

Water Desalination Plant

مشروع مصنع تحلية المياه

رقم المجموعة (4)

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1. Company Strategy

1.1 Company Vision

To be the leading company in providing Purified Drinking Water in Kingdom of Saudi Arabia.

1.2 Company Mission

- To be the buyer choice and the dominant water manufacturer and supplier to the local customers (Al-Baha Area) as well across the Kingdom.
- Target to provide to safe and healthy water by capitalizing state of the art technologies.
- Ensuring that water is supplied to the customers in timely manner at cheaper cost.
- Ensuring full compliance with local and World Health regulations and standards in producing the safe and healthy water in hygienic environment.

1.3 Company objectives

- Maximize the production by using more production units equipped with more advanced technologies.
- Increase the profitability by 3% annually through marketing campaign and by increasing expanding distribution points.
- Ensure the water quality is in compliance with WHO (world health organization) and local regulatory authority by getting regular update and ensure that the plant lab group is fully compliant to the requirements.
- Maintain the reliability of plant operation by having a reliable system in place and continuous improvement in the system as well by employees training.
- Keep work environment healthy by maintaining a frequent team building and providing a good development plan for work force.
- To ensure that the supplied drinking water will satisfy the customers and ensure a good relation with them.

1.4 Performance Measurement Indicators : Project team has focused on the following strategic objectives and utilized lead and lag measures indicators to assess the project health and performance.

Strategic objectives	Lead measure	Lag measure
Financial Improvement. Commonly this sector is concerned with basic financial data sources such as revenues, cost of sales, net gross margins, company expenses and net profit.		
Improve return on investment	Add three more products to the portfolio	Revenue growth by 3% annually
Reduce overall costs		Overall cost reduced by 1% annually
Customer's Satisfaction. It's obvious that unsatisfied customers will look for alternatives (approaching other suppliers) to meet their expectation.		
Maximize customer satisfaction	Effective account management	Focused on customer expectation and satisfaction score
Decrease Customer Attrition	Improved customer service	Monitor the customers service team performance
Learning and development dimension. The main resources in most companies today are its people, is essential, especially in a climate where technology is changing rapidly, that they grow and learn continuously.		
Development of the Strategic skills	Service/product cover ratio	Employee Performance & Satisfaction
Better strategic communication	Information availability	
Water Product Quality Multiple Water Desalination Plant designs available in the market with different processes and technologies. Proposed reverse osmosis system works on principle of difference in pressure created both sides is what allows the water to circulate through the membranes, as a result impurities including salt particles are recovered. During this process, water quality is continuously measured to ensure product specification are maintained.		
Maintain the Total Dissolved Salt in (TDS) in the product.	TDS instrument is installed in the process	TDS results between 110 – 150 ppm
Measure of how acidic/basic water is (PH)	PH instrument is installed in the process	PH measurement is neutral (PH=7)

Table 1 Performance Measurement Indicators

1.5 Project Charter

Project Name	Water Desalination Project
Project description	To open new production line within the current company plot to increase the production as the demand is increased. The new line will use the latest RO (Reverse Osmosis) technology. The new line will capitalize in using the current infrastructure such as Power\Electricity, Chemical, common header for plant intake and distributions.
Project objectives	• Maximize the production and increase the Company Profit by 3%. • Ensure the water quality is in compliance with all water regulation requirements. • Keep work environment healthy by maintaining a frequent team building and providing a good development plan for all the level of workers. • To ensure that the supplied drinking water got the customer satisfaction and maintain a good relation with them through campaigns and customer surveys.
Project is considered Successful when	• Meeting the project targeted Capital Cost and Schedule. • Project Quality and Safety indices have been met. • Final Product is easily accepted by customers.
Project participants	Project sponsor, Manager , Team Members\ Procurement \ Operation\Inspection \ and HSE.
Available resources	• Project Personnel are formed from functional department. • Available budget is: SR 10,000. • Availability of local vendors for suppling the plant Membranes, sand filter sand the high-pressure pumps.
Constraints	• Project Financing to accommodate project CAPEX. • Securing permanent Feed\Raw Water to the plant.
Potential risks:	• Water Quality out of specification. • Exceeding the Targeted project duration and cost. • Scope Creep (uncontrolled scope).
Due \ Deadline	01-04-2022

Table 2 Project Charter

2. Governance, Structure and process

2.1 Project Organization

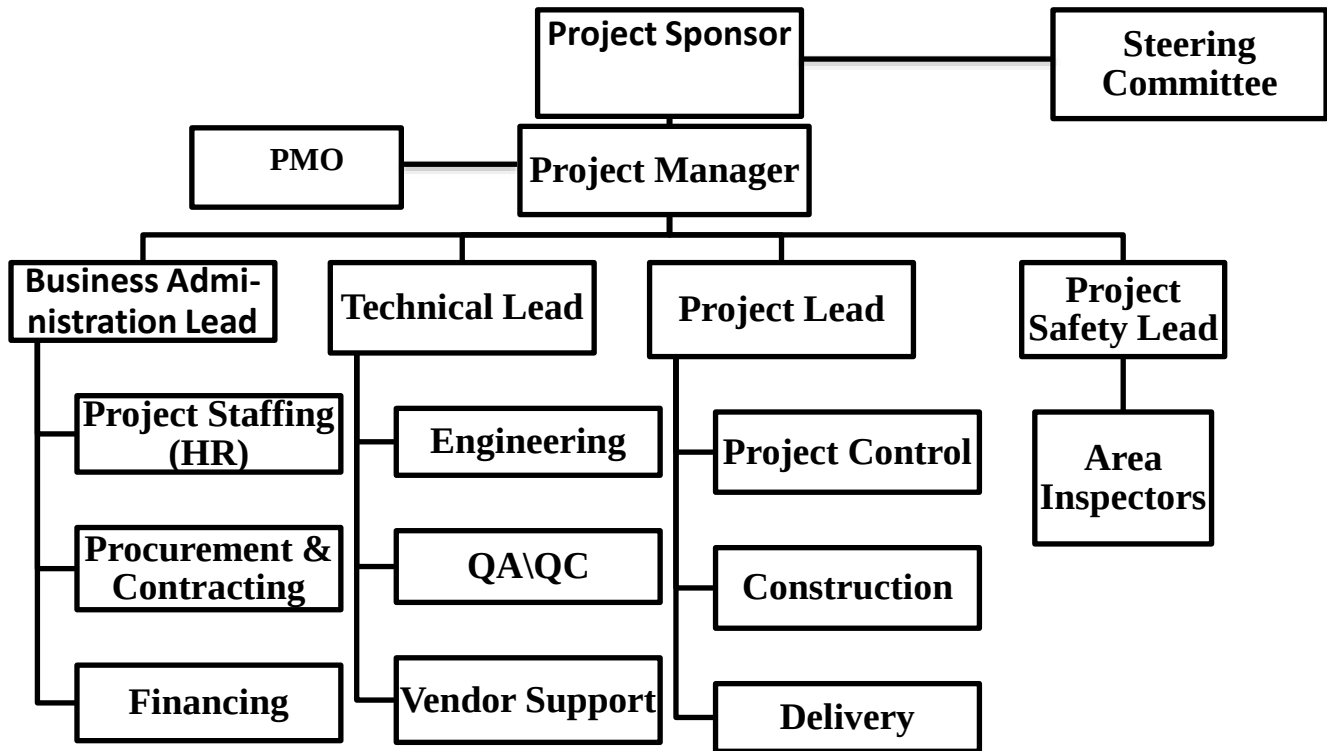


Figure 1 Organization Chart

2.2 Identify practical and scientific bases, which adopted in developing the structure.

Figure-02 shows the project organization structure that includes illustrates the and defines the organizational project framework where all works shall be coordinated in an effective manner. It defines the hierarchy of reporting in organization and it shows the number of levels in the chain of importance.

In setting up the project governance, the Project Sponsor (PS) is collaborating with project Steering Committee (SC) to the get required guidance on critical project decision making. Project Manager (PM), is responsible to manage project execution team , project delivery targets and maintain the project performance on track. Business Administration , technical

services, quality, procurement and safety units support PM during project development and execution. Each of these units has specific functions to support the project and it can be summarized on the following:

- Business team to support the project staffing, procurement and any matter related to finance.
- Engineering Team to support the project from all engineering disciplines (e.g. civil, electro-mechanical & QA\QC), Project standardizing format and getting vendor support.
- Project Team to support the project construction, managing the delivery with the stakeholders, and controlling the project schedule and cost.
- Project Safety team who has responsibility to ensure a safe work environment is practiced and any observations are reported by area inspectors.

2.3 Project Management Office (PMO) Model

As discussed from the previous section, the engineering team will support the project by sharing the standard project format and they will do this with collaboration with the company PMO. Company PMO normally supporting project managers in many areas such as :

- Managing shared resources across all projects;
- Identifying and developing project management methodology, best practices, and standards ;
- Coaching, mentoring, training, and oversight;
- Monitoring compliance with project management standards, policies, procedures, and templates by means of project audits.

In conclusion, project has been using the company PMO to support the project rather than monitoring and controlling by using standard project format such as project charter, risk register and stakeholders register.

3. Compliance, Standard and Regulations

3.1 Compliance Model For Project Delivery.

Description	Accepted	Rejected	Completeness	Remarks
Check water meter readings and record water production.	✓	-	Done	
Check chemical solution tanks and record amounts used.	✓	-	Done	
Check and record water levels in storage tanks.	✓	-	Done	
Inspect chemical feed pumps.	✓	-	Done	
Check and record chlorine residual at the point of application.	✓	-	Done	
Check and record chlorine residual in the distribution system.	✓	-	Done	
Inspect booster pump stations.	✓	-	In process	Need further work
Check and record fluoride concentration in the distribution system.	✓	-	Done	
Record well pump running times and pump cycle starts.	✓	-	Done	
Check instrumentation for proper signal input/output.	✓	-	In process	Need further work
Investigate customer complaints. Record threats or suspicious activity.	✓	-	Done	
Complete a daily security check.	✓	-	In Process	Need to provide reports
Inspect heater operation during winter months.	✓	-	Done	
Inspect well pumps, motors, and controls	✓	-	Done	

Table 3 Compliance Model

3.2 Check List Model for the Three Project Stages (Start- Plan- Achieve- Close)

Developing the Check List model for the three stages of the project (Start- Plan- Achieve- Close) as below:

Defining the checklists: it is a structured tool used to verify that a set of required steps or requirements are performed. Also, it become a part of a project record to verify the due compliance steps are taken during project lifecycle. The Checklist is not considered a formal type of schedule, it sometimes called a “to do list”. It used for very short-term planning, rarely more than a few days. Its main purpose is to ensure that nothing is omitted. It has its own advantages and disadvantages: like advantages is that it doesn’t require special skills, Tool, or training to use and maintain. On the other hand, it doesn’t show interdependence of activities.

Check List of Project:

To be completed by: Deadline: 1 Dec.2021

PHASE 1: STARTING

Starting stages:	Timeline	Status	Remarks
Forming	5-9-2021	Done	
Construction Tools	7-9-2021	Done	
Water Desalination Equipment	7-9-2021	Done	
Workforce	Operational	In process	
Stakeholders	10-9-2021	Done	
Water Desalination System	7-9-2021	Done	
Polices and procedure	5-9-2021	Done	

Table 4 Phase 1: Starting

PHASE 2: PLANNING

Planning stages:	Timeline	Status	Remarks
Siting	11-9-2021	Done	
Desk work	Operational	In process	
Scope & budget	11-9-2021	Done	
Safety + Crisis Plan	5-9-2021	Done	
Purchases	11-9-2021	Done	
Membrane Desalination	15-9-2021	Done	

Table 5 Phase 2: Planning

PHASE 3: ACHIEVING

Achieving stages:	Timeline	Status	Remarks
Revenue Analysis	11-11-2021	Done	
Zero problems List	10-11-2021	Done	
Percentage of sales	30-11-2021	Done	
Desaturation score	Operational	In process	
Primary water treatment list	Operational	In process	
Water desalting list	Operational	In process	
Final water treatment list	Operational	In process	

Table 6 Phase 3: Achieving

PHASE 4: CLOSING

Closing stages:	Timeline	Status	Remarks
Committing to deadlines	30-11-2021	In process	
Accepted deliverables	20-11-2021	In process	
Final report	30-11-2021	In process	
Data analysis	Operational	In process	
Archive documents	15-11-2021	In process	
handover	28-11-2021	In process	
Operational status	30-11-2021	In process	

Table 7 Phase 4: Closing

4. Power and Interest

4.1 Stakeholder Register

No	Name	Title	Role	Power (H/L)	Interest (H/L)	Influence (H/L)	Category	Contact information	
1	Mohammed	owner	Sponsor	H	H	H	Internal	Phone No: 055	Email: @gmail.com.com
2	Osama	Project Manager	Supervising	H	H	H	Internal	Phone No: 056	Email: @gmail.com
3	Rasha	Sales Manager	Sales Expert	L	H	H	Internal	Phone No: 055	Email: @gmail.com.com
4	Ahemd	Quality Assurance(From Minstry of Health)	Inspection	L	H	H	External	Phone No: 050	Email: @gmail.com
5	Abeer	Director of Accounting	Team Member	H	H	H	Internal	Phone No: 056	Email: @gmail.com
6	(SR Equipment) Company	Vendor	Machine and equipment vendor	L	H	H	External	Phone No: 050	Email: @gmail.com
7	Customer	Customer	End user	L	L	L	External	Phone No: 055	Email: @gmail.com
8	Saad	Program Analysis	Team Member	L	L	L	Internal	Phone No: 050	Email: @gmail.com
9	Operators	Operators	Team Member	L	H	L	Internal	Phone No: 051	Email: @gmail.com

