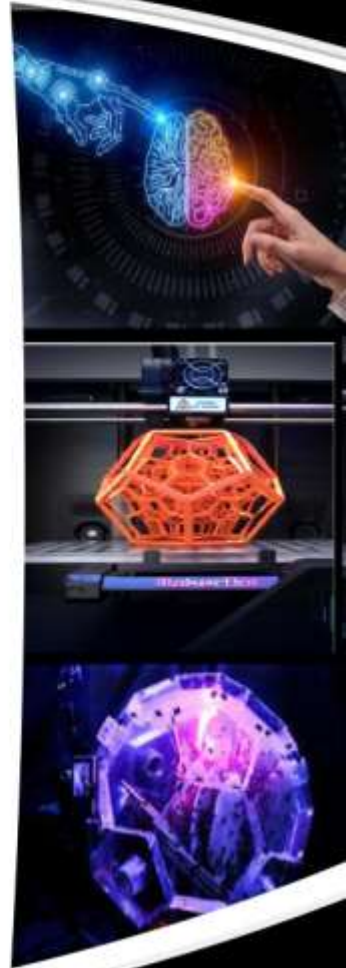


Project Title:

Making a Tourist Experience Through 3D Printers Around KSA



Kingdom Of Saudi Arabia
Vision 2030







PURPOSE OF THIS REPORT:

Throughout The master degree in project management at Everyone's Smart University, the student shall embody a trial of an organization by applying several practical trainings in which the main administrative methods and techniques are used. Each project management practitioner must master these techniques to meet the competencies needed for the project manager following the individuals' competencies standard of IPMA, which is provided through the theoretical lectures. The training of this course includes "25" competencies whose outputs should be included by the student in his final report of the project.

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EVERYONE'S SMART UNIVERSITY



EXPLORE

Wonderful places in Saudi Arabia



SAUDI ARABIA 2030 VISION

is touching many strategic areas in the country and boosting the economy is one of the strategy's pillars. Tourism is one of the objectives that Saudi Arabia is focusing on and aspires to grow spending on entertainment from 2.9% to 6.0%. The vision should be achieved through key enablers.



Ministry of Tourism

Tourism 2030 Vision aims to use the highest international standards to create attractions following the right steps. Key enablers are going to be applied to reach the goal e.g., improve visa issuance procedures for visitors, develop Saudi historical and heritage sites, and create new cities with appealing concepts. However, there are some requirements in order to realize this aspiration, such as, develop cutting-edge entertainment experiences, launching new entertainment attractions, and hosting world-class events and festivals.

Therefore, it is the perfect timing to start investing in tourism since the vision is encouraging tourist projects where The Tourist Investment Fund has signed an agreement with local banks to finance tourist projects with around 150 billion Saudi riyals. The Tourist Investment Fund is huge since it has been established with a capital of 15 billion SAR.



INTRODUCTION ABOUT THE PROJECT



3D PRINTERS

One way to enhance the experience of tourism in Saudi Arabia is by introducing high and new technologies that aim to make them enjoy their time and print whatever shape of cities they visited in Saudi Arabia by using new types of 3D printers in public places. These types of 3D printers can be used by the end-user through the internet to print the shape of cities they visited.



About The Project

This report represents a new idea for an imaginary project to show the competencies of the team members for planning and managing this imaginary project using the different techniques and tools for project management.

This imaginary project aims to:

- Studying the proper locations for installing 3D printers in tourism places around Saudi Arabia to be used by tourists.
- Proposed the proper 3D printers according to the specifications.
- Inspect and install 15 3D printers.
- Provide training for 3D printers operators.

This imaginary project was assumed to be launched by the ministry of tourism and performed by UST (United Smart Technology) imaginary corporate created by the team members.



PROJECT DISCRIPTION AND EXPECTED OUTCOMES

PROJECT TIMELINE:

From 01/01/2022 to 31/12/2022

01

GOALS:

Enhance the experience of the tourists in the famous places around Saudi Arabia.
Introduce the new technologies in the tourism sector.
Provide a unique service to the tourists in Saudi Arabia.
Attract tourists from the world to visit Saudi Arabia.

02

PROJECT ACTIVITIES AND REQUIRMENTS:

Study the proper and safe location based on a study within the tourist areas for Installing 3D printers.
Receive all the 3D printers and their accessories.
inspect all the 3D printers and their accessories.
Install 15 3D printers in the agreed places.
Test 15 3D printers after installation.
Provide Training for the equipment operators.
Handover the equipment to the ministry

03

PROJECT OUTPUTS:

Provide suitable and famous locations for 15 3D printers to be used by tourists and the public.
Evaluate, assess and Propose the most suitable 3D printers according to the proper requirements and specifications.
15 3D printers installed in different locations.
Training for 3D printers operators.

04

PROJECT EXPECTED OUTCOMES:

Increase tourist satisfaction about tourism in Saudi Arabia.
Increase the number of tourists in Saudi Araba.
Provide unique products and gifts.



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TEAM MEMBERS



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EXPERT TEAM

Let's meet our team members who are professional
and have rich experiences.



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ABOUT US

United Smart Technology Co. is one of the leading corporates providing Technological project management services in the Kingdom of Saudi Arabia was established in 2021. The corporate provides various types of services such as consultancy and project management for different projects like AI projects, 3D Printers and their technologies, and IoT projects.



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The planning and Scheduling of the tasks from the Group leader

The planning and scheduling for the final project tasks

- 1- The light blue color under each name will indicate that this person is responsible and accountable for that, the remaining members will give them their comments and feedback about their work in order to improve it.
- 2- Every week there will be 2 meetings all the members have to attend the meeting.
- 3- All members must support each other.

Week	Area	Task	Responsible
1 From 4/9/2021 to 10/9/2021	Preparation and planning	Writing the Purpose of the report.	OMAR
		Writing and design introduction about report.	ARWA
		Writing and design introduction about project.	OMAR
		Idea generating.	
		Planning and scheduling the tasks.	
		Infographic designs.	
		Design and Creating cover page.	
		Creating Table of Content.	
		Creating Table Index.	
		Creating Figure Index.	
		Design and Creating a logo for the corporate.	SHAHAD
		Design and Creating a team brochure.	RAHAF
		Writing the contents of the project report.	OMAR
		Writing introduction for the corporate.	
		Conducting a weekly meeting.	
		Manga, monitor and direct the progress of tasks and Collecting them.	
		Spelling check.	
		Writing Project phases	
		Taking Minutes of Meeting.	

2 2021\9\11 2021\9\17	Strategy	Mission formulation	ARWA + OMAR
		Vision formulation	
		Develop and set goals with the SMART model	OMAR + ARWA
		Develop and define performance or lagging indicators	OMAR
		Develop a project charter project.	OMAR
3 From 18/9/2021 to 24/9/2021	Governance, Structure and Processes	Develop the organization structure of teams and project work units.	OMAR
		Determine the practical and scientific foundations that were adopted in the development of the structure	
		Determining the most appropriate project office model for project management and specifying the reason	
	Compliance, Standards and Regulations	Design a compliance model for verification prior to receiving project deliverables	OMAR + SHAHAD
		Develop a Check List form for each of the three phases of the project (initiation and planning - implementation - closing).	
4 From 25/9/2021 to 1/10/2021	Power and Interest	Develop a stakeholder register and form groups for them.	ABDULAZIZ + OMAR
			ABDULAZIZ + OMAR
		Develop the two networks: (Strength/Interest) and (Influence/ Strength)	FATHI + OMAR
		Use the logical diagrams for the register of the stakeholder.	FATHI
	Culture and Values	To identify the culture of the organization	FATHI + ABDULAZIZ + OMAR
		Provide proposals of the organization values that can be adopted.	
5 From		Specify “3” personal behaviors of the student that can influence on the project.	OMAR +
		Study such behaviors, identify their reasons, and how they can be eliminated.	

2/10/2021 to 8/10/2021	Self-reflection and self- management	Conduct a self-professional assessment by using SWOT model	ALI
	Personal integrity and reliability	Provide “3” behaviors contradict the moral integrity.	MARAH + OMAR
		Analyze the financial, social, and technical influence, if any, of such behaviors on the works of the project and the relationships.	
	Personal communication	Prepare the register of the stakeholder.	MAHMOUD + OMAR
		Identify the personal communication and the effective communication.	
		Identify the shapes, models, and channels of the personal communication.	MAHMOUD + RAHAF + OMAR
		Establish the communication matrix.	
		Provide 3 wrong scenarios of communication	
	Relationships and engagement	Develop and prepare stakeholder assessment matrix.	RAHAF + OMAR
6 From 9/10/2021 to 15/10/2021	Leadership	Describe and identify the leadership model, which is preferred to the project leadership.	MARAH + OMAR
		Specify the reasons for which such model is preferred.	
		Provide “5” proposals for the motivation methods that are compatible with the nature of the project.	
	Teamwork	Design RACI model for 3 administrative measures of the project.	FATHI
	Conflict and Crisis	Identify the conflict and crisis	
		Provide 3 expected scenarios of the conflict’s events in the project.	
		Set the optimal strategies to deal with each conflict, and specify the reason of preference.	
7 From 16/10/2021 to 22/10/2021	Resourcefulness	Distribute the human resources on the functions.	ALI + NAIF + OMAR
		Analyze the influence of conducting Crashing and Fast-tracking process on the time table, in addition to representing the table after achieving the two measures.	

	Negotiation	Develop general rules for the negotiation process. negotiation plans 2 Prepare	ABDULAZIZ
	Project Design	Triple constraint of the project Identify the Set up a list of the project success factors. Develop and identify work breakdown structure, in addition to prepare a guide to illustrate it	NAIF + OMAR + ARWA
9 From 30/10/2021 to 5/11/2021	Requirements and Objectives	Identify Requirement traceability matrix the methods used in requirement collection Specify strategy the hierarchical structure of the objectives of the project connected to the Develop	ARWA + OMAR
10 From 6/11/2021 to 12/11/2021	Scope	the scope statement (Its limits- and objects that are not included) Develop, identify, and prepare identify, and explain the concepts: Scope creep and giving examples ,Develop product analysis management Illustrate activities the transformation of the work packages in Work Breakdown Structure to Illustrate	RAHAF + OMAR
	Time	the activities included in each work package in WBS Develop the functions list or the relationships between the activities Illustrate the logical diagram of the project activities, and identify the critical path Develop Prepare Gantt chart and Milestones model	NAIF + OMAR + SHAHAD
	Quality	quality Clarify Deming model for SIPOC model, and Ishikawa for one of the issues of the project outputs Develop	SHAHAD + OMAR
11 From 13/11/2021 To 19/11/2021	Finance	Structure, and the project balance in accordance with WBS Establish Cost Breakdown completion of 50% of Earned Value Management of the project after ending of 20% of its period and Calculate the outputs case-by-case basis	MAHMOUD + OMAR
12 From 20/11/2021 to 26/11/2021	Resources	Resource Leveling and Smoothing Explain the concept of trained on distributing the project resources of equipment and tool To be	ARWA + OMAR
	Procurement	execution process, and contractor selection Develop the procurement the comparison model between suppliers and the Scoring Model Develop	MARAH + OMAR

13 From 17/11/2021 to 3/12/2021	Plan and Control	virtual record of a virtual meeting Prepare agenda- Invitation and	RAHAF + OMAR
		submit reports, in addition to explaining the reason Identify performance measurement course and	
	Risk and Opportunities	(alternatives analysis recommendation -Develop Change Request model, including (impact analysis and giving examples ,Identify Risks (threats) and opportunities	ALI + OMAR
		Risk register Preparation	ABDULAZIZ + OMAR
		Risk Analysis Qualitative	
		Risk response strategies Specify	SHAHAD + OMAR
	Stakeholders	Assessment matrix Prepare Stakeholder engagement	FATHI
		Training Plan	ARWA
		Recommendations	NAIF
		Conclusion	NAIF

Table 1. Distribution of Work

Competence

Being good at what
I do, capable,
effective

Perspective Competences

Section 1

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Vision

To be part of creating environment support that aids the Saudi Ministry of Tourism in achieving 2030 vision by providing tourism experience that contributes to enhancing tourism in the KSA.

Mission

To become one of the main partners for the Saudi Ministry of Tourism to provide a creative, innovative, and exceptional tourism experience while creating a better journey that benefits both our customers and the end-users.

Strategic objectives, SMART objectives & KPIs:

The strategic objectives, SMART objectives, and KPIs for the project including both leading and lagging indicators were created based on five different perspectives:

- Financial/Budgeting.
- Customers/Stakeholders/Vendors/End Users.
- Quality.
- Health and Safety.
- Execution and Effectiveness.
- Learning and Development.

Every perspective were having a score based on their importance from the corporate side to be able to evaluate the success of their projects. The five perspectives are mentioned in the below tables:

PERSPECTIVE	100
Financial/Budgeting	18
Customers/Stakeholders/Vendors/End users	20
Quality	16
health and safety Environment	16
Execution and Effectiveness	15
Learning and Development	15

Table 2. Objectives and KPIs Five Perspectives

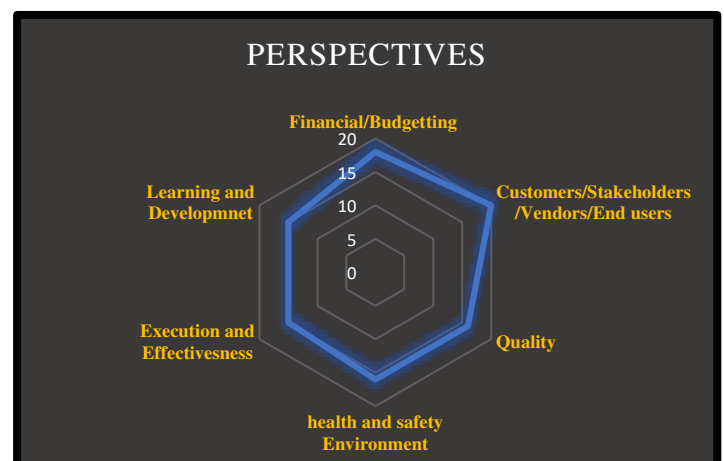


Figure 1. Objectives and KPIs Five Perspectives

Financial/Budgeting:

Perspective	Project Strategic Goals	Project SMART Objective	KPI Name	KPI Description	Calculation Methods	Owner	FREQ.	Weight	Unit	INC/DEC Better
FINANCIAL / BUDGETING	Improves the budgetary control over a project expenditure	Complete the project by the end of 2022 by 10% less than the allocated budget. (Acqnotes, n.d.) (The_motley_fool, n.d.)	# Of changes to the cost baseline	This KPI shows the number of the changes to the Cost Baseline	Count	Financial Analyst	Monthly	1%	Number	D
			% Budget spent ratio to the budget allocated	This KPI indicates the percentage of the spent budget over the allocated budget	Budget spent / Budget allocated	Financial Analyst	Quarterly	2%	%	D
			Cost variance	is the process of evaluating the financial performance of your project. Cost variance compares your budget that was set before the project started and what was spent.	((% of work completed x budget)- Actual cost) $CV = BCWP - ACWP$	Financial Analyst	Quarterly	1%	\$	D
			% Over budget	This KPI shows the percentage of the over budget	(Actual Cost - Allocated budget) / Allocated budget	Financial Analyst	Weekly	1%	%	D

	Monitor effectively all the expenses of work done	Track 100% the cost of the work done through a daily progress report within the system for 1 year.	# Of Budget at Completion (BAC) was reported	as a measure that is often used in earned value management to track the actual cost of a project against its forecasted budget.	Count	Project Coordinator	Semi-Yearly	1%	\$	I
			# Of Actual Cost of work performed (ACWP) were reported	the cost incurred and recorded in accomplishing the work performed within a given accounting period and is accumulated reported over time.	Count	Project Coordinator	Weekly	2%	\$	I
			# Budgeted Cost of Work Scheduled (BCWS) was reported	is the sum of the budget for all work scheduled to be accomplished with a given time period.	(% of work completed x budget) also called Earned value (EV)	Project Coordinator	Weekly	2%	\$	I
			# Of Budgeted Cost of Work Performed (BCWP) was reported	is the budgeted cost of the value of work that has actually been accomplished or completed to date	Count	Project Coordinator	Weekly	2%	\$	I
	Maximize revenues	improving Utilizing	Estimate at Completion (EAC)	is the current expectation of total cost at the end of a project.	EAC = actual costs (AC) + estimate to	Project Manager	Quarterly	2%	\$	D

	from project	the resources of the project by Enhancing the accuracy of the estimation to 95% for the remaining work cost till the end of 2022. (Fichtner, n.d.) (Malik, n.d.) (Team E., n.d.)			complete (ETC) or $EAC = \text{actual costs (AC)} + \text{budget at completion (BAC)} - \text{earned value (EV)}$					
			Estimate to Complete (ETC)	is the expected remaining cost to complete the project	$ETC = (BAC - EV) / CPI_p$ Formula I – Typical Performance $ETC = (BAC - EV) / CPI$ Formula II – Atypical Performance $ETC = (BAC - EV)$ Formula III $ETC = (BAC - EV) / CPI_p$ while the CPI_p will represent the percentage of the efficiency of the work	Project Manager	Monthly	2%	\$	D
			Cost performance	The Cost Performance Index (CPI) is a method for	$CPI = \text{earned value (EV)} /$	Project Manager	Monthly	1%	\$	I



		e Index (CPI)	calculating the cost efficiency and financial effectiveness of a specific project	actual cost (AC). $CPI = BCWP / ACWP$					
		To Complete Performance Index (TCPI)	It is a measure of the cost performance that is required to be achieved with the remaining resources to meet a specified management goal, expressed as the ratio of the cost to finish the outstanding work to the remaining budget.	$TCPI = (BAC - EV) \div (EAC - AC)$.	Project Manager	Quarterly	1%	Number	D
18%									

Table 3. Financial /Budgeting KPIs

I	Increase is better
D	Decrease is better

Customers/Stakeholders/Vendors/End users:

PERSPECTIVE	Project Strategic Goals									
		Project SMART OBJECTIVE	KPI NAME	KPI DESCRIPTION	CALCULATION METHOD	OWNER	FREQ.	WEIGHT	UNIT	INC/DEC BETTER
END USERS / CUSTOMER / STAKEHOLDERS / VENDORS	Improve stakeholder's satisfaction	Reduce stakeholders' complaints about the outcomes to 0 and increase their satisfaction to 98% by the end of 2022.	Average stakeholder satisfaction with the outcome of the project	This KPI will enhance the development of the communication with the stakeholders and get the right update of new changes to the requirements	satisfied Stakeholders / unsatisfied stakeholders	Customer Service	Monthly	3%	Number	I
			Average stakeholder satisfaction with project management	This KPI will enhance the development of the project's management of the corporate	satisfied Stakeholders / unsatisfied stakeholders	Customer Service	Monthly	3%	Number	I
			% of stakeholder's acceptance of deliverables	This KPI shows the number of the accepted deliverables and will help us to have continuous improvement	(# of stakeholders accepted deliverables / total number of stakeholders) *100	Customer Service	Quarterly	3%	%	I

			# Of stakeholder's complaints	This KPI will give a sign about the number of complaints about the done work	Count	Customer Service	Monthly	3%	%	D
Optimizing the communication with vendors	improves the availability of the purchased parts during the execution of the project to 95% by the end of the project 2022.	# Of vendor meeting schedule	This KPI will indicate the number of meetings scheduled with the vendors	Count	Project Coordinator	Monthly	2%	Number	I	
Improve tourists' satisfaction in Saudi Arabia in the tourist areas.	Developed local tourism around the Kingdom and increased the satisfaction of using the 3D printers by more than 90% in the tourist areas from the end of 2022 up to mid-2023.	# Of End users' complaints	This KPI will indicate the number of complaints of end-users about the installed 3D printers	Count	Customer Service	Yearly	3%	Number	D	
		% Of ends user's satisfaction about the installed 3D printers.	This KPI will show the percentage of complaints of end-users about the installed 3D printers	(# of satisfied end users / total number of end-users who used machines) *100	Customer Service	Yearly	3%	%	I	
20%										

Table 4. Customers/Stakeholders/Vendors/End users KPIs

I	Increase is better
D	Decrease is better

Quality:

PERSPECTIVE	Project Strategic Goals	Project SMART	KPI NAME	KPI DESCRIPTION	CALCULATION METHOD	OWNER	FREQ.	WEIGHT	UNIT	INC/DEC BETTER
		OBJECTIVE								
Quality	Increase the quality of the work done	Reduce the rework due to the quality issues of parts to 1 % by the end of 2022.	# Of non-conformities during vendor inspection	This KPI will indicate the specifications of the products and parts that are received from the vendors to prevent the rework.	Count	QA/QC Engineer	Weekly	4%	Number	D
			% Decrease in scrap and rework costs	This KPI will give a good indication if there is a decrease in the scrap and rework work	$((\text{Rework Cost} + \text{Scrap Cost}) / \text{Actual cost of work done}) * 100$	QA/QC Engineer	Monthly	4%	%	D
		Ensure all the installed parts have 100% no defects till the end of 2022.	% Of inspection for the installed parts	This KPI will give a good indication if there is a decrease in the scrap and rework work	$(\text{Number of inspected parts or products} / \text{number of total parts or products}) * 100$	QA/QC Engineer	Weekly	2%	%	I

	Ensure all the received parts have 100% no defects till the end of 2022.	% Of inspection for the received parts	This KPI will indicate the quality of the products and parts that are received from the vendors to prevent the rework.	(Number of inspected parts or products/number of total parts or products) * 100	QA/QC Engineer	Weekly	3%	%	I
		% Of sample failure	This KPI will give a good indication about the percentage of the failure of tested samples	(Number of failure samples / total samples) * 100	QA/QC Engineer	Monthly	3%	%	D
	16%								

Table 5. Quality KPIs

I	Increase is better
D	Decrease is better

Health and safety Environment:

PERSPECTIVE	Project Strategic Goals	Project SMART OBJECTIVE	KPI NAME	KPI DESCRIPTION	CALCULATION METHOD	OWNER	FREQ.	WEIGHT	UNIT	INC/D EC
Health and Safety Environment	Perform the required work in a healthy environment and safe way	Maintain 100 % safe and healthy work area during installing 3D printers till the end of 2022.	# Of safety and health training was provided to the staffing	This KPI will give a good indication about enhancing the awareness of the manpower before the work and during the work about safety	Count	HSE engineer	Weekly	4%	Number	I
			# Of safety toolbox were conducted	This KPI will give a good indication about enhancing the awareness of the manpower before the work and during the work about safety	Count	HSE engineer	Weekly	4%	Number	I
			# Of accident reported	This KPI will give a good indication of the number of injuries were happened	Count	HSE engineer	Monthly	4%	Number	D
			# Of near-miss incidents reported	This KPI will give a good indication of the number of incidents were happening	Count	HSE engineer	Monthly	4%	Number	D
			16%							

Table 6. Health and Safety Environment KPIs

I	Increase is better
D	Decrease is better

Execution and Effectiveness:

PERSPECTIVE	Project Strategic Goals									
		Project SMART OBJECTIVE	KPI NAME	KPI DESCRIPTION	CALCULATION METHOD	OWNER	FREQ.	WEIGHT	UNIT	INC/DEC BETTER
Execution and Effectiveness	Improve the Effectiveness of the work done	Reflect 100% of the achieved progress of the work done till the end of 2022.	% Progress reports submitted as planned	This KPI will give a good indication about the percentage of the submitted reports to the non-submitted reports	$(\text{Submitted reports} / \text{total reports}) * 100$	Project Engineer	Weekly	2%	%	I
			# Of project Milestones Achieved on Time	This KPI will give a good indication about the number of the achieved milestones to the non-achieved milestones	$(\text{Achieved Milestones} / \text{total Milestones}) * 100$	Project Engineer	Monthly	2%	Number	I
			Schedule Variance (SV)	indicates how much a project is ahead or behind schedule.	$\text{Schedule Variance (SV)} = \text{Earned Value (EV)} - \text{Planned Value (PV)}$	Project Coordinator	Weekly	2%	Number	D

			Schedule Variance (SV) = BCWP – BCWS					
	% Of Milestones Missed	This KPI will give a good indication about the percentage of the Milestones Missed to the non-Missed Milestones	(Missed Milestones / total Milestones) * 100	Project Coordinator	Weekly	2%	%	D
Increase the resources utilization up to 98% during the work done till the end of 2022.	% Resource utilization versus the plan	This KPI will give a good indication about Resource utilization and help managers understand how their team is spending their time to make more efficient resourcing decisions that maximize productivity and profitability.	Resource utilization = (worked time / available time) *100	Project Engineer	Weekly	2%	%	I
	Average # of people assigned per a project	This KPI will give a good indication of the average of people assigned per a project	Count	Project Engineer	Weekly	1%	Numb er	D

		% of project equipment available on Time	This KPI will show the percentage of equipment available on time within the project	(Number of equipment's available on time / total number of equipment needed) *100	Project Engineer	Weekly	2%	%	I
		% Amount of time lost due to the absence	This KPI will show the percentage of time lost due to the absence	(Total absence hours / Total hours of work for that day) *100	Project Engineer	Weekly	1%	%	D
	Install 15 3D printers in agreed locations by the end of 2022	# of 3D printers were installed	This KPI will show the number of 3D printers was installed	Count	Site Engineer	Monthly	1%	Number	I
	15%								

Table 7. Execution and Effectiveness KPIs

I	Increase is better
D	Decrease is better

Learning and Development:

PERSPECTIVE	Project Strategic Goals	Project SMART OBJECTIVE	KPI NAME	KPI DESCRIPTION	CALCULATION METHOD	OWNER	FREQ.	WEIGHT	UNIT	INC/DEC BETTER
Learning and Development	Improve the employees' skills and knowledge	Provide more than 20 training courses till the end of 2022.	# Of hours training was conducted	This KPI will indicate the number of hours training	Count	HR Analysts	Monthly	4%	Number	I
			# Training was provided	This KPI will indicate the number of training courses was provided	Count	HR Analysts	Monthly	4%	Number	I
		Provide training to all the employees and get more than 50% of employees certified in different sectors till the end of 2022.	# Of employees who had training	This KPI will indicate the number of employees who get training	Count	HR Analysts	Monthly	3%	Number	I
			% Of employees were passed and get certified after training for every sector	This KPI will indicate the percentage of employees who get certified and pass the exams after the training	(Number of employees who passed the exams / Number of employees those get trained)	HR Analysts	Monthly	4%	%	I
		15%								

I	Increase is better
D	Decrease is better

Table 8. Learning and Development KPIs

Project Charter:

The project charter is a formal document that authorizes the project and the project manager. It is the output of the first initialization processes. It has these core elements: *Overview and purpose, Objectives and high-level scope, General approach, Contractual aspects, Schedules, Resources, Personnel, Risk Management, Evaluation methods, High-Level constraints, and assumptions.*

(Muhammad Nabeel Mirzaa, 2013)

Elements of Project charter

A. Project Purpose:

The project purpose is part of the project charter and is the center of all subsequent project management activities of developing the project scope (Ryan, 2011). It contains two elements which are: Mission statement, Project Purpose statement.

