infrastructure requirements been finalized and addressed?			
Does the project team need to be co-located?			
Is everyone in the team aware of roles and responsibilities for everyone, including themselves?			
Is the team aware of the benefits and business value of the project?			
Is everyone in the team fully allocated to the project?			
Is the project team comfortable with the requirements and their details?			
Have you planned the resources required for the implementation?			
Is everyone in the project team aware of the project deadlines?			
Does the project team need to be co-located?			
Is everyone aware of the defect management process?			

Are you aware of the impact of systems shut down for implementation?			
Do you have a commitment from a business for testing resources?			
Do you have a list of housekeeping tasks for the project?			
Will the system need a User Manual?			
Do you have a list of critical tasks?			
Do you have a plan to update the system documentation after the project is complete?			
Does everyone in the project team have the required hardware and software?			
Is there a mechanism to track scope creeps and change requests?			
Have you created a project change management plan? Do you have a change request log and change request template?			
Do you have a communication plan?			
Is there a set of standard templates for project artifacts available?			
How often do you review your project budget?			
Do you have a detailed project schedule where the largest task is less than 5 days?			
Do you have a defect management process in place?			
What is the frequency of status reporting?			
Do you have a project status report for weekly and/or monthly reporting?			
Do you plan to conduct a monthly project team meeting?			
How will you track resource utilization in the project?			
How do you plan to manage ongoing leave management for the team?			
Was a risk assessment conducted for the project?			
Have you created a project risk and issue register?			
What is your stakeholder management plan?			
Do you have the required tools to capture timesheets?			

Table 6: Achieve Phase

- **Close Phase**

This phase serves as a sign of the deliverables by the stakeholders. This needs to close by the project manager and do the proper handover to the occupants' team.

Close Phase			
Description	Yes	No	Comments
Was an implementation review conducted?			
Are all the project benefits still on track?			
Will there be a closure document?			
Have all the stakeholders authorized the project closure?			
Are there any pending or open issues because of the project?			
Do you have a list of lessons learned?			
Have adequate arrangements been made for the handover of the new or updated systems/processes?			
Has the project budget been finalized?			
Are all the project resources released?			
Have all the post-project activities been complete?			
Handover is complete for all deliverables?			
All deliverables are accepted and signed off by the client?			
Final project status reports are complete?			
All financial processes and reports are complete?			
Staff performance evaluations and reports completed?			
All supply contracts and processes are terminated?			
Site operations and facilities used for the project closed down?			
Disposal of all equipment and materials is done?			
Completion of storage for all the project files?			
Communication: Announcement of completion of a project (internal, external, and public relations contacts)?			

Table 7: Close Phase

2.2 Power and Interest

The power/interest grid is a matrix used for categorizing stakeholders during a change project to allow them to be effectively managed. Stakeholders are plotted on the grid in relation to the power and interest they have in respect of the project.

2.2.1 Stakeholder Register and Form Groups for Them:

Stakeholder is: “individuals and organizations who are actively involved in the project, or whose interests may be positively or negatively affected as a result of project execution or successful project completion”. stakeholders include the project manager, the customer, team members within the organization, and the project sponsor.

The Stakeholder register is the document that contains information about identified stakeholders and is the main output of the identify stakeholders’ process. Moreover, the process of identifying and documenting relevant information regarding their interests, involvement, interdependencies, influence, and potential impact on project success is crucial.

This document contains information about identified stakeholders that includes but is not limited to: Identification information, Assessment information and Stakeholder classification. During this phase of the project, many tools were used, such as a brainstorming and expert that helped the team create a stakeholders register.

Stakeholders Register							
Project Name: Construction of PCR Lab				Project Reference Number: 6015			
Project Manager: Eng. Samir Asad				Project Owner/Client:.....			
Prepared By:				Date Prepared:			
Stakeholders Name	Position	Role	Group	Contact Details (Email– Mobile)	Classification	Interest	Influence
A	CEO	Project Sponsor	Owner	Ceo@pcr.com	Internal	H	H
B	PMO	Project Manager	Direct Management	Pmo@pcr.com	Internal	H	H
C	Subject Expert	Construction	Special Group	0004537899	External	H	L

D	Engineering Department	Construction	Functional Management	0003346733	Internal	H	H
E	Operation Department		Functional Management	Od@pcr.com	Internal	H	H
F	Information Technology Department	Computer systems management	Functional Management	IT@pcr.com	Internal	H	L
G	Construction Company	Lab Design	Special Interest Group	000453331	External	L	H
H	Procurements Department	Functional Management	Functional Management	Pd@pro.com	Internal	L	H
I	Saudi Telecom Company	Utility Companies	Utilities	stc@stc.com	External	L	L
G	Water National Company	Utility Companies	Utilities	Wnc@nwc.com	External	L	L
K	Saudi Electrical Company	Utility Companies	Utilities	Sec@sec.com	External	L	L
L	Suppliers	Material Suppliers	Suppliers	S@sup.com	External	H	H
M	–	Client, Customer	Customer	–	External	H	L

N	MOH	Auditor	Governments	N@moh.gov.sa	External	H	H
O	Finance Department	Provision of Funds	Functional Management	Fd@pcr.com	Internal	H	H
P	Human Resource Department	Recruitment	Functional Management	Hr@pcr.com	Internal	L	H
Q	Insurance Department	Third Party Payers	Special Interest Group	Ins@MMD.com	External	L	H
R	Infection Control Department	Internal Auditor	Special Interest Group	IC@pcr.com	Internal	L	H
S	Laboratory Department	Internal Auditor	Functional Management	Lab@pcr.com	Internal	H	H

Table 8 Stakeholders Register

2.2.2 The Two Networks: (Strength/Interest) and (Influence/ Strength):

Stakeholder analysis is used to classify and planning engagement for groups of stakeholders. It is a critical skill that help project team to ensuring that their projects succeed where others have failed.

Once you have the long list of individuals and organizations that are impacted by your work. Some of them may have the power either to block or advance. Some may be interested in what you are doing, others may not care. This is where the Power–Interest grid comes in handy in segregating/prioritizing the stakeholders. Doing this helps in identifying stakeholders based on their power and interest in the project. When you plot your stakeholders on a power/interest grid,

you can determine who has high or low power to affect your project, and who has high or low interest. People with high power need to be kept satisfied, while people with high interest need to be kept informed. When a stakeholder has both, make sure you manage her expectations very closely (Bdaiwi, 2017).

- High Power – High Interest: The stakeholders are decision makers and have the biggest impact on the project success and hence you must closely manage their expectations.
- High Power – Low Interest: The stakeholder needed to be kept in loop, these stakeholders need to be kept satisfied even though they aren't interested because they yield power. These types of stakeholders should be dealt with cautiously as well since they may use their power in a not desired way in the project if they become unsatisfied.
- Low Power – High Interest: Keep these people adequately informed and talk to them to ensure that no major issues are arising. These people can often be very helpful with the detail of your project.
- Low Power – Low Interest: Monitor these people, but do not bore them with excessive communication