Table 8 Stakeholder Register

Stakeholder Management Plan

No	Name	Title	Stakeholder Expectations	Communication Rules
1	Mohammed	owner	Cover the costs of the project and achieve the required profit	by meeting every week
2	Osama	Project Manager	Completion and delivery of the project on time at the specified cost without any accidents	by meeting every day
3	Rasha	Sales Manager	Ensure sales growth by expanding customer base	by emails every week
4	Ahemd	Quality Assurance(From Ministry of Health)	Checking product quality by comparing (water safety plan)	by meeting and emails every week
5	Customer	Customer	Ger a good product with lowest cost	by emails any time
6	(SR Equipment) Company	Vendor	Coordinating with vendors and completing purchase of equipment and machinery on time and at specified price	by meeting every week
7	Abeer	Director of Accounting	Weekly expense report	by emails every 2 week
8	Saad	Program Analysis	Monitoring the operating systems of equipment and machinery	by emails every week
9	Operators	Operators	Do the routine work	by weekly reports

Table 9 Stakeholder Management Plan

4.2 Stakeholder Power Matrix (Two Networks)

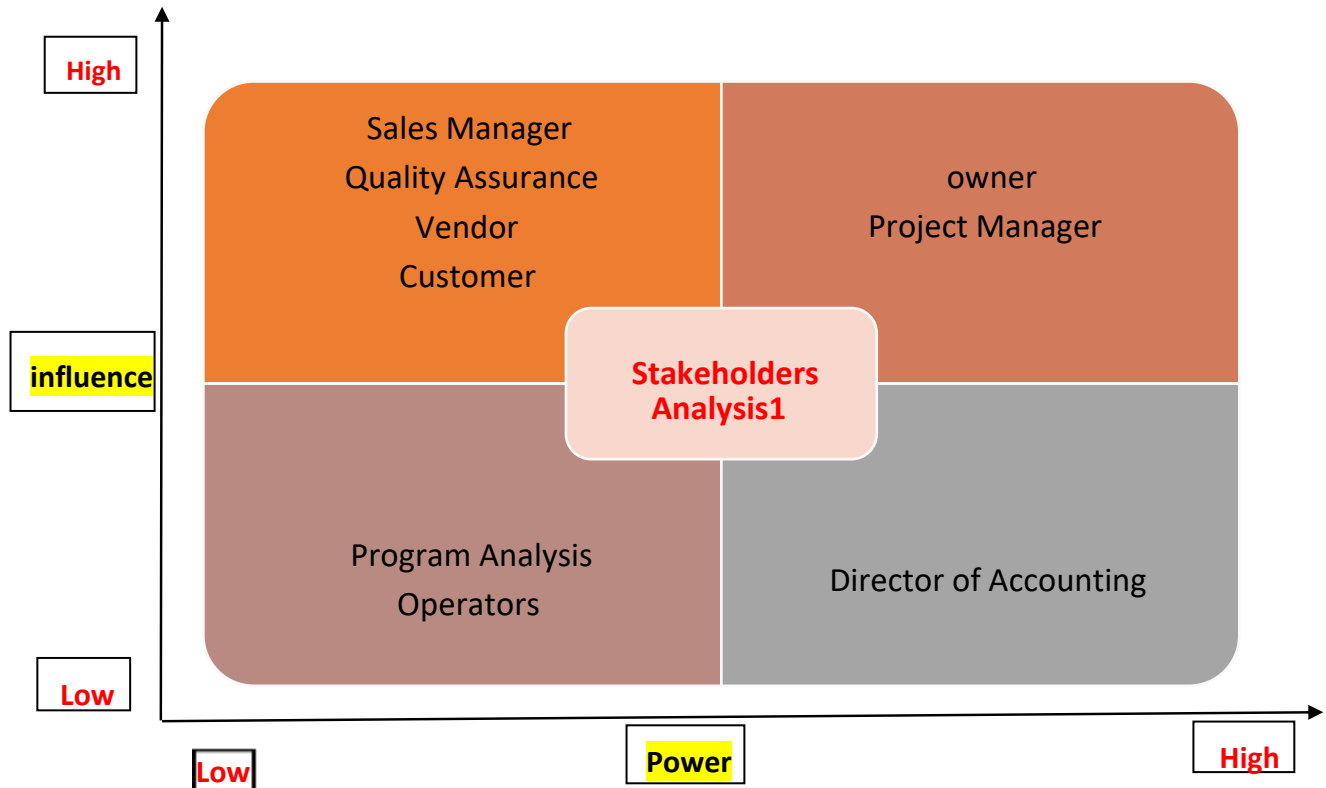


Figure 2 Stakeholder Analysis 1

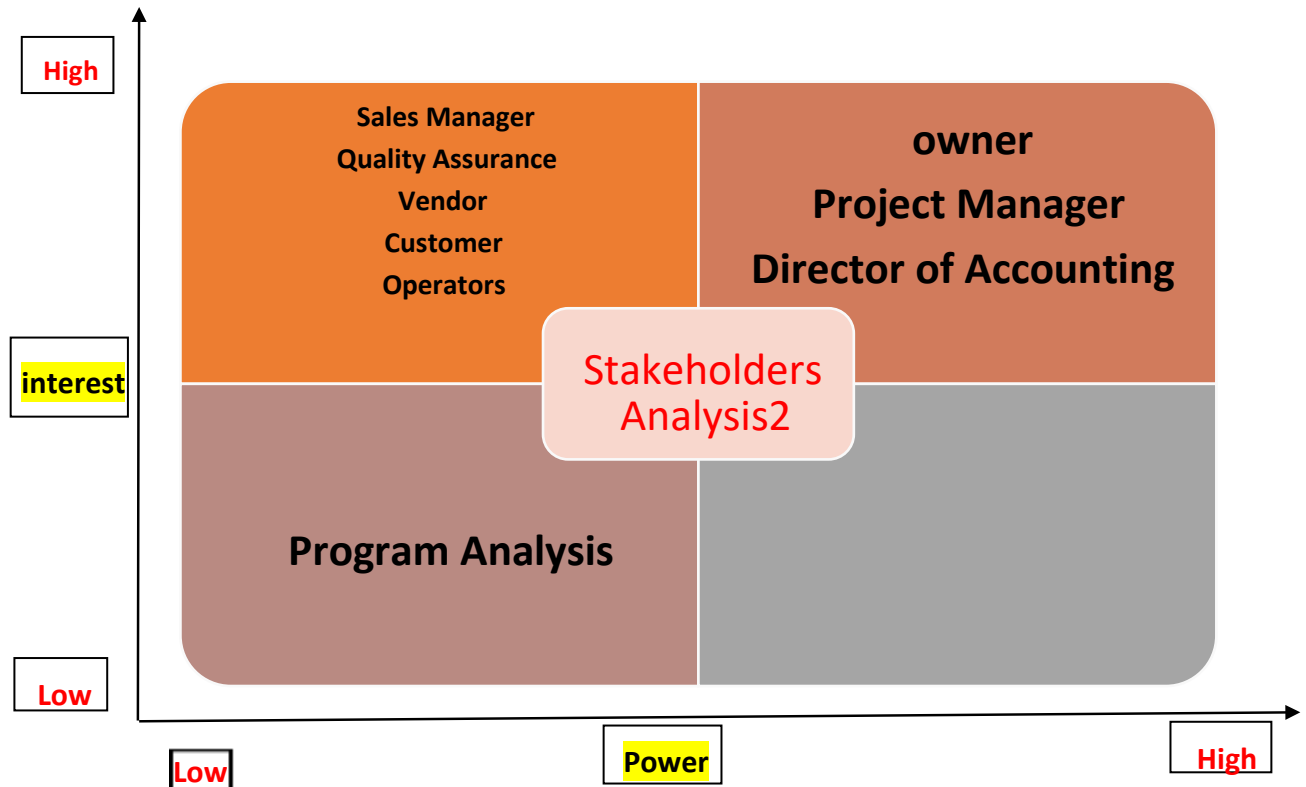


Figure 3 Stakeholder Analysis 2

4.3 To use the logical diagrams for the register of the stakeholder.

No	Name	Title	Aware?	Power	Supportive?	Interest
1	Mohammed	Owner	Aware	H	Supportive	H
2	Osama	Project Manager	Aware	H	Supportive	H
3	Rasha	Sales Manager	Aware	L	Supportive	H
4	Ahemd	Quality Assurance(From Minstry of Health)	Aware	L	Neutral	H
5	Customer	Customer	Somehow	H	Neutral	H
6	(SR Equipment) Company	Vendor	Aware	L	Supportive	H
7	Abeer	Director of Accounting	No	L	Neutral	H
8	Saad	Program Analysis	Somehow	L	Neutral	L
9	Operators	Operators	Aware	L	Supportive	H

Table 10 logical diagrams for the register of the stakeholder

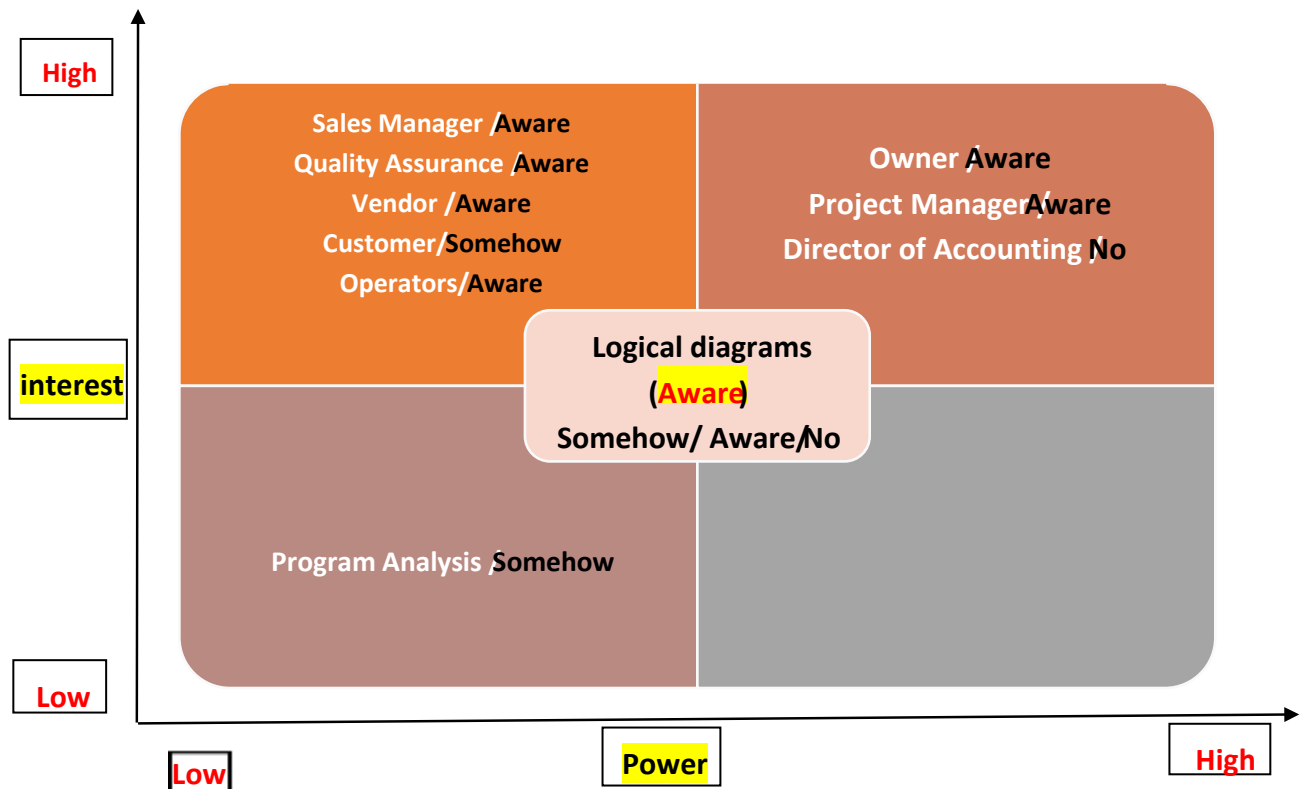


Figure 4 Logical diagrams (Aware)