B. Objectives Elements:

The project objectives are part of the project charter and mentioned using the SMART model, which is referred to •Specific •Measurable •Achievable •Realistic •Time-based (Richard Larson)

Processes to identify project charter, purpose, objectives, and scope:

The processes will display how to develop and identify each of the project charters, purpose, objectives, and scope by fulfilling the inputs and using the proper tools and techniques.

Project charter identification Processes:

The charter requires some inputs and some recommended tools and techniques to be generated, as shown in the chart below. (Project Management Institute, 2017)



Figure 4-2 (Guide). Develop Project Charter: Inputs, Tools & Techniques, and Outputs
A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition. ©2017 Project Management Institute, Inc. All rights reserved.

Figure 2. Develop Project Charter

Expert judgment is considered as one of the most important tools and techniques for developing the project charter among other tools and techniques. According to (Szwed, 2014) for the expert judgments there must be:

- Adoption of the systematic process for elicitation to improve the produced judgments.
- A way should be developed like mapping of elicitation methods to come up with the best possible judgment.
- Sufficient selection and training for the expert must be in place using the latest techniques.
- Using an appropriate method from the latest science to systematically elicit Judgments.

Project Purpose, Goals, and objectives identification process:

The below picture shows the suggested processes for identifying the project purpose and its formal decomposition into goals and objectives using an iterative process according to a study. (Ryan, 2011)

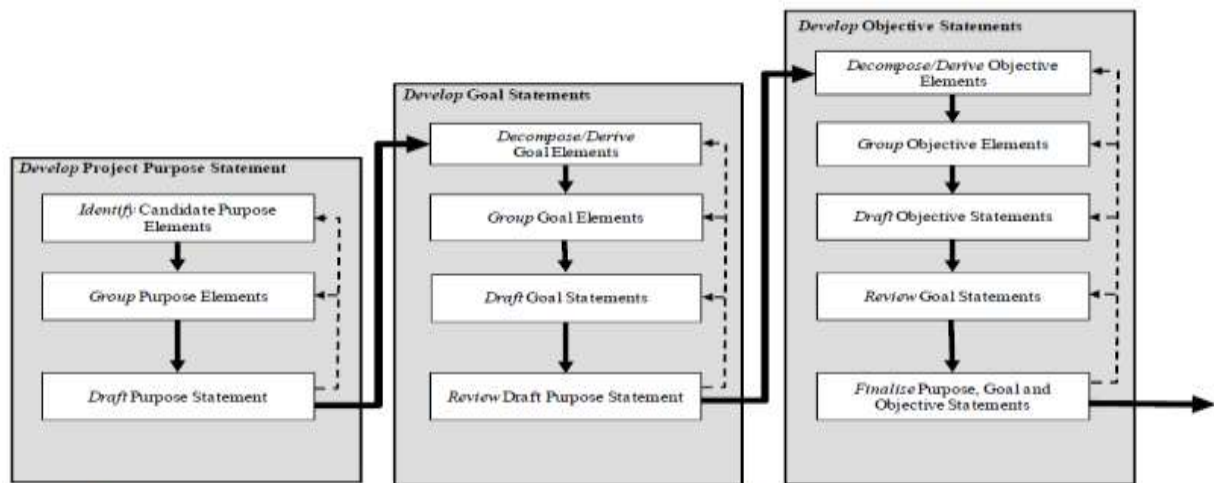


Figure 3. The development of project purpose statement, goals, and objectives for a system.

Figure 3. The development of project purpose statement, goals, and objectives for a system.

Another tool that offers structural guidance for writing objective statements using a SMART goal framework called OITT refers to • The outcome • Its indicator • Target level and • Time frame. As mentioned in the above figure. (Ogbeiwi, 2017)

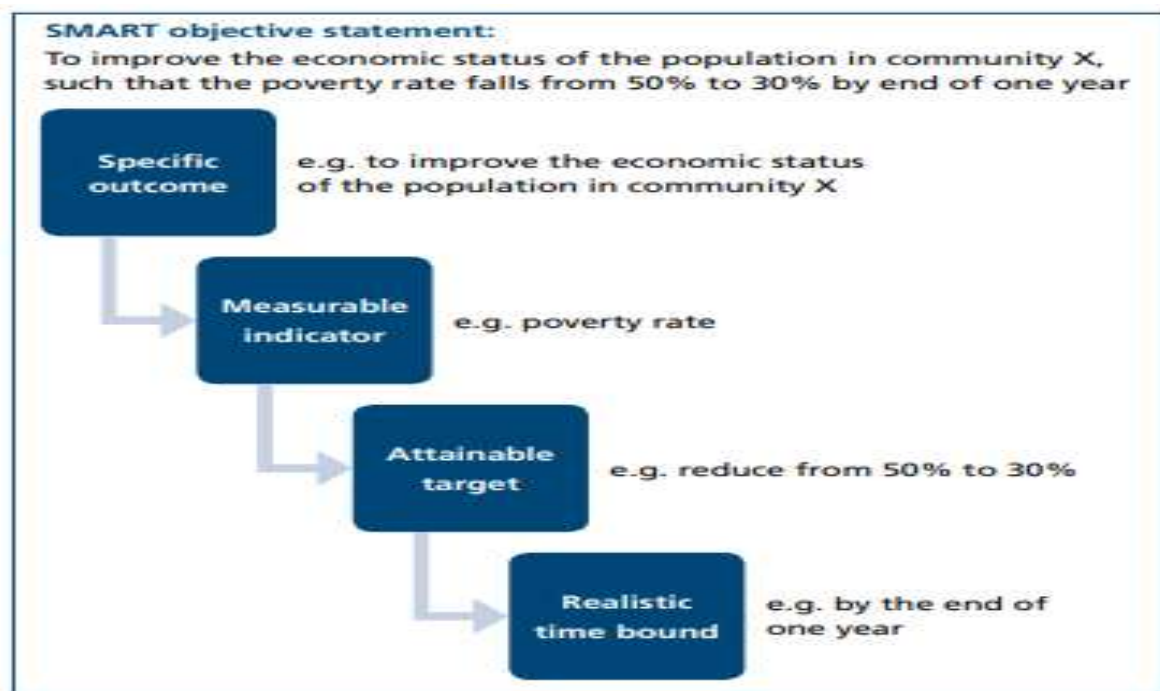


Figure 3. OITT framework of an objective statement

Figure 4. OITT framework for objective statement

PROJECT CHARTER

Project Name: Making a Tourist Experience Through 3D Printers Around KSA		Project Number: 3
Date Prepared: 01/01/2022		Revision Number: 0
1. PROJECT ESTIMATED COST		
5,000,000 SAR		
2. PROJECT PURPOSE		
The Purpose of the project is to improve tourists' experience in some famous areas in Saudi Arabia through using 3D printers.		
3. PROJECT HIGH-LEVEL DESCRIPTION		
intend to plan, construct and implement a structured plan to buy and install 3D printers in different locations around Saudi Arabia to be used easily by the tourists and visitors. The installed 3D printers will support the tourists to print a souvenir when they visit the famous tourists' places.		
4. DELIVERABLES		
- Establish standard 3D printers that include a variety of souvenirs, carefully selected for the sights and country culture, with high quality. - Increasing the percentage of domestic tourism satisfaction in the Kingdom by 20% compared to the previous five years. - Provide the proper and safe locations based on a study within the tourist areas for Installing 15 3D printers. - Design and define the proper 3D printers specifications. - Find and propose the proper vendors based on the technical specifications, technical requirements, and all other requirements from the customer. - Install 15 3D printers in the agreed places. - Testing 15 3D printers. - Train all 15 3D printers operators.		
5. BOUNDARIES:		
The project will be only within the Kingdom of Saudi Arabia in the famous areas, having more tourists, safe, suitable for 3D printers, and approved by the ministry of tourism. All other locations are out of scope.		
6. HIGH-LEVEL REQUIREMENTS:		
1-Study the proper and safe location based on a study within the tourist areas for Installing 3D printers. 2- Find and propose the proper vendors based on the technical specifications, technical requirements, and all other requirements from the customer. 3-Receive all the 3D printers and their accessories. 4-inspect all the 3D printers and their accessories. 5-Install 15 3D printers in the agreed places. 6-Test 15 3D printers after installation. 7-Provide Training for the equipment operators. 8-Handover the equipment to the ministry.		
7. SCOPE DEFINITION		
The project will include: -Propose a suitable place for installing 3D printers. -Inspect all the 15 3D printers and their accessories as per Spec. -Install The 15 3D printers in agreed places.		The project will not include: -Buying 3D printers and theirs items. -All required work for preparing the place for installing 3D printers. -Relocation of the 3D printers after installing.
8. PROJECT OBJECTIVES AND SUCCESS CRITERIA		
SMART Objectives		Success Criteria
Complete the project by the end of 2022 by 10% less than the allocated budget.		Budget of completion < by 10% of the allocated budget

Track 100% of the cost of the work done through a daily progress report within the system for 1 year.	Zero missing cost report for the work done
Improving Utilizing the resources of the project by Enhancing the accuracy of the estimation to 95% for the remaining work cost till the end of 2022.	Providing 4 updated reports quarterly
Reduce stakeholders' complaints about the outcomes to 0 and increase their satisfaction to 98% by the end of 2022.	Zero Stakeholders compliant
Improve availability of the purchased parts during the execution of the project to 95% by the end of the project 2022.	Zero-time deal from vendors for equipment's and accessories
Developed local tourism around the Kingdom and increase the satisfaction of using the 3D printers by tourists more than 90% in the tourist areas at the end of 2022 up to mid-2023.	Zero Complaints from tourists
Reduce the rework due to the quality issues of parts to 1 % by the end of 2022.	Less than 1 % rework
Ensure all the installed parts have 100% no defects till the end of 2022.	Zero defects for installed parts
Ensure all the received parts have 100% no defects till the end of 2022.	Zero defects for received parts
Maintain 100 % safe and healthy work area till the end of 2022.	Zero accidents and incidents
Reflect 100% of the achieved progress of the work done till the end of 2022.	Zero missing reports for the work done
Increase the resources utilization up to 98% during the work done till the end of 2022.	Utilization >=98%
Provide more than 20 training courses till the end of 2022.	Provided Training >= 20
Provide training to all the employees and get more than 50% of employees certified in different sectors till the end of 2022.	No. of certified employees >= 50% of company employees

4. HIGH-LEVEL PROJECT MILESTONES

Form Project Team / Preliminary Review / Scope	15/01/22
Finalize Project Plan / Charter / Kick Off	25/03/22
Study, analyze, and propose the proper locations for installing 3D printers	31/04/22
Receiving equipment's and their accessories	28/06/22
Inspect equipment's and their accessories	12/07/22
Install 3D printers in the agreed locations	16/11/22
Project Summary Report and Close Out	20/12/22

5. ASSUMPTIONS, CONSTRAINTS & DEPENDENCIES

ASSUMPTIONS:

- The project follows a Six Sigma DMAIC approach. The corporate has medium-level experience in doing projects according to this methodology. This project assumes that all stakeholders will understand and accept the six sigma-related work products and deliverables.
- All the 3D printers' machines will be delivered by the supplier with their needed accessories to the agreed places.
- The design of 3D printers and the technical specifications need to be specified. The corporate has limited experience in technical designing for the 3D printers. This project assumes that all technical specifications and designing parameters and parts will be specified between USTC and specialized company for that.

CONSTRAINTS:

Cost:

- The project cost 9,689,971 SAR.

Time:

- Time and schedule to complete the project within 52 weeks.

Scope:

- Find, study, analysis and propose the proper and suitable places to install 15 3D printing.
- I was provided and approved by stakeholders.
- Design and define the proper 3D printers' specifications.
- Training the Operators of the 3D printers.

6. RISKS

1. Changes to Project Scope - The project needs to stay focused on the agreed project scope with good communication with all stakeholders.
2. Bad Quality for the received equipment and their accessories- The received equipment and their accessories may get damaged during shipment or have some issues.
- 3-The project may not have the expected benefits and use from the End-users.
- 4-changing the location after 3D printers installation.

7. PROJECT ORGANIZATIONAL STRUCTURE

All personnel assigned to Developmental Projects, including Project Managers, Project coordinator, Financial Analyst, Project Planners and Schedulers, Project engineer. All personnel who provide leadership support above the project level.

8. PROJECT AUTHORIZATION

Approved by: Sponsor Mr. Mohammed Al-Ghamdi 	CEO Omar Ali Al-Ghamdi  Project Manager Rahaf Al-Shehri 	Date 20/12/2021 Date 20/12/2021
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Figure 5. Project Charter

Organization structure of teams and project work units:

The corporate structure of teams and project work units is a Strong matrix organization chart (a hybrid chart that combines functional and project-based structures) as shown in the below Picture.

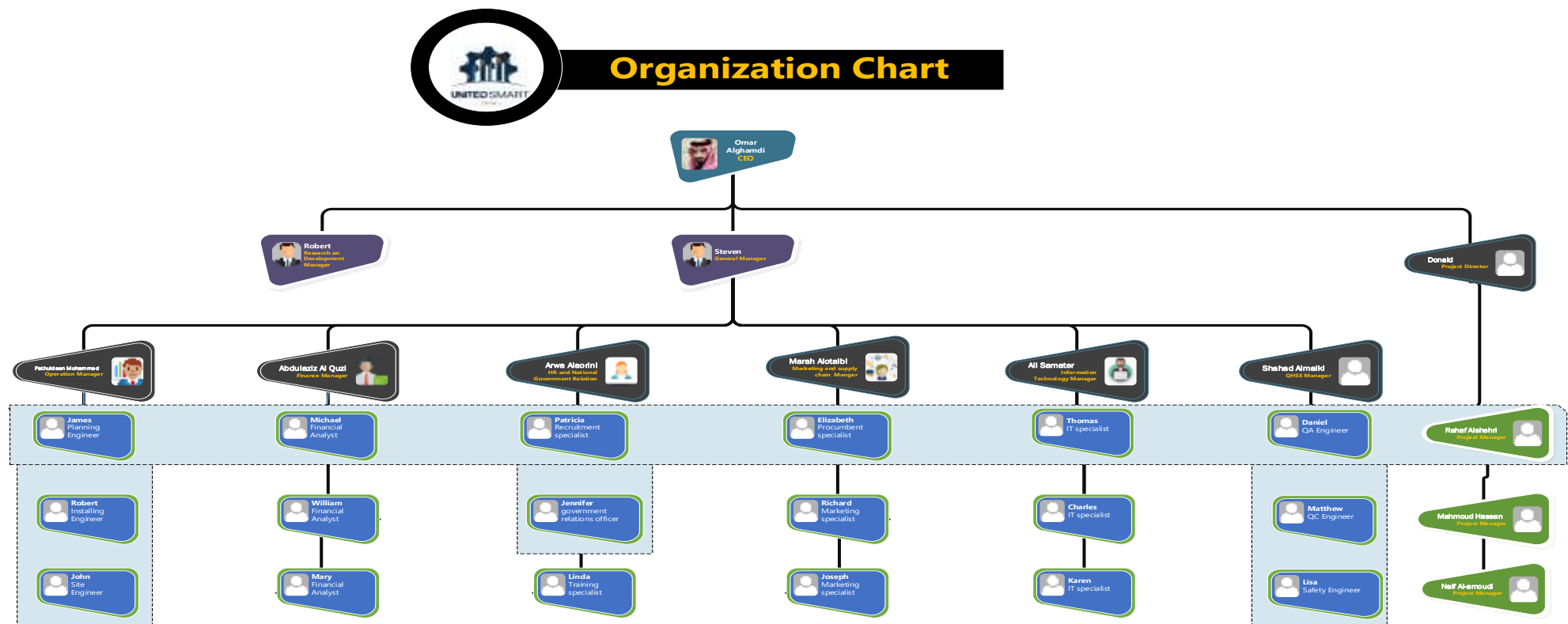


Figure 6. Organization Structure

Practical and scientific bases, which adopted in developing the structure:

United smart Tech. Corporate has 4 levels within its structure. Every level has its level of authority, control, and power as shown in the pyramid.

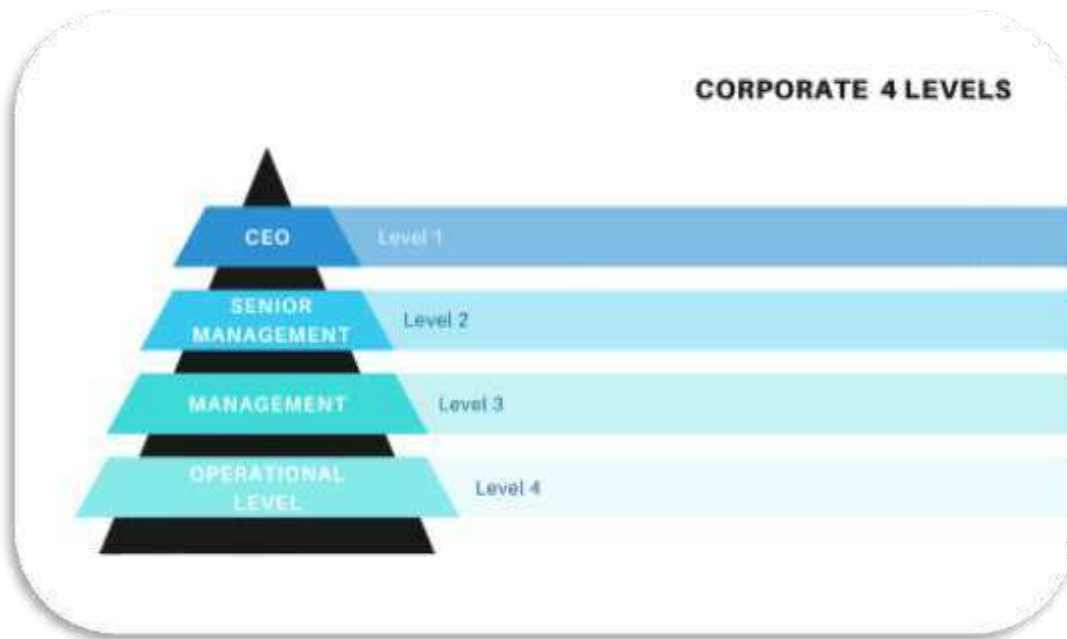


Figure 7. Corporate Levels

The development of organizational structure was based on different bases and factors which are (Team I. E., Matrix Organizational Structure: Advantages and Disadvantages, n.d.) (Herrick, n.d.):

- The long-term plan of the corporate in the future and what we want to provide to our customers.
- The authority and responsibility of the employees at every level.
- The integration among the divisions and departments and employees.
- The effectiveness and efficiencies of employees and their skills and experiences.

-The best way to Increase communication efficiently among the different departments.

-Enhance teamwork and improve employees' development with different responsibilities outside their area of specialization.

-Increasing utilization of resources usage within the corporate.

Project's office model, most appropriate to manage the project and the reason:

For every company that seeks professional control for its projects, it must have a PMO (Project Management Office). The responsibilities of PMO can vary from following processes, managing the project by ensuring they are providing the required product or services in an efficient way to reduce the cost and close the projects within time. There are three different types of projects (Williams, n.d.):

-Supportive PMO's

-Controlling POM's

-Directive POM's

United Smart Tech. Corporate has Directive POM's since it is relying on the projects for its business and need a high level of consistency of practice across all projects to (institute, n.d.) (Rastogi, n.d.):

- Implement a common methodology for all projects.
- Standardize terminology to increase the level of efficiency and consistency.
- Introduce effective repeatable project management processes.
- Provide common supporting tools for all projects.
- Ultimately, the objective is to improve levels of project success within the organization.

Check compliance model before delivering the project outputs:

It's important for every project to have a clear compliance work plan, to avoid the compliance risk and delays in the agreed project delivery date. Below compliance model covers five of the most important compliance areas.