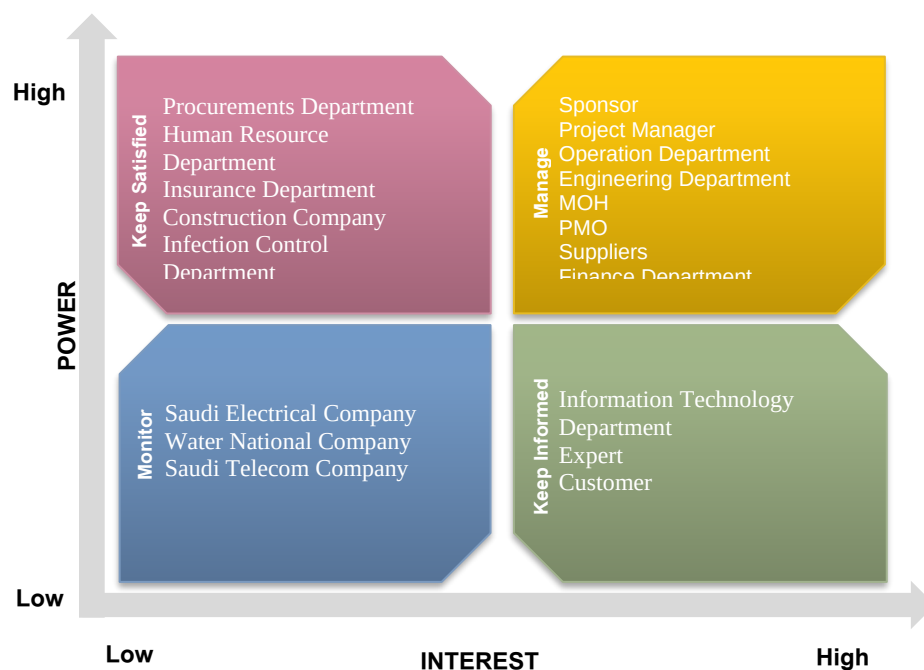


Figure 12: Power & Interest

2.2.3 The logical diagrams for the register of the stakeholder.

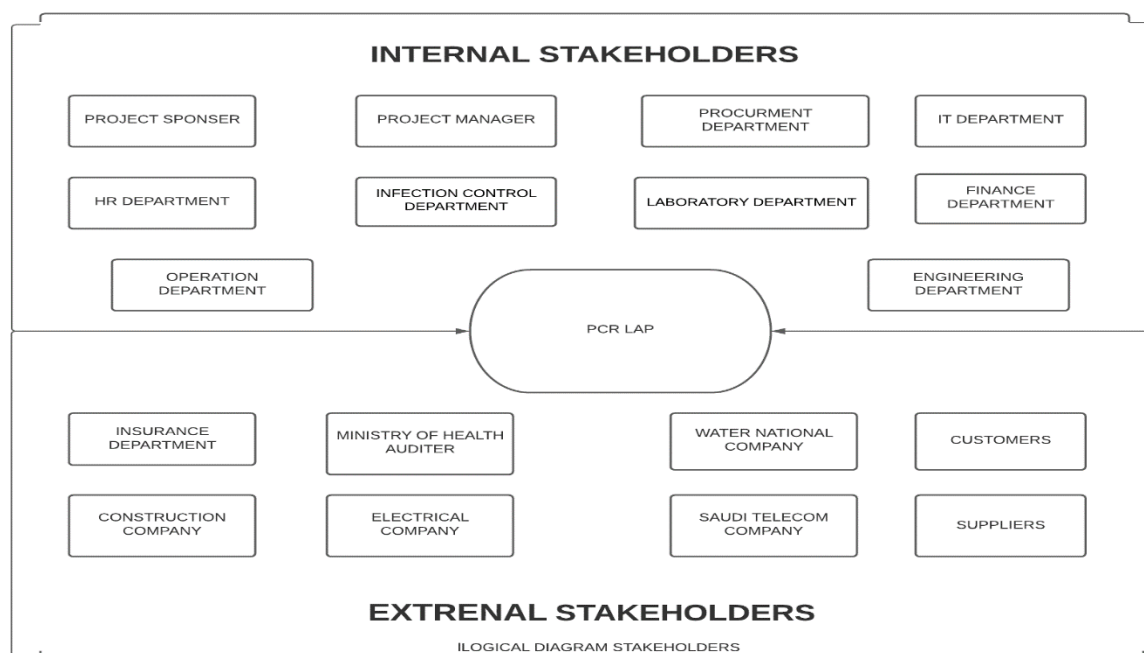


Figure 13: External Stake Holders

2.3 Culture and Values

An organization with a strong culture is one where its employees know how to respond to any situation, know how they will be rewarded when demonstrating the organization's values, and understand and know how they will be held accountable.

A highly effective organization is based on a strong culture that is rooted in deeply held and widely shared beliefs which are then strengthened by a well-developed strategy and structure (SHRM, 2021). Epstein et al. (2014) argued that it is critical to implement sustainability in an organization that has a shared culture that is based on sustainability. According to empirical studies, sustainability-integrated firms are more likely to integrate sustainability messaging into mainstream marketing and advertising.

2.3.1 The Culture of the Organization:

Organizational culture includes an organization's expectations, experiences, philosophy, as well as the values that guide member behavior, and is expressed in member self-image, inner workings, interactions with the outside world, and future expectations

The new quality strategy represents an ambitious attempt to develop an over-arching framework for health care quality. These documents articulate a detailed set of interlocking strategies, tactics, and supporting initiatives aimed at three factors:

- defining appropriate quality standards;
- delivering health care congruent with these standards;
- monitoring to ensure that uniformly high quality of care is achieved

Principle	Description
Customer Focus	Understanding current and future customer needs and expectations.
Leadership	Leaders establish and maintain an environment where employees can become fully involved in achieving the organization's objectives.
Involvement of People	People at all levels of the organization are fully involved in the organization. This will result in retaining competent employees, enabling their knowledge and skills, and leading to their empowerment.
Process Approach	Processes must be managed by the leaders, and related resources provided.
System approach to Management	Systems management and systems thinking leads to effectiveness and efficiency in achieving objectives.
Continuous Improvement	A continuous focus on performance improvement should be a permanent objective of the organization with all personnel contributing.
Factual Approach to Decision Making	Analysis of data and information will lead to effective decision-making.
Mutually Beneficial Supplier Relationships	The organization and its suppliers are interdependent and a good relationship between them creates value for all.

Table 9: Principle & Description

Domains	Competencies
Quality Improvement (QI)	Use data to monitor the outcomes of care processes and use improvement methods to design and test changes to continuously improve the quality and safety of healthcare systems.

Safety	Minimize risk of harm to patients and providers through both systems effectiveness and individual performance.
Teamwork and Collaboration	Function effectively within nursing and interprofessional teams, fostering open communication, mutual respect, and shared decision-making to achieve quality patient care.
Patient-centered Care	Recognize the patient and designee as the course of control and full partner in providing compassionate and coordinated care based on respect for patient's preferences, values, and needs
Evidence Based Practice (EBP)	Integrate best current evidence with clinical expertise and patient/family preferences and values for delivery of optimal health care
Informatics	Use information and technology to communicate, manage knowledge, mitigate error, and support decision making.

Table 10: Domains & Competencies

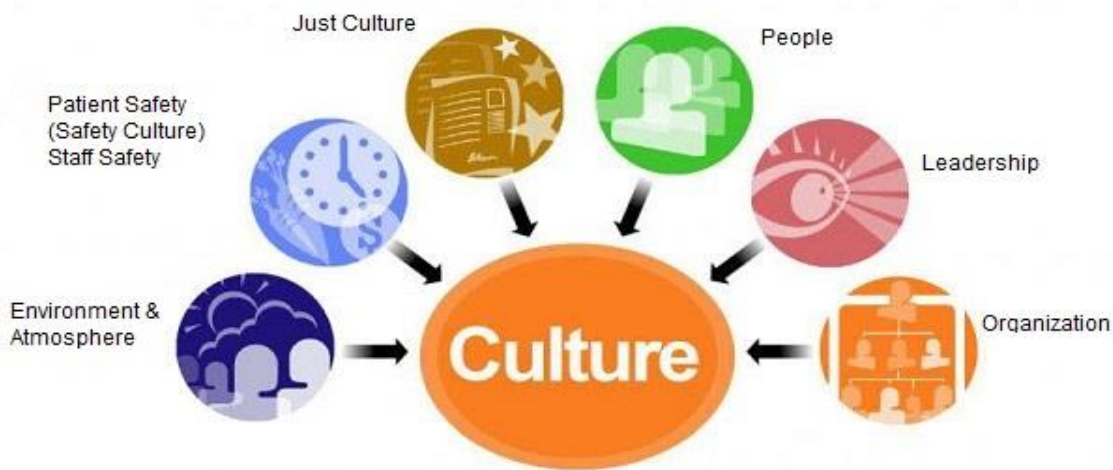


Figure 14: Culture of the organization

2.3.2 The Organization's Values

Values are the beliefs, philosophies, and principles that drive your business. They impact the employee experience you deliver as well as the relationship you develop with your customers, partners, and shareholders.

Organizational values describe the core ethics or principles the organization will abide by, they inspire employees' best efforts and also constrain their actions. Strong, clearly-articulated values should

be a true reflection of your organization's aspirations for appropriate workplace behavior, and play an important role in building a positive culture at organization.

- Teamwork: to create a teamwork spirit that allows us to work calmly as there is applying of constructive collaboration and mutual trust among team's members and leaders.
- Safety: We build our capabilities and implement necessary processes to eliminate preventable harm in PCR Lab.
- Quality: We care deeply about our work, about providing excellent customer service, and we truly care about achieving results for our clients.
- Mutual Respect: Respecting the values, ideas and beliefs of others whilst not imposing our own on others.
- Honesty: Always telling the truth.