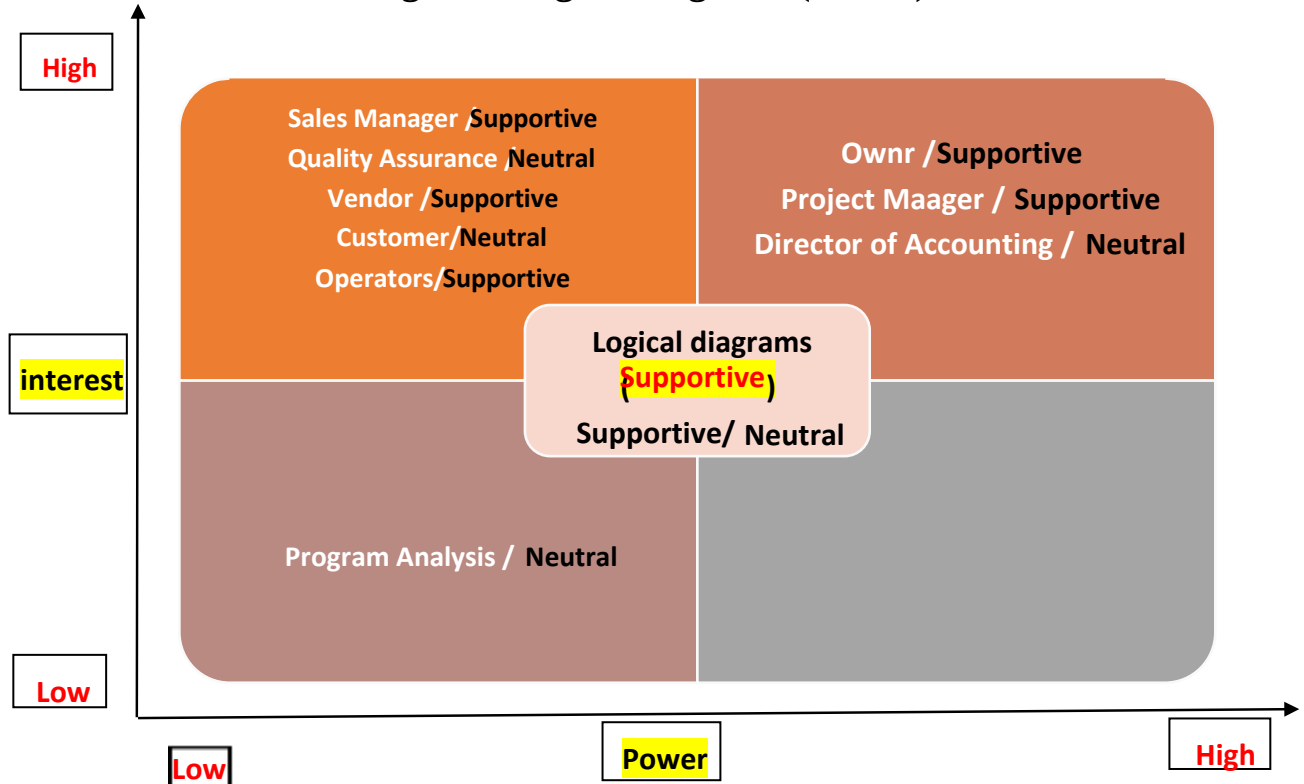


Figure 5 Logical diagrams (Supportive)

5.Culture and Values

5.1 Identify the Culture of the organization.

Culture is the behaviors or beliefs that determine how an organization or team interacts or carries out work. Core values serve to constantly guide both the employee and the company in achieving their mutual goals, in a manner that is based on an ethical and ideological framework. Every business is different, and so are their core values. there are some principles that are alike for all.

5.2 Provide the Proposals of the organizations values that can be adopted

Here are three such core values every organization should have:

1. Integrity and Ethics:

the two principles of integrity and ethics translate into doing the right thing, in an honest, fair and responsible way. Building your entire business on the foundation of honesty and integrity goes a long way into building a strong, trusting relationship with its employees, stakeholders, and customers.

2. Respect:

Respecting all employees means respecting their individual human rights and privacy, eliminating all kinds and forms of discrimination, whether based on religion, belief, race, ethnicity, nationality, gender or physical disability. Moreover, ensuring a safe and healthy work environment for all employees is an important part of giving respect to them. This inspires feelings of commitment and a drive to do even better.

3. Innovation:

Employees are encouraged to be dynamic and come up with innovative ideas that can translate into successful products for the company. Constantly imitating others won't take the business far (Project Team Leadership and Communication by Samuel Malachowsky, 2018).

6. Self-reflection and self-management

6.1 To specify “3” personal behaviors of the stakeholders that can influence on the project.

It's very essential to monitor and manage the stakeholder behaviors and their engagement in a project as this may positively or negatively impact the project (Project Management Institute, PMBOK® Guide, Sixth Edition, 2017).

Functional Manager

As one of the stakeholders, functional manager who is keeping some of the project team members to follow his priority and ignore project need, as they are originally from his function department, He kept them busy on some of the department matter and mostly show resistance to allow these members focused on the project deliverables.

Project Team Member

The second stakeholder, is one of the project team member who is very rude with his colleagues. He does not behave well and criticize rather support the management.

Supplier of the Membrane

The third stakeholder is the supplier of the membrane column who is consistently late in responding to our project team inquiries. He always find excuse on commitment sometime to quality assurance issue, late raw material deliveries and always try to hide his own shortcomings.

6.2 To study such behaviors, identify their reasons, and how they can be eliminated.

The three behaviors aforementioned in section 6.1 have been analyzed on their root causes and ways for eliminating them and results are summarized as follow:

Stakeholder's behavior	Root cause	Resolution
Resistance of the functional manager in	Plant engineering support demand is increased.	Make a contract with supplemental manpower company to provide the

freeing his team members focused in the project.		project with necessary resources
Communication Rudeness of one of the project team members	Stress due to the rumor of company intention to lay off some of the employee due to the ongoing economic crisis	Issue an official announcement by company to all employee that such rumor is not true and reiterating on the fact that their employees are the considered asset\valuables resources for the project and company
Lateness of the supplier in responding to project team inquirers	Supplier is not focused on the inquiries priorities as he is receiving multiples requests from multiples team members from the same project and some of them is repetitive.	Assign one single point of contact from project team to communicate any project matter with the supplier.

Table 11 Stakeholder's Behavior

6.3 To conduct a self-professional assessment by using SWOT model

The SWOT analysis examines the project from each of the strengths, weaknesses, opportunities, and threats (SWOT) perspectives. A comprehensive study and analysis have been gone through in this project to assess the internal strength and weakness for the company as well as the other opportunities and threats that come from external factors such

as market conduction, risks and any government regulation. Below showing the summary of the analysis:

strengths	weaknesses	opportunities	threats
•Superior in water manufacturing in southern region. •Has good trasnporation system for delivering the product. • Plane equipied with advanced system that help meeting the water qulaity specification.	•The Plant not designed for redundant operation •Most of the employees age are above 45 and they are expat • Rewarding system is not updated since 2000	•Demand is increased due to increase in population •Current market study showed positive trend •Use new approved technology to recycle some of the wasted water	•New government regulation dictate new increase in employing local people • Lack of local vendre services in supporting the plant operation • Loss of market share due to ξnexpected presence of a competitor in the market

Table 12 SWOT Model

7. Personal Integrity and Reliability

7.1 To provide “3” behaviors contradict the moral integrity.

Acceptance of gifts, benefits and hospitality

Must not accept gifts or hospitality or receive other benefits from anyone who might reasonably be seen to compromise their personal judgement or integrity.

Exploiting the influence of the job

Using his job authority to achieve a material benefit for himself and his family at the expense of the Project’s interest, such as bribery, obtaining subsequent rewards for performing job duties, embezzlement, and the employee’s harm to public interests in the field of deals, contracting, supplies, public works, and others, in return for the employee’s obtaining certain material or financial gains, Or the employee withholding all or some of the salaries or wages that the employees or workers are entitled to or delaying payment to them with the intention of benefiting from them personally.

Disclosing secrets that he learns by virtue of his position, even after leaving the service

Disclosing any information that he becomes acquainted with by virtue of his position if it is confidential in nature or pursuant to instructions requiring that without written permission from the PMO, and this obligation shall remain in place after leaving the service.

7.2 To analyze the financial, social, and technical influence, if any, of such behaviors on the works of the project and the relationships.

Financial impact: the project incurred financial losses because the employee did not override the project's interest in choosing the right contracts for work, but rather his personal interest in choosing contracts accordingly.

Social impact: The project bears bad moral effects on the employees and workers due to the delay, disruption or failure to complete the work properly, in order to choose contracts that are not technically good, but for personal interest, not for the benefit of the project.

Technical Impact: Incompletion or failure of the project or even completed in a way that does not conform to the technical, time and budget specifications.

8- Personal communication & 9.Relationships and Engagement

SUMMARY

This is the communication plan for the Water Desalination Plant team. It covers our schedule of meetings, how we communicate at other times.

COMMUNICATION GOALS

- Keep each other informed about the status of tasks (i.e., green, yellow, or red).
- Ask for and offer help where needed.
- Track schedule and budget to actual.
- Define information so you can share it with product owners and other stakeholders.

1. To prepare the register of the stakeholder.

No	Name	Title	Role	Power (H/L)	Interest (H/L)	Influence (H/L)	Category	Contact information	
1	Mohammed	Project Owner	Sponsor	H	H	H	Internal	Phone No: 055	Email: @gmail.com.com
2	Osama	Project Manager	Supervising	H	H	H	Internal	Phone No: 056	Email: @gmail.com
3	Rasha	Sales Manager	Sales Expert	L	H	H	Internal	Phone No: 055	Email: @gmail.com.com
4	Ahemd	Quality Assurance (From Ministry of Health)	Inspection	L	H	H	External	Phone No: 050	Email: @gmail.com
5	Abeer	Director of Accounting	Team Member	H	H	L	Internal	Phone No: 056	Email: @gmail.com
6	(SR Equipment) Company	Vendor	Machine and equipment vendor	L	H	H	External	Phone No: 050	Email: @gmail.com
7	Customer	Customer	End user	L	H	H	External	Phone No: 055	Email: @gmail.com
8	Saad	Program Analysis	Team Member	L	L	L	Internal	Phone No: 050	Email: @gmail.com
9	Operators	Operators	Team Member	L	H	L	Internal	Phone No: 051	Email: @gmail.com

Table13 Stakeholder Register

2. To identify the personal communication and the effective communication.

Communication is directly proportional to the choice of words or its content. The more precise and crisp the content is the more effective the communication would be. It is essential for the sender to use the correct words, phrases so that the information reaches the recipient bang on (Anuja Shekhawat, 2019).

Effective communication goes a long way in passing the correct and the desired information to the recipient and the work is accomplished without errors in a short span of time. Effective communication also nullifies the chances of misunderstandings, conflicts and errors which might crop in cases where the message is not clear (Anuja Shekhawat, 2019).

We prefer and encourage the employees in this project to communicate, speak sensibly, clearly, convey the message in clear words, not to complicate things and most importantly not to forget to crosscheck with the recipient. Effective communication will definitely help the individual to make a mark of his own and stand apart from the crowd (Anuja Shekhawat, 2019).

3. To identify the shapes, models, and channels of the personal communication.

Written	• Company official letters • Minuets of meetings	• Emails • Instant messaging/texting
Verbal	• Presentations	• Conversations • Phone Call
	Formal	Informal

4. To establish the communication matrix.

COMMUNICATION	PURPOSE	MEDIUM	FREQUENCY	AUDIENCE	OWNER	DELIVERABLE
Kickoff Meeting	Introduce project. Review objectives and goals.	In person / Face-to-face	Once	Project team Project owner Stakeholders	Project manager	Agenda
Project Team Meetings	Review status of project	Face-to-face or Conference call	Daily	Project team	Project manager	Agenda Project plan
Weekly Project Status Meetings	Update leadership on project status.	Face-to-face or Conference call	Weekly	Project manager Stakeholders	Project manager	Slide presentation Project plan
Project Status Reports	Detailed report on project status including progress, costs, and problems.	Email	Weekly	Project manager Stakeholders (except vendor and customer)	Project manager	Project status report Project plan

Table 14 Communication Matrix

5. To provide 3 wrong scenarios of communication.

1- Scenario 1 (Using the Wrong Communication Tool):

Set the vision and scope of team assignments through email instead of the kick off meeting.

2- Scenario 2 (Saying Too Much);

Forward an email which contains sensitive information or details like the details of the budget with the vendor or customers.

3- Scenario 3 (Failure to Communicate Fully):

The project manager asks the director of accounting to review the budget and the director of accounting respond by “OK”.

6. To develop and prepare stakeholder assessment matrix.

Stakeholder Name	Contact Person	Impact	Influence	How could the stakeholder contribute to the project?	Strategy for engaging the stakeholder
Mohammed	Mobile no: 050 Email: @gmail.com	H	H	Providing support whenever needed	Weekly Meetings and emails that include detailed report on the project status
Osama	Mobile no: 050 Email: @gmail.com	H	H	Completion and deliver the project	Daily Meetings
Rasha	Mobile no: 050 Email: @gmail.com	M	H	Ensure sales growth	Weekly Meetings and emails that include detailed report on the project status
Ahemd	Mobile no: 050 Email: @gmail.com	M	H	Checking product quality	Weekly meetings and emails
Abeer	Mobile no: 050 Email: @gmail.com	H	H	Person in charge for the financial part of the project	Every 2 weeks emails
(SR Equipment) Company	Mobile no: 050 Email: @gmail.com	L	H	Coordinating with vendors and completing purchase of equipment and machinery	Weekly Meetings
Customer	Mobile no: 050 Email: @gmail.com	L	L	Providing feedback for the final product if any.	By emails whenever needed
Saad	Mobile no: 050 Email: @gmail.com	L	L	Monitoring the operating systems of equipment and machinery	Daily meetings and emails
Operators	Mobile no: 050 Email: @gmail.com	L	L	Do the routine work	Daily meetings and emails

Table 15 Stakeholder Assessment Matrix.

➤ **Stakeholders Engagement Assessment Matrix**

Stakeholder	Unaware	Resistant	Neutral	Supportive	Leading
Mohammed				C	
Osama				C	D
Rasha				C	
Ahemd			C		
Customer	D		C		
(SR Equipment) Company			D	C	
Abeer			C	D	
Saad			C		
Operators				C	

Table 16 Stakeholder Engagement Assessment Matrix

10. Leadership

10.1. To describe and identify the leadership model, which is preferred to the project leadership.

Affiliative Leadership Style - Emotional Leadership is the leadership model that used in our project “Water Desalination Plant” is a very preferred among the project leadership models. The most important thing in affiliative leadership style that it focuses on creating personal connections between employees and their managers to build a sense of community and trust. We choose affiliative leadership style for Plant Project because the project manager like to affiliate directly with all team members as most of the team members came from functional groups to support the projects.