General Compliance for Project:

Project Name		Making a Tourist Experience Through 3D Printers Around KSA		Owner		Ministry of Tourism	Main Contractor		United Smart Tech	
Date		1/1/2022		Day		Sunday	Ref		01-Rev03	
Requirements						Compliance				
No.	Compliance Area	Goal / Deliverable	Due Date	Responsible	Details of Deliverables	Goal / Deliverable	Compliant (Yes/No/NA)	Compare to Expectations (Low / Normal / High)	Remarks	
1	Governmental	Commercial Registration	3/1/2022	National Government Relation Officer	Avoid Penalties and Delays in starting the project	Issue and obtain				
		Business License	5/1/2022			Issue and obtain				
		Municipal License	7/1/2022			Issue and obtain				
		File with General Authority of Zakat & Tax	9/1/2022			Issue and obtain				

		File with General Organization for Social Insurances (GOSI)	11/1/2022			Issue and obtain			
		File with Ministry of Labor and Social Development	13/1/2022			Issue and obtain			
2	Operational	Installation and construction permit from each organization around KSA	15/2/2022	Operation Manager &	Smooth implementation	Issue and obtain			
		Drawings and designs approval	25/2/2022	HR and National Government Manager		Issue and obtain			
		Import certificates for the Custom Clearance regulations for the 3D printers (SABER, IEEE, COC..etc..)	1/3/2022			Issue and obtain			
3	Quality Assurance	ISO 9001 Certificate	15/2/2022	QSHE Manager	Prevent mistakes and defects process at every stage	Issue and obtain			
		Test Reports	25/2/2022			Issue and obtain			
		Maintain the Approved Supplier List	1/3/2022			Issue and obtain			
		Audit & inspection reports	112/7/2022			Issue and obtain			
4	Health & Safety	ISO 45001 Certificate	15/2/2022	QSHE Manager	Workplace Health and	Issue and obtain			



5	Standard	Measurement and Monitoring of Safety (MMS)	25/2/2022		Safety Standards will help organizations meet their legal obligations and protect staff	Issue and obtain			
		Audit Reports	1/4/2022			Issue and obtain			
		Health & Safety Plan	112/7/2022			Issue and obtain			
	Human Resources	Saudization	3/2/2022	HR and National Government Manager	Maintain productive & trained manpower	Issue and obtain			
		Residency Permits	25/2/2022			Issue and obtain			
		Training Program	1/12/2022		Meet Saudi employment regulation	Issue and obtain			

Table 9. General Compliance for Project

Specific Compliance for Project output:

The below compliance model describes all the required technical specifications for the 3D printers. The results represent that all the specifications are complied to the requirements and for those which don't comply they are exceeding the expected outcome.

Project Name	Making a Tourist Experience Through 3D Printers Around KSA	Owner	Ministry of Tourism	Main Contractor	United Smart Tech		
Date	1/1/2022	Day	Sunday	Ref	01-Rev03		
Requirements				Compliance			
No.	Goal / Deliverable	Responsible	Details of Deliverables	Goal / Deliverable	Compliant (Yes/No/NA)	Compare to Expectations (Low / Normal / High)	Remarks
1	High technical specification of the 3D printer	Operation Dep	The X-Y resolution r of the 3D printer should be between 15-80 μm	The X-Y resolution provided 15 μm and its adjustable			
2	High technical specification of the 3D printer	Operation Dep	The Z resolution r of the 3D printer should be between 0.781μm	0.781μm			
3	High technical specification of the 3D printer	Operation Dep	Typical printing speed: 120 mm/s	Typical printing speed: 130 mm/s			

4	High technical specification of the 3D printer	Operation Dep	Print Multi colors	Print Multi colors			
5	High technical specification of the 3D printer	Operation Dep	Have a smart interface screen that is easy to use	Have a smart interface screen that is easy to use			
6	PLA filament	Operation Dep	The material used for printing should be PLA 1.75mm	The material used for printing should be PLA 1.75mm			
7	Maintenance	Operation Dep	The contractor should provide a minimum of 2 years of operation maintenance of the printer after installing	The 3D printers are provided with 5 years insurance and maintenance policy from the supplier			
8	Follow Health & Safety standards	QHSE Dep	The printers should be safe for public use (Flameless, High-temperature warning)	The printers should be safe for public use (Flameless , High-temperature warning (			



9	Productive manpower	Operation Dep	Training program for the staff who will be handling the 3 d printers after launching	3 months training program will be provided for the staff who will be handling the 3 d printers after launching			
---	---------------------	---------------	--	--	--	--	--

Table 10. Specific Compliance for Project output

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

A project checklist is an important tool that represents the activities required for each phase of the project and the completion status. The below checklist was built to ensure that all the deliverables and documentation are completed.

PROJECT DOCUMENTATION CHECKLIST

Eff Date: 15-Jan-22
 Doc Code : ES-FM-16 (5)
 Page: 1 of 4
 Owner: USTC / Projects
 Issue date:

CUSTOMER NAME & LOCATION		PROJECT CLASSIFICATION			
Ministry of Tourism of Saudi Arabia – Saudi Arabia		☐ BULK INSTALLATION ☐ ENGINEERING & INSTALLATION E & I ☐ SPECIAL PROJECTS ☐ OTHERS (pls. specify)			
PROJECT TITLE	Making a Tourists Experience Through 3D Printers Around KSA				
ASSIGNED PE		COMPLETION DATE	31/12/2022		
Phase		Status	Due Date	Responsible	
Initiation	☐	Scope Review and sign-off	Done		
	☐	Set Project Goal and Objectives	Done		
	☐	Determine the Project deliverables	Done		
	☐	Budget Approval	Done		
	☐	Identify the roles and constraints	Done		
	☐	Identify Stakeholders and make stakeholders register	Done		
	☐	Resource's requirements	Done		
	☐	Establishing Project Charter	Done		

Note: This checklist should be attached in front of project files and will serve as a Table of Content

Figure 8. Initiation Project checklist

PROJECT DOCUMENTATION CHECKLIST

Eff Date: 15-Jan-22
 Doc Code : ES-FM-16 (5)
 Page: 2 of 4
 Owner: USTC / Projects
 Issue date:



CUSTOMER NAME & LOCATION		PROJECT CLASSIFICATION			
Ministry of Tourism of Saudi Arabia – Saudi Arabia		☐ BULK INSTALLATION ☐ ENGINEERING & INSTALLATION E & I ☐ SPECIAL PROJECTS ☐ OTHERS (pls. specify)			
PROJECT TITLE	Making a Tourists Experience Through 3D Printers Around KSA				
ASSIGNED PE		COMPLETION DATE	31/12/2022		
Phase			Status	Due Date	Responsible
Planning	☐	Identify Technical and Functional requirements of the 3D printers	Done		
	☐	Study the proper and safe location in the tourist areas for Installing 3D printers	Done		
	☐	Develop work breakdown structure	Done		
	☐	Develop project schedule and identify the milestones	Done		
	☐	Create Communication plan	Done		
	☐	Develop a risk assessment plan	Done		
	☐	Develop Resources management plan	Done		
	☐	Develop Quality Plan	Done		
	☐	Hold “Kick-off” meeting	Done		

Note: This checklist should be attached in front of project files and will serve as a Table of Content

Figure 9. Planning Project checklist

PROJECT DOCUMENTATION CHECKLIST

Eff Date: 15-Jan-22
 Doc Code : ES-FM-16 (5)
 Page: 3 of 4
 Owner: USTC / Projects
 Issue date:

CUSTOMER NAME & LOCATION		PROJECT CLASSIFICATION			
Ministry of Tourism of Saudi Arabia – Saudi Arabia		☐ BULK INSTALLATION ☐ ENGINEERING & INSTALLATION E & I ☐ SPECIAL PROJECTS ☐ OTHERS (pls. specify)			
PROJECT TITLE		Making a Tourists Experience Through 3D Printers Around KSA			
ASSIGNED PE		COMPLETION DATE		31/12/2022	
Phase			Status	Due Date	Responsible
Execution	☐	Develop status reports and manage sponsor expectation			
	☐	Perform Quality Assurance / Testing			
	☐	Procurement document package			
	☐	Address risk/ Corrective action			
	☐	Change Requests			
	☐	Install 3D printers in the agreed locations			

Note: This checklist should be attached in front of project files and will serve as a Table of Content

Figure 10. Execution Project

Eff Date: 15-Jan-22
 Doc Code : ES-FM-16 (5)
 Page: 4 of 4
 Owner: USTC / Projects
 Issue date:

PROJECT DOCUMENTATION CHECKLIST

CUSTOMER NAME & LOCATION		PROJECT CLASSIFICATION			
Ministry of Tourism of Saudi Arabia – Saudi Arabia		☐ BULK INSTALLATION ☐ ENGINEERING & INSTALLATION E & I ☐ SPECIAL PROJECTS ☐ OTHERS (pls. specify)			
PROJECT TITLE		Making a Tourists Experience Through 3D Printers Around KSA			
ASSIGNED PE		COMPLETION DATE		31/12/2022	
Phase			Status	Due Date	Responsible
Closure	☐	Confirm with the sponsor that success factors are met			
	☐	Resources are released			
	☐	Hold project Close-out meeting			
	☐	The final project closure report is assembled and distributed			
	☐	Submitting Lessons Learned for all phases of the project			

Note: This checklist should be attached in front of project files and will serve as a Table of Content

Figure 11. Close Project checklist

Stakeholder register and form groups for them:

Stakeholders' management is a very important discipline for project managers during project management.

➤ **Summary**

A project is successful when it achieves its objectives and meets or exceeds the expectations of the stake-holders. Considering that in the organization or business, it's easy to get swept up in the day today. It is likely juggling new projects, customers, clients, services, technologies, objectives, and outcomes. Thus, it's important to realize that the success of day-to-day activities depends on one thing, people. In other words, the stakeholders. (Bdaiwi, n.d.) (Project, 2021)

So, in our project, we do realize and talk more about the importance of our stakeholders, how our stakeholders might be, what are their impact in our project whether is positive and negative.

➤ **Identifications of our Stakeholders**

Stakeholders have a defining role in any project because they can negatively and positively influence it. Therefore, it's essential for the project's success that you can recognize your project stakeholders and understand their expectations during project initiations. So, basically Identifying the stakeholders is the first step toward effectively managing them and using them to steer our project towards successful execution. (Usmani, 2021)

How to identify stakeholders in a project



Figure 12. How to identify Stakeholders in a project

There has to be a significant effort toward identifying project stakeholders early on. This involves prioritizing stakeholders according to the interests of our client and other stakeholders in the project as well as their overall impact and influence on the project.

So, as we have all this information, we are in a step of identifying our stakeholders, it is also significant to have all the right steps to go through stakeholders' interests and how to deal with them in the right way. Considering that managing all the different stakeholders is perhaps the most critical part of the project. Managing stakeholders effectively. (Team, n.d.)

Thus, based on these four steps, we identify our project stakeholders:

1. Project Charter
2. Reviewing the Enterprise Environmental Factors
3. Interviewing the influencers
4. Asking questions

There are also five ways which help us toward efficient management of project stakeholders:

1. Involve stakeholders throughout the project
2. All stakeholders must agree on the deliverables
3. Define mechanisms that govern changes
4. Effective communication is key
5. Try to see things from their perspective

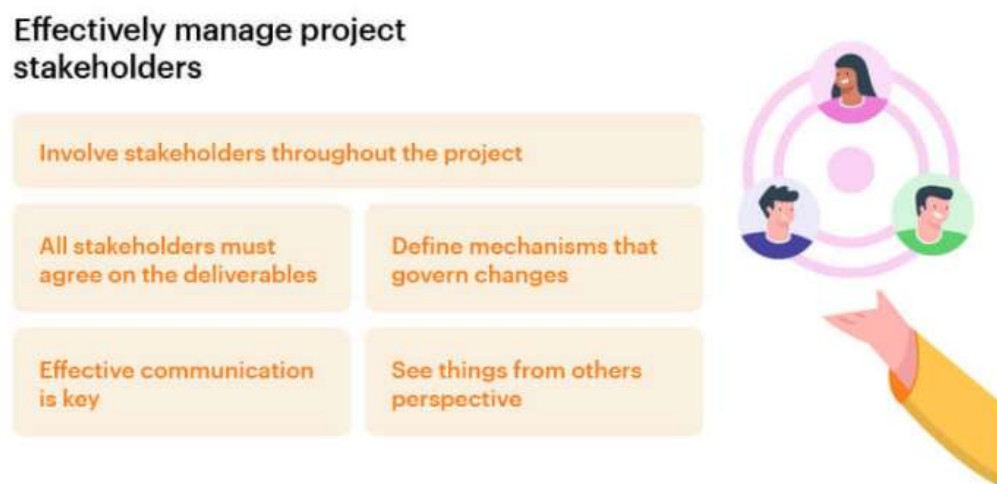


Figure 13. Effectively manage project Stakeholders

The importance of the stakeholders:

Project stakeholders are probably the most critical people who play a role in the project's success.

As mentioned above, any project's success depends on the satisfaction of our stakeholders. Understanding the needs and expectations of our stakeholders is very important for successful project execution. Therefore, the role of stakeholders in our project is important because of the following reasons:

They bring experience to the table

Stakeholders often provide invaluable expertise about the project. They have a sound understanding of the relevant process and how things work in the industry. Based on their experience, they can provide clear deliverables and identify project constraints that our project manager might not be aware of. (Team, n.d.)

They help identify risks

The only way to mitigate risks is to first identify them. This is where our stakeholders can offer valuable insights. They might also raise concerns at the beginning of the project and might want to discuss potential risks. So, identifying risks at the beginning can allow us to prepare accordingly and prepare contingency plans. (Team, n.d.)

They help increase the chances of success

Engaging with stakeholders helps to have a clear view of the project expectations right from the start. It also helps keep them on the same page regarding their expectations of the project, especially as the project progresses. Taking continuous input from stakeholders might increase their interests and stakes in our project. This can increase the chances of our project success dramatically.

Furthermore, our project stakeholders are grouped into two categories which are as follows:



Figure 14. Internal and External Stakeholders

Internal stakeholders

These individuals or organizations are involved in the project from within the organization. They include (but are not limited to):

The project team: United Smart Tech Co, Project Management Team

The project manager: The project manager of United Smart Tech Co,

The sponsor: Ministry of Tourism

Functional Managers: Other Managers/Teams or departments of United Smart Tech Co,

External stakeholders

External stakeholders are affected by the project's outcome even though they are not involved in the project directly. They include but are not limited to:

The external clients (Ministry of Tourism)

The end-user (The Tourists)

The subcontractors (if there is)

The government/Services providers (Ministry of Tourism, Municipalities, Saudi Electric Co, Ministry of transportation)

The supplier (Vendors of the 3D printers, Vendors of other facilities).

Thus, the stakeholders' aspect is considered a major factor of project success, and behavior is one of the majors that drive successful project management. as today's world virtual project teams often not co-located are commonplace. In this environment, it is essential that behavior, emotions, and culture be well understood by our project manager and the project team members (Team, n.d.).

However, we all know that projects are considered successful only when they are completed within the boundaries of scope, time, cost, and quality (when achieve there are objectives). Poor project management is detrimental and can be very difficult to deal with – especially large projects that exceed there is own allocated budget.

Hence, there are several ways that we will use to make the required identification, prioritizing, and requirements of our stakeholder engagement and some essential tools to help us to get it all done. The below table is showing the Stakeholder register and form groups (Team, n.d.).

Stakeholder register and form groups for them:

Stakeholder	Stakeholder role	Organization or Group	Requirements	Expectations	Stakeholder Analysis Group	Internal / External	Classification	Power (H/L)	Interest (H/L)	Influence (H/L)
Ministry of Tourism	Partner	Saudi Government	1-Study the proper and safe location based on a study within the tourist areas for Installing 3D printers. 2-Receive all the 3D printers and their accessories. 3-inspect all the 3D printers and their accessories. 4-Install 15 3D printers in the agreed places. 5-Test 15 3D printers after installation. 6-Provide Training for the equipment operators. 7-Handover the equipment to the ministry.	Finish project on time Finish project with Budget Update the progress of the project frequently	Meet their need	External	Primary	High	Low	Low
General Authority of Civil Aviation	Partner	Saudi Government	documents Submitting all needed	Communicate with them	Keep informed	External	Primary	Low	High	High
Omer Alghamdi	CEO	United Smart Company	Following the Corporate strategies and rules policies	Finish project on	Key player	Internal	Primary	High	Low	Low

Steven	General Manager	United Smart Company	Commitment on work
Robert	Research and development manager	United Smart Company	Professionalism on work
Donald	Project Director	United Smart Company	Keep Customer Satisfied
Rahaf Alshehri	Project Manager	United Smart Company	
Fathuldeen Mohammed	Operation Manager	United Smart Company	
Abdulazi Al Quzi z	Finance Manager	United Smart Company	
Arwa Alaorini	HR and National Government Relation	United Smart Company	
Mahmou Hassan d	Project Manager	United Smart Company	



time	Key player	Internal	Primary	High	Low	Low
Finish project with Budget or less	Key player	Internal	Primary	Low	Low	Low
Update the progress of the project frequently	Key player	Internal	Primary	High	Low	Low
	Key player	Internal	Primary	High	High	High
	Key player	Internal	Primary	High	High	High
	Key player	Internal	Primary	High	High	High
	Key player	Internal	Primary	High	High	High
	Key player	Internal	Primary	High	High	High

Marah Alotaibi	Marketing Manager	United Smart Company			Key player	Internal	Primary	High	High	High
Ali Samater	Information Technology Manager	United Smart Company			Key player	Internal	Primary	High	High	High
Shahad Almalki	QHSE Manager	United Smart Company			Key player	Internal	Primary	High	High	Low
Al- Naif amoudi	Project Manager	United Smart Company			Key player	Internal	Primary	High	High	High
Team Members	Member	United Smart Company			Key player	Internal	Primary	High	High	High
Ahmad	Site security manager	Police	Room Provide Car and	Fast delivered	Keep informed	External	Secondary	High	Low	Low
D3 printer Vendors	Supplier	Company	Features of 3D printers All Specifications and	To be clear and fast delivered	Keep Communicate	External	Secondary	Low	High	High
Tourists	End users	Public	printers Ease of use and fast 3D	Accessible with affordable price	Meet their need	External	Secondary	Low	High	High

Subcontractors	Other activities related	Company	All requirements from main contractor	To be clear and fast delivered	Keep Communicate	External	Secondary	Low	High	High
Saudi Electric Co	Other activities related	Company	D printers are specified3 the The locations of	The locations of D 3 the printers are specified	Keep Communicate	External	Secondary	Low	High	High

Table 11. Stakeholder register and form groups

Two networks: (Strength/Interest) and (Influence/ Strength):

(Strength/Interest):

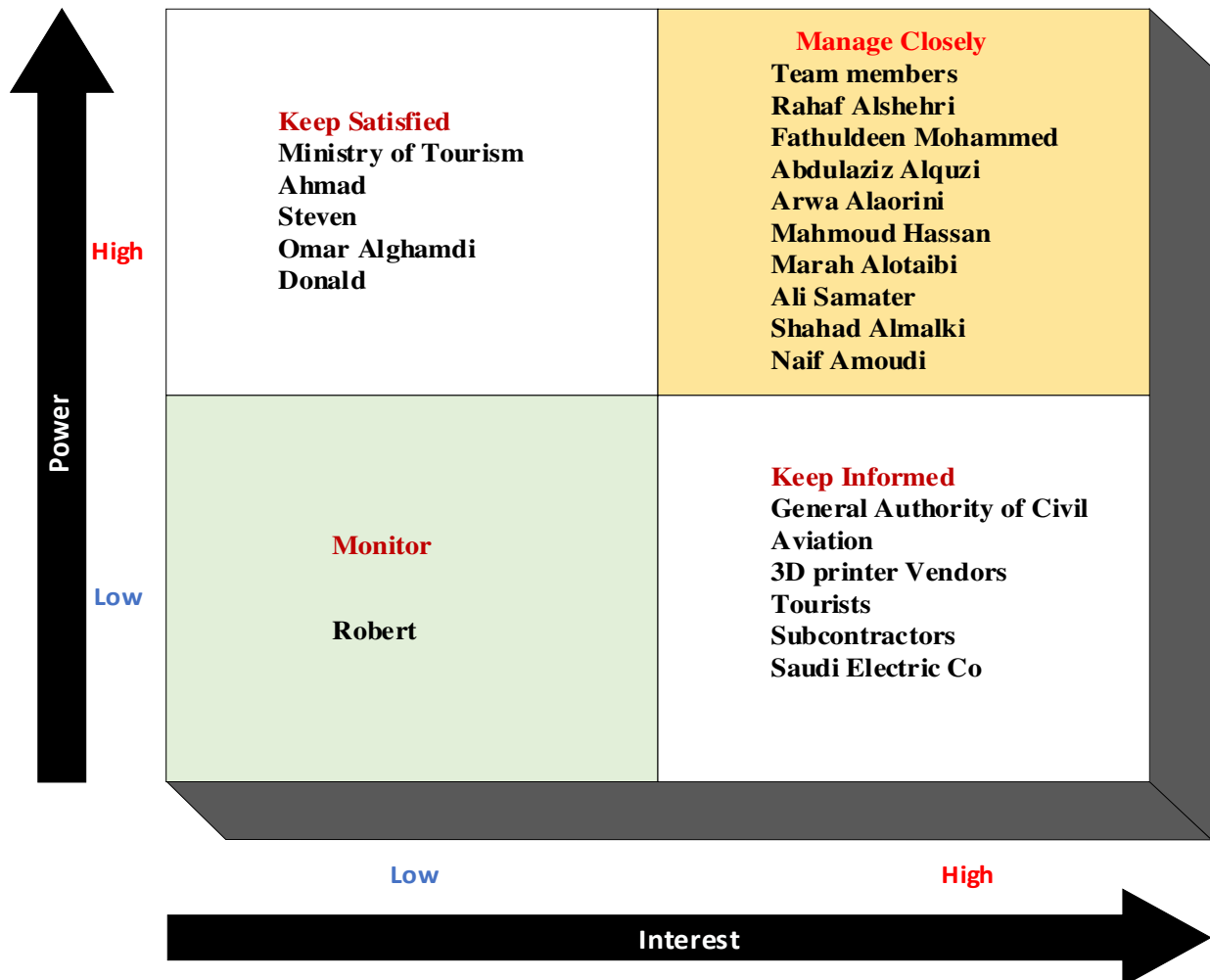


Figure 15. Strength/ Interest Network

(Strength /Influence):