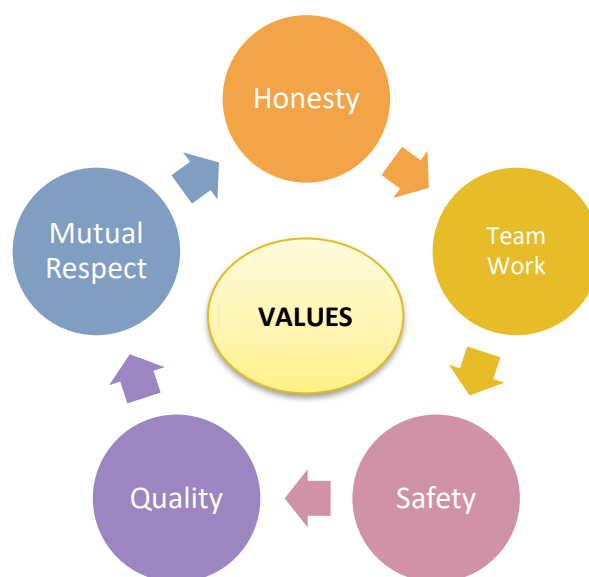


Figure 15: Values of the organization

3.1 Self-reflection and self-management

We all know that a project is considered successful if it is completed within the scope, time, cost, and quality constraints. Poor project management is expensive and difficult to deal with, especially when large projects with large sums of money are involved. Only small fractions of the many projects that are attempted around the world are truly successful. Projects are completed and closed, but they

are not always regarded as successful due to cost or schedule overruns, with the most prevalent cause of project failure being cost overrun. As a result, firms must apply improved concepts, creative approaches, and frameworks in project management.

3.1.1 Personal Behaviors Impacting the Project

One of the most important factors influencing project success is people's behavior. In the remote work environment of today, managers must understand the emotions and culture of their work team to give employees a chance at succeeding in the long run and completing projects in the manner that they should be handled. Project management revolves around people, and their actions have a direct impact on the project's success. All processes revolve around people, which is why projects cannot thrive without their input and ideas.

In this research, we will discuss three project manager personal behaviors that might have an impact on the project, as well as how project managers can manage people without jeopardizing the project's success. The following is a list of three personal behaviors of project manager that can influence the project:

- **Understanding Culture**

For humans, culture is one of the most significant and sensitive variables. To different people, the term culture can signify different things. From the standpoint of a project manager, culture could simply mean "how projects are managed here." People bring their culture along with them as luggage. Project managers must interpret and comprehend the significance of workplace culture.

At a global level, managers may find it challenging to comprehend cultural variations. While project management teams' global reach has resulted in an infusion of bright individuals, it has also resulted in a situation where project managers aren't always in control of how their team's culture is seen and what they can do about it.

Employees are frequently required to work in environments that aren't supportive of their efforts or the job they produce. Employee morale can be harmed by a lack of acknowledgment and praise where it is due, as well as a lack of confidence to attempt new things at work. In the PCR Test Center project, PM should encourage everyone to communicate in short clear sentences and discourage, as much as possible, the use of idiom, slang, or words with multiple meanings.

- **Engaging Team Members**

After you've figured out what culture is, the next step is to engage team members and make sure they're paying attention. Successful project management necessitates involving team members and harvesting communication between them. The level of engagement should be the same for both team members and stakeholders so that everyone is on board with the development and ready to pitch in where it's needed.

Throughout the course of a typical project's lifecycle, engagement levels should be assessed, and employees' feelings should be closely tracked. The way the project team interacts and performs as a whole can have a big impact on productivity. In the PCR Test Center project, PM should Start with setting a clear vision and specific project goals before you provide challenging but exciting assignments. Empower your team to make independent decisions and share the project's progress on an ongoing basis. Provide social and structural resources for the team and work to remove any obstacles that are hindering team success.

- **Good Communication**

People management issues aren't about the technical aspects of day-to-day interactions with people; rather, they're about a lack of communication among stakeholders. Employees will be able to communicate with one another through a variety of channels at any given time. Make sure that the communication is consistent and that it aids in the achievement of beneficial outcomes.

If project managers want to get the best results on their new initiatives, they'll have to go beyond what's written in the books. People's emotional bonds as individuals and as members of teams must be recognized to effectively manage them and reduce difficulties. In the PCR Test Center project, PM should make good communication by focusing on the way communication is delivered and received, project management teams will see their projects run smoothly and more efficiently.

3.1.2 Behaviors reasons, and how they can be eliminated:

Team members should be acceptable communicators who advance clear, explicit data trade. It is PM work as an undertaking chief to keep many individuals educated. PM task groups must get what's generally anticipated of them, including what they should do, when they should do it, and what spending plan, time, and quality objectives they're focusing on. On the off chance that undertaking colleagues don't have the foggiest idea what their obligations are or how to finish them, the project will stop.

PM will not have the option to follow project progress in the event that PM doesn't have the foggiest idea of what the venture group is doing (or isn't doing). At last, on the off chance that PM doesn't have a clue what the client anticipates from PM, the task will not make headway. Subsequently, project correspondence can be summed up as deciding "who needs what data and when" and guaranteeing that they have it. All activities require viable communication plans, yet not all undertakings will utilize similar sorts of correspondence or spread data similarly.

The correspondence the board plan diagrams how the partners' correspondence needs will be met, including the kinds of data that will be conveyed, who will impart it, and who will get it; specialized techniques; correspondence timing and recurrence; the strategy for refreshing the arrangement as the venture advances, including the increasing system; and a glossary. The objective of the project manager is to finish things. Each association has its own arrangement of strategies, functional

methodology, and hidden culture. Political traps, unique inspirations, contending interests, and force battles flourish.

A venture director should know about every one of the concealed powers at work in the association. The initiative is characterized as the capacity to spur and rouse others to accomplish explicit objectives. Pioneers impart a feeling of direction in their supporters and join them behind a shared objective. A decent venture administrator can propel and move the undertaking group to comprehend the task's vision and worth. As a pioneer, the undertaking administrator can spur the task group to discover an answer for the apparent issue.

3.1.3 Self–professional assessment using SWOT Model

SWOT stands for Strengths, Weaknesses, Opportunities, and Threats. A personal SWOT analysis is a self–introspection exercise that can help you better understand yourself and plan for future growth. It's a reliable technique for distinguishing inside and outer qualities and shortcomings, just as promising circumstances and dangers. The evaluation is remembered for any great business or promoting plan since it gives pivotal data to fostering a development system. People can profit from this significant exercise too.

An individual SWOT investigation can assist you with accomplishing your objectives, regardless of whether you're searching for a new position or attempting to progress up the professional bureaucracy. A novel technique for self–assessment can assist you with sorting out where your profession is currently and where it may go later on.

SWOT analysis process captures information about PM internal strengths and weaknesses as well as external opportunities and threats. Key to completing your SWOT analysis is to treat your career as a business and yourself as a competitive product.



Figure 16: SWOT Analysis

• Strengths

To help you understand your strengths, picture yourself as a competitive product in the marketplace. A personal strength is an asset to you as a product and can be used as a way to differentiate PM from others when interviewing or trying to obtain your next promotion. Strengths such as strong expertise, inspiring, quality, coaching, project management skills and ability to improve processes.

• Weaknesses

A personal weakness is a liability or an area of opportunity for growth. These are characteristics PM could improve upon to increase future job opportunities. Weaknesses such as easily bored with routine work, poor typing skills, poor paper work and poor listener.

• Opportunities & Threats

When thinking about opportunities and threats, PM always finds it easier to begin with the “threats.”

Try comparing yourself to PMs, who you will likely compete against for that next job or promotion.

Then, as objectively as possible, judge your threats and determine possible ways to overcome them.

3.2 Personal Integrity and Reliability

The construction industry is a challenging and demanding business sector. Alqasmi (2019) discussed that construction projects include many stakeholders, often with varying views, and require various procedures and processes according to the context of each project. Between those procedures, gaps occur, and individuals are required to make decisions. Some of these decisions and practices may

be considered unethical. The Cambridge Business English Dictionary (2013) defines ethics as “a system of accepted rules about behavior, based on what is considered right and wrong”. On the other hand, unethical practices include “acts that have harmful effects on others and are either illegal or morally unacceptable to the larger community (Jones, 1991).

Ethical practice in the building and construction industry is the vital importance in the same way to other disciplines. Scholars that the unethical practice ranks top among the most severe ills affecting the construction industry. The construction industry faces some ethical issues that are comprised of but are not restricted to: conflict of interest, inflation of bills, professional incompetence, poor work delivery, fraud, bribery, professional misconduct, intimidation and kickbacks among several other evils. The consequences of such unethical behaviors in such industry lead to confidence reduction in the profession, continuous insecure practices that risk lives and property, loss of income by clients and governments, needless and baseless expenditures.

3.2.1 “3” Behaviors that contradict moral integrity

Human integrity is crucial in business and in dealing with people as it may negatively affect others not only the individuals who breach integrity or ethics.

For example, if an individual went to a certain place looking for some laboratory results that is important to his health and family you expect the lab to be professional when dealing with patients or customers, as it is important to clearly examine the results in order to hand it to the patients.