10.2 To specify the reasons for which such model is preferred.

The first reason for choosing Affiliative Leadership Style is this type of leadership style makes the loyalty increased 70% for employees at any project. The leader in Affiliative Leadership Style pours his heart and soul to the employees. His support is a gift that employees will always treasure. The second reason is this type of leadership style makes the employees turnover decreased 54% for employees. Working with this leadership style is like

a desire for everyone. Water Desalination Plant Project Manager is truly become one of the few great leaders by using Affiliative Leadership Style. The Project Manager gives the best of himself to others to support, advance and give a better prospective.

“Affiliative Leadership Style” makes employees more shine, confident and positive impact on daily work tasks”.

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

The first proposal for the motivation methods that are compatible with the nature of the project is creating effective teams along with caring about the team on a personal level such as birthday celebration, new baby born and farewell parties. The second proposal is training from Water Desalination Plant Project Manager`s side as senior level management. The training builds a high level of trust on employees even if they did something not 100% correct. The third proposal is to help the team to provide the good service and thinking together on new ideas to develop the project better in the future to maintain best quality for our customer. The fourth proposal is guiding people during 24 hours with a high level of communication. Water Desalination Plant Project Manager`s work attitude makes the team know how great leaders deal with people. The way of teaching how the team must “love and appreciate people” by allowing them to work on something they love. The fifth proposal is creating “the Star of The Month” activity. Most important is that impact of encouragement words is inspiration to the team. Water Desalination Plant Project Manager dedicated himself to provide a source of direction and light to others and do monthly assessment to pick the most effective employee which will motivate and inspired other employees to be competitive. Also, investing time and energy in our team that makes each member of our team feel respected.

11.Teamwork

The following RACI model, as shown in figure 6, illustrates three administrative measures for this project:

RACI Matrix

[Water Desalination Project]

Roles and Responsibilities

Responsible, Accountable, Consulted, Informed

		ROLES															
		Sponsor/ Owner	Project Manager	Sales Manager					Program Analysis	Program Analysis	Director of Accounting			Vendor	Customer		
Deliverable or Task	Status	Sponsor / Leadership				Project Team						Other Resources					
Phase 1																	
	Coordination for Water Desalination		A	R	C				I	I	I			C			
Phase 2																	
	Project Delivery Schedule		A	R	I				C	I	C			I			
Phase 3																	
	Project Periodic Reports		I	A	I				R	R	C			I			

R	Responsible
A	Accountable
C	Consulted
I	Informed

Assigned to complete the task or deliverable.

Has final decision-making authority and accountability for completion. Only 1 per task.

An adviser, stakeholder, or subject matter expert who is consulted before a decision or action.

Must be informed after a decision or action.

Figure 6 RACI MODEL

12. Conflict and Crises

Conflict is when personalities, values, or opinions conflict with each other. In some cases, this is a natural contradiction. Crisis management is the process through which the organization deals with a major event that threatens to cause harm. Therefore, there must be logical solutions that help us advance the organizations and thus bring a clear benefit to the stakeholders or the general public. It must be recognized that conflicts are natural to human nature and can be constructive and promote better performance between individuals and do not pose difficulties in the future.

Deliberation in the role of the crisis, in general, leads us to touch a thread that leads us to the fact that the societies in which the leadership hierarchy depends on special and efficient teams in dealing with crises were more resilient and more compliant than their peers who adopted a different method represented by the improvised response and dealing in unthoughtful ways. In advance with the hotbeds of conflict and tension, which consequently led to their weakness and disintegration, and between each stage and a new stage, there is a crisis that stirs the minds, ignites the conflict, stimulates creativity, and touches on early spaces that pave the way to a new stage, often underlining the signs of another crisis and another future change. Therefore, the crisis must be studied and analyzed and try to get out. Including the least losses and delaying the subsequent crisis, if it is not possible to disrupt the project, and it must be recognized that there is a real crisis that must be resolved and confronted by forming a committee in which the project manager will study and research the crisis, or underestimate the crisis, or provide an opportunity to emerge for the necessary internal pressures, or empty the active forces of the crisis, Or emptying the crisis and finding alternative paths to it, or isolating the active forces of the crisis, or quelling the crisis and the violent and public conflict with it. Therefore, these crises are more profound on the project, and have a stronger impact, because of the clear interaction between not following the scientific methods, dealing with crises and conflicts due to ignorance of those methods,

and adhering to random and improvisational methods; Which reflects the organization's potential and capacity. Accordingly, the problem of the current study revolves around the following main question: “What is the level of application of crisis management (crisis management planning; availability of an information system; the existence of a communication system; availability of leadership skills; formation of work teams)

Therefore, solutions must be developed and activated as follows:

- Revealing the level of availability of leadership skills for team members from the project manager's point of view
- Is the level of communication in the project management appropriate so that it is easy for the project manager to communicate effectively with team members and speed up the completion with efficiency and high quality? (The impact of crises on projects by Sheikh, Saleh , October 11, 2020).

13.Resourcefulness

13.1 To distribute the human resources on the functions.

No	Name	Title	Role	Contact information	
1.	Mohammed	CEO	Supervising on department managers	Phone No: 055	Email: @gmail.com
2.	Osama	Purchasing manager	Budget follow-up - contracts	Phone No: 056	Email: @gmail.com
3.	Rasha	Purchasing employee	Prepare Pamphlet - checking factory needs	Phone No: 055	Email: @gmail.com.com
4.	Ahemd	Logistics and warehouse manager	Overseeing all logistical support and inventory management	Phone No: 050	Email: @gmail.com
5.	Abeer	warehouse employee	Inventory follow-up - order shortcomings in stock	Phone No: 056	Email: @gmail.com
6.	Hamad	Logistics Support employee	Support departments as needed - follow up on transfers	Phone No: 050	Email: @gmail.com

7.	Hassan	Customer Service Manager	Supervising customer satisfaction performance indicators - finding improvement and development plans	Phone No: 055	Email: @gmail.com
8.	Saad	Customer Service employee	Follow up on customer complaints and suggestions - provide comfort to the customer	Phone No: 050	Email: @gmail.com
9.	Abdullah	Director of Human Resources	Oversight of recruitment processes - oversight of salaries and regulations	Phone No: 051	Email: @gmail.com
10.	Manal	HR Officer	Monitor the day-to-day operations of human resources	Phone No: 055	Email: @gmail.com
11.	Mohammed	Production Manager	Supervising production processes, monitoring and analyzing errors	Phone No: 055	Email: @gmail.com
12.	Faisal	production employee	Work on daily production lines	Phone No: 056	Email: @gmail.com
13.	Amjad	Quality and performance manager	Supervising KPLs and finding improvement solutions	Phone No: 055	Email: @gmail.com
14.	Waleed	Quality control officer	Monitor and analyze product quality	Phone No: 050	Email: @gmail.com
15.	Reema	performance management officer	Establishment of development and monitoring of KPLs	Phone No: 056	Email: @gmail.com

Table 17 Human Resources on the Functions

The Influences of crashing project:

New resources may not be familiar with the tasks to be performed, so they will probably be less productive than current team members. New members will most likely have to be teamed up and led by the most productive members of the team, who could instead dedicate their time completely to the task and get it done more quickly. Being available does not mean being qualified. Sometimes the extra resources are qualified yes, but tangentially with respect to the activity, and even if the new resources have the right skills, they may not be of the same quality as the current team members. On the contrary, if new resources are over-qualified, conflicts may occur within the team.

The influences of fast-tracking a project:

Fast-tracking a project sounds great, you can perform multiple tasks together and potentially deliver before the deadline. But fast-tracking a project that's already in motion is risky. It means you'll have to rework the current schedule and communicate those changes to your team.

Running too many projects at the same time is also one of the biggest project management challenges that organizations face:

Running too many tasks at once comes with the same pitfalls. Consider the impact that multitasking has on productivity. Studies have shown that people who multitask make more mistakes and are less efficient. Slamming your team with more work than they can handle can affect their output quality. And fast-tracking only works for activities that can be overlapped. You can't fast track a new paint job until the rest of the car is built.

There's also the risk that fast-tracking a project won't affect the end date.

The critical path is the longest series of tasks through your project — It's the path that determines your final delivery date. Which means the only way fast-tracking will change your end date is if it's done to tasks on this path (aka the critical activities).

Task	Timeline
Revenue Analysis	11-11-2021
Zero problems List	11-11-2021
Percentage of sales	30-11-2021
Desaturation score	30-11-2021
Primary water treatment list	30-12-2021
Water desalting list	30-12-2021
Final water treatment list	30-01-2022
Committing to deadlines	01-02-2022
Accepted deliverables	01-02-2022
Final report	20-02-2022
Data analysis	20-02-2022
Archive documents	15-03-2022
Handover	15-03-2022
Operational status	01-04-2022

Table 18 Fast Tracking

Task	Timeline	Resources
Revenue Analysis	11-11-2021	Revenue analyst / budget
Zero problems List	11-11-2021	Expert / budget
Percentage of sales	30-11-2021	Sales Expert / budget
Desaturation score	30-11-2021	
Primary water treatment list	30-12-2021	
Water desalting list	30-12-2021	
Final water treatment list	30-01-2022	Water treatment Expert / budget
Committing to deadlines	01-02-2022	
Accepted deliverables	01-02-2022	Quality Expert / budget
Final report	20-02-2022	
Data analysis	20-02-2022	Data analyst / Budget
Archive documents	15-03-2022	
Handover	15-03-2022	
Operational status	01-04-2022	

Table 19 Crashing

14.Negotiation

14.1 General Rules of Negotiation

Negotiation is resorting to compromise solutions that satisfy the two parties in a specific place and date, and the parties' opinion is neutral so that one of the parties does not take sides with the other and thus takes the main issue for which we came to another topic, while it is almost impossible to avoid conflict, the ability to negotiate how to solve it. It is a useful skill that must be trained to achieve the desired goals, which we sought for. Therefore, it is necessary to enable negotiation skills to achieve stronger relationships with stakeholders and better relations with customers and in general a stimulating work environment, so the

negotiator had to make some efforts in preparing for negotiation and to be prepared. The reaction from the other sides may be a bit difficult and embarrassing because it is unlikely that everything will be discussed and resolved in one meeting. The negotiations must take a long time. (Tuccinardi, R. (1999). Athena).

The 10 Rules of Negotiation are: 1. Don't (unless you need to), 2. Never negotiate with yourself, 3. Never accept their first offer, 4. Never make the first offer (if you can avoid it), 5. Listen more and talk less, 6. Never give free gifts, 7. Always watch for the salami, 8. Don't fall for the rookies regret, 9. Always avoid the quick deal, 10. Never reveal what your bottom line is (or was).

14.2 Negotiation Plan:

Draft a negotiation plan. Contents may vary based on activity requirements, but the plan should include information such as the following:

- Background (e.g., contract, contractor, and negotiation situation);
- Major and minor negotiation issues and objectives (Both price and non-price);
- Negotiation priorities and positions on key issues (Including minimum, objective, and maximum positions on price); and
- Negotiation approach.

Review the Plan. Review the negotiation plan with key negotiation team members.

Plan1: Maximizing mutual benefit

Seeks to find acceptable alternatives and solutions for all parties to the negotiating process, develop cooperation, deepen the existing relationship, expand the scope of negotiations and extend them to new areas.

Plan 2: Procrastinate

These work to procrastinate and gain time and miss the opportunity in order to disrupt the negotiations or prolong them considering that time will be the most influential factor in the issue or problem under negotiation as well as during the negotiating process and its administrations.

15. Project Design

15.1 To identify the Triple constraint of the project.

The success of all projects is significantly influenced by three limiting factors namely time, scope, and cost constraints. Figure 7 shows the project triple constraints



Figure 7: Project Triple Constraints

15.1.1 Time constraint

When carrying out the project, it is important to analyze the time needed for the completion of the project. Such analysis is necessary since it highlights the time needed to finish all the components of the entire project. In addition to that, analyzing the project's time ensures that the available time for the entire project is allocated to a specific task. As such, effective planning of time in project management ensures that the project is completed within the stipulated time.

The project is expected to run for 42 days. However, unprecedented events or occurrences may lead to project delays and therefore it is essential to overcome time constraints through planning, scheduling, monitoring, and controlling activities. To determine whether the project is running according to plan and timely detection of constraints, a Gantt chart visualizes the project's timeline and therefore allows the project manager to monitor and control activities.

15.1.2 Scope constraint

It is essential to ensure that all stakeholders are updated on any changes made on the project scope during entire project lifecycle. The project manager is responsible for establishing a scope definition to ensure that the project scope is adequately documented and communicated.

Deliverable title and description	Assumptions and constraints
Construction of 3 new production lines to expand existing plant	It is assumed that additional production lines will lead to an increase in revenue generation.
Integration of latest RO membrane design in each production line to take advantage of latest desalinating plant technology	It is assumed that RO membrane price estimates will not be affected by fluctuation of market prices.
Testing the water quality with the existing water analyzer devices for compliance to WHO STANDARDS	It is assumed that the installation of water analyzers will lead to production of high-quality water.
Integration of redundancy in processes involving critical equipment for enhanced availability of plant expansion.	It is assumed that redundancy will facilitate reliability and sustainability of the desalinization plant.
Development of tie-in procedure optimize tie-in resources.	It is expected that interruptions to existing plant will be minimized.