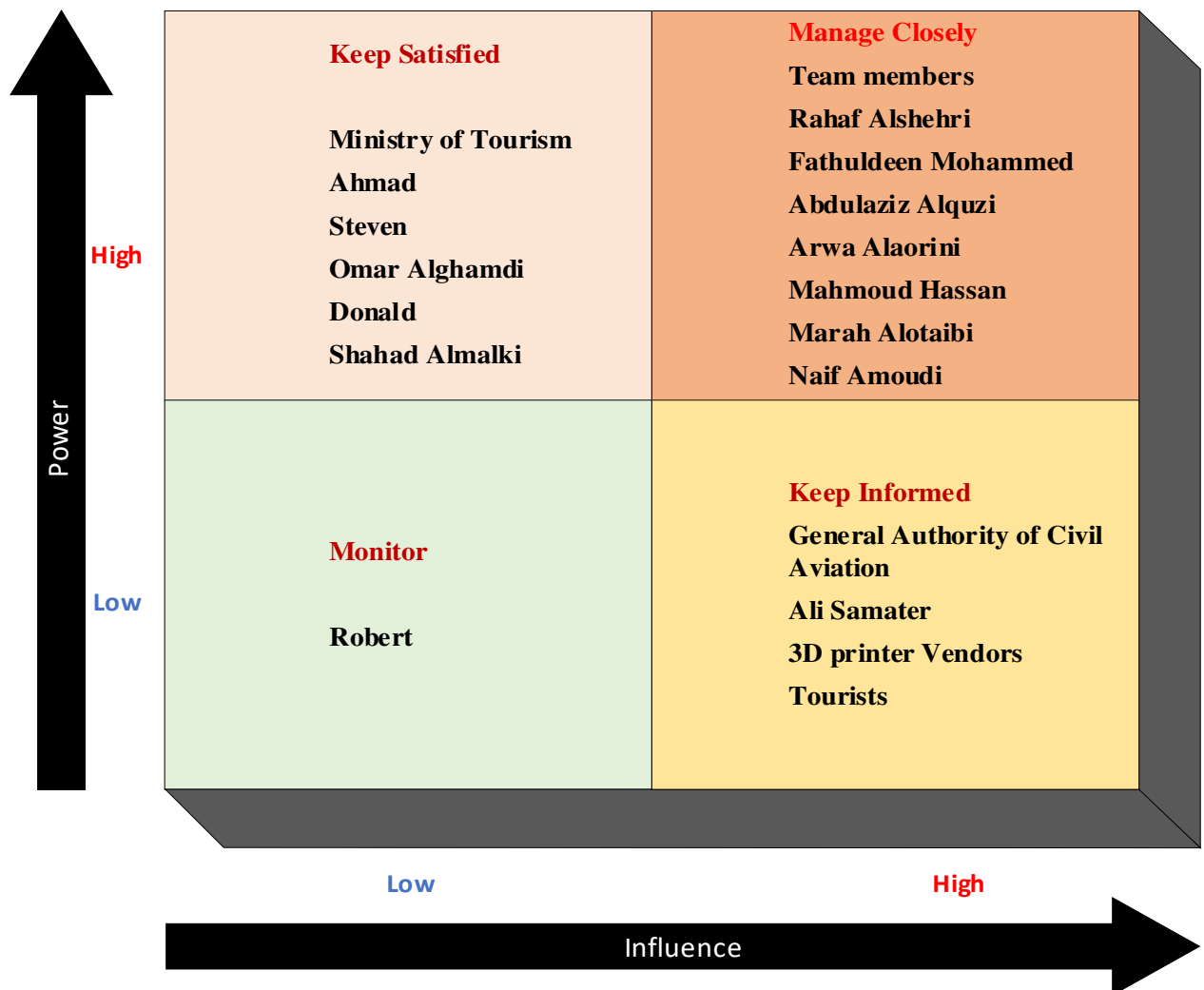


Figure 16. Strength/ Influence Network

Logical diagrams for the register of the stakeholder:

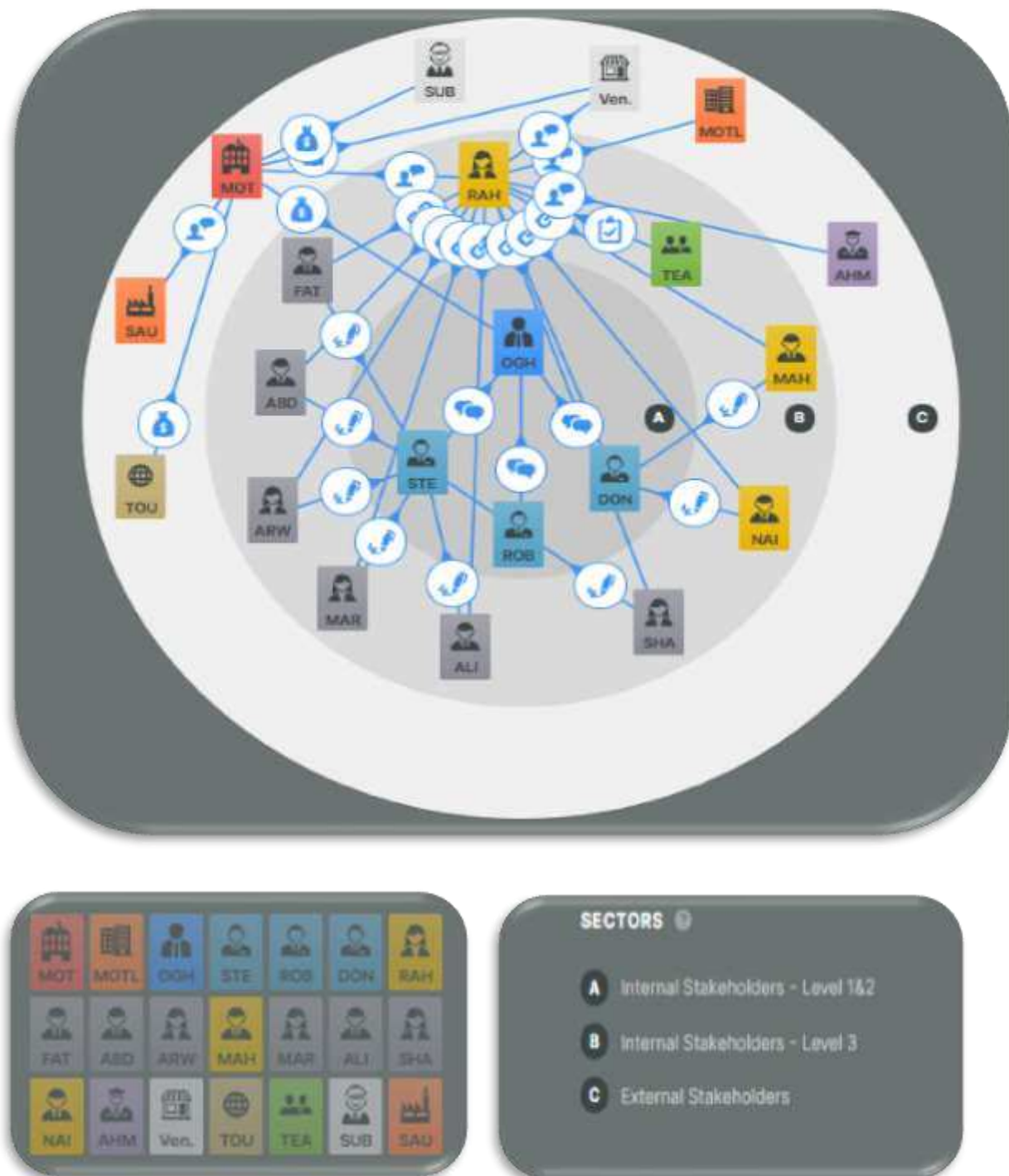


Figure 17. Logical diagrams for the register of the stakeholder.



Figure 18. Key Players within Level 1 & 2 in top management.



Figure 19. Internal Communication and reporting Directly for this specific Project between level 3 and 4.



Figure 20. Direct Communication and reporting between internal and external stakeholders.



Figure 21. Internal reporting between level 2 & 3.

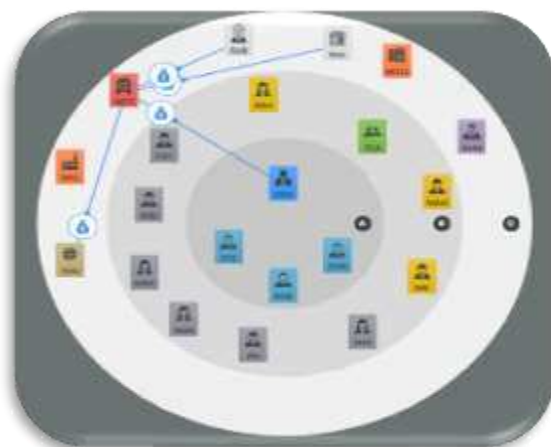


Figure 22. Money Transaction.

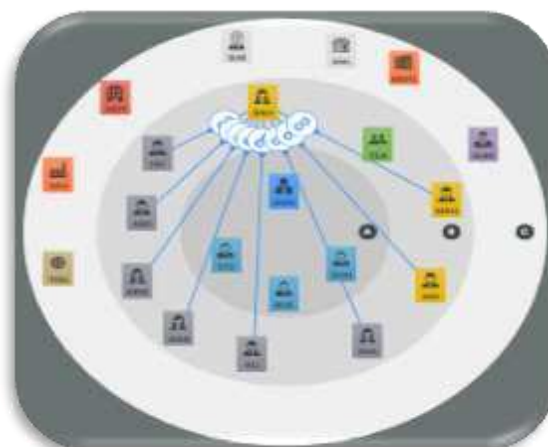


Figure 23. Follow up between departments Managers and Project Managers.

Organizational culture:

Our behavior is what defines us – as a company, as employees, as people. Everything we do is anchored by our corporate values: **Safety**, **Accountability**, **Excellence**, and **Integrity**. By living our values and sound business practices, we consistently achieve high levels of performance and efficiency – delivering value not only for our company but for our customers, partners, and the communities in which we operate.

Excellence:

United Smart Tech Corporation, excellence translates into all aspects of our workplace. It is our personal and group commitment to doing what we do well. We drive for the best results and are agile in addressing new challenges.

As a business, we drive excellence by setting challenging goals, rewarding top performance, committing ourselves to develop our people, encouraging innovation, creativity, and diversity of thought, and fostering teamwork and open communication.

Accountability:

Accountability means all employees at USTC take responsibility for their actions in meeting corporate objectives. Accountability for achieving the company's overarching business objectives starts with the goals and objectives outlined by the president & CEO for the company's business lines and pervades through the entire company.

Our employees place authority where responsibility lies, deliver on commitments, and seek and provide constructive feedback.

Safety:

Safety is an integral part of USTC culture. We are committed to providing a safe and respectful working environment for all with the appropriate safety procedures and policies in place onsite and within the community.

We define Safety as protecting ourselves, protecting others, and protecting our future.

Integrity:

The integrity of business at USTC is based on the ethical standards of our employees in our everyday operations. Integrity is a precious asset; it is our reputation and the foundation of corporate integrity is personal integrity.

We treat people with fairness and respect, we embrace diversity and accept differences.

Proposals of the organization values that can be adopted:

There are some professional values that can be adopted by the organization as showing in the below picture:

-INNOVATION.

-RELIABILITY.

-COMMITMENT.

-EMPOWERMENT.

-ADAPTABILITY.

Proposals of the organization values that can be adopted



Figure 24. Proposal for Organization Values that can be adapted

Competence

Being good at what
I do, capable,
effective

People Competences

Section 2

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“3” personal behaviors of the Stakeholders that can influence on the project and study such behaviors, identify their reasons, and how they can be eliminated:

As a technological company that is responsible for such a huge project (Making tourists experience through 3D printers around K.S.A). Undoubtedly, we have a tremendous of stakeholders as identified above.

Furthermore, it is significant to highlight the behaviors that we might encounter with our stakeholders during the project lifecycle. Considering that the Stakeholder Analysis is one of the significant steps in the Project Management Lifecycle, it is also an important process that successful people use to win support from others. In addition, managing stakeholders will help us to ensure our project succeeds. (Team, n.d.).

External Stakeholders behaviors:

No	Stakeholders of the project	External/Internal Stakeholders	Negative Behaviors/Impact	Reasons for Negative Behaviors	Impact (High/Medium/Low)	Likelihood (High/Medium/Low)	Result	Elimination of Negative Impact
1	Ministry of Tourism	External	Delay provision of agreed services providers. SOW changes due to new requirements from the project sponsor	• Due to unavailability resources and overcommitted	High	Medium	High to medium likelihood	Strong Communication between USTC-PMT & Other stakeholders Top management agreement.
2	Subcontractors	External			High	High		
3	General Authority of Civil Aviation	External			High	High		
4	Vendors	External			High	High		
5	Saudi Electrical Company (SEC)	External	Delay to delivery of materials from suppliers/vendors	• Changes of the SOW is usually due to new requirements from the project sponsor	Medium	Low	Medium to a low likelihood	Understanding the project requirements & needs early on. Transform USTC-PMT experience to

6	The Tourists (End-user)	External	ors resulting from EEF, or economic changes	Due to Environmental Enterprise Factor (EEF), or economic changes	Medium	Low	Medium to a low likelihood	other stakeholders Understands of the project importance
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Table 12. Analysis of External Stakeholders behaviors

Internal Stakeholders behaviors:

No	Stakeholders of the project	External /Internal Stakeholders	Negative Behaviors/Impact	Reasons for Negative Behaviors	Impact (High /Medium /Low)	Likelihood (High /Medium/ Low)	Result	Elimination of Negative Impact
1	United Smart Tech Co, (Human Resource)	Internal	Change of Stakeholders' awareness and interest.	Unclear of project objectives and strategic	High	High	High to the medium likelihood	Enhancing to be committed to the Core Team values & concepts.
2	United Smart Tech Co, (Finance)	Internal	Uncontrolled project funds & Lack of commitment to core team values and concepts	- Uncontrolled scope creep - Unclear of Team charter	High	High		Launch training programs of Project Management ethics
3	United Smart Tech Co (PMT)	Internal	Resources availability to internal enterprise factors and unawareness of HR functional.	Due to internal enterprise factors and unawareness of HR functional.	Medium	Medium	Medium to a low likelihood	Early preparation of internal enterprise factors and HR functionals

Table 13. Analysis of Internal Stakeholders behaviors

Self-professional assessment by using SWOT model

Many suggest the **SWOT** (**Strength**, **Weaknesses**, **Opportunities**, **Threats**) system as an analytical tool that should be used to categorize essential environmental factors that are both internal and external to the organization or project.

However, **SWOT** Analysis is a technique that is used in organizations for strategic planning and strategic management. In order to develop organizational strategy, it can be also used effectively during the project lifecycle. (Usmani, 2021)

Furthermore, the method covers four areas in two dimensions. It has four parts: **Strengths**, **Weaknesses**, **Opportunities**, **Threats**. Strengths and Weaknesses are internal factors, and the organization's features, opportunities, and threats are external environmental factors and it is explained as follows (Usmani, 2021):

Strength:

- The organization's manpower and staff are professional and have very good and long experiences in the same field.
- The organization software is updating frequently to the latest one and using the latest technology.
- The project team is dealing with the project based on an Agile mindset and having good background.
- Great deals with sponsors and stockholders.
- Reachable for the target market.

- The reputation of the organization is very good and has a good market share internationally.

Weaknesses:

- Many of the project team members talk only in one language.
- The average old of team members are more than 50 years old and some of them are past 60 years old.
- Some of the team members are working online and virtual due to still their country being locked down.
- Marketing methods are still under improvement and have not reached the latest marketing methods, strategies, and techniques.
- The company structure is complex and there are too many levels and communication channels.
- The company debts are considered a little high and should be covered as per schedule without any delay.

Opportunities:

- Create more creative making campaigns.
- Making the most of the sponsors' deals and involve in the Saudi 2030 vision projects and be a part of the Saudi vision 2030.
- More improvement of market methods, and targeting new customer and place as well as gaining marketing experiences.
- Increase the availability, productivity of credit, and investment potential for the company and other company investors.
- Expanding the company projects and businesses which helps the company to grow more and for sustainability.

Threats:

- One of the threats is negative employee approach and resistance to change employee approach which leads to badly damage the company project and make the company environment unhealthy for work.
- Moreover, the negative employee threat is overconfidence employee threat who doing the job without considering the small issue and those small issues may lead to disaster.
- When the company uses the latest technology in different sectors, they are facing cyber and phishing attack threats.
- Environmental and social threats toward the company projects.

“3” behaviors contradict the moral integrity:

The rise of the Internet has contributed to rapid access to knowledge and to keeping pace with technological innovations. Every educational organization must keep pace with these rapid developments by integrating technology into the educational process in a way that contributes to the higher-level thinking and critical thinking skills of the learner (Manufactur3dmag, 2021), with a view to achieving educational output. Despite the importance of traditional educational trips, they face many challenges and difficulties, the most important of which is the fear of teachers and parents about security and safety procedures during the trip, or the lack of financial support to implement such trips, hence the need to implement virtual trips through 3D experience.

These experiences need care and keeping the liability to come out with the best results and benefits, so we are about to explain personal integrity and liability.

Personal integrity and liability:

Integrity means conducting one's private affairs in the same manner as one's public affairs. It is as important to develop confidence between parties as it is to maintain integrity (Caldwell, 2018). When it comes to human relationships, Ryan Hamm reminds us that "integrity or a lack thereof" can occur at any time. Integrity necessitates adherence to accepted ethical ideals and the norms of behaviours that go along with them (Schöttl, 2015).

In terms of personal integrity, a distinction is frequently made between personal and moral integrity when using the term integrity. As opposed to moral integrity, which indicates a person's commitment to moral values and principles, personal integrity denotes a person's dedication to personal values and principles that they consider important (Crosby, 1991).

There are behaviours that don't comply with personal integrity. By applying those unethical behaviours to the experience through 3D tourism, we can find that these actions have a major effect on many aspects. Following, we are about to mention those immoral behaviours on many career progressions. There are numerous ways in which unethical behaviours might present itself. There are several examples of unethical behaviours in the 3D experience; therefore, we've compiled a few below:

Misleading communications: Falsely representing a product or service by leaving out information that is relevant;

Deceitful marketing methods that inflate expectations beyond reality

Inflating prices in order to use a fake promotion or discount later;

Anti-competitive activity: Competitive price-fixing; Discussion and fixation of consumer price charges with competitors.

(Agreeing with competitors on the markets and clients each will target)

Market sharing; Sharing of information that could reduce competition (for example, prices, stocks, markets, and plans);

Not complying with the regulations: committing a behavior against the rules
(Unethical behavior in the workplace: Definition, examples, and statistics, n.d.).

The impact of the previous behavior on the project if found

Perspective	Misleading communications	Anti-competitive activity	Not complying with the regulations
Financial impact	It won't be harmful to marketing except after the tourist tries for the first time and realize that he was deceived, this would be bad advertising to the experience.	Leads to major financial loss.	Causes harm due to losses that could happen due to breaking the laws.
Technical impact	Causes confusion	Will affect future outcomes due to shortage of finance.	Failure to follow the rules of one of them may lead to stumbling and destroying the part of the technical side
Social impact	Bad advertising and reputation	Bad advertising as this experience is deceitful.	Part of the experience is destroyed and will take time to be fixed leaving a bad impression and Putting down the reputation of the experience

Table 14. Impact of 3 behaviors contradict the moral integrity on the Project

Preparation of the register of the stakeholders:

A Stakeholder is any person or entity that can influence the success of a project in a negative or positive manner. A Stakeholder Register is a document that contains a list of external and internal project stakeholders (Crosby, 1991).

Register of the stakeholders:

Stakeholder	Stakeholder role	Organization or Group	Requirements	Expectations	Stakeholder Analysis Group	Internal / External	Classification	Power (H/L)	Interest (H/L)	Influence (H/L)	Address	Phone numbers	Email address	Communications sent to date
Ministry of Tourism	Partner	Saudi Government	1-Study the proper and safe location based on a study within the tourist areas for Installing 3D printers. 2-Receive all the 3D printers and their accessories. 3-inspect all the 3D printers and their	Finish project on time Finish project with Budget	Meet their need	External	Primary	High	Low	Low	KSA-Riyadh City	118808855	Info@mt.gov.sa	Letters

			accessories. 4-Install 15 3D printers in the agreed places. 5-Test 15 3D printers after installation. 6-Provide Training for the equipment operators. 7-Handover the equipment to the ministry.	Update the progress of the project frequently										
General Authority of Civil Aviation	Partner	Saudi Government	Submitting all needed documents	Communicate them with	Keep informed	External	Primary	Low	High	High	KSA-Riyadh City	118744444	Info@mot.gov.sa	Letters
Omer Alghamdi	CEO	United Smart Company	Following the Corporate strategies and policies rules	Finish project on time	Key player	Internal	Primary	High	Low	Low	KSA-Riyadh City	555511111	Omar@unitedsmart.com	Phone calls
Steven	General Manager	United Smart Company	Commitment on work	Finish project Budget or with less	Key player	Internal	Primary	High	Low	Low	KSA-Riyadh City	555511122	Steven@unitedsmart.com	Phone calls
Robert	Research and developm	United Smart Company	Professionalism on work	Update the progress of the	Key player	Internal	Primary	Low	Low	Low	UAE-Dubai City	555511133	Robert@unitedsmart.com	Phone calls and Letter

United Smart Tech. Corporation

Shahad Almalki	QHSE Manage	United Smart Company			Key player	Internal	Primary	High	High	Low	KSA-Riyadh City	555511112	Shahad@unitedsmart.com	Phone calls
Al- Naif amoudi	Project Manager	United Smart Company			Key player	Internal	Primary	High	High	High	KSA-Riyadh City	555511113	Naif@unitedsmart.com	Phone calls
Team Members	Member	United Smart Company			Key player	Internal	Primary	High	High	High	KSA-Riyadh City	555511114	Workforce@unitedsmart.com	Phone calls
Ahmad	Site security manager	Police	Provide Car Room and	Fast delivered	Keep informed	External	Secondary	High	Low	Low	KSA-Riyadh City	555511115	Ahmad@xx.com	Phone calls and letter
printer D3 Vendors	Supplier	Company	All Specifications Features and of 3D printers	To be clear and fast delivered	Keep Communicate	External	Secondary	Low	High	High	KSA-Riyadh City	555511115	Dtechn@3xxx.com	Phone calls and letter
Tourists	End users	Public	Ease of use and fast 3D printers	Accessible with affordable price	Meet their need	External	Secondary	Low	High	High	Around KSA	NA	NA	NA
Subcontractors	Other activities related	Company	All requirements from the main contractor	To be clear and fast delivered	Keep Communicate	External	Secondary	Low	High	High	KSA-Riyadh City	555511115	Dtechn@3xxx.com	Phone calls and letter
Saudi Electric Co	Other activities related	Company	The locations D 3 the of printers are specified	The locations D 3 of the printers are specified	Keep Communicate	External	Secondary	Low	High	High	KSA-Riyadh City	555511115	Dtechn@3xxx.com	Phone calls and letter

Table 15. Register for Stakeholder

Stakeholder Analysis:

Stakeholder	Stakeholder role	Organization or Group	Stakeholder Analysis Group	Phase	Importance				Success Priorities. Most to least important for the stakeholder				Describe if success priority is "Other"
					Stakeholder Impact on Project	Project Impact on Stakeholder	Stakeholder Rating	Level of Support	Time	Cost	Scope	Other	
Ministry of Tourism	Partner	Saudi Government	Meet their need	All Phases	Low	High	3	Medium	3	1	3		
General Authority of Civil Aviation	Partner	Saudi Government	Keep informed	Project Execution	High	Low	3	Low	3	1	2		
Alghamdi Omer	CEO	United Smart Company	Key player	Project Monitoring and Controlling	Low	High	3	Low	3	3	3		
Steven	General Manager	United Smart Company	Key player	All Phases	Low	High	3	Medium	2	3	2		
Robert	and Research development manager	United Smart Company	Key player	Project Monitoring and Controlling	Low	Medium	2	Low	1	2	2		
Donald	Project Director	United Smart Company	Key player	All Phases	Low	High	3	High	3	3	3		
Alshehri Rahaf	Project Manager	United Smart Company	Key player	All Phases	High	High	3	High	2	3	2		
Fathuldeen Mohammed	Operation Manager	United Smart Company	Key player	Project Planning	High	Medium	6	Medium	2	3	2		
Al Quzi Abdulaziz	Finance Manager	United Smart Company	Key player	Project Planning	High	Medium	6	Medium	2	3	2		

Alaorini Arwa	HR and National Government Relation	United Smart Company	Key player	Project Planning	High	Medium	6	Medium	2	3	2		
Hassan Mahmoud	Project Manager	United Smart Company	Key player	Project Planning	High	Medium	6	Medium	2	3	2		
Alotaibi Marah	Marketing Manager	United Smart Company	Key player	Project Initiation	High	Medium	6	Medium	2	3	2		
Samater Ali	Information Technology Manager	United Smart Company	Key player	Project Planning	High	Medium	6	Medium	2	3	2		
Almalki Shahad	QHSE Manage	United Smart Company	Key player	Project Planning	Low	Medium	2	Medium	2	3	2		
Al-amoudi Naif	Project Manager	United Smart Company	Key player	Project Monitoring and Controlling	High	Medium	6	Medium	2	3	2		
Members Team	Member	United Smart Company	Key player	Project Execution	High	High	9	High	2	1	3		
Ahmad	Site security manager	Police	Keep informed	Project Execution	Low	Low	1	High	2	1	3		
printer Vendors D3	Supplier	Company	Keep Communicate	Project Execution	High	Medium	6	Medium	2	3	3		
Tourists	End users	Public	Meet their need	Project Closeout	High	High	9	Low	3	2	2		
Subcontractors	Other activities related	Company	Keep Communicate	Project Execution	High	Low	3	Medium	2	3	3		
Electric Co Saudi	Other activities related	Company	Keep Communicate	Project Execution	High	Low	3	Low	2	3	3		

Table 16. Stakeholders Analysis

Identification of personal communication and effective communication:

Communication Management Plan

Personal communications:

It is the way that two personnel are sharing the information and discussion on a certain topic, the communication could be direct and indirect, Direct communication is the best way to exchange the information and get the team involved, either it is face to face or through a tool, direct communication supported by the body language and the tone of voice that are all necessary to provide the correct message to the other party,

Personal communications include:

- telephone conversations
- interviews or notes that are not recoverable
- emails
- private letters
- non-archived discussion groups

Personal communication should as well consider the following communication barriers such as

- Language
- Culture
- time zones

Effective communications

It is defined as the communication and feedback, ensuring that the message has been conveyed and understood correctly and the other party sends the feedback of the same understanding and the same level of information.