Sometimes unethical behaviors might lead to bad results for the society not only to the individuals. If an employee is not dealing ethically with the results this might lead to misunderstanding the health situation of the patient, and it is not right.

Equally important, having ethics and good manners when dealing with all patient with equality will show that the lab cares about respecting everyone’s right and turns as well, not breaching lines or ethics when people offer money for special requests or services as favors.

So, dealing with bribe or lies considered as unethical behaviors in workplace that always lead to bigger issues that affects individuals and the society itself as well.

In addition, it is important to mention that employees in such workplace should always consider dealing with people in good manners whether in delivering news to them about the results or talking to them about the right solution to deal with certain health issue that need to be taken care of,

3.2.2 Analyze the Financial, Social, and Technical Influence, if Any, of such Behaviors on the Works of the Project and the Relationships

1. Overbilling

Cash flow is critical to the construction industry. Project work packages cannot be completed without acquiring materials and manpower payments. Therefore, contractors use billings in excess to manage their expenses and reduce their reliance on credit to pay for upfront costs (Sandage, 2021).

Overbilling arises when a contractor bills for contracted labor and materials before that work is being finished. For instance, during a billing cycle, a contractor completes 40% of a project but bills their customer for 50%. That extra 10% is the overbilled amount.

Overbilling leads to situations where the estimated cash required to complete the project exceeds the amount that can still be billed before completion. Such practices lead to a negative cash flow for the remaining activities. Also, it results in an inaccurate monthly income (or profit-and-loss) statement. In other words, over-billing will reflect too much profit in the profit and loss financial statement for the contractor.

2. Late Payments or Unpaid Work

Nowadays, finances are a major issue facing the construction industry in 2020. It is significant to have a positive cash flow for the company with a responsibility to ensure the livelihood of the employees and their families. Latham (1994) stated that “the cascade system of payment starts from

the financial institution to the main contractor to subcontractor and so on down the chain". The insolvency of one party in the payment chain could cause severe impacts to parties down the contractual chain.

It is found in the construction of PCR Test Center the subcontractor is not receiving payment for its completed work in several instances. Consequently, subcontractor typically files claim against the general contractor and owners in several major projects. Also, subcontractors are front-loading costs on many projects and paying their suppliers and employees. However, they are patiently awaiting payment from the general contractor or owner who may be disputing the payments, although the work is completed. The impact of late payments or non-payment leads to:

1. Delay in project's progress
2. Extension of time for project
3. Low quality works due to contractor's uncertain financial condition
4. Abandonment of the project
5. Creates negative relationship among parties
6. Creates financial hardship for the company
7. Subcontractors refuse to continue works on the project

3. Corruption

The construction industry has an international reputation for corruption and bribery. Corrupt practices can be found at every phase in construction projects, such as the planning stage and the awarding of construction contracts (Rodriguez, Waite & Wolfe, 2005). Examples of corruption include bribes, fraud, and kickbacks. Examples of corruption in the design stage of the project cycle include but are not limited to the following:

- Corrupt selection of consultants for feasibility studies, preparation of specifications/bid documents.
- Over-designed and overpriced projects.

The global infrastructure Anti-corruption Center (n.d) states that such corrupt practices cause loss and damage including financial loss and property damage. For instance, financial loss may arise from

inflation of project price, increased maintenance and repair costs, damage to reputation, and legal fees. Project funds may be wasted where there is corruption in project selection or project design resulting in non-viable projects or projects which are unsuitable for the intended purpose.

3.3 Personal communication

Communication is the process of exchanging information, intended or involuntary, between project team and stakeholders. In this project we use different methods to exchange information between stakeholders such as; private letters, memos, emails, personal interviews or telephone conversations.

3.3.1 The Register of Stakeholders

See Table 8 Stakeholders Register.

3.3.2 The Personal Communication and the Effective Communication

Communication is one of the most basic functions of management. Communication is essential for achieving managerial and organizational effectiveness. Good communication helps employees become more involved in their work and helps them develop a better understanding of their jobs. Clear, precise and timely communication of information also prevents the occurrence of organizational problems. Without communication, employees will not be aware of what their coworkers are doing, will not have any idea about what their goals are, and will not be able to assess their performance. Managers will not be able to give instructions to their subordinates and management will not receive the information it requires to develop plans and take decisions, hence communication acts as nervous system for any organization.

Communication refers to a process of conveying information, ideas, feelings, opinion, messages or facts between two or more persons either verbally or non-verbally using a medium.

Organizational Communication can be broadly classified into formal and informal communication.

Formal communications are those that are official, that are a part of the recognized communication system which is involved in the operation of the organization. These communications may be oral or

written. A formal communication can be from a superior to a subordinate, from a subordinate to a superior, intra administrative, or external. Formal communications take place externally to the organization i.e., with outside groups, such as suppliers, clients, unions, government agencies and community groups. Formal communications may be mandatory, indicative or explanatory. Mandatory communication implies an order or command to be followed and goes by various euphemistic names such as instructions, briefing, etc., this kind of communication is mostly vertical and usually one way from top to downward. The indicative or explanatory communication may exist between any level and may be vertical as well as horizontal.

Informal communications grow out of the social interactions among people who work together. These are not bound by any chart on the wall but are bound by conventions, customs and culture. Such communication provides useful information for events to come, in the form of grapevine.

Effective communication occurs when there is shared meaning. The message that is sent is the same message that is received. There must be a mutual understanding between the sender and the receiver for the transmission of ideas or information to be successful.

Characteristics of effective communication are:

1. **Clarity of Purpose:** The message to be delivered must be clear in the mind of sender. The person to whom it is targeted and the aim of the message should be clear.
2. **Completeness:** The message delivered should be complete. It should be supported by facts and observations. It should be well planned and organized. No assumptions should be made by the receiver.
3. **Conciseness:** The message should be concise. It should not include any unnecessary details. It should be short and complete.
4. **Feedback:** Whether the message sent by the sender is understood in same terms by the receiver or not can be judged by the feedback received. The feedback should be timely and in personal. It should be specific rather than general.

5. **Empathy:** Empathy with the listeners is essential for effective verbal communication. The speaker should step into the shoes of the listener and be sensitive to their needs and emotions. This way he can understand things from their perspective and make communication more effective.
6. **Modify the message according to the audience:** The information requirement by different people in the organization differs according to their needs. What is relevant to the middle level management might not be relevant to the top level of management. Use of jargons should be minimized because it might lead to misunderstanding and misinterpretations. The message should be modified according to the needs and requirements of the targeted audience.
7. **Multiple Channels of communication:** For effective communication multiple channels should be used as it increases the chances of clarity of message. The message is reinforced by using different channels and there are less chances of deformation of message.
8. **Make effective use of Grapevine (informal channel of communication):** The employees and managers should not always discourage grapevine. They should make effective use of grapevine. The managers can use grapevine to deliver formal messages and for identification of issues which are significant for the employees. The managers can get to know the problems faced by the employees and can work upon it.

3.3.3 The Shapes, Models, and Channels of Personal Communication:

Communication is a complex process, and it is difficult to determine where or with whom a communication encounter starts and ends. Communication is the process of exchanging information, intended or involuntary, between project team and stakeholders. Communications describes the means by which information can be sent or received, either through activities, such as meetings and presentations, or artifacts, such as emails, social media, project reports, or project documentation (PMBOK, 2017).

This paper will explain some important models of communication, specific concepts and steps within the process of communication, obstacles in communication and how to overcome these obstacles by communicating together.

Models of communication simplify the process by providing a visual representation of the various aspects of a communication encounter. They can represent the communication process in its most basic linear form (sender and receiver) or a more interactive form that encompasses the additional element of feedback, or human elements such as the sender and recipient. Although these models of communication differ, they contain some common elements (PMBOK, 2017).

Basic sender/receiver communication model: This model describes communication as a process and consists of two parties, defined as the sender and receiver. This model is concerned with ensuring that the message is delivered, rather than understood.

Interactive communication model: This model also describes communication as a process consisting of two parties, the sender and receiver, but recognizes the need to ensure that the message has been understood.