Table 20: Scope definition

15.1.3 Costs constraint

Resources or cost is the second element to be considered for effective project planning in our organization. For any resources to be used in the project, some amount of cost must be incurred, which implies that cost and resources are interchangeable when it comes to aspects of project management. As such, the cost of our project refers to any resources that are needed in the project to ensure effective and reliable results. For this reason, the cost in our project can include resources such as effort, materials bills, contractors' rates, and labor, among other factors that are needed to ensure that the project is driven towards achieving the set goals and objectives.

It is essential to ensure that cost overruns that may lead to project delays are avoided through effective budgeting. Therefore, all variable and fixed costs must be accounted for through cost control.

15.2 To set up a list of the project success factors.

The success of the project depends on the following factors.

1. Efficient leadership
2. Adequate planning
3. Effective risk assessment
4. Healthy interpersonal relationships and good teamwork
5. Committed workforce
6. Effective communication
7. Efficient cost control
8. Monitoring progress
9. Investment in efficient desalinization plant technology

15.3 To develop and identify work breakdown structure (WBS) , in addition to prepare a guide to illustrate it.

15.3.1 The work breakdown structure of the project is shown in table 21.

Element Number	WBS Elements/Activity
1.0	Engineering
1.1	<i>Engineering Review</i>
1.2	<i>Engineering Approval</i>
2.0	Procurement
2.1	<i>HP Pump</i>
2.2	RO Membranes
3.0	Construction
3.1	<i>Tie-Ins</i>
3.2	Installation
4.0	Commissioning and Testing
4.1	<i>Cold Run Test</i>

Table 21: Project WBS

15.3.2 Illustration guide of the WBS

The work breakdown structure is illustrated in figure 8 below.

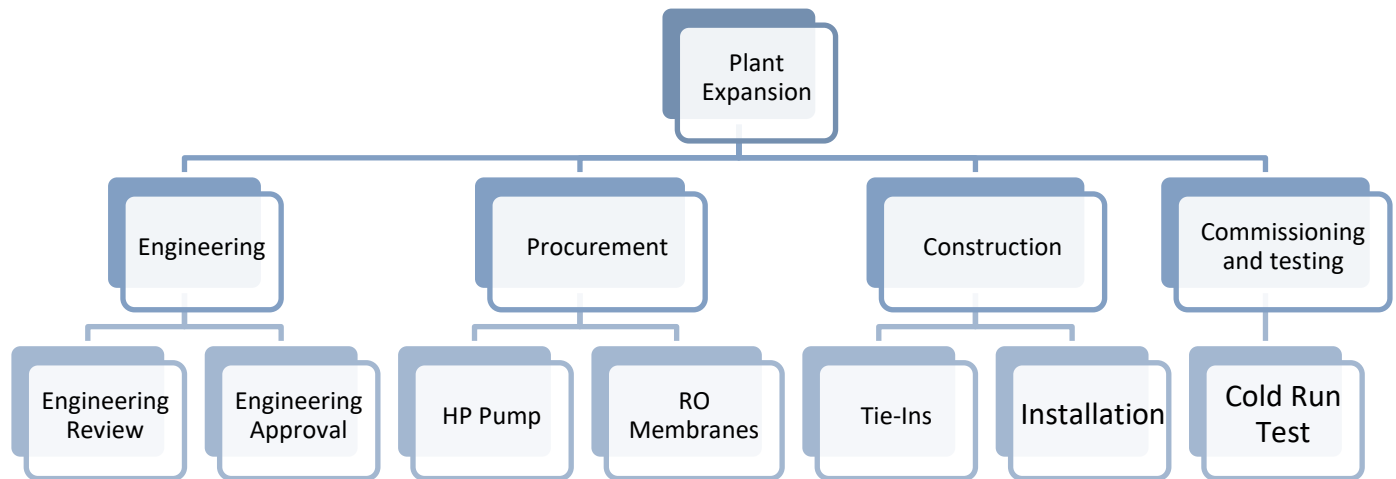


Figure 8 Project WBS

16. Requirements and Objectives

It is very important to determine and document the stakeholders needs and requirements in order to achieve the project objectives.

16.1 To identify Requirement Traceability Matrix.

In this project, the team has used a Requirements Traceability Matrix (**RTM**) in order to connect the product requirements to the deliverables that project aimed to deliver (Project Management Institute, PMBOK® Guide, Sixth Edition, 2017). The following table 22 is presenting the RTM for this project.

ID	Requirement Description	Business Need (Justification)	Project Objective	WBS Deliverables	Specification	Design	Test Cases
1	To expand existing plant	Increase the revenue	Add 3 new production lines	3.0 (Construction)	Finished	In-progress	1000
2	Use high technology for water desalination	Use latest desalinating plant technology	To consider RO membranes in each line	2.0 (Procurement)	Finished	In-progress	2000
3	Produce Hi water quality	To be in compliance with WHO	Install water analyzers devices	4.0 (Commissioning and Testing)	Finished	In-progress	3000
4	High availability of the new expansion	operation sustainability and reliability	Use redundancy for critical equipment	2.0 (Procurement)	Finished	In-progress	4000
5	Minimize number of the required Tie-ins to existing.	To minimize the interruption to existing plant.	Tie-in procedure to be developed and followed.	3.0 (Construction)	Finished	In-progress	5000

Table 22 Project RTM

16.2 To specify the methods used in requirement collection.

There is multiple methods and techniques which can be used to identify to collect the project requirements such as expert judgment, data representation; mind mapping and affinity diagram, prototypes, decision making and interpersonal and team skill. In this project, the team has used data gathering technique and specifically made an interview with

key stakeholders such as project sponsor, members from steering committee, and some functional department such as plant operation and maintenance managers.

16.3 To develop the hierarchical structure of the project objectives connected to the strategy.

Figure 9 shows the relationship and connection between the plant strategy with the outcome of this project.

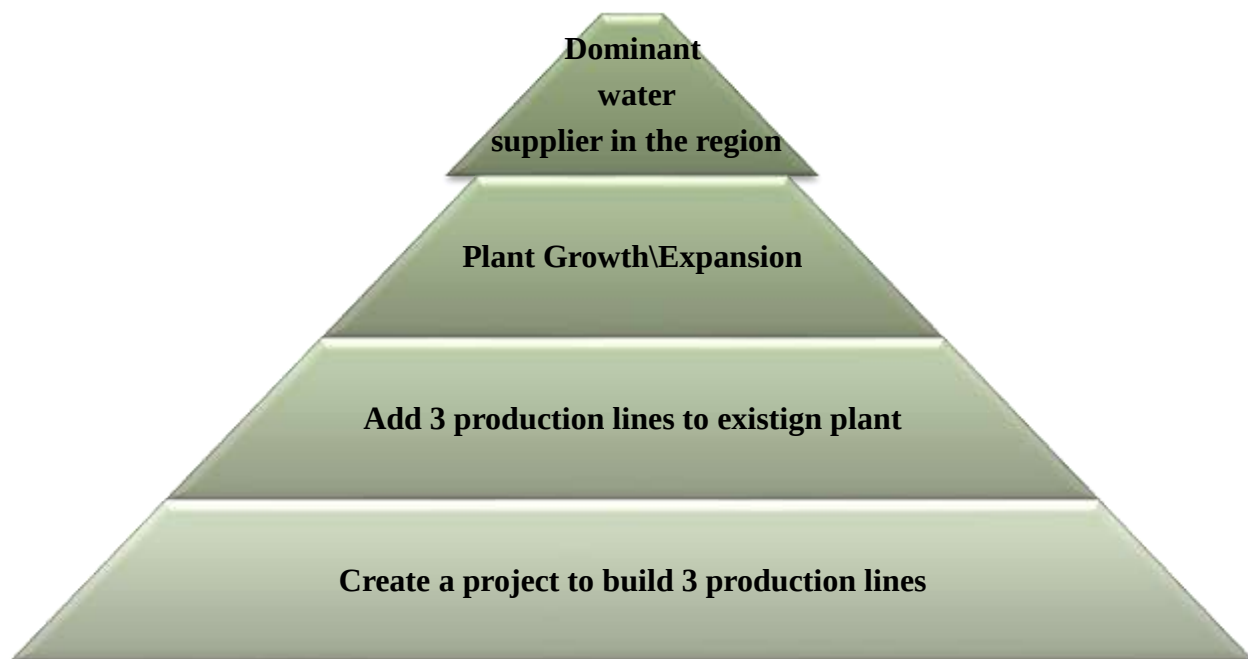


Figure 9 Relationship between the strategy and project.

17. Project Scope

17.1 To develop, identify, and prepare the scope statement (Its limits- and objects that are not included)

The project scope statement is set around the project's scope, major deliverables and its assumptions and constraints (Project Management Institute, PMBOK® Guide, Sixth Edition, 2017). It addresses the project and product project scopes and it includes the

project deliverables, acceptance criteria and the exclusion. This statement will set a common understanding of the project's scope for all stakeholders and this project will basically consider the following:

- 1- All the engineering, procurement, construction and testing that are required for the successful of the three production lines.
- 2- To follow the current (Sep.2021) company standard practices for the project design and procurement.
- 3- Project will use the existing plant infrastructure such as raw water and product water tanks, Feed Pump, power system, sand filter and chemical treatment systems.
- 4- Project will install one high-pressure (HP) pump with three RO membranes and the tie-in work will be part of the project scope and shall be aligned with operation team to minimize the interruption to the existing plant operation.
- 5- All the testing will follow the vendor standard practices.
- 6- All the operation and maintenance training are out of the project scope.

Following schematic diagram (Figure 10) illustrates the project scope at glance:

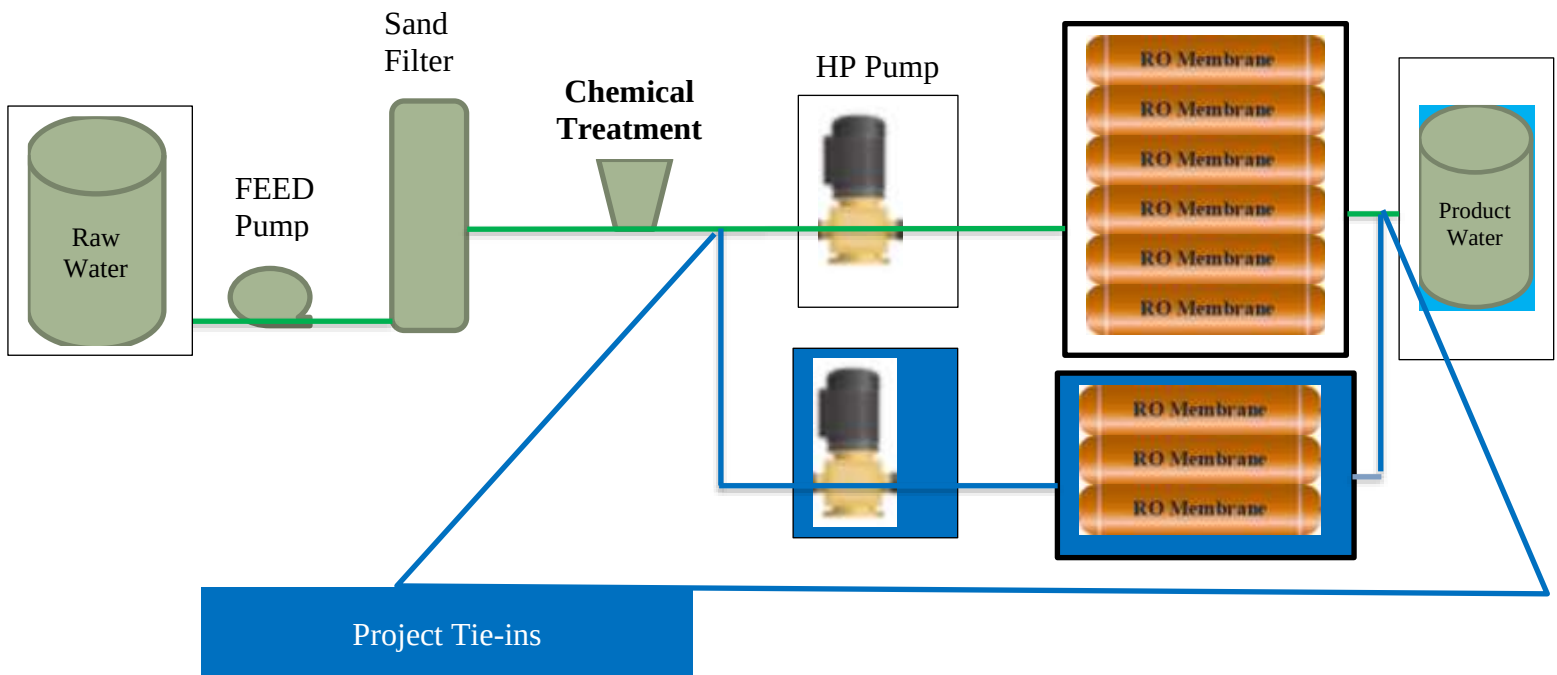


Figure Project Scope

17.2 To develop, identify, and explain the concepts: (Scope creep and giving example).

It becomes a normal to see in many projects that a customer or other stakeholders have tendency to request new requirement or features that is not agreed upon at the outset of the project. This new requirement happened due many reasons such as an ambiguity in the scope definition. For that, it is very crucial to keep project on track and on control by continues monitoring and controlling for the project which is one of the PM's role.

So, the project creep can be described by an adding, to the original scope, an additional feature of a new product or work that is not authorized or approved by the Change Control Board (CCB). As an example, this project has clearly identified that the training is outside the project boundary and if the PM is accepting this project duet some influence from the plant operation team, this will definitely be going to impact both project cost and schedule.