Identification of the shapes, models, and channels of the personal communication:

Effective communication model

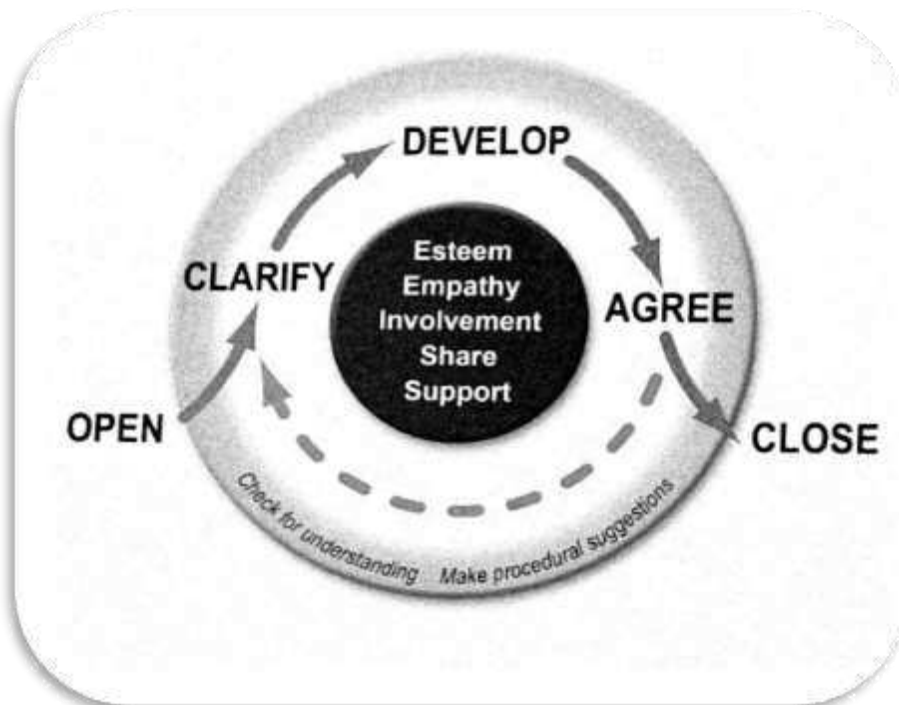


Figure 25. Effective Communication strategy

Effective communication strategy focus on two approaches:

1. Business approach: Open, Clarify, develop, agree, and close
2. Human approach: Esteem, empathy, involvement, share, and support



Figure 26. Effective Communication Approaches

The business approach included opening the issue and clarifying the problem and developing the potential solution and agreeing on it then closing the topic while implementing the human approach meanwhile showing empathy and esteem is a key behavior and doing the necessary involvement and sharing and supporting the ideas.

Effective communication difficulties sometimes appear to be a challenge such as

1. Communication technology
2. Communication methods
3. Communication skills such as
 - Active listening
 - Conflict management
 - Cultural awareness

- Meeting management
- Networking
- Political awareness

To make sure you communicate in the most effective manner possible, you need to know what are the 7 principles of communication. Therefore, the below list of the 7Cs of communication, also known as the 7 principles of communication, will provide you with a useful checklist to ensure good communication in the workplace.

1. Concrete:

When the message that you want to convey is concrete – not liable to have fallen, your audience (team or clients) will have a clear picture of what you're trying to tell them. It will only be concrete when it has suitable data that backs it up. Your argument should be supported by factual material that includes data and figures, leaving no space for the audience to imagine the things.

2. Coherent:

The whole point behind your message will be useless when you are not coherent. You need to have a good understanding of what goes where and what comes when. Coherent communication is logical. It is a well-planned, logical, and sequential manner of communication. There should be a good connection with the main topic and the flow should be consistent.

3. Clarity

The purpose of your message should be clear so that the reader doesn't head up scratching his/her head to understand what you mean. Be clear of what format do

you want to say it in. Be clear about your goal or purpose. Your readers shouldn't have to make assumptions regarding what you're trying to say. For example, the sentences should be short, prefer the active voice and state it in separate bulleted points.

4. Commitment

Commitment is a major part of workplace communication skills. It simply measures one's dedication and the degree to which one communicates surety in the argument. It convinces the prospects kindly. A well-committed message will leave a greater impact and increase your morale.

5. Consistency

The choice of words matters when you are communicating at work. Your words shouldn't leave your team confused. You need to communicate your message in the least possible words, have the consistency of tone, voice, and content so that you can save time. There is no room for repetition. Try to use short sentences and short words.

6. Completeness

Never leave your sentences incomplete. Each message must have a logical conclusion. People shouldn't be left wondering if there is more to come. Make sure you communicate completely that includes the need to be informed and take action.

7. Courteous

Let's keep it positive. Your argument should make the other person respectful. Try your best that in your communication you're honest, respectful, open, and polite. Say it with proper care and it will be perfectly effective and important. Offensive words can put people off.

Establishment the communication matrix:

This section will explain the project communication plan and the purpose of a communication plan is to define who needs to be aware of and informed about the project, how and how often information will be distributed, and who will be responsible for the distribution. Which is a part of the overall Project Management Plan.

It acts as a guiding tool for the process of internal and external communication between parties and works to ensure that you're reaching out to your stakeholders and constituencies effectively. (Juliana Raupp, 2012). The communication matrix was created to clarify the people involved, the methods of effective communication, and the means used to transmit information among them with high efficiency and quality to achieve sound outputs. (Charity Rowland, 2010) Moreover, these communications have been documented and included in the appendix.

Communication matrix:

SUMMARY:

Pinpoint exactly how an individual is communicating and provide a framework for determining logical communication goals.

GOALS:

To clarify the relationships between audiences, messages, channels, activities, and materials.

To include stakeholder input in the communications process.

To ensure that you're reaching out to your stakeholders and constituencies effectively.

NUM BER	TYPE OF COMM	Level of Urgency for RECIPIENTS (1-4)	OBJECTIVES	METHOD OF COMM	FREQUENCY	RECIPIENTS	PERSON RESPONSIBLE	DELIVERABLE	Due Date
1	Kickoff Meeting	4	Introduce project. Review objectives and goals.	F2F	Quarterly	Project Team	Project Manager	●Agenda ● Set Milestones ●Project Scope	25/03/2022
		3				Project Sponsor			
		3				Stakeholders			
2	Project Plan	4	Review Project Plan	F2F	Monthly	Project Team	Project Manager	●Agenda ●Project Charter	25/03/2022
		3				Project Sponsor			
		2				Stakeholders			
3	Technical Requirem ents	4	Determine all the technical requirements that the project needs	Conference call	As needed	Project Team	Information Technology Manager	●Technical Requirements ●Technical Issues ●Technical solution	15/01/2022
		3				Project Sponsor			
		4				Stakeholders			
4	Quality Assurance	4	Fitness to use and conformance to requirements	Conference call	Weekly	Project Team	QHSE Manage	●Quality Standard Checklist	12/7/2022
		2				Project Sponsor			
		3				Stakeholders			
5	Risk Managem ent	4	Identify risks and control threats	F2F/E-mail	Quarterly	Project Team	Operation Manager & QHSE Manage	●Risk Register ●Risk Matrix	25/03/2022
		4				Project Sponsor			
		3				Stakeholders			



6	Performance Update	4	Monitor performance and progress of project phases	Conference call/Virtual Platform	Monthly	Project Sponsor	Project Manager & Project Team	● Performance Report (Phases) ● Dashboard Progress (Phases)	20/12/2022
		4				Stakeholders			
7	Cost Review	2	Monitor expenditures and anticipate needs	Conference call/E-mail	Bi-Monthly	Project Team	Finance Manager	● Financial Report ● Budget Analysis	20/12/2022
		4				Project Sponsor			
		3				Stakeholders			
8	Status Report	4	Review the project progress	In-person/Virtual Platform	Quarterly	Project Sponsor	Project Manager & Project Team	● Progress Report (Overview) ● Dashboard Progress (Overview)	20/12/2022
		4				Stakeholders			

Table 17. Communication Matrix

3 Wrong scenarios of communication:

Communication Challenges

Good communication is an essential skill to manage the success of any project and arguably the most common root cause of problems in any organization and during any project is “lack and/or incorrect communication”. Poor and/or wrong communication is the cause of most conflicts in projects management.

As per the study, one out of five projects is unsuccessful due to ineffective communications. (Pattnaik, 2017).

The process of managing communication through cross-functional teams is not an easy duty that requires leadership, analytical and human skills. However, it may occur some wrong communication during the project phases, and here are the three most prominent scenarios of wrong communication and the consequences of that and how to solve it.

[Scenario 1 \(Weekly meeting vs one-on-one conversations\)](#)

Most project managers give a lot of importance to weekly status meetings. These meetings are important for understanding project progress, providing project updates, and understanding whether all team members are on the same page in terms of understanding project requirements. (Brown, 2020). But it takes a lot of time and effort to prepare in return for delaying the completion of some other tasks, which delays the scheduling of work. Moreover, a lot of changes and decisions will be taken which means many inputs/adjustments in a short period of time.

[Solution](#)

It should be short and direct. Also, to resolve any deeper issues with any team member, you should focus on having one-on-one conversations with your team to find out their problems. They may not be comfortable bringing up their problems during weekly case meetings with everyone present.

Scenario 2 (Emotional Outbursts)

Work pressure, complexity, a large number of technical problems, and conflicts will generate emotional outbursts and cause difficulties and obstruction in the progress of the project in general, which will directly affect the project outputs.

Solution

The project manager should have good listening skills and the ability to read the body language of his team so that he can discover the problem before it escalates. (Mark, 2015)

Regular personal meetings with team members to review their progress on a personal level and discuss their problems, if any, work great to solve many other problems.

Hiring a professional team leader will help resolve 60% of internal conflicts. (Luthra, 2015)

Scenario 3 (Lack of stakeholder engagement)

It is estimated that 1 in 3 projects fail due to poor stakeholder engagement. Stakeholders are critical to project success; failure to communicate regularly with stakeholders can result in project closure sometimes. Lack or weakness of effective planning for all aspects of the project, including managing the expectations of

stakeholders and identifying ways of communicating with them, causes major problems in the project. (Alqaisi, 2016)

Solution

A regular meeting should be conducted with stockholders in order to know what the customer wanted. Moreover, to ensure project success, it helps that you know all of the key stakeholders on your project, how they prefer to communicate, what their needs are, and what the acceptable end results are. (Widman, 2020)

Development and preparation of stakeholder Engagement assessment matrix:

The Stakeholder Engagement Matrix is a very useful tool, and it is mapping current stakeholder engagement levels with the desired levels of engagement required for successful project delivery. (Jaansoo, 2019)

There are five different levels at which we can measure stakeholder participation as follows:

Development and preparation of stakeholder Engagement assessment

matrix:

Legends:	
● High	Desired
● Low	Current

Ministry of Tourism	Power	Interest	Unaware	Resistant	Neutral	Supportive	Leading
Ministry of Tourism	●	●				<u>CD</u>	
General Authority of Civil Aviation	●	●			<u>C</u>	<u>D</u>	
Alghamdi Omer	●	●			<u>C</u>	<u>D</u>	
Steven	●	●					<u>CD</u>
Robert	●	●			<u>C</u>	<u>D</u>	
Donald	●	●					<u>CD</u>
Alshehri Rahaf	●	●					<u>CD</u>
Mohammed Fathuldeen	●	●					<u>CD</u>
Al Quzi Abdulaziz	●	●		<u>C</u>		<u>D</u>	
Alaorini Arwa	●	●					<u>CD</u>
Hassan Mahmoud	●	●					<u>CD</u>
Alotaibi Marah	●	●					<u>CD</u>
Samater Ali	●	●					<u>CD</u>
Almalki Shahad	●	●		<u>C</u>			<u>D</u>
Al-amoudi Naif	●	●					<u>CD</u>
Members Team	●	●					<u>CD</u>
Ahmad	●	●					<u>CD</u>
printer Vendors D3	●	●		<u>C</u>		<u>D</u>	
Tourists	●	●	<u>C</u>			<u>D</u>	
Subcontractors	●	●		<u>C</u>		<u>D</u>	
Electric Co Saudi	●	●	-	<u>C</u>		<u>D</u>	

Table 18. Stakeholders Engagement assessment matrix

Describing and identification of the leadership model, which is preferred to the project leadership:

Leadership models

According to career coach Kathleen Brady, "true leadership is the ability to influence individuals to create a better result for an organization or group. Employee satisfaction, a healthy bottom line, an innovative culture, and social transformation are just a few examples of how a leader's influence may be seen in the workplace. For instance, research reveals that managers have a significant impact on 70% of employee engagement (Helena Cooper-Thomas, 2011), which is measured by how committed and connected an employee feels to their company.

Not all leadership possibilities are found in the business. At every level of an organization, there are leaders and managers who lead modest departmental projects to those who supervise large worldwide initiatives. It's a good idea to familiarize yourself with the leadership model that works best for you before applying for a new leadership position.

What is truly a leader?

A leader is someone who uses their own actions and behaviors to influence or guide others. This could refer to someone who is in charge of a specific division or department inside a company. To be clear, though, seniority isn't a necessity.

Even if you're not in charge of a team on a daily basis, you may need to assume leadership responsibilities from time to time. It's possible you're in charge of a crucial cross-functional project or are required to organize a gathering.

Those are chances for you to take on a leadership role and be held up as an example to the rest of the group. These are also the times when your personal leadership style and qualities will shine through. So, if you don't hold a C-suite position, don't discount these tactics as irrelevant to you (12 Leadership Models That Can Define Your Style, 2021) (Helena Cooper-Thomas, 2011).

What is a leadership model?

In theory, a leadership model outlines the ideal ways to lead and manage personnel. It often implies a manner of reaction to organizational and employee demands that has worked well under that model of leadership.

Leadership models give you a framework for defining the management strategies that are best suited to your working style and personality. You can make modifications and improvements to maximize your efficacy and influence by knowing your personal approach to leadership—both where it came from and where you want to go with it. Despite the fact that there is no such thing as a standalone leadership model, you can take aspects from multiple models and apply them in different contexts or throughout time (12 Leadership Models That Can Define Your Style, 2021).

Despite the fact that leadership models and leadership styles are similar, they are two wholly different things. A leader's style is the pattern of leadership actions they exhibit in pursuit of greatness while the model acts as the intellectual framework to describe what makes a leader great (12 Leadership Models That Can Define Your Style, 2021).

Because of this, leadership models are constantly evolving, even though they go back to ancient times when philosophers were debating whether or not Julius Caesar was the right man to govern (Boogaard, n.d.).

1. Transformational

Integrity and vision are fundamental attributes of transformational leaders. As a transformational leader, you will achieve your goals through open lines of communication with staff, exhibiting your integrity and the respect you hold for your people's expertise and knowledge. This reciprocal regard leads to advances in staff satisfaction and employee retention, both demonstrated to improve overall patient care and safety (12 Leadership Models That Can Define Your Style, 2021).

Once you share your vision for a project, you will need to motivate others to make it a reality. However, you risk ignoring the requirements of individual staff members in pursuit of completing your broader objective.

You Might Be a Transformational Leader If...

You examine every single existing process with a discerning eye and a strong sense that it should be better.

You're always urging others to step outside their comfort zones and challenge their own limitations.

You might burst with pride anytime you witness a team member achieve something that was previously thought to be impossible (Boogaard, n.d.).

2. Transactional

Transactional leadership is a basic rewards-based strategy. It works off the premise that an employee's own interests (as opposed to corporate interests) are the major elements pushing them to accomplish an assigned task or reach a performance level. If you're a transactional leader, you will set performance goals for staff, promise a reward, and offer that reward upon their successful accomplishment of the goal—or impose a consequence if employees don't fulfill their goals. This kind of leadership can be very effective for getting work done, but it fails to give space for

creating connections at work and inspiring staff to submit new ideas (Boogaard, n.d.) (team, 2021).

The transactional model is one of the most prominently adopted in the medical business. It can be a beneficial technique for defining and attaining short-term targets, such as performing specified tasks, achieving quantified patient satisfaction goals, and successfully following all safety regulations.

You Might Be a Transactional Leader If...

You commonly use the prospect of having to stay late when you need to encourage your employees.

You're constantly planning inventive methods to acknowledge great work—your team can't wait to see what you come up with after last month's taco party.

3. Servant

While a servant leader, you will balance selflessness with an emphasis on the greater needs of others as your team works to accomplish your goal. You get insight into your own life and work purpose, the meaning of their leadership activities, and your personal character via self-reflection and awareness. By mentoring your employees, you may help them achieve greater success, thereby enhancing morale and the bottom line.

The interdisciplinary nature of healthcare necessitates the collaboration of a variety of professionals. This is consistent with the servant leader's commitment to collaborate and promote team members in the name of patient care improvement.

You Could Be a Servant Leader If...

You're well-known for asking, "How can I assist?" daily, at least three times.

You place a premium on removing impediments and assisting others in completing tasks.

You never hesitate to assist when asked—because you know that your own to-do list will still be waiting for you when you return.

4. Autocratic

When making choices, autocratic leaders do not consult or consider others' perspectives. You decide on a plan of action and communicate your thoughts with the full assumption that personnel would carry out your instructions without inquiry. This leadership style is effective in situations that necessitate rapid decision-making.

Doctors, nurses, and other senior healthcare professionals must be able to make split-second choices in times of crisis. However, the autocratic leader must bear in mind that if employees and patients are handled in ways that disrespect their needs, they may feel invisible, neglected, and potentially mistreated.

You May Be an Autocratic Leader If...

You believe that group talks and brainstorming just serve to slow down the process and that it is better to make critical decisions alone.

You despise it when staff cast doubt on your decisions—once you've made a statement, it's final.

5. Democratic

Democratic leadership commonly referred to as "participative leadership," is the polar opposite of autocratic leadership. As a democratic leader, you will solicit feedback and views from your staff, even if the final decision is ultimately yours. Utilizing cooperation and conversation effectively can result in an increase in creativity and innovation. However, you may encounter difficulties in situations requiring you to juggle a variety of divergent opinions and ideas.

Certain leadership decisions in healthcare involve input from personnel and brainstorming in order to discover a novel solution to an ongoing problem. The democratic leadership paradigm significantly contributes to employee engagement in problem-solving.

You Might Be a Democratic Leader If...

You think the finest meetings are indeed the ones where everyone has an equal chance to consider.

You can't recall the last time you made a significant decision without receiving advice from at least just one person.

6. Bureaucratic

Following the rules is the secret to bureaucratic leadership success. In this most formulaic of leadership styles, you have a defined job title, a set of tasks, and a pre-existing method for responding to urgent requirements. Requiring such stringent adherence to established norms and protocols can produce a rigid and hostile workplace for employees.

You Might Be a Bureaucratic Leader If...

You regularly find yourself wondering how your predecessor handled particular scenarios—you want to be sure that you're following the recognized process. You always request assurance that you're doing things right anytime you're charged with something new (Boogaard, n.d.).

Why Is it Important to Understand Your Leadership model?

Before we delve right into the deep gritty, there's one important question that has to be answered: Why do leadership models and styles matter?

“Understanding how you lead and desire to lead can offer you a stronger sense of control over the extent and scope of your reach and impact,” adds Joyel Crawford, a Muse career coach, and leadership development consultant (Boogaard, n.d.).

"By increasing your awareness, you can take ownership and responsibility," Tara Padua, executive coach, entrepreneur, and startup advisor add. "Our leadership style is a vortex of our values, natural abilities, and capabilities, [as well as] our beliefs and experiences. Understanding your leadership style can assist you in aligning that whirlpool with your vision, goals, and even the purpose and vision of your firm."

Simply put, in order to have an influence as a leader, you must be effective. And in order to be productive, you must first comprehend your starting point—as well as your destination. Knowing your present strategy establishes a baseline from which you can discover areas for improvement.

Specifying the reasons for which such model is preferred:

For our project, I prefer the model servant as I will explain the reason next. Servant leaders live by the adage, "Serve first, lead second" (Martinuzzi, 2021).

Rather than considering how they may inspire others to follow their lead, they devote the majority of their energy to assisting others. They put the needs of others ahead of their own.

Despite their inherent leadership abilities, persons who practice servant leadership do not attempt to keep a white-knuckle grip on their own status or power. Rather than that, they place a premium on elevating and developing those who follow them.

Pro: This approach boosts morale and fosters trust, resulting in improved employee performance and an overall more favorable workplace culture.

Cons: It's difficult. Constantly putting your own needs and priorities on hold is not something that comes naturally to the majority of us (team, 2021).

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

It is critical to motivating your project team in order to achieve the greatest results. Consider the characteristics of team members, the breadth of their function, and their out-of-office obligations when devising a strategy to engage them individually and collectively. While you cannot control how each person is feeling about their work, there are ways available to motivate and excite your staff.

1. Establish attainable goals

While this may seem self-evident, it is occasionally worthwhile to re-evaluate your project objectives and ensure they are practical and attainable.

Beginning a new project is exciting, and it's tempting to overestimate your own and your team's capabilities. Naturally, you want to work as hard as possible and attain the finest outcomes possible but be careful not to overdo it.

2. Be unambiguous and direct

Once you've established a timeline and some achievable goals for the project, ensure that everyone is aware of their workload and deadlines and that you communicate this clearly to them.

You should develop an environment that encourages your employees to speak up about any concerns they have about the work they have been assigned. For instance,

you may believe you've established an attainable deadline, but your staff member may disagree.

3. Make contact with your team members

Conduct a weekly or monthly catch-up session to check in on your team members' progress.

If they understand that they must demonstrate improvement each week, they will be more driven to adhere to deadlines and work regularly. Additionally, it will foster chances for conversation and collaboration, as well as address issues as they emerge.

4. Praise someone on a job well done.

Maintain a steady flow of positive reinforcement for modest accomplishments to keep your team motivated and respected.

Compliment employees that go above and above, and be sure to do it in front of your team so that other employees are inspired and see the consequences of their efforts.

5. Emphasize adult training

Keep your coworkers updated on any short courses or seminars they might attend to enhance and refine their abilities. Constant learning inspires personnel to push themselves and achieve more within the team, thus funding an outlet to enhance this is a sensible investment.

Management seminars are useful for individuals wishing to progress into higher positions. Gaining an insight into the everyday expectations of a manager is vital not only for broadening your team members' horizons, but may also provide them an insight into why you are making certain decisions day-to-day (Sabel, n.d.).