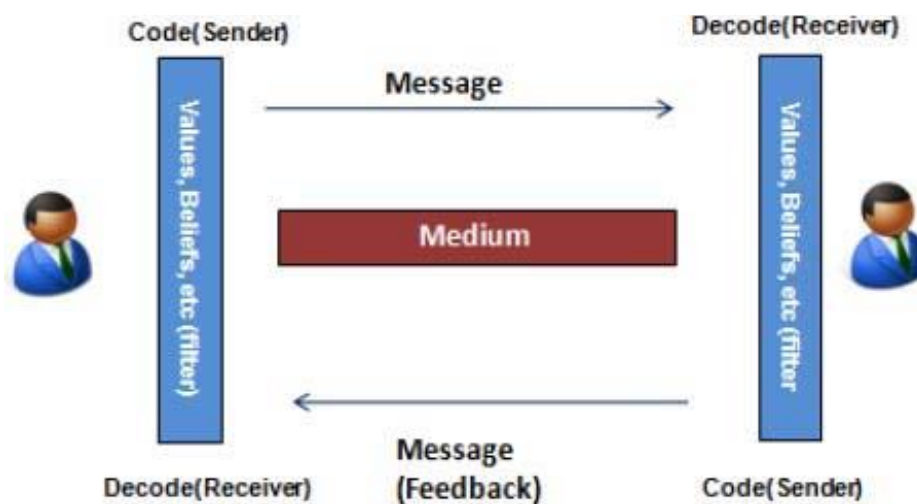


Figure 17: Interactive communication model

The sender is responsible for the transmission of the message, ensuring the information being communicated is clear and complete, and confirming the message is correctly interpreted. The receiver is responsible for ensuring that the information is received in its entirety, interpreted correctly,

and acknowledged or responded to appropriately. These components take place in an environment where there will likely be noise and other barriers to effective communication (PMBOK, 2017)..

3.3.4 The Communication Matrix:

Communication is, essentially, the effective sending and receiving of information. In order to share the right information about the project with the right people in an effective and timely manner. The following table identifies the communication requirement for constructing this project.

Type	Objective	Medium	Frequency	Audience	Owner	Deliverables	Format
Kick-off meeting	Create a shared understanding of the project background. Introduce the project team. Review project objective and management approach.	Face to Face	Once	Project Sponsor Project Team Stakeholders	PM	Agenda Meeting minutes	Soft copy in the archive Hard copy distribution
Project Team Meeting	Review the status of the project with the team	Face to Face Conference call	Weekly	Project Team	PM	Agenda Meeting minutes	Soft copy in the archive

						Project schedule	Hard copy distributio n
Technic al Design Meeting	Discuss and develop the technical design for the project	Face to Face	As needed	Project design team	Design lead	Agenda Meeting minutes	Soft copy in the archive Hard copy distributio n
Monthly Project Status Meeting	Report the status of the project to management	Confere nce call	Monthly	PMO	PM	Slide templates Project schedule	Soft copy in the archive Hard copy distributio n
Project Status Report	Report the status of the project including activities progress and cost	Email	Monthly	Sponsor Project Team PMO	PM	Project Status report Project schedule	Soft copy in the archive Hard copy distributio n

Table 9: Communication Matrix

3.3.5 3 Wrong Scenarios of Communication

- **Assuming You Know the Message Before the Person Finishes Talking:** When we are listening to someone speak, we already assume that we know what is going to be said before he/she finishes his/her full sentence. When we assume know what the person going to say, we will miss what is actually being said.
- **Letting Your Emotions Dictate Your Response:** We are more inclined to say things we do not mean when we are emotionally charged. A good communicator allows emotions to sit for a while and then chooses to carefully respond rather than react.
- **Workplace Intimidation:** Intimidation methods are a type of negative communication that may swiftly turn a workplace into a toxic and fear-filled one. High turnover is likely for a supervisor who pressures his people into getting things done. Coworkers competing for the same promotion can likewise be intimidated. This unsettling behavior is frequently expressed through direct verbal language or physically threatening actions. Loud shouting, physically taking over the workspace, or standing in close physical proximity to inflict discomfort are examples of intimidation.

3.3.6 Stakeholder's Assessment Matrix

When creating the stakeholder engagement assessment matrix, e.g., in the process 'plan stakeholder engagement', a project manager should refer to the stakeholder engagement plan for the desired level of engagement. The desired level ("D") of engagement is then incorporated into the stakeholder engagement matrix. When monitoring the actual stakeholder engagement, the project manager adds the observed current level ("C") of engagement for each stakeholder

Stakeholder	Unaware	Resistant	Neutral	Supportive	Leading
Sponsor				D C	
Project Manager					D
Project Management Team					D C

Project Department				D	
Engineering Department				D	
Procurements Department				D	
O&M Departments				D C	
Health Department			D		
Madina Community			D C		
Transportation Department				D	
Construction Contractors					D
Saudi Electrical Company				D	
Saudi Telecom Company				D	
Childcare Facilities				D	
Material Suppliers				D	
Local residents				D	

Table 10: Stockholder Assessment Matrix

4.1 Leadership

4.1.1 The leadership model, which is preferred to the project leadership:

“Leadership is not about titles, positions or flowcharts. It is about one life influencing another” (John C. Maxwell)

From this phrase we can understand that leadership is about people and the way of dealing with those people towards productivity. Thus, every individual has a preferred way to be dealt with as well as teams.

Eng. Samuel A Malachowsky the author of (Project Team Leader and Communication –2018) has classified the leadership styles into seven styles. Those styles were classified according to the nature of people and the situations. Considering the type of our project and the team members, we have studied all seven styles, and we’ve found that the most appropriate leadership style to be used in managing this project is the “Democratic” as primary, and we’ve chosen the “Transformational/Visionary” leadership style as secondary.

4.1.2 Specify the reasons for which such a model is preferred:

The Democratic leadership style was chosen in discussion the different parts of the project because the team has different experiences, and this kind of leadership style can harness the advantages of this variations which brings a high quality of work.

The reasons that guide us to use Transformational/Visionary style are the project itself and the complexity of it. Also, at the early start of this project, the project idea was rejected by the instructor of this course, resulting a need by the team to be inspired that the effort that was done will be rewarded.

4.1.3 “5” proposals for the motivation methods that are compatible with the nature of the project.

Motivators are different among individuals; someone motivator shouldn't be another motivator. So, in our project we will use 5 different types of motivators:

1. Purpose: since the project is serving a greater purpose to society.
2. Money/Power: The most common motivator and mostly the force that bring people to work.
3. Autonomy/ Interesting work: Both architects and engineers of the project would be motivated by new and exciting work.
4. Recognition: The project is complex and has many team members, we know that some of the team would prefer recognition for their work.

Mastery/Exploration: The team has many creative individuals who are motivated by finding solutions and overcoming challenges.

4.2 Teamwork

4.2.1 RACI Model for 3 Administrative Measures of the Project:

One of the essential parts of project manager roles is delegation, therefore, early identification of roles and responsibilities early in a project is extremely essential. As a project manager, it is necessary to set the expectations of people involved in a project from outset. Projects are recognized

by the involvement of many people, yet, how a situation where people are struggling against one another to do a task is avoided.

The same goes for dealing with a situation in which no one is taking responsibility and making a decision. How can people differentiate between their level of responsibility, when they should consult their project manager, or when they should exercise their own judgment? Applying the RACI matrix can help. The RACI matrix is a straightforward tool utilized for identifying and assigning roles and responsibilities and avoiding confusion over those roles and responsibilities during a project. (Santos, 2021).

RACI Matrix Model						
Project Deliverable or Activity	Roles					
	Executive Sponsor	Project Sponsor	Project Manager	Functional Lead	Subject Matter Expert	Project Team Members
Initiate Phase Activities						
Submit Project Request	A,C	R,A	R,A	A,C	C	
Request Review By PMO			R	C		
Research Solution	I	C	R,A	A,C	C	
Develop Business Case	I	A,C,I	R,A		C	
Plan Phase Activities						
Create Project Charter	C	C	R,A	C	C	
Create Schedule	I	I	R,A	C	C	C
Review Plans		R,A	C	I		
Create additional plan if required	I	I	R,A			I
Execute Phase Activities						
Bulid Deliverables	C,I	C,I		R,A	R,A	R,A
Create Status Report	I	I	R,A	R,A	R,A	
Monitor/Control Phase Activities						
Perform Change Management		C	R	A	A	A
Close Phase Activities						
Create Lessons Learend	C	C	R,A	C	C	C

Estimate Budget		A	C	R	I	
Final Review		R	A	C	I	
Create Project Closure Report	I	I	R,A	I	I	I
R: Responsible person or role for ensuring that the item is completed. A: Accountable person or role responsible for actually doing or completing the item. C: Consulted person or role whose subject matter expertise is required in order to complete the item. I: Informed person or role that needs to be kept informed of the status of item completion.						

4.3 Conflict and Crisis

Construction projects nowadays have become more complex in nature. McManamy (1994) stated that the complex, relational and lengthy process of designing and executing makes construction a process wherein arguments and conflicts are virtually ensured. Moreover, Whitfield (1994) argued that the participation of multidisciplinary in construction projects may lead to conflicts among different parties. In other words, conflict and disputes are inevitable to the construction industry particularly when most of the construction projects are surrounded by many uncertainties.