17.3 To illustrate product analysis management.

The features and functions that characterize a product, service, or result are called product scope (Project Management Institute, PMBOK® Guide, Sixth Edition, 2017). Product Analysis is one of the tools and techniques that's used to define the scope by asking questions about a product and forming answers to describe the use and characteristics of what is going to be built. The following figure 11 represent the project outputs by providing a clear and unambiguous statement of what the project is to deliver.

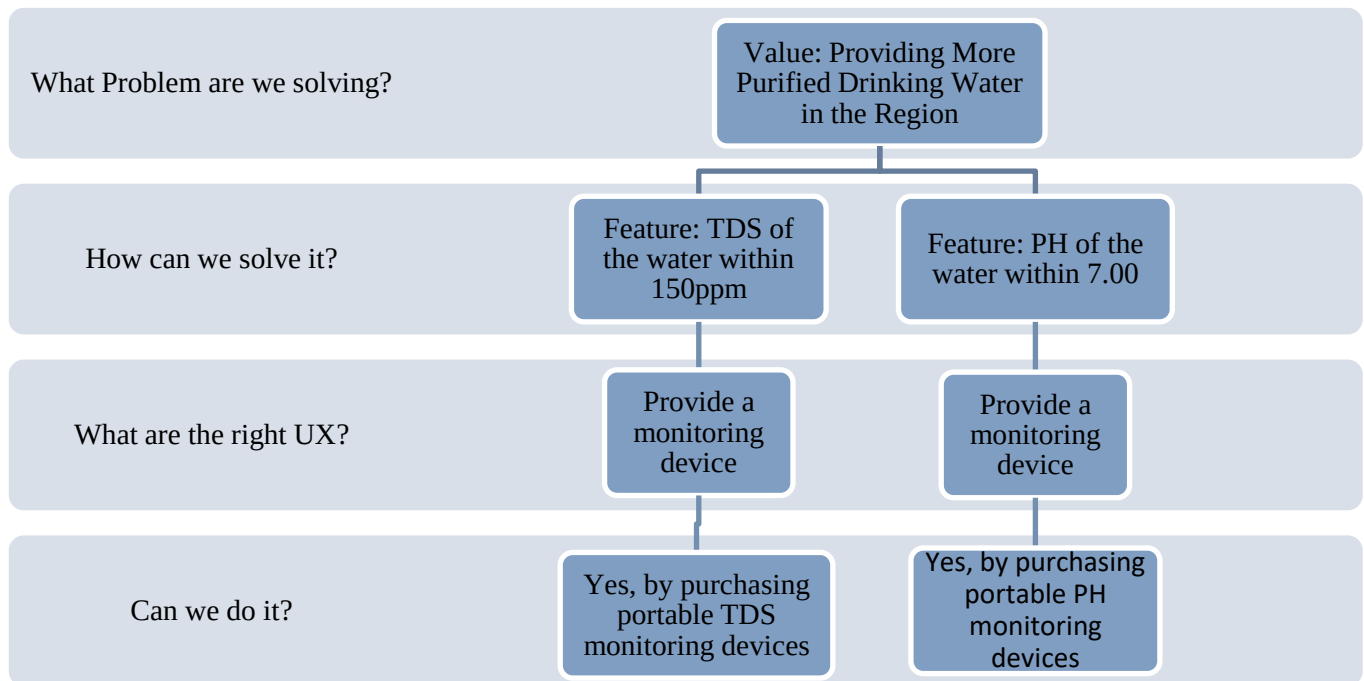


Figure 11 Level of Product Analysis

17.4 To illustrate the transformation of the work packages in Work Breakdown Structure to activities.

The WBS is a deliverable oriented decomposition and is progressively decomposed until the lowest work units\packages cannot be logically sub-divided further. WBS contain only deliverables and not activities.

The work packages are broken into smaller, more manageable, components called activities or in some terms called tasks. The activity list is a comprehensive list of activities with unique identifier and description of what needs to be done. (Project Management Institute, PMBOK® Guide, Sixth Edition, 2017).

As a summary, the WBS started with the project objective, then followed by project phases, after that a list of project deliverables (work-packages) are identified and finally each work packages are broken-down in to activities\tasks.

18. Project Time

18.1 To develop the functions list or the activities included in each work package in WBS.

The following table 23 summaries the project activities for each work packages in WBS .

Activities	Work Packages						
	<u>Engineering Review</u>	<u>Engineering Approval</u>	<u>Procurement HP Pump</u>	<u>Procurement RO - Membranes</u>	<u>Construction Tie-Ins</u>	<u>Construction Installation</u>	<u>Cold Run Test</u>
	Complete the review of 60% (Activity A)	Issue for approval (Activity C)	Issue request for quotation (Activity D)	Issue request for quotation (Activity G)	Complete First Tie-in (Before membranes) (Activity L)	Install HP Pump (Activity N)	Complete the test for the new installation (Activity R)
	Complete the review of 90 % (Activity B)		Review & approve quotation (Activity E)	Review & approve quotation (Activity H)	Complete 2nd Tie-in (After membranes) (Activity M)	Install RO membranes (Activity O)	
			Issue Purchase Order (Activity F)	Issue Purchase Order (Activity I)			
			Receiving and inspecting the pump (Activity J)	Receiving and inspecting the membrane (Activity K)			

Table 23 WBS Activities

18.2 To illustrate the relationships between the activities.

There are four relationships used during the creation of any project schedule to establish the sequencing of activities and they indicate the predecessor and successor for each relationship. These relationships are Finish to Start (FS), Finish to Finish (FF), Start to Finish (SF) and Start to Start (SS). In this project, the following depict the relationship between the project activities:

FS Relationships:

- Activity A toward Activity B
- Activity B toward Activity C
- Activity C toward Activity D
- Activity D toward Activity E
- Activity E toward Activity F
- Activity F toward Activity J
- Activity J toward Activity N
- Activity N toward Activity R
- Activity C toward Activity G
- Activity G toward Activity H
- Activity H toward Activity I
- Activity I toward Activity K
- Activity K toward Activity O
- Activity J toward Activity N
- Activity O & N toward Activity L
- Activity O & N toward Activity M
 - Activity L toward Activity R
 - Activity M toward Activity R

18.3 To develop the logical diagram of the project activities, and identify the critical path.

To ease the development of the logical diagram of the project activities, the following table 24 is developed and it shows the project activities with its precedence and duration.

Activity	Description	Precedence Activity	Activity duration (Days)
A	Complete the review of 60%	None	5
B	Complete the review of 90 %	A	5
C	Issue for approval	B	5
D	Issue request for quotation for pump	C	2
E	Review quotation & approve for pump	D	2
F	Issue Purchase Order for pump	E	2
J	Receiving and inspecting the pump	F	10
G	Issue request for quotation for RO	C	2
H	Review quotation & approve for RO	G	2
I	Issue Purchase Order for RO	H	2
K	Receiving and inspecting the RO membrane	I	15
O	Install RO membranes	K	1
N	Install HP Pump	J	2
L	Complete First Tie-in	O,N	1
M	Complete 2nd Tie-in	O,N	2
R	Complete the test for the new installation	L,M	3

Table 24 Project Activities

Now, the logical diagram can be developed as shown in figure 12. The diagram shows that there are 4 paths and they are as follow:

- I. ABCDEFJNLR (the duration for this path is 37).
- II. ABCDEFJNMR (the duration for this path is 38).
- III. ABCGHIKOLR (the duration for this path is 41).
- IV. **ABCGHIKOMR (the duration for this path is 42).**

The critical path is the one that has the longest duration **(42)** which is “**ABCGHIKOMR**”.

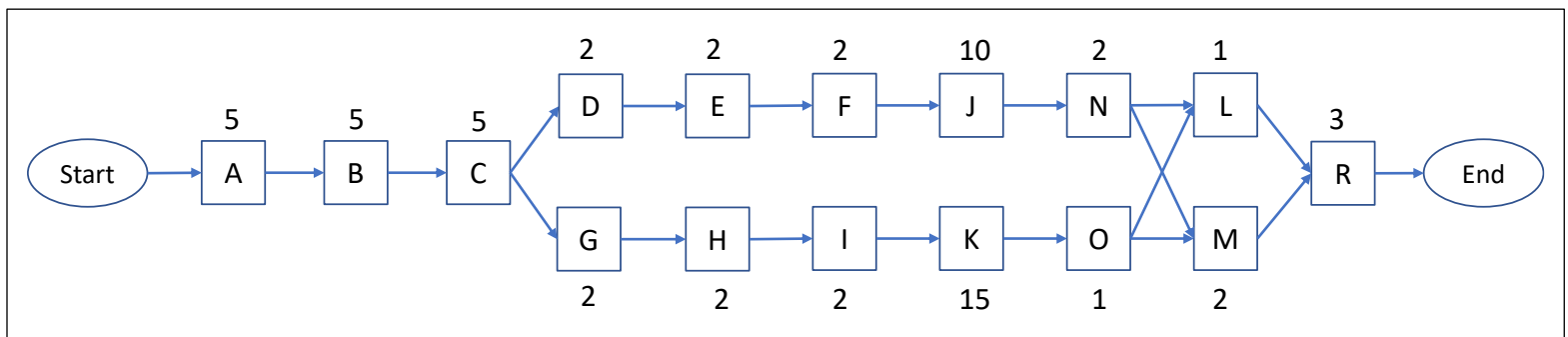


Figure12 Project Logical Diagram

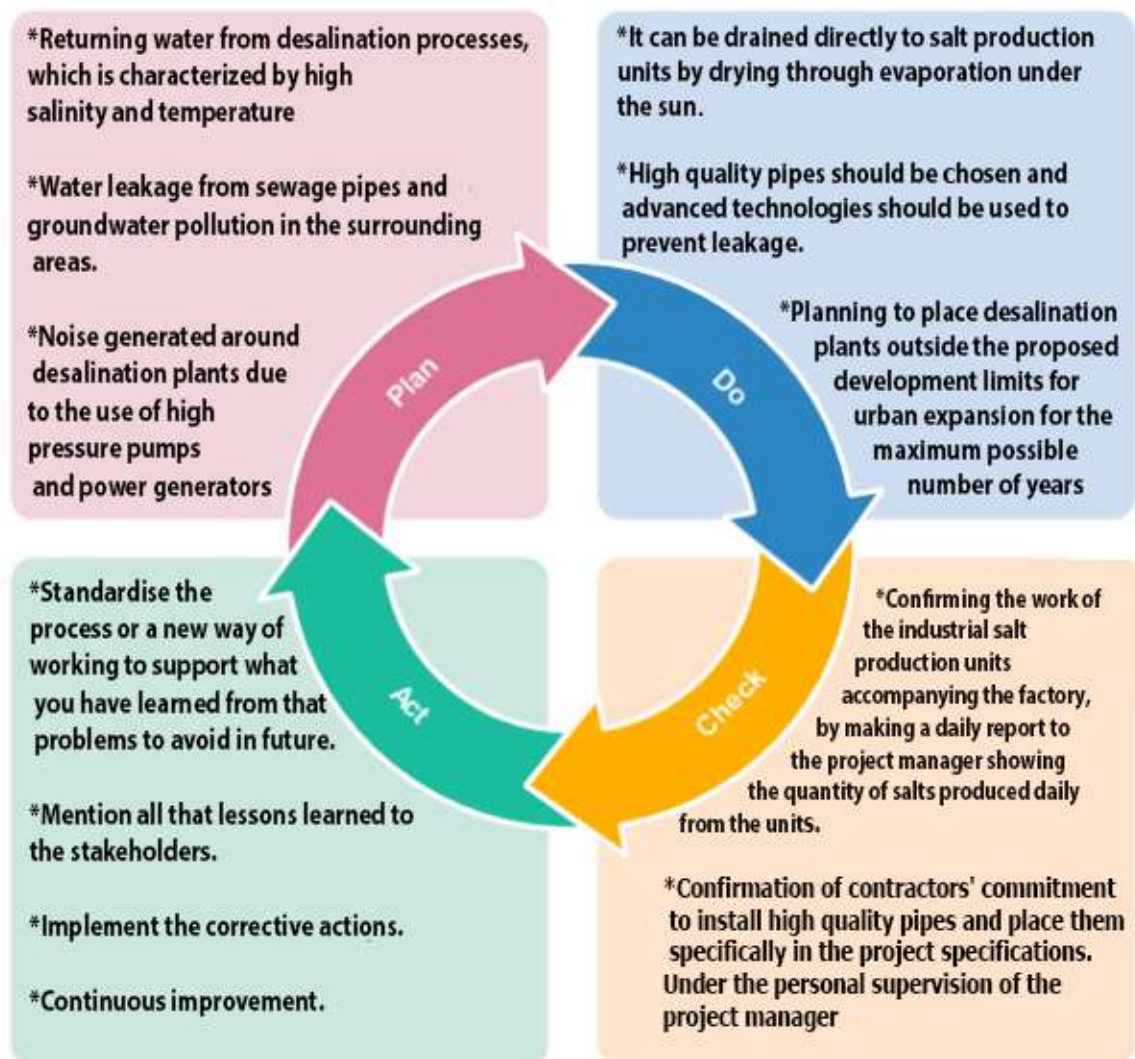
18.4 To prepare Gantt Chart and Milestones model.

Key Milestones	Week No.
Issue engineering work for approval	Monday; Week 3
Receiving HP Pump	Saturday; Week 6
Receiving RO Membranes	Thursday; Week 6
Complete 2 nd tie-in construction	Monday; Week 7
Issuing PE Complete the test for the new installation	Thursday; Week 7

The activities along with project milestone are presented in the following chart as shown in figure 13.