Designing RACI model for 3 administrative measures of the project:

Administrative measures	Project procedure	Project manager	Consultant	Site Engineer	Contractor	Client
1	Assess risks	A	R	I	C	I
2	Define performance requirement	A	R	I	I	I
3	Approve construction work	I	I	C	C	R

R= RESPONSIBLE A= ACCOUNTABLE C= CONSULTED I= INFORMED

Table 19. RACI model for 3 administrative measures of the project

Identifying of the conflict and crisis:

Conflict in project management is inevitable. The potential for conflict in information systems development projects is usually high because it involves individuals from different backgrounds and orientations working together to complete a complex task. The cause of conflict in team projects can be related to differences in values, attitudes, needs, expectations, perceptions, resources, and personalities. Proper skills in dealing with conflict can assist project managers and other organization members to handle and effectively resolve conflicts which can lead to a more productive organization as a whole. Conflict is "a situation of competition in which the parties are aware of the incompatibility of potential future positions and in which each party wishes to occupy a position which is incompatible with the wishes of the other (Ohlendorf, 2001).

Most project managers dread the thought that one day they may wake up to find that their well-managed project is now front-page news due to an overnight catastrophe. Job descriptions aside— the project manager just became a crisis Team Communication (Sawle, 1991).

3 expected scenarios of the conflict's events in the project, Optimal strategies to deal with each conflict, and specify the reason of preference and Root Cause Analysis:

Scenarios	Strategies Used	Root Cause Analysis
Poor Communication: a lack of communication can be the most costly for people working in construction. By far, a lack of communication will do the most damage to a construction project. Giving wrong or unclear instructions can set a project back. As a project manager, you have to communicate with each worker what needs to be done, when it needs to be done, and how they should go about completing it. A project manager that fails to communicate in a clear way will set up the project for failure. A lack of communication can delay a project by a lot of time and will increase costs as a result. Communicating with your workers is crucial. It gives the project manager the ability to oversee how the project is developing and also gives them insight into some of the problems happening onsite. (Hojati, 2018)	Collaborating is an effective technique to manage conflict when a project situation is too important to be compromised. (Admin, 2018)	Many times, it so happens that team members work in silos and are not aware of the progress of each other's tasks. This lack of communication can stall the progress of projects . Clear communication is a must to avoid confusion and to keep everyone on the same page. With each individual clear about his tasks, the chances of task duplication are reduced to a minimum.
Managing Stakeholders: Often there is more than one major stakeholder in the project. An increase in the number of stakeholders adds stress to the project and influences the project's complexity level . stakeholders can lose track of what's going on in your project, as they may be splitting their time between multiple concerns or are simply unclear about how things are developing. (Solera, 2009)	Smoothing, or accommodating, is an appealing approach. It involves emphasizing areas of agreement while avoiding points of disagreement. Smoothing is appropriate to keep harmony and avoid outwardly conflictive situations. (Admin, 2018)	When managing a project, it is vital to keep all participants up to date on what is going on - especially the stakeholders. Keeping the stakeholders informed is an oft-neglected but vital part of running a successful project. There are many ways to inform stakeholders - from using collaborative software that informs clients

		of the project status, to creating status reports, to having daily or weekly meetings.
Additional Work: When proponent requests additional work, and this request is out of our scope of work.	Forcing (using power or dominance) implies the use of position power to resolve the conflict. It involves imposing one viewpoint at the expense of another and is characterized by a win-lose outcome in which one party overwhelms the other. This approach is appropriate when quick decisions are required. (Admin, 2018)	At the beginning of a project, the scope is established in documents like the scope statement. It clarifies the work and deliverables of a project, setting out the expectations for both parties. If a client asks for another feature or service to be included, this can be considered to be “out of scope”.

Table 20. 3 expected scenarios of the conflict’s events in the project, Optimal strategies to deal with each conflict, and specify the reason of preference and Root Cause Analysis

Allocating of human resources to tasks:

➤ What are the human resources in the project and why it is important?

Project Human Resource Management of our company/project includes the processes that organize, manage, and lead the project team. The project team is comprised of the people with assigned roles and responsibilities for completing the project. However, the human Resources in our project focus on Project Team recruitment, organization and management until the end of a given project. Its role starts from defining core competencies which are going to be needed, to team building and motivation. The interest is to understand how an executive function can impact Project Management. It is as interesting as Human Resource is a function for which we feel a particular affection. The link between our Human Resource Management and Project Management is strategic (Lewis, 2016). Both of them are useful for the company competitiveness. Human Resources are the key of every work done within our company in this particular project as they represent people. We ensure in our project that the project management is measured by the different project success that can represent benefit, innovation or any improvement. It appears that project success require success in team project management, which is the HR function. Three main processes are taken into account: selecting, training and managing. Furthermore, the knowledge is composed of the following processes (Lewis, 2016):

Plan Human Resource Management—The process of identifying and documenting project roles, responsibilities, required skills, reporting relationships, and creating a staffing management plan (team, n.d.).

Acquire Project Team—The process of confirming human resource availability and obtaining the team necessary to complete project activities.

Develop Project Team—The process of improving competencies, team member interaction, and overall team environment to enhance project performance.

Manage Project Team—The process of tracking team member performance, providing feedback, resolving issues, and managing changes to optimize project performance.



(source (team, n.d.))

Figure 27. The process of identifying and documenting project roles

➤ **How to plan and manage HR projects within our project:**

As we are all aware that today's human resources teams don't just handle payroll, onboarding, and offboarding. They're also responsible for a wide range of projects and internal processes to ensure the success of every employee. But without a central system for managing work and priorities, HR teams struggle to keep up with everything on their plate. Fortunately, we have set up a clear process for a work management tool which can help our HR teams track work progress, scale processes (Demilliere, 2014), and stay aligned with less effort. and the following method are

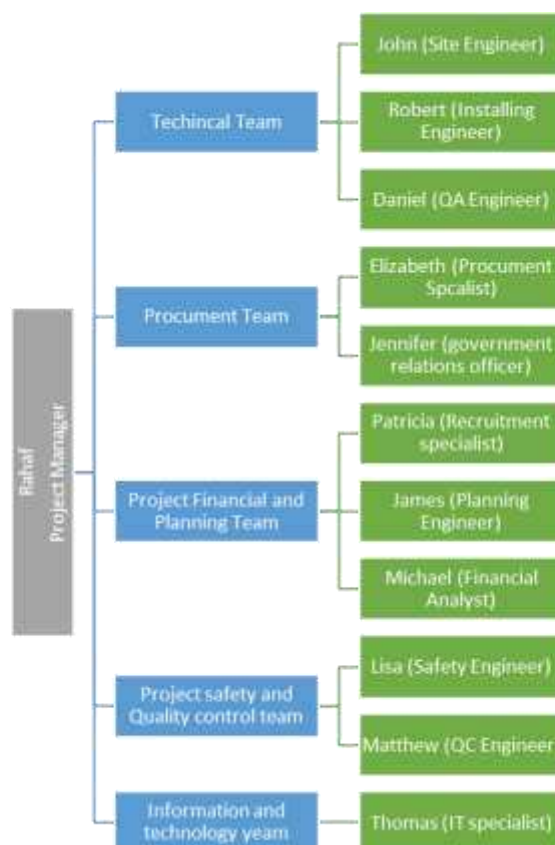
the main concept of our process towards the recruiting and the distribution of the functioning in our project (team a. , n.d.).

Streamline recurring work. We establish repeatable processes for common HR workflows—such as quarterly planning or review cycles—so we can spend less time planning work and more time getting it done. (team a. , n.d.).

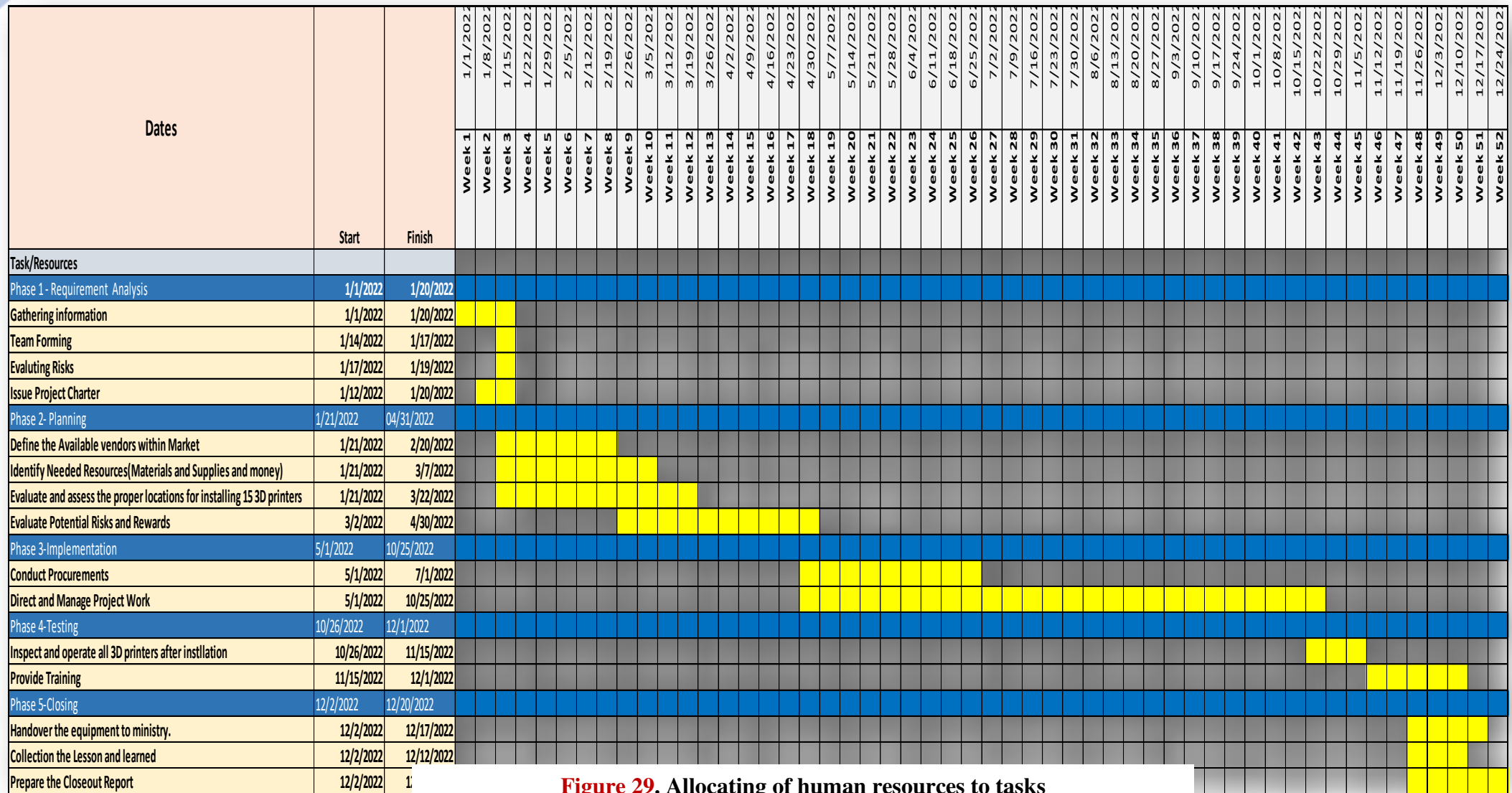
Set team priorities. We always make sure that everyone knows which tasks are mission-critical, and which are nice-to-haves, by defining and prioritizing goals across our team.

Communicate progress. Track and share updates in one place to keep everyone on the same page without the endless email threads (team a. , n.d.).

- Flow Chart of Project Team



- **Figure 28.** Flow Chart of Project Team



Tasks	Phase 1 - Requirement Analysis	Assigned to who	No. Of Resources	No. of Days	Start date 1/1/2022	End date 1/20/2022
			13	20		
Main task	Gathering information		5	10	1/1/2022	1/20/2022
Sub tasks	Collect Information for the Requirements	PMT	2	4	1/1/2022	1/5/2022
	Define internal requirements	PMT	2	3	1/5/2022	1/8/2022
	Identify available skills, information and support	PMT	2	2	1/8/2022	1/10/2022
	Identify the stakeholders	PMT	2	2	1/10/2022	1/12/2022
	Identify needed resources	PMT	2	2	1/12/2022	1/14/2022
	Identify project Estimated Cost	PMT	2	3	1/14/2022	1/17/2022
	Identify High level project Milestones	PMT	2	3	1/17/2022	1/20/2022
Main task	Team Forming		1	3	1/14/2022	1/17/2022
	Form Project Team	PMT	1	3	1/14/2022	1/17/2022
Main task	Evaluating Risks		3	3	1/17/2022	1/19/2022
	Determine financial requirements	PMT	1	1	1/17/2022	1/17/2022
	Assess needed resource availability	PMT	1	1	1/17/2022	1/18/2022
	Review personal suitability	PMT	1	1	1/18/2022	1/19/2022
Main task	Issue Project Charter		3	4	1/12/2022	1/20/2022
	Conduct meeting with all stakeholders	PMT	2	1	1/12/2022	1/13/2022
	Confirm decision to proceed	PM	1	1	1/13/2022	1/14/2022
	Review all requirements	PM	1	2	1/14/2022	1/16/2022
	Develop Project Charter	PM	1	4	1/16/2022	1/20/2022

Table 21. Allocating of human resources to tasks for phase 1

Tasks	Phase 2- Planning	Assigned to who	No. Of Resources	No. of Days	Start date 1/21/2022	End date 04/31/2022
			32	100		
Main task	Define the Available vendors within Market		5	30	1/21/2022	2/20/2022
	Access available information	PMT	2	5	1/21/2022	1/26/2022
	Create procurement analysis plan	PMT	2	10	1/26/2022	2/5/2022
	Implement procurement analysis plan	PMT	2	3	2/5/2022	2/8/2022
	Identify potential vendors	PMT	2	7	2/8/2022	2/15/2022
	Summarize the potential vendors	PMT	2	2	2/15/2022	2/17/2022
	Identify Vendors market niche	PMT	2	3	2/17/2022	2/20/2022
Main task	Identify Needed Resources (Materials and Supplies and money)		12	45	1/21/2022	3/7/2022
	Develop Project Management Plan	PMT	3	3	1/21/2022	1/24/2022
	Plan Scope Management	PMT	4	2	1/24/2022	1/26/2022

	Collect Requirements	PMT	3	3	1/26/2022	1/29/2022
	Define Scope	PMT	3	2	1/29/2022	1/31/2022
	Create WBS	PMT	2	3	1/31/2022	2/3/2022
	Validate Scope	PMT	3	2	2/3/2022	2/5/2022
	Plan Schedule management	PMT	3	2	2/5/2022	2/7/2022
	Define Activities	PMT	3	2	2/7/2022	2/9/2022
	Sequence Activities	PMT	3	1	2/9/2022	2/10/2022
	Estimate Activity Durations	PMT	3	2	2/10/2022	2/12/2022
	Identify management staff resources	PMT	3	1	2/12/2022	2/13/2022
	Identify staffing requirements	PMT	3	2	2/13/2022	2/15/2022
	Identify needed raw materials	PMT	3	1	2/15/2022	2/16/2022
	Identify needed utilities	PMT	3	3	2/16/2022	2/19/2022
	Develop Schedule Management	PMT	3	1	2/19/2022	2/20/2022
	Plan Cost Management	PMT	2	2	2/20/2022	2/22/2022
	Estimate Costs	PMT	2	2	2/22/2022	2/24/2022
	Determine Budget	PMT	2	2	2/24/2022	2/26/2022
	Summarize operating expenses and financial projections	PMT	2	1	2/26/2022	2/27/2022
	Plan Quality Management	PMT	2	2	2/27/2022	3/1/2022
	Plan Resource Management	PMT	2	2	3/1/2022	3/3/2022
	Estimate Activity Resources	PMT	2	1	3/3/2022	3/4/2022
	Plan Communications Management	PMT	2	1	3/4/2022	3/5/2022
	Plan Stakeholder Engagement	PMT	2	1	3/5/2022	3/6/2022
	Plan the delivery method for the received 3D printers to the agreed location	PMT	2	1	3/6/2022	3/7/2022
Main task	Evaluate and assess the proper locations for installing 15 3D printers		10	60	1/21/2022	3/22/2022
	Assess all famous and suitable locations for tourists around KSA	PMT	3	20	1/21/2022	2/10/2022
	Create locations analysis plan	PMT	4	10	2/10/2022	2/20/2022
	Implement locations analysis plan	PMT	5	10	2/20/2022	3/2/2022
	Identify potential locations	PMT	4	10	3/2/2022	3/12/2022
	Summarize the potential locations	PMT	3	10	3/12/2022	3/22/2022
Main task	Evaluate Potential Risks and Rewards		5	60	3/2/2022	4/30/2022
	Assess needed resources availability	PMT	2	5	3/2/2022	3/7/2022
	Identify Risks	PMT	1	7	3/7/2022	3/14/2022
	Perform Qualitative Risk Analysis	PMT	2	6	3/14/2022	3/20/2022
	Perform Quantitative Risk Analysis	PMT	1	7	3/20/2022	3/27/2022
	Plan Risk Responses	PMT	2	5	3/27/2022	4/1/2022
	Plan Risk Management	PMT	1	8	4/1/2022	4/9/2022
	Forecast financial returns	PMT	2	6	4/9/2022	4/15/2022
	Review and modify the Risk plan	PMT	2	5	4/15/2022	4/20/2022
	Confirm decision to proceed	PMT	2	10	4/20/2022	4/30/2022

Table 22. Allocating of human resources to tasks for phase 2

Tasks	Phase 3-Implementation	Assigned to who	No. Of Resources	No. of Days	Start date	End date
			38	177	5/1/2022	10/25/2022
Main task	Conduct Procurements		5	112	5/1/2022	7/1/2022
	Contact the vendors	Procurement Team	2	5	5/1/2022	5/6/2022
	Collect the offers	Procurement Team	2	10	5/6/2022	5/16/2022
	Review the offers	Procurement Team	5	5	5/16/2022	5/21/2022
	Negotiation for Price, Delivery and warranty	Procurement Team	2	7	5/21/2022	5/28/2022
	Follow UP with Vendor	Procurement Team	2	14	5/28/2022	6/11/2022
	Receive the Printers	Procurement Team	3	10	6/11/2022	6/21/2022
	Close the contract with Vendors	Procurement Team	3	10	6/21/2022	7/1/2022
Main task	Direct and Manage Project Work		33	177	5/1/2022	10/25/2022
	Manage Team	PM+PMT	33	177	5/1/2022	10/25/2022
	Manage Communications	PMT	5	177	5/1/2022	10/25/2022
	Implement Risk Responses	PMT	5	177	5/1/2022	10/25/2022
	Manage Stakeholder Engagement	PMT	3	177	5/1/2022	10/25/2022
	Monitor and Control Project Work	PMT	5	177	5/1/2022	10/25/2022
	Perform Integrated Change Control	PMT	3	177	5/1/2022	10/25/2022
	Control Scope	PMT	2	177	5/1/2022	10/25/2022
	Control Schedule	PMT	3	177	5/1/2022	10/25/2022
	Control Costs	PMT	2	177	5/1/2022	10/25/2022
	Control Quality	PMT	5	177	5/1/2022	10/25/2022
	Control Resources	PMT	3	177	5/1/2022	10/25/2022
	Monitor Communications	PMT	2	177	5/1/2022	10/25/2022
	Monitor Risks	PMT	2	177	5/1/2022	10/25/2022

Table 23. Allocating of human resources to tasks for phase 3

Tasks	Phase 4-Testing	Assigned to who	No. Of Resources	No. of Days	Start date	End date
			15	36	10/26/2022	12/1/2022
Main task	Inspect and operate all 3D printers after installation		15	35	10/26/2022	11/15/2022
	Inspect the all installed 15 3D printers	PMT	5	20	10/26/2022	11/15/2022
	Ensure all the installed 3D printers are worked properly	PMT	5	35	10/26/2022	11/30/2022
	Confirm the quality of installation and operation for all 15 3D printers	PMT	5	20	10/26/2022	11/15/2022
Main task	Provide Training		15	16	11/15/2022	12/1/2022

	Provide Training for the equipment operators.	PMT	15	16	11/15/2022	12/1/2022
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Table 24. Allocating of human resources to tasks for phase 4

Tasks	Phase 5-Closing	Assigned to who	No. Of Resources	No. of Days	Start date	End date
			4	18	12/2/2022	12/20/2022
Main task	Handover the equipment to ministry.	PMT	2	15	12/2/2022	12/17/2022
Main task	Collection the Lesson and learned	PMT	1	10	12/2/2022	12/12/2022
Main task	Prepare the Closeout Report	PMT	1	18	12/2/2022	12/20/2022

Table 25. Allocating of human resources to tasks for phase 5

Analyzing of the influence of conducting Crashing and Fast-tracking process on the time table, in addition to representing the table after achieving the two measures:

There are basically two techniques that can be used to shorten the project duration while maintaining the project scope. These techniques are Fast Tracking and Crashing.

Crashing: Crashing is a process of adding resources to one's project so as to be able to finish faster. It has a cost Impact.

Fast tracking: First Tracking On the other hand is the process of performing tasks in parallel so as to be able to finish the project sooner. It does not any cost Impact but it has a risk.

We prefer to go with fast tracking technique first and last choice will be crashing.

Crashing:

Dates	Start	Finish	1/1/2022	1/8/2022	1/15/2022	1/22/2022	1/29/2022	2/5/2022	2/12/2022	2/19/2022	2/26/2022	3/5/2022	3/12/2022	3/19/2022	3/26/2022	4/2/2022	4/9/2022	4/16/2022	4/23/2022	4/30/2022	5/7/2022	5/14/2022	5/21/2022	5/28/2022	6/4/2022	6/11/2022	6/18/2022	6/25/2022	7/2/2022	7/9/2022
			Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16	Week 17	Week 18	Week 19	Week 20	Week 21	Week 22	Week 23	Week 24	Week 25	Week 26	Week 27	Week 28
Task/Resources																														
Phase 1 - Requirement Analysis	1/1/2022	1/20/2022																												
Gathering information	1/1/2022	1/20/2022																												
Team Forming	1/14/2022	1/17/2022																												
Evaluating Risks	1/17/2022	1/19/2022																												
Issue Project Charter	1/12/2022	1/20/2022																												
Phase 2- Planning	1/21/2022	2/25/2022																												
Define the Available vendors within Market	1/21/2022	2/7/2022																												
Identify Needed Resources(Materials and Supplies and money)	1/21/2022	2/13/2022																												
Evaluate and assess the proper locations for installing 15 3D printers	1/21/2022	2/18/2022																												
Evaluate Potential Risks and Rewards	1/21/2022	2/25/2022																												
Phase 3-Implementation	2/26/2022	5/14/2022																												
Conduct Procurements	2/26/2022	7/1/2022																												
Direct and Manage Project Work	2/26/2022	5/14/2022																												
Phase 4-Testing	5/21/2022	6/17/2022																												
Inspect and operate all 3D printers after installation	5/21/2022	6/3/2022																												
Provide Training	6/4/2022	6/17/2022																												
Phase 5-Closing	6/25/2022	7/9/2022																												
Handover the equipment to ministry.	6/25/2022	7/9/2022																												
Collection the Lesson and learned	6/25/2022	7/2/2022																												
Prepare the Closeout Report	6/25/2022	7/9/2022																												

Figure 30. Crashing

Fast tracking: Performing tasks in parallel so as to be able to finish the project sooner.