Kumaraswamy & Yogeshwar (1998) agreed that contractual matters, including variation, time extension, payment, quality of the technical specification, availability of information, administration and management, unrealistic client expectations and determination are common causes of construction conflicts.

Conflict in the PCR Test center project may hinder the achievement of one of the parties nevertheless, it has many advantages that may improve the performance of the project as cited by Rauzana (2016). First, it provides information and generates ideas that improve the quality of decision-making. Second, it influences different parties to consider others' views. Third, it helps the project manager/leader to in finding the best solutions for matters that had been buried and become open. Finally, it provides mutual understanding and respect for others' opinions.

In today's globalized world, negative events are the cause of the crisis, which affects construction companies gradually. In most cases, these events may occur suddenly or over a period of time. When a crisis arises in an organization, a disruption to the organization's normal routine procedure makes this impossible. Environmental causes of the crisis are beyond the control of companies. In

general, these are related to economic, political, legal, natural, and rivalry conditions, clients' expectations, and technological developments.

Crisis occurs across different industries such as the construction industry, much of the information on crises and their responses tend to be general. Nevertheless, certain things appear common to industrial crises conceptualization. Hällgren & Wilson (2007) claimed that progress in construction projects can be interrupted by many incidents. Nurul Islam & Hamidul Islam (2020) conducted a study and concluded that fourteen major variables influencing crisis management implementation in construction projects. Those are poor initial estimation, financial issues, too many changes, lacking the contractor's experience, worker strikes issues, inadequate knowledge of workers, workers unavailability, conflicts between parties, target cost, technical issues, political issues, natural issues, schedule variance issues, compressing schedule. Also, Nurul Islam & Hamidul Islam (2020) found that the crisis in construction projects occurred due to inadequate funds, inflation rate, and political stability.

4.3.1 The Conflict and Crisis

1. Project Life Cycle and Conflict

Conflict is defined, as cited by Meredith & Mantel (2012), as “the process which begins when one party perceives that the other has frustrated, or is about to frustrate, some concern of his”. To understand how conflict affects the performance in the construction industry, it is necessary to relate the project life cycle with the primary conflict groups and determine how certain patterns of conflict are associated with the various periods/phases in the project life. Therefore, the project manager can diagnose the nature of the conflict quickly and accurately.

Project life cycle stages such as PCR Test center projects have been differently classified by scholars. For example, Adams et al. (1983) break the project life cycle into four stages: conceptualization, planning, execution, and termination. Meredith & Mantel (2012) cited that all project life cycle stages appear to be typified by conflict. Conflicts are rooted in matters such as schedules, priorities, staff

and labor requirements, technical factors, administrative procedures, cost estimates, and, certainly, personality conflicts.

2. Areas of Conflicts between Project Owner and Construction Contractor

Conflict in the construction of PCR Test center leads to dysfunction, which is detrimental to the project's outcome and stakeholders. Conflicts that are ignored can transform a simple issue into one that may become insuperable afterward. Addressing conflict once it arises is the most efficient way to avoid future discord. According to the International Risk Management Institute (IRMI)(n.d.), conflict arises for several reasons, and the most common ones are conflicts of interest, poor communication, and limited resources.

3. Conflicts associated with the Construction of PCR Test center are listed below:

Areas of Conflicts between Project Owner and Contractor in the Construction of PCR LAB		
S/N	Area of Conflict	Reasons for Conflict
1	Communication	Different communication styles. Unclear roles and responsibilities of project parties.
2	Scope of Work	Poor preparation. Developing the scope by a non-specialized team.
3	Schedule	Unrealistic schedules (being overly optimistic). Unclear listing of project activities.
4	Resources Allocation	Running multiple projects at a time. Non-availability of required tools and materials. Insufficient budget.
5	Re-assignment of Project Team Members	Overlapping with other projects. Projects priority not set properly. Unqualified manpower.
6	Conflict of Interest	Fighting for Personal Goal Transferring Risk

Figure 18: Area & Reason for conflict

4.3.2 Expected scenarios of the conflict's events in the project

Scenario 1: Communication Conflict

It is found that the contractor is submitting the status report to different people once requested without concerning the main concerned party. Therefore, such behavior leads to misunderstanding and discord among people working together on construction projects. Also, lack of information, partial information, untimely information, and inaccurate information all can lead to work being done that does not meet expectations and sets the stage for conflict and animosity.

Resolution Strategies:

Standardize the channels of communication in the project to fasten and ease the communication process.

To establish a clear chain of command on a construction site that standardizes communication, creates efficiency and accountability, and eliminates confusion. The hierarchy for a work site should be laid out in the initial contract documents and include:

- Project owner
- General contractors
- Subcontractors
- Members of individual crews like engineers, architects, plumbers, and electricians.

Outline relationships in the contract documents and share them among concerned project parties.

Scenario 2: Schedule Overrun

Construction schedule overrun is common on construction projects over the world and the Saudi Arabia construction industry has not escaped the challenges of failing to deliver projects on time. According to Alkhathami (2004), schedule overrun is defined as “extra time required to finish a given construction project beyond its original planned duration, whether compensated for or not”.

Ali, Smith, Pitt, and Choon (2012) emphasized that four factors that cause schedule overruns: contractor-related factors, consultant-related factors, client-related factors, and external factors. Scenarios of schedule overrun caused by external factors involve unforeseen site conditions, bad weather, and updated governments regulation. For example, some products/ materials are behind scheduled delivery.

Resolution Strategies:

- Evaluate alternative products or vendors
- Determine product slack
- Seek alternative vendors
- Use a 10% budget cushion to expedite delivery

- Update budget

Scenario 3: Conflicts of Interest

Individuals fighting for personal goals may lose sight of the project or organizational goals meaning that a person or party has concerns that do not coincide with an overall goal. It is in the owner's best interest that a project is completed at the highest quality for the lowest cost. In contrast, a contractor would prefer to expend the least number of resources necessary to complete a project to maximize their profits. Each side is attempting to transfer risk to the other party (IRMI, n.d.).

For instance, the owner may attempt to take project management into their own hands and fail to adequately manage duties. Alternatively, a general contractor may attempt to delegate most of the work to a subcontractor. Often an owner will insist on a lump sum contract that places an increased amount of risk on a contractor. In this scenario, a poorly estimated project scope can result in a contractor footing the bill (Contney Attorneys & Consultant, n.d.). another example is that the contractor is transferring manpower among other projects.

4.3.3 The Strategies to Deal with Each Conflict, and Specify the Reason for

Preference:

One tactic may be continually reminding owners, partners, employees, and the contractor how their personal goals and efforts "fit" into the project's strategic goals and outcome expectation. Being able to recognize and openly address conflicts of interest is crucial to a project's success. Nevertheless, the only way to be sure that everyone's interests are protected is to get it in writing.

Having a well-written contract and a well-defined scope of work is the only way to mitigate these kinds of disputes. Deciding where risks lie in advance will go a long way towards securing project completion regardless of the varying interests of biased parties involved.

Other Scenarios:

Another scenario for conflict may arise from the limited resources. Many situations on projects when resources are limited and have to be managed effectively. Conflict may arise over the use of

equipment, space, material, time, manpower, etc. Such conflicts must be dealt with effectively to maintain harmony on-site. An optimal strategy is to include employees and partners in the resource allocation process. This will provide them with a better understanding of how allocation decisions are made in the best interest of the project.

4.3.4 Root Cause Analysis

Root cause analysis (RCA) is defined as “the process of discovering the root causes of problems to identify appropriate solutions” (Aventis Learning, n.d.). RCA assumes that it is much more effective to systematically avoid and resolve underlying issues. RCA can be performed with a collection of principles, techniques, and methodologies that can all be leveraged to identify the root causes of an event or trend. Approaches of RCA include:

1. Events and causal factor analysis
2. Change analysis
3. Barrier analysis
4. Management oversight and risk tree analysis
5. 5-why’s technique

The 5-why’s technique is used to analyze the root cause for the above-stated conflicts. It is a simple and effective tool for solving problems. Its main goal is to find the exact reason that causes a given problem by asking a sequence of “Why” questions. This technique helps the team to focus on finding the root cause of any problem. Also, it encourages each team member to share ideas for continuous improvement, rather than blaming others. In addition, it gives the team the confidence that it can eliminate any problem and prevent the process from recurring failures.