- Study – Checking and examining
- Act – Taking action to improve or standardize a process.

There are several applications of the PDCA cycle. It can help to manage the daily routines and activities of an individual as well as a team. It helps to streamline problem-solving, project management, can act as a tool to plan for continuous development, vendor development, development of products and human resources, and so forth.



19.2 To develop SIPOC model, and Ishikawa for one of the issues of the project outputs.

A SIPOC model gives everybody clear insight into the reasons the process was started SIPOC is a method to properly describe the transformation process within a company that offers products and/or services (Mulder, P. 2018).

SIPOC is an abbreviation and can be explained as follow:

Supplier – The provider of inputs into a process

Input – Materials, information and other resources needed to complete a process

Process – Structured steps used to convert inputs into outputs

Outputs – Products or services resulting from the process

Customer – Recipient of the outputs

This method ultimately creates a process in which all factors influence the transformation process and which parties are involved. By mapping this, a company can find out everything that needs to be worked out to have their business processes run smoothly.

Following table 25 demonstrates the SIPOIC for this project:

Supplier	Input	Process	output	Customer
• Water Bottles Vendors • Chemical (Chlorine, & sodium) Supplier • HP pump Corporation • RO membrane company	• Raw Water • Chlorine • Sodium	• Raw water fed to the Sand filter • Water is treated by adding sodium and chlorine • High pressure water is injected to the RO membranes.	Drinking water.	• Delivery to customer • Delivery through distribution center

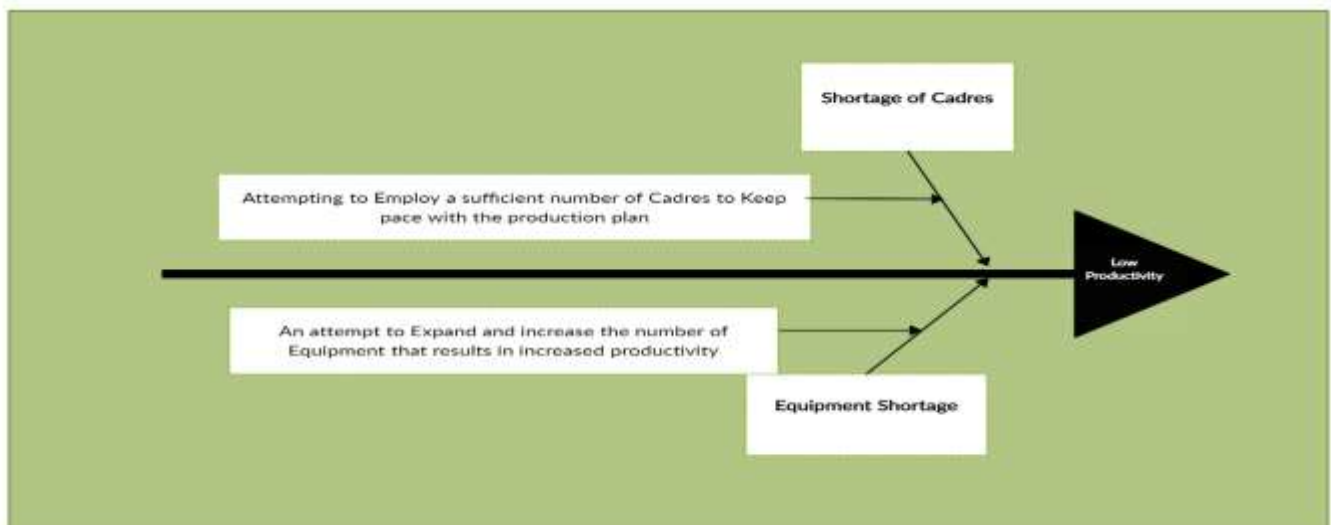
Table 25 SIPOC

Ishikawa Fishbone Diagram:

Following showing an Ishikawa fishbone diagram for two issues in this project.



Ishikawa Fishbone Diagram for Equipment Malfunction



Ishikawa Fishbone Diagram for Low Productivity

20. Project Finance

20.1 To establish Cost Breakdown Structure (CBS), and the project balance in accordance with WBS.

Table 26 below shows the project CBS based in WBS.

Description	Cost (SR)	Activity duration (Days)
• Engineering	12000	15
Complete the review of 60 %	4000	5
Complete the review of 90 %	4000	5
Issue for approval	4000	5
• Procurement	31000	37
Issue request for quotation for pump	1000	2
Review quotation & approve for pump	1000	2
Issue Purchase Order for pump	1000	2
Receiving and inspecting the pump	15000	10
Issue request for quotation for RO	1000	2
Review quotation & approve for RO	1000	2
Issue Purchase Order for RO	1000	2
Receiving and inspecting the RO membrane	10000	15
• Construction	6000	6
Install RO membranes	1000	1
Install HP Pump	2000	2
Complete First Tie-in	1000	1
Complete 2nd Tie-in	2000	2
• Commissioning and testing	3000	3
Complete the test for the new installation	3000	3

Table 26 Project CBS

20.2 To calculate Earned Value Management of the project after ending of 20% of its period and completion of 50% of the outputs case-by-case basis.

Below table 27 describes the activities with their budget cost , duration and with their start and finish dates.

Task Name	Duration (DAY)	Estimated Cost (SR)	Budget Reserve	Project Budget	COST Budgeting = Project Budget + management Reserve (5400) =SR 60000	Project Week (W) #	Start	Finish
DEALINATION PLANT EXPANSION PROJECT	43	52000	2600	54600		Total 6 weeks	6/11/2021	23/12/21
Complete the review of 60%	5	4000	200	4200		W1	6/11/2021	9/11/2021
Complete the review of 90 %	5	4000	200	4200		W1-2	10/11/2021	11/16/2021
Issue for approval	5	4000	200	4200		W2-3	17/11/2021	22/11/2021
Issue request for quotation for pump	2	1000	50	1050		W3	23/11/2021	24/11/2021
Review quotation & approve for pump	2	1000	50	1050		W3-4	25/11/2021	27/11/2021
Issue Purchase Order for pump	2	1000	50	1050		W4	28/11/2021	29/11/2021
Receiving and inspecting the pump	10	15000	750	15750		W4-5-6	30/11/2021	11/12/2021
Issue request for quotation for RO	2	1000	50	1050		W3	23/11/2021	24/11/2021
Review quotation & approve for RO	2	1000	50	1050		W3-4	25/11/2021	27/11/2021
Issue Purchase Order for RO	2	1000	50	1050		W4	28/11/2021	29/11/2021
Receiving and inspecting the RO membrane	15	10000	500	10500		W4-5-6	30/11/2021	16/12/2021
Install RO membranes	1	1000	50	1050		W7	18/12/2021	18/12/2021
Install HP Pump	2	2000	100	2100		W6	13/12/2021	14/12/2021
Complete First Tie-in	1	1000	50	1050		W7	19/12/2021	19/12/2021
Complete 2nd Tie-in	2	2000	100	2100		W7	19/12/2021	20/12/2021
Complete the test for the new installation	3	3000	150	3150		W7	21/12/2021	23/12/2021

Table 27 Project Activities Budget

20% of project's period can be calculated as follow:

20% multiply by 42 days (project duration) = 8.2 days.

If project is 50% complete, then the earned value = Project Budget (54600) multiply by .05 = SR27300. However, to properly use earned value, a few additional calculations must be considered such as cost and schedule variance analyses.

- Scheduled variance

The project duration is 42days and the project is 20% of project period. That means the Planned Value PV = 20% = 8.2 days. Since the project is complete 50% which means 50% of the duration that equals to 21 days.

So, the $SV = EV - PV = 21 - 8.2 = 12.8$. It indicates that the project is ahead of schedule.

- Cost Variance

The $CV = EV - AC$ (actual cost). The $EV = SR27300$ and the $AC =$ cost spent and it is 10920. So, $CV = 27300 - 10920 = SR 16380$. It indicates that the project is under budget.

Additional to above the Scheduled and Cost Performance Indices can be calculated as follow:

$SPI = EV / PV = 21 / 12.8 = 1.64$ (Ahead of schedule).

$CPI = EV / AC = 27300 / 10920 = 2.5$ (Under Budget).

21. Project Resources

21.1 To explain the concept of Resource Leveling and Smoothing.

Resource Leveling is also called Leveling Techniques delay noncritical activities by using positive slack to reduce peak demand and fill in the valleys for the resources. Practitioners have attacked the utilization problem using resource leveling techniques that balance demand for a resource. The method for leveling resources is applicable to leveling project

costs; costs are treated just as another resource. We can mention some advantages like the peak of demand for the resource was reduced, resources over the life of the project have been reduced and the fluctuations in resource demand were minimized. Another point is disadvantages like loss of flexibility that occurs from reducing slack and increases in the criticality of all activities. Resource Leveling is “A technique in which start and finish dates are adjusted based on resource constraints with the goal of balancing the demand for resources with the available supply”. We can use Resource Levelling both for human and material resources. We need this tool when shared or critical resources are available only at: defined times, in limited quantities, or over-allocated. Resource Smoothing: by doing Resource Smoothing; we try to adjust activities in such a way that we achieve this desired level of resource allocation so we do it only wherever slack is available. We are not aiming to change the project duration; we smoothed the project schedule by playing around the free and total float. We apply resource smoothing after doing resource-leveling. Since we need to first accommodate the resource constraints before we can optimize it. Here we make use of slack and will not result in a change of project duration. Because the total allocation of a certain resource remains the same while in Resource leveling It applies the resource constraints to the project and may result in a change in project duration. Another point to be mentioned that Resource Smoothing is more to do with desired limits like we do have 45 hours available for a given resource, but we wish that we allocate 38 hours per week, so we have some breathing space while Resource Leveling is primarily driven by resource constraints like you do not have more than 45 hours of the given resource for a week. Also, The desired limit identified in resource smoothing may not be applied in some cases, if we do not have slack. It is optimized within the float boundaries while in Resource Leveling the allocation limits identified in resource leveling must be applied. In Resource smoothing will not change the critical path; it tries to make the best use of slack, while when Resource Leveling changes the project dates, may also change the critical path, since constraints drive it. (Larson, Erik, and Clifford Gray. 2017).

21.2 To be trained on distributing the project resources.

Table 28 representing the project RACI Chart:

Equipment	CEO	Purchasing manager	Purchasing employee	Logistics and warehouse manager	warehouse employee	Logistics Support employee	Customer Service Manager	Customer Service employee	Director of Human Resources	HR Officer	Production Manager	production employee	Quality and performance manager	Quality control officer	Performance management officer
Desalination System	C			I		I					A	R	I	I	
HAVC System	C	A	R	C	I	C					I	I			
RO Membranes		R	R	A		C							I	I	
Tie-Ins		I	I	IC		I					A	R	I	I	
Water Bottle	I	IC	I				IC	I			A	R	IC	IC	R
Forklift				A	I	R						I	IC	I	
Feed Pump		A	R	IC	I	I					I	IR	I	I	
HP Pump		A	R	IC	I	I					I	IR	I	I	
Autocad	C			A		R	C	C			IC	I	I	I	R

Table 28 RACI Chart

Also, the following table No.29 presents the HR distribution based on their function in the project. This is the key resources of the company used in this project used to oversee the project.

No	Name	Title	Role	Contact information	
1	Mohammed	CEO	Supervising on department managers	Phone No: 055	Email: @gmail.com
2	Osama	Purchasing manager	Budget follow-up - contracts	Phone No: 056	Email: @gmail.com
3	Rasha	Purchasing employee	Prepare Pamphlet - checking factory needs	Phone No: 055	Email: @gmail.com.com
4	Ahemd	Logistics and warehouse manager	Overseeing all logistical support and inventory management	Phone No: 050	Email: @gmail.com
5	Abeer	warehouse employee	Inventory follow-up - order shortcomings in stock	Phone No: 056	Email: @gmail.com

6	Hamad	Logistics Support employee	Support departments as needed - follow up on transfers	Phone No: 050	Email: @gmail.com
7	Hassan	Customer Service Manager	Supervising customer satisfaction performance indicators - finding improvement and development plans	Phone No: 055	Email: @gmail.com
8	Saad	Customer Service employee	Follow up on customer complaints and suggestions - provide comfort to the customer	Phone No: 050	Email: @gmail.com
9	Abdullah	Director of Human Resources	Oversight of recruitment processes - oversight of salaries and regulations	Phone No: 051	Email: @gmail.com
10	Manal	HR Officer	Monitor the day-to-day operations of human resources	Phone No: 055	Email: @gmail.com
11	Mohammed	Production Manager	Supervising production processes, monitoring and analyzing errors	Phone No: 055	Email: @gmail.com
12	Faisal	production employee	Work on daily production lines	Phone No: 056	Email: @gmail.com
13	Amjad	Quality and performance manager	Supervising KPLs and finding improvement solutions	Phone No: 055	Email: @gmail.com
14	Waleed	Quality control officer	Monitor and analyze product quality	Phone No: 050	Email: @gmail.com
15	Reema	performance management officer	Establishment of development and monitoring of KPLs	Phone No: 056	Email: @gmail.com

Table 29 HR distribution

- CEO: The highest-ranking officer in a company and the responsible person for taking managerial decisions. The major role is to direct and execute all activities of the corporation either directly or through delegated authority; and to provide leadership in these and other areas.
- Purchasing Manager: Heading a team responsible for procuring goods and services for resale or project use. Seeking the best available quality for the lowest price. Evaluating suppliers, negotiating contracts, and reviewing product quality.
- Purchase Employee: Conducting project research and sourcing new suppliers and vendors. Sourcing materials, goods, products, and services and negotiating the best or most cost-effective contracts and deals.
- Logistics and Warehouse Manager: Ensuring all project equipment and goods are stored in a safe and logical manner. Keeping clear and concise records of goods in and out to aid in the stock taking process.
- Warehouse Employee: Ensuring that the daily functions and procedures of the distribution centers for project manufacturers and retailers run smoothly and efficiently.
- Logistics Support Employee: Providing a full range of logistical and supply chain management support for the project. Providing logistical support and managing the overall logistic processes in support of project.
- Customer Service Manager: Ensuring the satisfaction of customers at all times. Managing customer service team who's interacting with customers and handling customer queries and complaints in a timely manner.
- Customer Service Employee: Manage appointments, enquiries or complaints from customers or clients. Accurately and efficiently address any issues or disputes with customers.
- Director of Human Resource: Overseeing HR systems, handling employee relations, ensuring compliance with regulations, managing budgets, assessing staffing needs, hiring employees, designing training programs, and developing compensation plans.