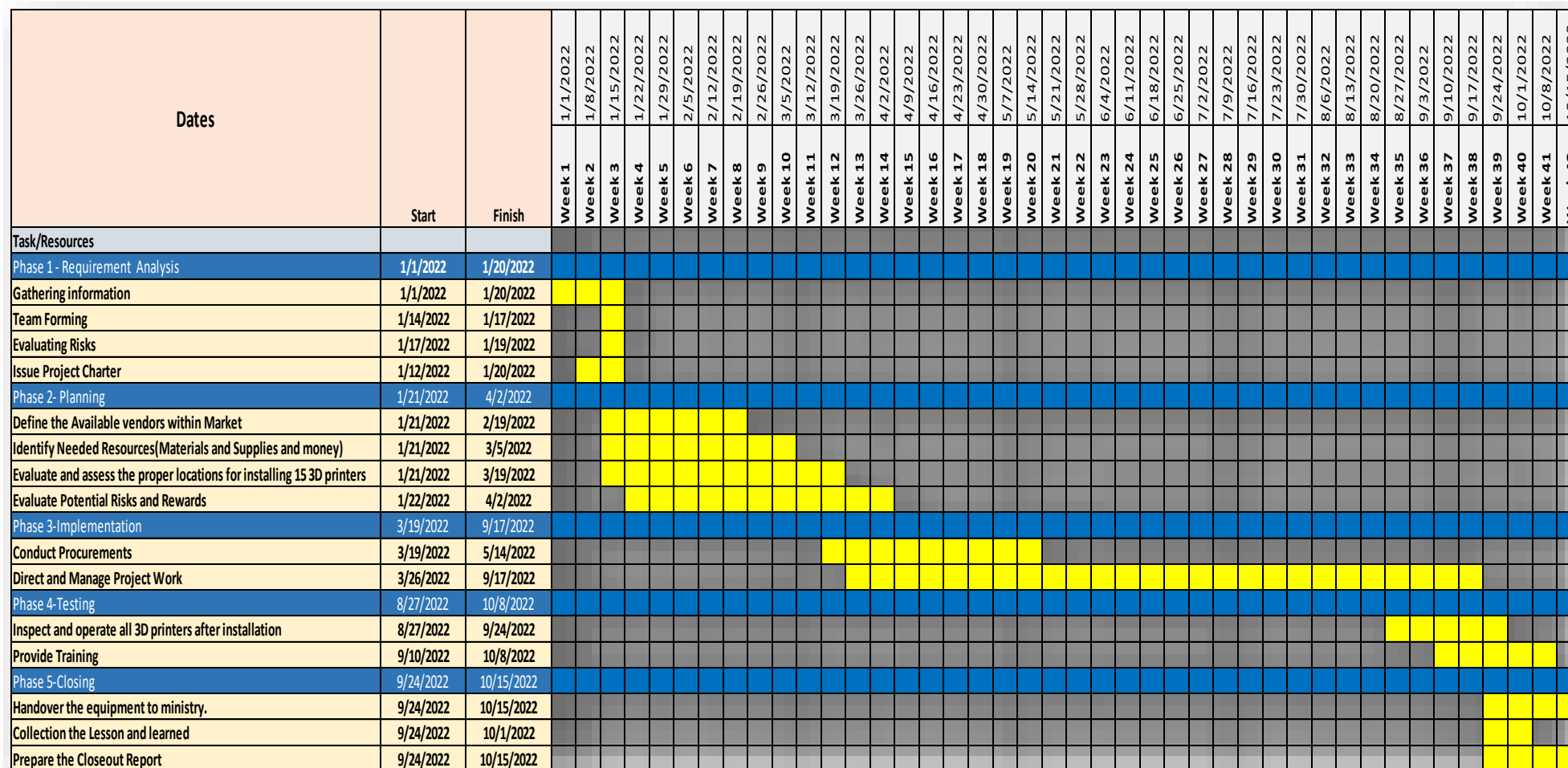
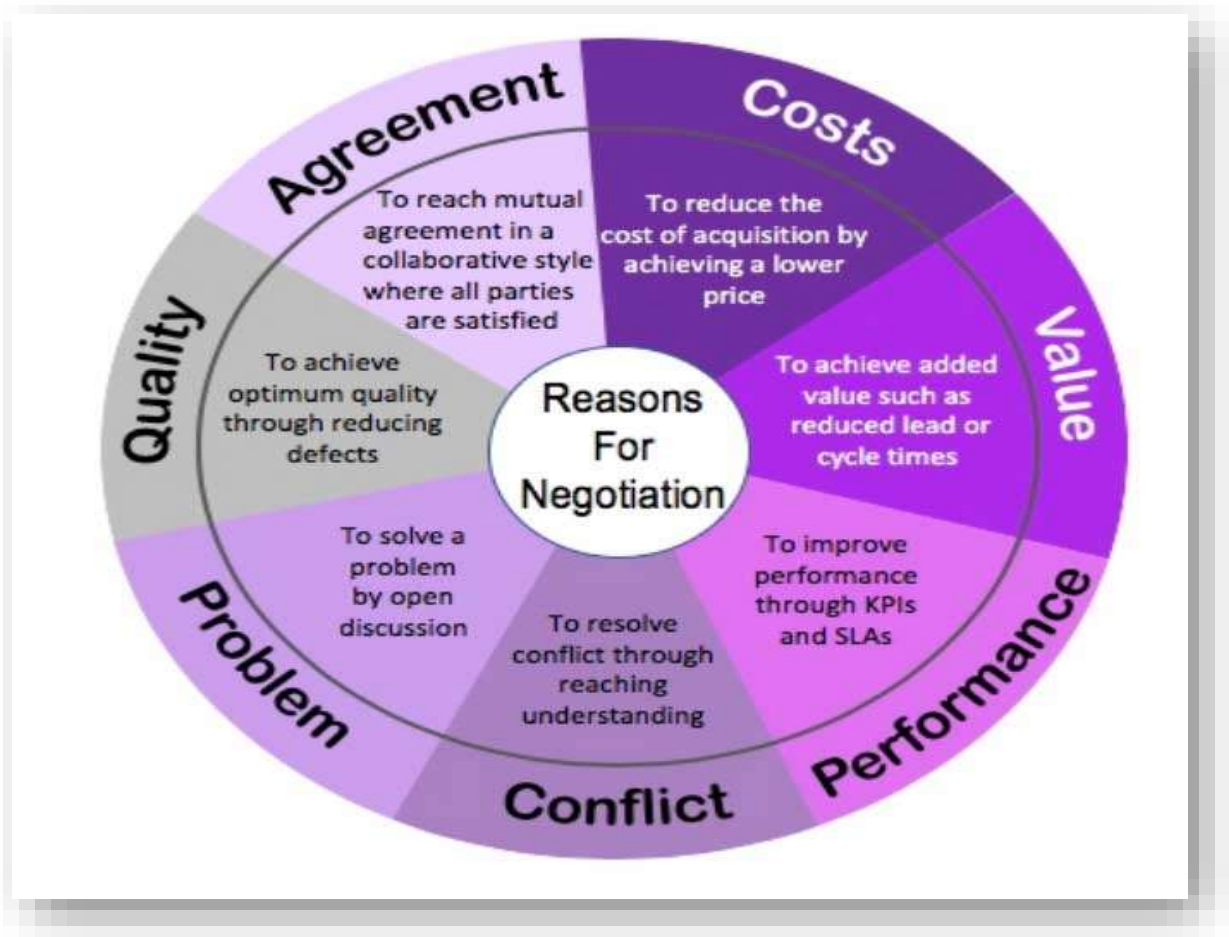


Figure 31. Fast tracking

Development of general rules for the negotiation process:

Negotiation General Rules for Organisation:

There are many reasons for Negotiation even inside or outside the organisation, the below figure shows the main reason:



(Source: Jarvis-Grove, 2020)

Figure 32. Reasons for Negotiation

For 3D printer project, we agreed on the below rules of Negotiation:

- **Clear realistic objectives:**
 - To consider the criteria for success. Also consider the output to be achieved as well as thinking the output achievement when cannot achieve What to do? (team, n.d.)
- **Develop your game plan:**

Know the negotiator position it is strong or weak or in between to think and analysis what to deal so it is very important to make the negotiation SUCCESS (team, n.d.).
- **Research your opposition:**

It is important to study the other parties in negotiation and know their style, objectives, goals, what their interest also to communicate effectively (team, n.d.).
- **Win-Win:**

The most important results for all parties in negotiation is win-win agreement or deal and that will build good relationship. The on goal of the organization is to be sustained and keep good relationships with the stockholders for growth and sustain, so should deal fairly and consider that win-win deal is most important than win-lose (team, n.d.).
- **Active Listening:**

In the communication, the listening to other parties during negotiation and pay good attention playing important roles to understand well the consternation of the other parties and what is matter for them as well as know what motivate them and then asking good specific questions to make the negotiation success and reach to win-win deal (team, n.d.).
- **Build Trust:**

Building trust is key to a negotiation. The trust to be built for all other parties and that will help to sustain the good relationship.

- **Focus on Value:**

The value of our organization or other party organization should be considered very well in negotiation and that will lead to a win-win deal.

As 3D printer project, we agreed on the below main Stages of Negotiation:

1. **Preparation:**

It is the most important step. It includes the research, analysis, understanding underlines and looking to other alternatives which also called BATNA (Best Alternative to a Negotiated Agreement) in negotiation to reach to the best outcome (team, n.d.).

2. **Opening:**

It is better to start with ice-break to allow all parties feel free and comfortable in explaining their interest as a result coming to a great deal.

3. **Testing:**

In this stage, it is the best for all parties to have effective communication skills to use and each party try to understand the other and what is important and matter as well as the listening with body language skills play a very important role to read the underlining from other parties (team, n.d.).

4. **Proposing:**

This is where each party puts their words and what they are looking for to reach and what they like to achieve for their own good.

5. **Bargaining:**

In this stage we can call it offering stage because of each party put their offers to see the reaction of other party and counter offers in return and no issue to do it many times with other offers (team, n.d.).

6. **Agreement:**

Once bargaining has been completed it is seeming that agreement can be made. When all parties reach to agreement then it is necessary to written the acceptance in legal forms to keep all rights (team, n.d.).

7. **Closure:**

This is the final stage. It is actually documentation stage whether that is a contract or written agreement. Without the documentation the agreement is consider still the negotiation open and not completed (team, n.d.).

"2" two negotiating plans:

Negotiation Plans:

Plan-1:

The effective negotiation is to reach to win-win deal or agreement. That better to accept the good outcome for all parties and be open for different

alternative to achieve the best agreement. Intentional influencing does not have to result in winners and losers, or be characterized as manipulation, conflict, or competition, so the below for all stakeholders should be considered and planned (Englund, 2010):

- Study the stakeholders and their interests with the impact to them.
- When negotiation starts, better to start asking for their expectations and thoughts then listen very carefully to their feedback and responses after that analysis deeply.
- It is expected that the problems will arise, so it is better to consider in this point to mitigate the problem or think about what might make it worth the extra trouble.
- Take some time for thinking and analysis and then offer something of value in exchange that which feels like a win for all parties and bringing the good feedback to all.
- Ask for acceptance and counter offer, if still not all parties accepted then again ask question and repeat the process until achieve the acceptance for all parties.

Plan-2:

Step 1: Work Out What You Want:

First, we need to work out what it is that we are actually after. What does the best possible outcome look like for us? Think about what you must get out of this negotiation and what we would like to have. Use different tools

like mini question and answer to create a list of everything we want and rank the prioritizes for our organization with the objective and should be align with organization strategy to make the negotiation value and win. That will give to negotiator good idea of how should manage and control the negotiation and give step ahead of what the negotiation will go to (Harrin, 2016).

Step 2: Establish What we are Prepared to Give Up:

Think about what concessions us as organization which prepared to make and result to be achieved. The negotiator might have to have prior discussion with his/her boss or project sponsor to ensure that the negotiator know what he/she is prepared to sacrifice during the negotiation. Preparation time and carefully reviewing are the most important in this plan and that will give the organization good chance to achieve grate deal in limit time because many ideas discussed and reviewed with the subject matter of experts (Harrin, 2016).

Step 3: Clarify Authority Limits:

Before start negotiation and represent the organization or someone, the negotiator should ensure having clear authorization and the boundary as well of authority with limited time or subject. The negotiator works out and confirm with the line manager the authority limit and what to do also not to do. With understand and clarify the authority given, the negotiator will offer must suitably offer and making the good deal or agreement. Furthermore, the authority will tell to the negotiator about the situation which help to through to suitable conclusion (Harrin, 2016).

Step 4: Do Your Homework:

Here the negotiator should spend more time to make the negotiation worth. Gather different information on the market and strategy value of similar deals and what is the outcome. Research about similar deals happened with different companies in different projects either internally or externally and what was the wrong as well as which condition to be put to make the negotiation successful. The information find out from the Reacher will help to identify what's reasonable in organization situation. It gives organization a benchmark and helps the negotiator to see what's fair given the terms of organization own situation. It assures the negotiator is going into the discussion not asking for something wildly inappropriate (Harrin, 2016).

Step 5: Decide on What Techniques to Use:

Think about what techniques would be useful in this negotiation. This involves planning a great location for the discussion and the time for negotiation which the attention of all parties increases and be more concentrate with clear mind.

Also think about which approach is going to use and how to use in the negotiation as well as which information to tell first and which information to be hold until the end with draw different scenarios about the negotiation. There is a range of tactics and techniques you can use for negotiating but it's important to choose ones that feel right (and ethical) to negotiator and organization (Harrin, 2016).

Below are ten main negotiating techniques:

1. Make the pie bigger
2. Use humor
3. Show your strength
4. Ask a question
5. Review your preparation (privately)
6. Breathe deeply
7. Name hard-line tactics
8. Take a break
9. Use silence (after your proposal)
10. Reframe an issue.

Specific suggestions for negotiating in the project environment for 3D printer project include:

- ✚ Ensure the project is chartered well and sponsored.
- ✚ Consider the organization and project priorities and escalate to management to get support.
- ✚ Specified the project result with the organizational priorities.
- ✚ Alignment the project goals and result to supporting overall business strategy.
- ✚ Well consider the resource requirements.
- ✚ Clearly define and vividly illustrate the tasks required to reach project goals.

- ✚ Trust to be built through honest communication with considering the planning and schedules.
- ✚ Analysis the risk and look forward to how to deal with risks.
- ✚ Consider the cost. In case of delay.
- ✚ Consider the cost of quality and resources required.

Competence

Being good at what
I do, capable,
effective

Practice Competences

Section 3

ALL RIGHT RESERVED



Project Life Cycle:

Method for Picking the projects:

Various types of projects that is offered by different Ministries and government entities within Saudi Arabia are analyzed and evaluated in order find the suitable projects that support and enhance our corporate to reach its vision and align within mission.

Project Life Cycle (PLC):

For every project to be planned, managed and controlled to finish it within its due date or even before the Project Life Cycle for the project must be defined. The Project Life cycle that USTC used for this project has 5 phases:

-Requirements Analysis: In this phase all the requirements from the clients of the projects that we win from Government Tenders are collected and analyzed in order to

-Planning: This is the most important phase among all other phases of PLC. where most of the work of the project is done in it.

Note: This report will be showing the planning phase of the project and all the 5 phases of Project Management Life cycle.

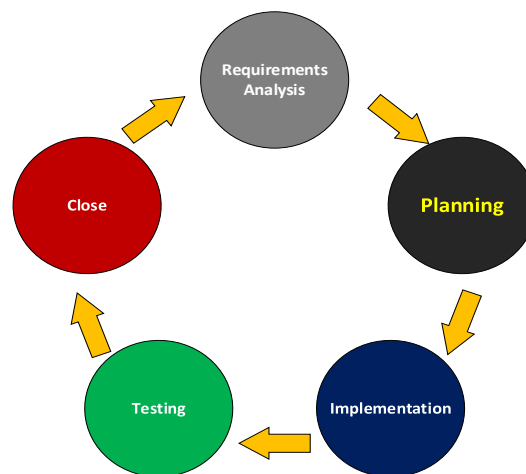


Figure 33. Project phases

Identifying the Triple constraints of the project:

Triple constraints:

Each project has constrained, and the classic projects constrains as per below:

- 1- Time
- 2- Cost
- 3- Scope/Quality

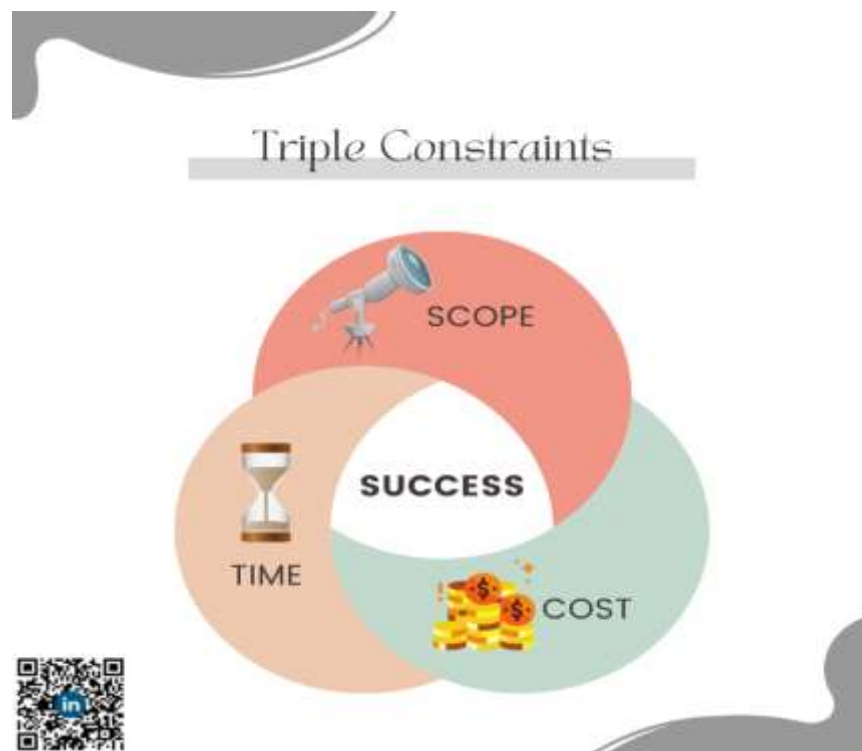


Figure 34. Project triple Constraints

In Project Management, we identified the constraints as boundaries of the project that we should be respected. All project constraints elements are connected to each other.

To change or modify the constraints, we should follow the process and procedure of management of change and have upper management approval and stakeholder as this is considered the main change on project element.

As we mentioned above, the change on constraints will affect the other element on positive or negative. (Westland, 2018)

Time:

our project has identified time and schedule approved by project stakeholders. Any change on project milestones has a significant reaction on the project, as time change will guide to change on project cost. As a result, we expect to have modifications on time if the project scope has changed by increasing or decreasing.

Cost:

The project's cost communicated by the client and estimated by the project is constrained, and most projects avoid changing on this element to avoid cost overrun. In our project, we try to prevent any change to this constraint.

Scope & Quality:

The project's scope should identify and approved by stakeholders as the beginning of the project. Changing on scope should pass through management of change and evaluate the other constrain elements affected by this change. (Baratta, 2006)

In our project, we identified the constraints as per below:

- **Cost:**
 - The project cost 5 Million SAR.
- **Time:**
 - Time and schedule to complete the project within 52 weeks.
- **Scope:**
 - Find, study, analysis and propose the proper and suitable places to install 15 3D printing.
 - I was provided and approved by stakeholders.

List of the project success factors:

According to PRINCE2's definition, critical success factors (CSFs) are "elements in a project that are critical to the project achieving its mission or goal." (McHale, 2020)

Any project effect by different influences. We can consider the factors as per influences as per below:

A- Internal:

Each project will have internal factors to success, starting with setting the goals and agreeing to these goals by the project team and getting the commitment to support the project to achieve these goals and mission. (Hughes, 2010)

B- External:

As the project will have an external party influence the project and affect its success, we need to consider it the primary point to gain stakeholder approval and commitment to the project. The main success factor In achieving the target of the project will be active communication with stakeholders. (Hughes, 2010)

In our project, we consider all required actions to deliver the project's requirements and achieve the project goals as success factors.

We are starting by preparing the project charter to gain the management commitment to the project and prepare the plan for the project to cover all areas of success factors.

We consider the external influences by analyzing the stakeholder requirements and ways to deal with each factor affecting the project to achieve the mission. A kick-off meeting was conducted to inform the

stakeholders about the project plan to ensure all their requirements were considered. Below list has identified the project success factors:

PROJECT SUCCESS FACTORS



01

EFFECTIVE GOVERNANCE :

Effective Governance is one of our success factors in our project we have a very clear and defined (apm.org.uk, n.d.):

Leadership.

Responsibilities.

Reporting lines and communications between all parties.

02

GOALS AND OBJECTIVES

All the Goals and Objectives of the project must be identified and recognized in a clear and easy way by all the identified stakeholders. In addition, there must be no discrepancy with any other subsidiary objectives, and all the project team members must have a very clear vision for the project (apm.org.uk, n.d.). Wherefore our project team has:



1-Analyze the project requirements.

2-Set up clear goals and objectives for the project.

3-Communicated these goals and objectives with all project teams and stakeholders.

03

COMMITMENT TO PROJECT SUCCESS

All the related parties to the project must commit to working together harmoniously to succeed in the project. Any lack of commitment to the project must be identified quickly and dealt with it immediately in a professional way to prevent its consequences (apm.org.uk, n.d.).

Wherefore our project team has:



1-Prepare clear and project scope.

2-Agreed on the scope of work with clients and ensure they understood Everything clearly.



PROJECT SUCCESS FACTORS CONT...

04



CAPABLE SPONSORS

All sponsors play a significant role in the project's success during the project life cycle and are assumed to have ultimate responsibility and accountability for the project's success (apm.org.uk, n.d.). Wherefore our project team has:

- 1-Identify and Analysis all the sponsors' requirements and capabilities.
- 2-Keep all clients and stakeholders aware of any updates and progress and communicate effectively and efficiently with them.

05



SECURE FUNDING

The project has two critical things related to the funding, which are considered as success factors for the project:

- 1-Secure fund base for the payments.
- 2-Identify the contingency funding from the beginning of the project and strict control of the budget to maximize the obtained value (apm.org.uk, n.d.).

06



PROJECT PLANNING AND REVIEW

Sufficient, thorough, and efficient pre-project planning is considered as one of our project success factors (apm.org.uk, n.d.).

This including:

- 1-Careful progress monitoring.
- 2-Using realistic time schedules for the project.
- 3-Pro-active risk management.
- 4-Post-project review and review the lessons learned from all previous projects.
- 5-Prepare the project execution plan and change plan.



PROJECT SUCCESS FACTORS CONT...

07

SUPPORTIVE ORGANISATIONS

Refers to the environment in which the project is operating. A project-friendly environment in USTC provides full support and resources for all the project activities and enables access to all stakeholders (apm.org.uk, n.d.).



08

END USERS AND OPERATORS

The requirements and engagement of the end-users and operators are critical in designing the product of our project. Our project team will engage with the users through a survey and interview to consider all expected outputs and outcomes of the products and project (apm.org.uk, n.d.).



09

COMPETENT PROJECT TEAMS

The professional project team with positive behavior and competence internally and externally is a significant success factor in our project. For that, we are selecting the right team to execute the project (apm.org.uk, n.d.).



PROJECT SUCCESS FACTORS CONT...

10



ALIGNED SUPPLY CHAIN

All the direct and indirect suppliers need to be involved professionally since this is a core success factor. Our suppliers are aware and engaged about all the needs, requirements, and quality standards (apm.org.uk, n.d.).