Below is the root cause analysis for the above three conflicts:

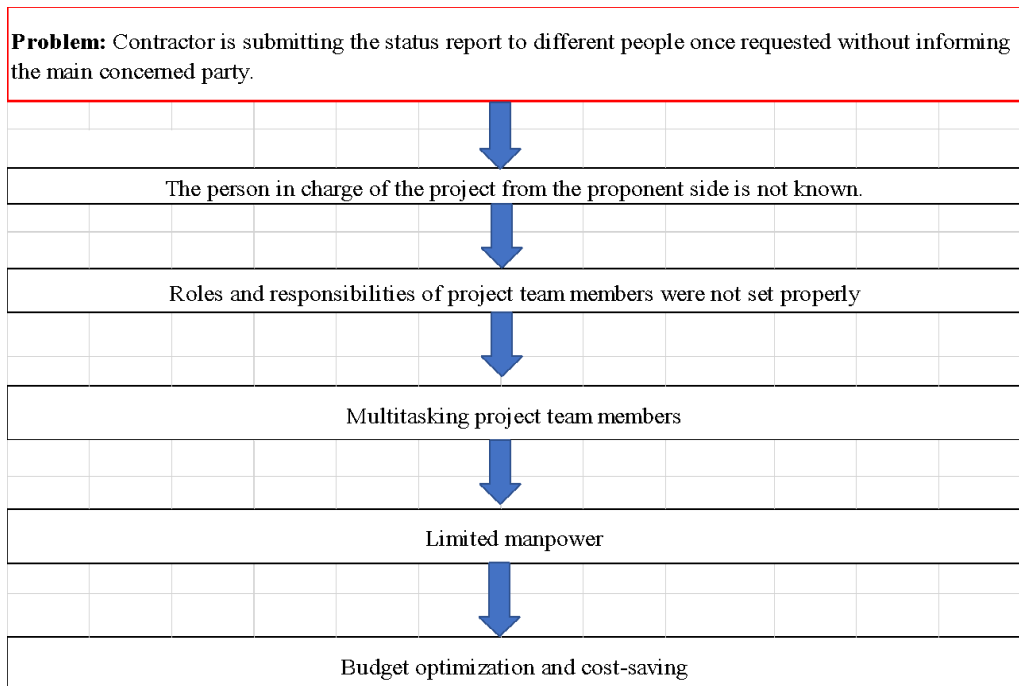


Figure 19: Communication conflict root cause analysis

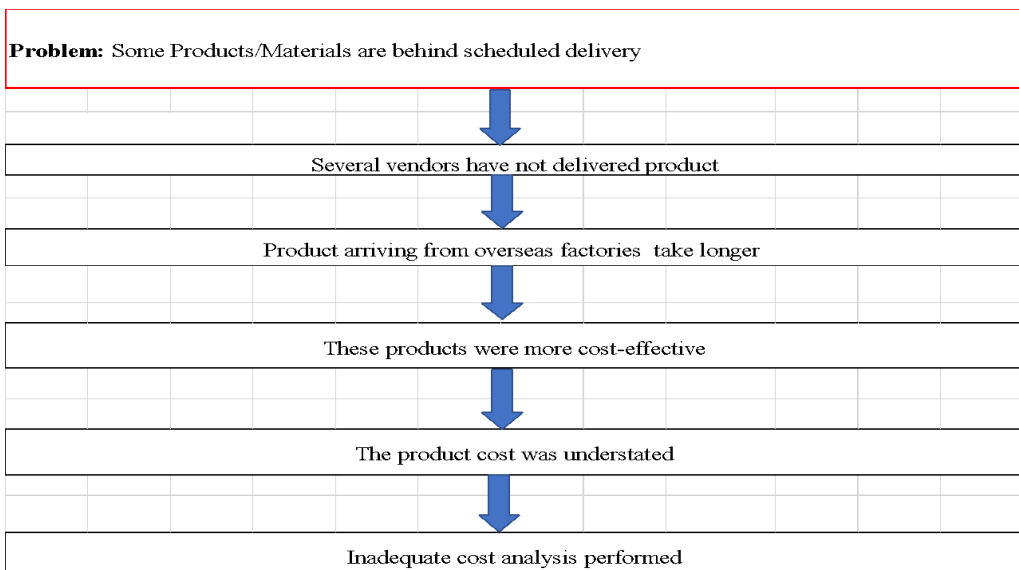


Figure 20: Product/Materials conflict root cause analysis

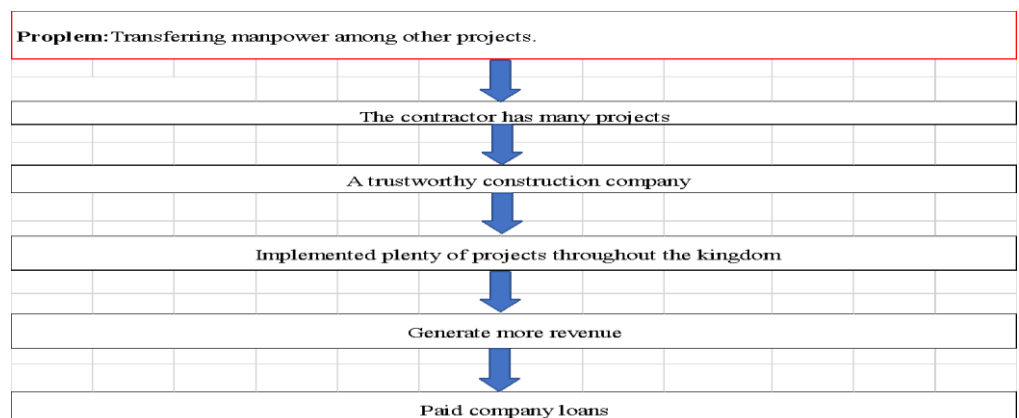


Figure 21: Transferring Manpower root cause analysis

5.1 Resourcefulness

Resourcefulness is defined as the ability and creativity to cope with difficulties. The key to being resourceful is to ask the right questions in a positive way. This is done by adopting an attitude of the art of the possible: extreme positive thinking. Becoming resourceful is a journey for you, your team, and even your organization. We'll be able that we're resourceful. instead of giving up when come across an issue we're unprepared to deal with, we become determined to find a solution.

5.1.1 Distribute the human resource on the Functions:

Stages	Functions	Department	Duration
1. Initiation Project Concept	1.1 Get the approvals from sponsor to provide the project charter	PM	2 days
	1.2 Get the polices of environment & all necessary Documents	PM	2 days
	1.3 Build design team	PM	1 days
	1.4 Select project site	Project Team	1 days
	1.5 Discuss and select the construction services	Project Team	1 days
	1.6 Identify project parameters / feasibility and materials	Project Team	2 days
	1.7 Obtain necessary Permits and Insurance	PM	3 days
	1.8 Recruiting the work teams	HR	3 days
2. Planning and Design Development	2.1 Identify required functionality & aesthetics	Engineering Dept.	4 days
	2.2 Complete schematic design	Engineering Dept.	7 days
	2.3 Prepare preliminary estimate	PM	3 days
	2.4 Establish preliminary schedule and finalized	PM	5 days
	2.5 Complete site plan approval process	PM	6 days
	2.6 Perform value engineering	Engineering Dept.	1days

	2.7 Secure financing	Finance Dept.	4 days
	2.8 Finalize construction documents	PM Engineering Dept.	2 days
	2.9 Establish final project budget	PM Finance Dept.	2 days
3. Award	3.1 Identify subcontractor list	Procurement Dept.	3 days
	3.2 Solicit subcontractor		1 days
	3.3 Award subcontracts		6 days
4. Active Construction at Job Site	4.1 Purchase the materials	Procurement Dept.	24 days
	4.2 Field supervision/ quality control	PM	7 days
	4.3 Manage subcontractors	PM Procurement Dept.	5 days
	4.4 Inspections	PM Internal Auditor	5 days
	4.5 Track costs (budget vs. Actual)	PM	7 days
5. Project Closure	5.1 Final Inspections	PM	3 days
	5.2 Certificate of Occupancy		1 days
	5.3 Punch List		2 days
	5.4 Closure Documentation		2 days
	5.5 Hand over all deliverables		1 days
Total Project Duration			116 days

Table 11: Human Resource

5.1.2 Conducting Crashing and Fast-Tracking Process:

Fast-tracking in project management is a technique where activities are performed in parallel, instead of being carried out sequentially using the original schedule.

Crashing in project management is when you shorten the duration of a project by reducing the time of one or more tasks. Crashing is done by increasing the resources to the project, which helps make tasks take less time than what they were planned for.