- HR Officer: Providing support in the various human resource functions. Provide support to supervisors and staff to develop the skills and capabilities of staff.
- Production Manager: Responsible for both product planning and product marketing. This includes managing the product throughout the Product Lifecycle, gathering and prioritizing product and customer requirements.
- Production Employee: Responsible for planning and managing the production activities of a company based on job orders. Also expected to respond to customer concerns and inquiries.
- Quality and Performance Manager: Overall responsibility over the strategy around the quality management system and the performance management framework. Ensuring that the quality of work and service meets or exceeds the contractual requirements.
- Quality Control Officer: Interpret and review shop drawings. Monitor overall construction performance with regard to technical quality and compliance.
- Performance Management Officer: Developing, implementing and maintaining measures of organizational performance. Undertake analysis and produce recommendations to drive improvements in performance management as a result of project work.

22. Project Procurement

22.1-To develop the procurement execution process, and contractor selection.

The procurement process for project major materials is explained below while other materials will be used from the exiting company warehouse:

First: Receive quotation request from Project Manager.

Second: Identify Equipment Type to be purchased

Equipment Name	Quantity	Equipment Type
Pump	1	Mechanical
RO membrane	3	Mechanical

Third: List Approved Suppliers

No	Name
1	Arab Heavy Equipment Co.
2	(PFW) Company
3	Top Heavy Industry Machinery Co.

Fourth: Send Request for Quotation (RFQ) for Suppliers and determine the required specifications

Equipment Name	Quantity	Standard or nonstandard	Pressure	Assurance Period
Pump	1	Standard	High	3 years

Equipment Name	Quantity	Membrane transport Model	Operation cost	Assurance Period
RO membrane	3	Solution-Diffusion Imperfection	Low	3 years

Fifth: After we are receiving the quotations from suppliers the following **Scoring Model**, as shown in table 30, will help for choosing the best Supplier

For HP Pump and RO membrane

Supplier Name	Delivery Time	Cost	Quality	Documentation
Arab Heavy Equipment Co.	Within 24 days	Pump: 9,750 SR RO membrane: 5,800 SR	Middle	All certificates and warranties are available
(PFW) Company	Within 20 days	Pump: 10,300 SR RO membrane: 7,000 SR	High	All certificates and warranties are available
Top Heavy Industry Machinery Co.	Within 10 days	Pump: 8,000 SR RO membrane: 6,500 SR	High	All certificates and warranties are available

Table 30 Scoring Model

* After reviewing the scoring model by Project Manager, Top Heavy Industry Machinery Co. was chosen

Sixth: Issue Purchase order (PO) for Supplier (Top Heavy Industry Machinery Co.)

Then send the (PO) to finance Department for Approved the payment method as the supplier requested in payment conditions (Advance or after receiving)

Seventh: Receive the Equipment form Supplier

Eighth: inspect the Equipment

Ninth: Signe the Delivery Note and inform the project Manager that, All Equipment are received in our Warehouse.

22.2-Scoring Model (Develop comparison model between suppliers)

As illustrated earlier in section 22.1, Scoring Model has been considered as part of the Procurement execution process and the outcome is summarized below in table 31.

Supplier Name	Delivery Time	Cost	Quality	Documentation
Arab Heavy Equipment Co.	Within 24 days	Pump: 9,750 SR RO membrane: 5,800 SR	Middle	All certificates and warranties are available
(PFW) Company	Within 20 days	Pump: 10,300 SR RO membrane: 7,000 SR	High	All certificates and warranties are available
Top Heavy Industry Machinery Co.	Within 10 days	Pump: 8,000 SR RO membrane: 6,500 SR	High	All certificates and warranties are available

23. Plan and control

23.1 To prepare agenda- Invitation and virtual record of a virtual meeting.

Agenda:

Review Project performance to date and compare against benchmarks

Discussion benchmarks warrant a change?

Is it worth the costs?

Invitation:

Respected

We are happy to invite you to attend the business meeting of our Water Desalination Project. We want to discuss with you about Ensure the water quality is in compliance with all water regulation requirements.

Therefore, we are requesting you to join us in this business meeting and help us with your expertise. The meeting will be on Monday. We are requesting you to inform us if you are unable to join us.

We look forward to your precious presence.

Thank you .

Virtual Record:

Name	Attendance	
Project Manager	✓	
Sales Manager	✓	
Director of Accounting	✓	
Engineering	✓	
Director of Human Resources		X
Quality and performance manager		X
Production Manager	✓	
Logistics and warehouse manager		X

23.2 To identify performance measurement course and submit reports, in addition to explaining the reason.

In pursuit of the highest quality and improve customer experience performance measurement will be done in a weekly basis with the following KPIs :

1- Number of defected products / whole number of products *100

2-Number of mismatches in water acidity / whole number *100

Performance is measured through the mentioned performance indicators on a weekly basis to determine the areas of improvement in the outputs, which contributes to raising the quality of the customer experience. After raising the levels of performance and product improvement, the periodicity of measurement is changed to monthly to assess the level of performance and find development projects to raise performance.

KPI Goal		To reach lowest ratio of defects which will decrease the cost of production and improve the quality of the product		Current Reading	38%
KPI equation		Number of defected products / whole number of products *100			
Week number	Objectives		Week number	Readings	
Week 1	35%		Week 1	36%	
Week 2	30%		Week 2	30%	
Week 3	26%		Week 3	26.2%	
Week 4	23%		Week 4	22%	
Week 5	20%		Week 5	19.8%	
Week 6	17%		Week 6	17.3%	
Week 7	14%		Week 7	14.6%	
Week 8	11%		Week 8	11.7%	

Table 31 Number of defected products

KPI Goal	To maintain the natural levels of PH in the water production Lines to produce healthy and safe product which will help in gaining customer satisfaction			Current Reading	24%
KPI equation	Number of mismatches in water acidity / whole number *100				
Week number	Objectives		Week number	Readings	
Week 1	22%		Week 1	22.1%	
Week 2	20%		Week 2	20%	
Week 3	17%		Week 3	17.5%	
Week 4	13%		Week 4	13.7%	
Week 5	10%		Week 5	10.2%	
Week 6	8%		Week 6	8%	
Week 7	5%		Week 7	5.9%	
Week 8	2%		Week 8	3%	

Table 32 Number of mismatches in water acidity

23.3 To develop Change Request model, including (impact analysis- alternatives analysis- recommendation).

Following table No.33 shows one of the change requests encountered in this project.

Change Request Form:	
Project Name: Water Desalination Plant	
Request No : 01	Date of Request: 11-11-2021
Requested By: Plant Operation Mr.Osama	
Change Description:	
To add into scope a training for the plant operator for the new installed HP pump.	
<i>Change Reasons :</i>	
Increase the knowledge of the new two plant operators to handle the operation of the new HP Pump	
<i>Impact of the change :</i>	
The new scope will cost the project by SR 5000.	

Decision	
☐ Approved	☒ Rejected
☐ Approved with modifications	☐ Deferred
Justifications	
This was set clearly during planning phase that any training will be out of the project scope. Also, the operation department already has similar pump in the existing plant and the experience operator can help the new operator on handling the new pump. Also, there will be a cost impact by SR5000 by this change if accepted which project does not account for.	

Table 33 change request form

24. Risk and Opportunities

24.1 To identify Risks (threats) and opportunities, and giving examples.

Risk is: The combination of the probability of an uncertain event to occur and its consequence. This risk could be a threat which has a negative impact in the project.

Also, the risk could be something that has a positive impact in the project and then will be called an opportunity. In other meaning, the opportunity is something (tangible or effect) recognized within the project deliverables that has the potential to unlock or otherwise assist a positive or beneficial effect.

To balance and justify the cost (of the taken risks) , such things are sought and documented in the Business Case.

Example:

- **Present of new competitor in the markets (Threats)**
- **High or additional transaction costs (Threats)**
- **Sales or earnings are declining (Threats)**
- **Synergies with new company or forming new Joint Venture (Opportunity)**
- **High Demand (Opportunity)**

24.2 To prepare Risk register.

The following table 34 is showing the project risk register.

#	Risk description	Likelihood	Impact	Severity	Owner	Mitigating action	Contingent action	Progress on actions
1	Water Quality out of specification	Very Low	Low	Low	Engineering	Examination of samples and extraction of defects	Escalation to the project sponsor and chief engineer to fix the faults and calculate the cost of delay and repair	Escalation to the project sponsor and chief engineer to fix the faults and calculate the cost of delay and repair
2	Exceeding the Targeted project duration and cost	Low	High	High	Project Manager	Break down the risks of "cost estimates" and "schedule errors." Use two cost estimation methodologies, and keep meticulous track of costs and forecast cost at completion, making modifications as needed. Allow for a 10% cost and schedule contingency. Daily schedules should be kept track of, and every project team meeting should	Escalate to project sponsor Raise a change request for changes to budget or schedule.	Contingency agreed by project sponsor

						include a schedule review. Forecast mistakes and/or delays should be reported to the Project sponsor as soon as possible.		
3	Scope Creep	Medium	High	High	Project Manager	The project scope should be documented in a Project Initiation Document or Project Charter and approved by the Project sponsor. Refer to it throughout the project and evaluate all modifications against it, making sure that any changes are in line with the Business Case.	Every instance of scope creep should be documented. Prior to beginning work, submit a change request, no matter how small, and get approval from the project sponsor. This includes zero cost modifications.	Scope clearly defined in the Project Initiation Document.

Table 34 Risk Register

24.3 Qualitative Risk Analysis

Qualitative risk analysis for this project is showing in below table 35.

Impact					
Very low	Low	Medium	High	Very High	
1000	5000	10000	20000	30000	Cost Effect
1	10	30	60	90	Time
Probability					
Highly unlikely	Unlikely	Possible	Likely	Very likely	

Table 35 Qualitative Risk Analysis

24.4 To specify Risk response strategies.

The project has provided a risk mitigation as a response for some of the project identified risks and they are showing in the following table 36.

#	Risk description	Mitigating action	Contingent action	Progress on actions
1	Water Quality out of specification	Examination of samples and extraction of defects	Escalation to the project sponsor and chief engineer to fix the faults and calculate the cost of delay and repair	Escalation to the project sponsor and chief engineer to fix the faults and calculate the cost of delay and repair
2	Exceeding the Targeted project duration and cost	Break down the risks of "cost estimates" and "schedule errors." Use two cost estimation methodologies, and keep meticulous track of costs and forecast cost at completion, making modifications as needed. Allow for a 10% cost and schedule contingency. Daily schedules should be kept track of, and every project team meeting should include a schedule review. Forecast mistakes and/or delays should be reported to the Project sponsor as soon as possible.	Escalate to project sponsor Raise a change request for changes to budget or schedule.	Contingency agreed by project sponsor

3	Scope Creep	The project scope should be documented in a Project Initiation Document or Project Charter and approved by the Project sponsor. Refer to it throughout the project and evaluate all modifications against it, making sure that any changes are in line with the Business Case.	Every instance of scope creep should be documented. Prior to beginning work, submit a change request, no matter how small, and get approval from the project sponsor. This includes zero cost modifications.	Scope clearly defined in the Project Initiation Document.
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Table 36 Risk Response Strategy

25. Project Stakeholder

25.1 To prepare Stakeholder engagement assessment matrix.

Table 37 , as showing below, is illustrated the current (C) and Desired (D) position for the key project stakeholders.

Stakeholder	Role	Unaware	Resistant	Neutral	Supportive	Leading
Mohammed	Project Sponsor				C	D
Osama	Project Manager				C	D
Rasha	Sales Manager		C		D	
Ahemd	Quality Assurance			C	D	
Customer	Customer	C			D	
Equipment Company	Vendor	C			D	
Abeer	Director of Accounting			C	D	
Saad	Program Analysis			C	D	
Operators	Operators		C		D	

Table 37 Stakeholder engagement assessment matrix.

26. Recommendations

After going through this project, it is worth to note the following recommendations which going to add more value and profits to the company in next growth projects:

- 1- Make sure to use all the collected lessons learned from this project.
- 2- Make sure to include the proponent\operation team during the project development and to get his endorsement officially in receiving the final product.
- 3- Make sure to conduct the constructability workshop in order to identify and find a plan for all the challenges that might be encountered during the project execution especially that if the project is executed in an existing plan (brownfield project)

27. Summary

This project was brought in to fulfill the new expected demand in the region and will increase the company profit. This, also, fulfilling one of the company missions which is to ensure that the company is a reliable source for supplying the purified and drinking water to their customers in a timely manner.

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