Crashing vs Fast Tracking

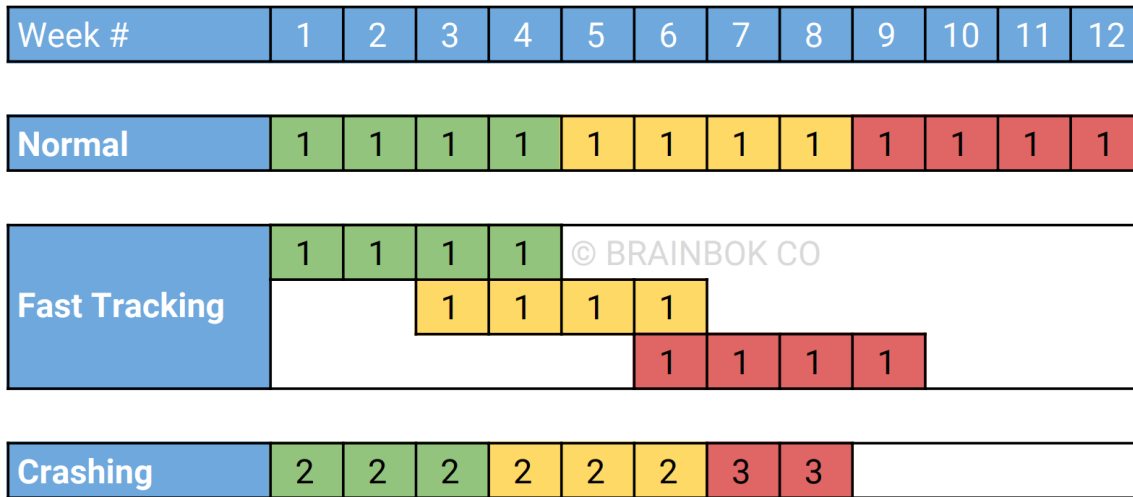


Figure 22: Crashing Vs Fast Tracking

Normal table in our Project

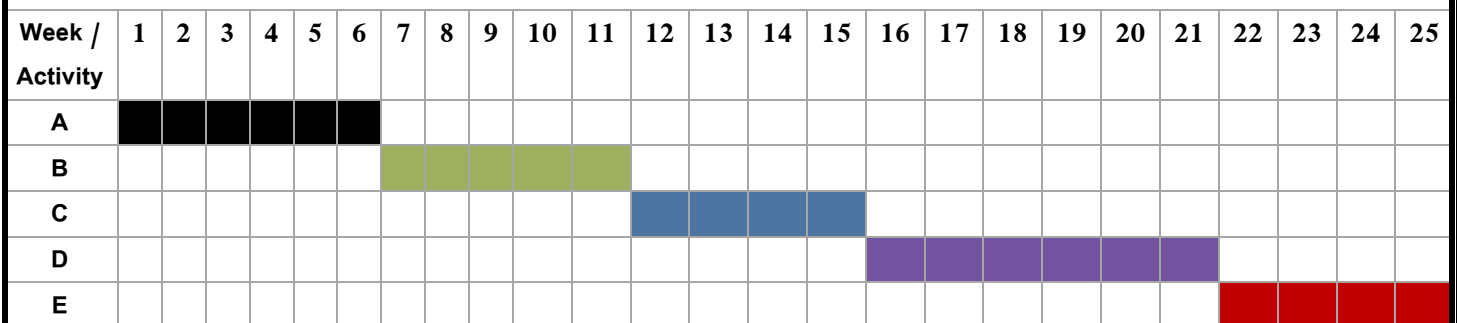


Figure 23: Normal Table

Fast-Tracking:

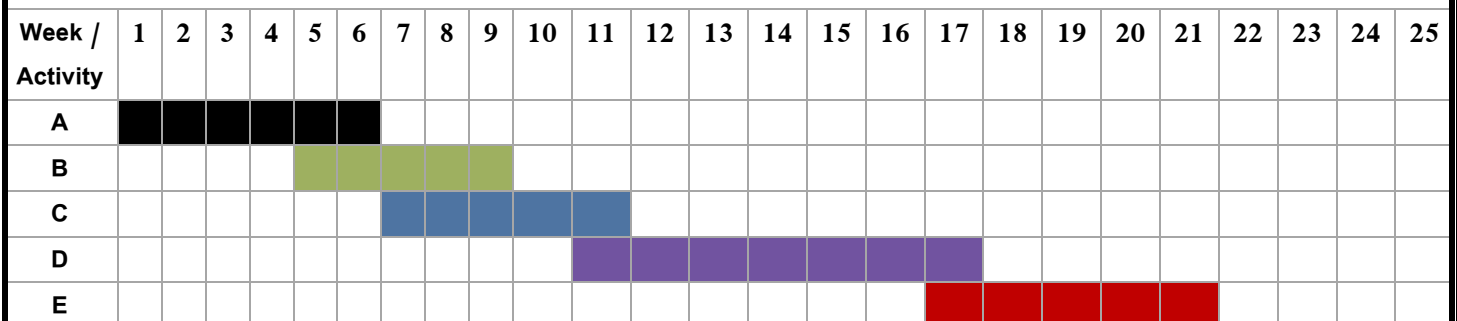


Figure 24: Fast-tracking

Crashing:

Week / Activity	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
A	■	■	■	■	■																				
B						■	■	■	■	■															
C										■	■	■	■												
D													■	■	■	■	■								
E																	■	■	■	■					

Figure 25: Crashing

5.2 Negotiations

Negotiation is a strategic discussion to resolve issues in a way that both parties find acceptable. In a negotiation, each side tries to convince the other to share their views. Through negotiations, the parties try to avoid disputes but agree to some form of compromise. (Kenton, 2021)

The gist is a defined plan for all the requirements of the project to be created Negotiated agreements that avoid internal and external conflicts of interest. also, we will successfully guide the matching principle of both parties. Internal negotiations are part of introducing all departmental requirements and discussing values Use our project and do it by solving all the problems. Starting with external negation, requires the participation of other entities and our relationship Values and project strategies give us the space to discuss and match potential needs Benefit to a perfect negation.

5.2.1 General rules for the Negotiation process.

Model presented below identifies the five stages of each negotiation in a simplified framework that will help you analyze, assimilate, and apply Best Negotiation Practices. (Watershed, 2018).



Figure 26: Five Stages of Negotiation

Five Stages of a Negotiation:

Stage 1: Prepare

Which is includes:

- Identify potential value.
- Begin to understand interests.
- Develop Fact base.

Stage 2: Information Exchange and Validation

Which is includes:

- Discovering and creating value.
- Assess interests.
- Build rapport and trust.

Stage 3: Bargain

Which is includes:

- Create and distribute value.
- Address interests.
- Make and manage concessions.

Stage 4: Conclude

Which is includes:

- Capture value.
- Confirm interests have been met.
- Thank them.

Stage 5: Execute

Which is includes:

- Expand value.

- Addressing changing interests.
- Strengthen relationships.

5.2.2 Negotiation Plans:

In many projects, the balance of power has dramatically shifted from buyers to suppliers. Whatever the reason, the project manager needs to negotiate the situation strategically. Neither experience, bargaining skills, nor persuasion on the part of the negotiator can compensate for the absence of preparation. The following are two examples of negotiation plans:

Negotiation plan 1 for Sellers

This plan consists of strategies that help determine how the seller will manage negotiation strategies with the preferred responder prior to finalizing the contract award. The negotiation team should concentrate on the following points:

- Recognize the requirements of the other party.
- Identify the buyers: User, Technical, Strategic, Coach
- Determine the other party positions and interests
- Identify BATNA (Best Alternative to a Negotiated Agreement) and the other party BATNA
- Determine each side's sources of power and leverage: time, information, standards, expert and title power.
- Determine the best, most likely, and least likely outcomes.
- Find out what our killer arguments are.
- Determine our most important discriminators.
- Find out what our ghosting discriminators are.
- Determine the return on investment that we will provide to the prospect.
- Identify team members: leaders, experts, spokesperson, numbers person, experts, observer.
- Determine the roles of third-parties.

- Develop opening statement for relationship building
- Develop questioning strategies
- Develop an opening proposal
- Develop pricing strategies
- Develop concession strategies
- Develop bargaining strategies
- Ready for unethical negotiating techniques

Negotiation plan 2 for Procurement

Planning for negotiation is critical to achieving a successful result in the construction of Lab procurement stage (CIPS, 2020). Areas that the negotiation team needs to concentrate on include:

- Deciding on the nature of the contractor's relationship with the supplier and how to establish that.
- Identifying all the points to be negotiated.
- Prioritizing the contractor's needs and wants and the supplier's needs and wants.
- Identifying alternative positions and the point at which the contractor will exit negotiations.
- Deciding on the approach to achieving the contractor's most desired outcome.
- Anticipating the supplier's moves and how to counter them.
- Working with the supplier to establish a realistic contract delivery or implementation plan.
- Addressing transitional arrangements from the current supply arrangement.
- Establishing what sustainability will look like.
- Identifying what best public value will look like.
- A negotiation plan should be completed and approved before initiating negotiations with the recommended supplier. The following approvals are needed:
 - Procurement manager confirms that the plan meets the requirements.
 - Project sponsor gives authority to proceed to negotiations with a contract view.

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