11



PROVEN METHODS AND TOOLS

One of the essential success factors is the methods, tools, and techniques used to manage, direct, and monitor the project's progress. Our team uses the best practices that have proven its efficiency to direct and manage our project, which provides and keeps a balance between flexibility and robustness (apm.org.uk, n.d.). In addition, we are in our project applying the professional KPI to measure the project achievement.

12



APPROPRIATE STANDARDS

We are using the related quality standards actively and professionally to drive the quality of our project outputs. We are frequently monitoring the adherence to other quality standards to ensure the best practice for the delivery (apm.org.uk, n.d.).



Development and identifying of work breakdown structure, in addition to prepare a guide to illustrate it:

In our project, we prepared the WBS and decomposed the work packages activity during project phases as per below:

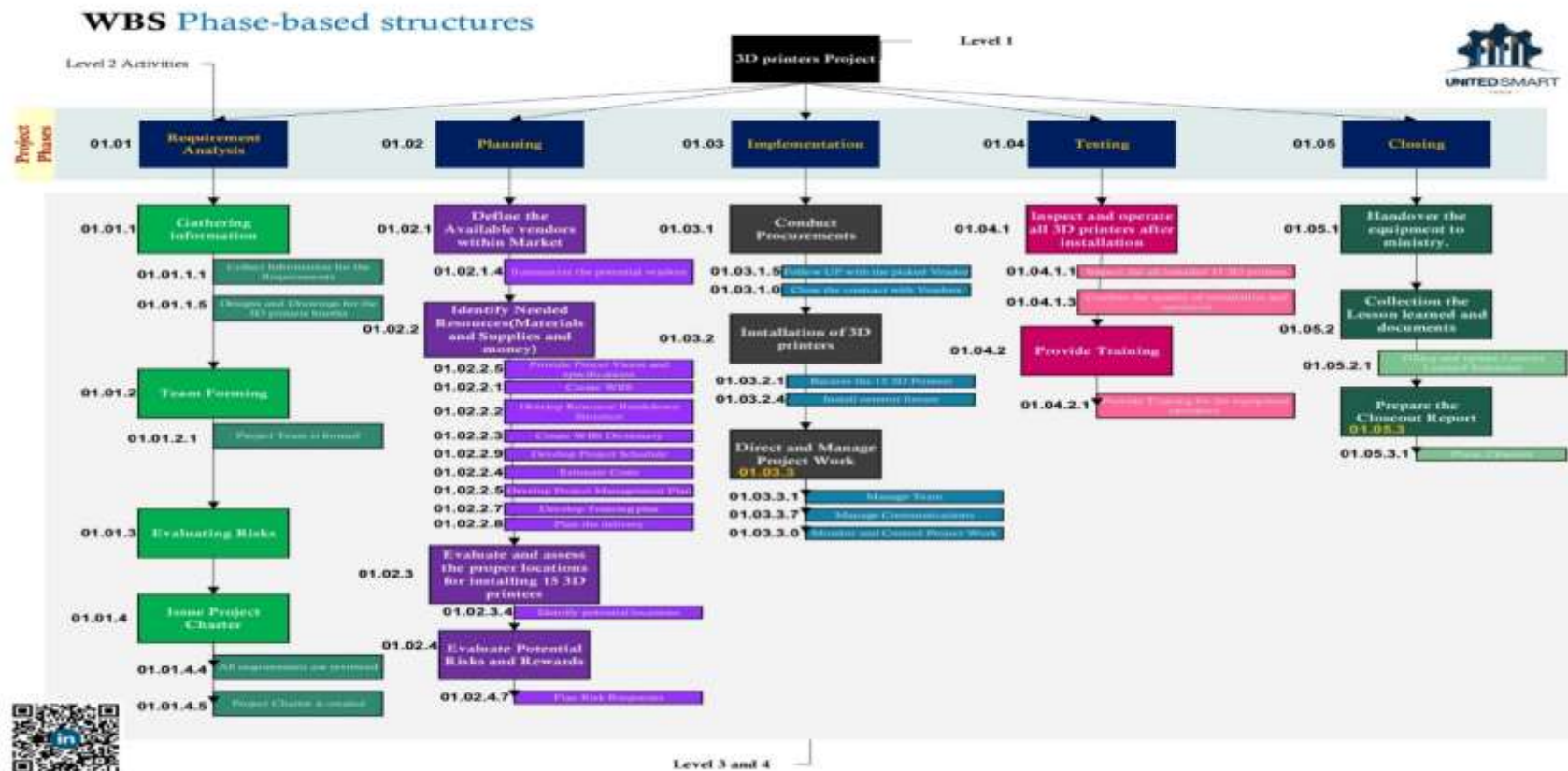


Figure 35. Project WBS (Dionisio, 2017)

WBS- Project Phases (Level1)	
WBS	Task Description
1.1	Requirement Analysis
1.2	Planning
1.3	Implementation
1.4	Testing
1.5	Closing

WBS- Project Phases (Level1) + Work Packages (Level2)	
WBS	Task Description
1.1	Requirement Analysis
1.1.1	Gathering information
1.1.2	Team Forming
1.1.3	Evaluating Risks
1.1.4	Issue Project Charter
1.2	Planning
1.2.1	Define the Available vendors within Market
1.2.2	Identify Needed Resources (Materials and Supplies and money)
1.2.3	Evaluate and assess the proper locations for installing 15 3D printers
1.2.4	Evaluate Potential Risks and Rewards
1.3	Implementation
1.3.1	Conduct Procurements
1.3.2	Installation of 3D printers
1.3.3	Direct and Manage Project Work

WBS- Project Phases + Work Packages + Milestones	
WBS	Task Description
1.1	Requirement Analysis
1.1.1	Gathering information
1.1.1.1	Collect Information for the Requirements
1.1.1.5	Designs and Drawings for the 3D printers' booths
1.1.2	Team Forming
1.1.2.1	Form Project Team
1.1.3	Evaluating Risks
1.1.4	Issue Project Charter
1.1.4.4	Review all requirements
1.1.4.5	Develop Project Charter
1.2	Planning
1.2.1	Define the Available vendors within Market
1.2.1.4	Summarize the potential vendors
1.2.2	Identify Needed Resources (Materials and Supplies and money)
1.2.2.5	Create and define Product Vision and Specifications
1.2.2.1	Create WBS
1.2.2.2	Develop Resource Breakdown Structure
1.2.2.3	Create WBS Dictionary
1.2.2.9	Develop Project Schedule
1.2.2.4	Estimate Costs
1.2.2.5	Develop Project Management Plan
1.2.2.7	Develop Training plan
1.2.2.8	Plan the delivery method for the received 3D printers to the agreed location
1.2.3	Evaluate and assess the proper locations for installing 15 3D printers

1.4	Testing
1.4.1	Inspect and operate all 3D printers after installation
1.4.2	Provide Training
1.5	Closing
1.5.1	Handover the equipment to ministry.
1.5.2	Collection the Lesson and learned
1.5.3	Prepare the Closeout Report

Note	
WBS	Task Description
####	Read Activities related to the project Management internally
####	Black Activities related to the project deliverables
####	Work packages
####	Milestones

1.2.3.4	Identify potential locations
1.2.4	Evaluate Potential Risks and Rewards
1.2.4.7	Plan Risk Responses
1.3	Implementation
1.3.1	Conduct Procurements
1.3.1.5	Follow Up with Vendor
1.3.1.0	Close the contract with Vendors
1.3.2	Installation of 3D printers
1.3.2.1	Receive the 15 3D Printers
1.3.2.4	Install exterior fixture
1.3.3	Direct and Manage Project Work
1.3.3.1	Manage Team
1.3.3.7	Manage Communications
1.3.3.0	Monitor and Control Project Work
1.4	Testing
1.4.1	Inspect and operate all 3D printers after installation
1.4.1.1	Inspect the all installed 15 3D printers
1.4.1.3	Confirm the quality of installation and operation for all 15 3D printers
1.4.2	Provide Training
1.4.2.1	Provide Training for the equipment operators.
1.5	Closing
1.5.1	Handover the equipment to Ministry.
1.5.2	Collection the Lesson and learned
1.5.2.1	Filling and update Lessons Learned Summary
1.5.3	Prepare the Closeout Report
1.5.3.1	Filling and update Project or Phase Closeout

Table 26. WBS of the project(Dionisio, 2017)

WBS Dictionary

WBS DICTIONARY

Project Title: Making a Tourists Experience Through 3D Printers Around KSA **Date Prepared:** 04/Dec/2021

Work Package Name: Gathering information

Code of Accounts: 1.1.1

Description of Work: Collect the information and requirement using different tools and techniques

Assumptions and Constraints: Refer to Approved Scope of Work

Milestones:

1. Collect Information for the Requirements
2. Designs and Drawings for the 3D printers' booths

Due Dates: 17/2/2022

ID	Activity	Resource	Labor			Material			Total Cost
			Hours	Rate	Total	Units	Cost	Total	
1.1.1.1	Collect Information for the Requirements	PM + Departments Managers	40	300	12000	2	2500	5000	17000
1.1.1.2	Identify the stakeholders	PMT	24	541.6667	13000	1	4000	4000	17000
1.1.1.3	Define internal requirements	PM + Planning Engineer	16	750	12000	2	2500	5000	17000
1.1.1.4	Identify available skills, information and support	Recruitment Specialist	24	583.3333	14000	1	3000	3000	17000
1.1.1.5	Designs and Drawings for the 3D printers' booths	3D printers engineering Consultancy company (outsourcing - OOK)	240	1937.5	465000	3	11666.67	35000	500000
1.1.1.6	Identify needed resources	PM+PMT	16	750	12000	1	5000	5000	17000
1.1.1.7	Identify project Estimated Cost	PMT	24	416.6667	10000	1	7000	7000	17000
1.1.1.8	Identify High level project Milestones	PMT	32	531.25	17000	0	0	0	17000

Quality Requirements: Refer to Quality Plan

Acceptance Criteria: Refer to Quality and inspection requirement

Technical Information: Refer to Equipment specification

Agreement Information: Refer to Project Contract # 665229431

Table 27. WBS Dictionary workpackage 1

WBS DICTIONARY

Project Title: Making a Tourists Experience Through 3D Printers Around KSA **Date Prepared:** 04/Dec/2021

Work Package Name: Team Forming			Code of Accounts: 1.1.2						
Description of Work: To Build the team and gain the harmonic			Assumptions and Constraints: Refer to Approved Scope of Work						
Milestones: 1. Form Project Team			Due Dates: 28/1/2022						
ID	Activity	Resource	Labor			Material			Total Cost
			Hours	Rate	Total	Units	Cost	Total	
1.1.2.1	Form Project Team	PM + Recruitment Specialist	160	62.5	10000	1	3720	3720	13720
Quality Requirements: Refer to Quality Plan									
Acceptance Criteria: Refer to Quality and inspection requirement									
Technical Information: Refer to Equipment specification									
Agreement Information: Refer to Project Contract # 665229431									

Table 28. WBS Dictionary workpackage 2

WBS DICTIONARY									
Project Title: Making a Tourists Experience Through 3D Printers Around KSA Date Prepared: 04/Dec/2021									
Work Package Name: Evaluating Risks				Code of Accounts: 1.1.3					
Description of Work: Identify and evaluate the project request				Assumptions and Constraints: Refer to Approved Scope of Work					
Milestones: NO				Due Dates: 9/2/2022					
ID	Activity	Resource	Labor			Material			Total Cost
			Hours	Rate	Total	Units	Cost	Total	
1.1.3.1	Assess needed resource availability	PM+PMT	80	125	10000	1	3332.667	3332.6667	13332.7
1.1.3.2	Review personal suitability	Recruitment Specialist	160	43.75	7000	1	6332.667	6332.6667	13332.7
1.1.3.3	Determine financial requirements	PM+ Financial Analyst	80	87.5	7000	1	6332.667	6332.6667	13332.7
Quality Requirements: Refer to Quality Plan									
Acceptance Criteria: Refer to Quality and inspection requirement									
Technical Information: Refer to Equipment specification									
Agreement Information: Refer to Project Contract # 665229431									

Table 29. WBS Dictionary workpackage 3

WBS DICTIONARY									
Project Title: Project Title: Making a Tourists Experience Through 3D Printers Around KSA Date Prepared: 04/Dec/2021									
Work Package Name: Issue Project Charter				Code of Accounts: 1.1.4					
Description of Work: Preparing the project charter for final approval				Assumptions and Constraints: Refer to Approved Scope of Work					
Milestones: 1. Review all requirements 2. Develop Project Charter				Due Dates: 21/2/2022					
ID	Activity	Resource	Labor			Material			Total Cost
			Hours	Rate	Total	Units	Cost	Total	
1.1.4.1	Conduct meeting with all stakeholders	PM+PMT	80	5.60625	448.5	2	275.75	551.5	1000
1.1.4.2	Confirm decision to proceed	PM	40	5.60625	224.25	0	0	0	224.25
1.1.4.3	Develop Assumption Log	PM	40	5.60625	224.25	0	0	0	224.25
1.1.4.4	Review all requirements	PM	40	5.60625	224.25	0	0	0	224.25
1.1.4.5	Develop Project Charter	PM	40	5.60625	224.25	0	0	0	224.25
1.1.4.6	Develop Stakeholders Register	PM	40	5.60625	224.25	0	0	0	224.25
1.1.4.7	Develop Stakeholders Analysis	PM	40	5.60625	224.25	0	0	0	224.25
Quality Requirements: Refer to Quality Plan									
Acceptance Criteria: Refer to Quality and inspection requirement									
Technical Information: Refer to Equipment specification									
Agreement Information: Refer to Project Contract # 665229431									

Table 30. WBS Dictionary workpackage 4

WBS DICTIONARY

Project Title: Making a Tourists Experience Through 3D Printers Around KSA **Date**

Prepared: 04/Dec/2021

Work Package Name: Define the Available vendors within Market

Code of Accounts: 1.2.1

Description of Work: Prepare the procurement plan including identify the potential vendors

Assumptions and Constraints: Refer to Approved Scope of Work

Milestones: 1. Summarize the potential vendors

Due Dates: 31/3/2022

ID	Activity	Resource	Labor			Material			Total Cost
			Hours	Rate	Total	Units	Cost	Total	
1.2.1.1	Access available information	PMT	160	31.25	5000	1	1370.25	1370.25	6370.25
1.2.1.2	Develop Procurement strategy	PM+ Procurement specialist	24	208.3333	5000	1	1370.25	1370.25	6370.25
1.2.1.3	Identify potential vendors	PM+ Procurement specialist	40	125	5000	1	1370.25	1370.25	6370.25
1.2.1.4	Summarize the potential vendors	PM+ Procurement specialist	16	312.5	5000	1	1370.25	1370.25	6370.25
1.2.1.5	Create procurement analysis plan	PM+ Procurement specialist	160	31.25	5000	1	1370.25	1370.25	6370.25
1.2.1.6	Develop Procurement Management plan	PM + Procurement specialist	24	208.3333	5000	1	1370.25	1370.25	6370.25
1.2.1.7	Identify Vendors market niche	PM+ Procurement specialist	24	208.3333	5000	1	1370.25	1370.25	6370.25
1.2.1.8	Develop and Create Contractor Status Report	PM+ Procurement specialist	16	312.5	5000	1	1370.25	1370.25	6370.25
1.2.1.9	Develop and Create procurement Audit Forms	PM+QA/QC Engineers + Procurement specialist	16	312.5	5000	1	1370.25	1370.25	6370.25
1.2.1.10	Develop and Create Contact Closeout Report	PM + Procurement specialist	24	208.3333	5000	1	1370.25	1370.25	6370.25

1.2.1.1	Develop and Create Product Acceptance Form	PM + Procurement specialist	32	156.25	5000	1	1370.25	1370.25	6370.25
Quality Requirements: Refer to Quality Plan									
Acceptance Criteria: Refer to Quality and inspection requirement									
Technical Information: Refer to Equipment specification									
Agreement Information: Refer to Project Contract # 665229431									

Table 31. WBS Dictionary workpackage 5

WBS DICTIONARY

Project Title: Making a Tourists Experience Through 3D Printers Around KSA **Date**

Prepared: 04/Dec/2021

Work Package Name: Identify Needed Resources
(Materials and Supplies and money)

Code of Accounts: 1.2.2

Description of Work: Prepare the procurement plan including identify the potential vendors

Assumptions and Constraints: Refer to Approved Scope of Work

Milestones:

1. Create and define Product Vision and Specifications
2. Create WBS
3. Develop Resource Breakdown Structure
4. Create WBS Dictionary
5. Develop Project Schedule
6. Estimate Costs
7. Develop Project Management Plan
8. Develop Training plan
9. Plan the delivery method for the received 3D printers to the agreed location

Due Dates: 13/4/2022

ID	Activity	Resource	Labor			Material			Total Cost
			Hours	Rate	Total	Units	Cost	Total	
1.2.2.1	Collect Requirements	PMT	160	62.5	10000	1	3325.521	3325.521	13325.521
1.2.2.2	Define Scope	PM+PMT	40	250	10000	1	3325.521	3325.521	13325.521
1.2.2.3	Validate Scope	PM+PMT	16	625	10000	1	3325.521	3325.521	13325.521
1.2.2.4	Project Scope Statements	PM+PMT	8	750	6000	1	2883.681	2883.681	8883.681
1.2.2.5	Create and define Product Vision and Specifications	PM+PMT	8	555.23	4441.84	1	0.000336	0.000	4441.840

1.2.2.6	Develop and Create Project Road Map	PM+PMT	8	787.5	6300	1	2583.681	2583.681	8883.681
1.2.2.7	Create and define Product Backlog	PM+PMT	8	250	2000	1	2441.84	2441.840	4441.840
1.2.2.8	Plan Scope Management	PM+PMT	40	375	15000	1	2767.361	2767.361	17767.361
1.2.2.9	Create Activity List	PM+PMT	8	750	6000	1	2883.681	2883.681	8883.681
1.2.2.0	Create and develop Milestone List	PM+PMT	8	812.5	6500	1	2383.681	2383.681	8883.681
1.2.2.1	Create WBS	PM+PMT	80	77.5	6200	1	2683.681	2683.681	8883.681
1.2.2.2	Define Activities	PM+PMT	16	387.5	6200	1	7125.521	7125.521	13325.521
1.2.2.3	Define Activity Attributes	PM+PMT	8	750	6000	1	2883.681	2883.681	8883.681
1.2.2.4	Estimate Activity Resources	PM+PMT	8	750	6000	1	2883.681	2883.681	8883.681
1.2.2.5	Sequence Activities	PM+PMT	8	1312.5	10500	1	2825.521	2825.521	13325.521
1.2.2.6	Develop Duration Estimating Worksheet	PM+PMT	8	750	6000	1	2883.681	2883.681	8883.681
1.2.2.7	Estimate Activity Durations	PM+ Estimation Team	24	437.5	10500	1	2825.521	2825.521	13325.521
1.2.2.8	Create Source Selection Criteria	PM+ Recruitment Specialist + Department Managers	8	800	6400	1	2483.681	2483.681	8883.681
1.2.2.9	Identify staffing requirements	PM + Recruitment Specialist +Department Managers	16	625	10000	1	3325.521	3325.521	13325.521
1.2.2.0	Identify needed raw materials	PM+PMT+ Procurement Specialist	8	1250	10000	1	3325.521	3325.521	13325.521
1.2.2.1	Identify needed utilities	PM+PMT(Engineering)	24	437.5	10500	1	2825.521	2825.521	13325.521
1.2.2.2	Develop Resource Breakdown Structure	PMT	8	787.5	6300	1	2583.681	2583.681	8883.681

1.2.2.3	Create WBS Dictionary	PMT	8	750	6000	1	2883.681	2883.681	8883.681
1.2.2.4	Create and develop Network Diagram	PMT + Planning Engineer	8	725	5800	1	3083.681	3083.681	8883.681
1.2.2.5	Develop Responsibility Assignments Matrix	PM+PMT	8	800	6400	1	2483.681	2483.681	8883.681
1.2.2.6	Develop Team Charter	PM	8	750	6000	1	2883.681	2883.681	8883.681
1.2.2.7	Identify management staff resources	PM + Recruitment Specialist	8	1312.5	10500	1	2825.521	2825.521	13325.521
1.2.2.8	Plan Resource Management	PM+PMT	16	418.75	6700	1	2183.681	2183.681	8883.681
1.2.2.9	Develop Project Schedule	PMT + Planning Engineer	40	150	6000	1	2883.681	2883.681	8883.681
1.2.2.0	Develop Schedule Management plan	PM + PMT + Planning Engineer	24	437.5	10500	1	2825.521	2825.521	13325.521
1.2.2.1	Develop Requirements Management Plan	PM+PMT	8	875	7000	1	1883.681	1883.681	8883.681
1.2.2.2	Develop Requirements Documentation	PM+PMT	8	837.5	6700	1	2183.681	2183.681	8883.681
1.2.2.3	Requirements Traceability Matrix	PM+PMT	8	762.5	6100	1	2783.681	2783.681	8883.681
1.2.2.4	Estimate Costs	PM+PMT + Financial Analyst	16	393.75	6300	1	2583.681	2583.681	8883.681
1.2.2.5	Summarize operating expenses and financial projections	PM+PMT + Financial Analyst	8	775	6200	1	2683.681	2683.681	8883.681
1.2.2.6	Define Cost Baseline	PM+ PMT + Financial Analyst	8	768.75	6150	1	2733.681	2733.681	8883.681
1.2.2.7	Create and develop Variance Analysis report	PM+ PMT+ Financial Analyst	8	75	600	1	8283.681	8283.681	8883.681

1.2.2.8	Create and develop Earned Value Analysis report	PM + PMT + Financial Analyst	8	825	6600	1	2283.681	2283.681	8883.681
1.2.2.9	Plan Cost Management	PM+ PMT + Financial Analyst	16	390.625	6250	1	2633.681	2633.681	8883.681
1.2.2.0	Develop Plan Stakeholder Engagement	PM+PMT	8	787.5	6300	1	2583.681	2583.681	8883.681
1.2.2.1	Develop Plan Communications Management	PM+PMT	8	775	6200	1	2683.681	2683.681	8883.681
1.2.2.2	Develop Quality Metrics	PM+PMT+QC/QA Engineers	8	750	6000	1	2883.681	2883.681	8883.681
1.2.2.3	Plan Quality Management	PM+PMT+QC/QA Engineers	16	425	6800	1	2083.681	2083.681	8883.681
1.2.2.4	Develop Change Management Plan	PM+PMT	8	875	7000	1	1883.681	1883.681	8883.681
1.2.2.5	Develop Project Management Plan	PM+PMT	80	875	70000	1	9953.22	9953.220	79953.220
1.2.2.6	Create and develop Release Plan	PM+PMT	8	250	2000	1	2441.84	2441.840	4441.840
1.2.2.7	Develop Training plan	Training Specialist	24	104.1667	2500	1	1941.84	1941.840	4441.840
1.2.2.8	Plan the delivery method for the received 3D printers to the agreed location	PMT + Procurement Specialist	8	812.5	6500	1	2383.681	2383.681	8883.681

Quality Requirements: Refer to Quality Plan

Acceptance Criteria: Refer to Quality and inspection requirement

Technical Information: Refer to Equipment specification

Agreement Information: Refer to Project Contract # 665229431

Table 32. WBS Dictionary workpackage 6

WBS DICTIONARY

Project Title: Making a Tourists Experience Through 3D Printers Around KSA **Date Prepared:** 04/Dec/2021

Work Package Name: Evaluate and assess the proper locations for installing 15 3D printers

Code of Accounts: 1.2.3

Description of Work: This part of evaluation to finalize the proper locations for 3D printers to install

Assumptions and Constraints: Refer to Approved Scope of Work

Milestones: 1. Identify potential locations

Due Dates: 12/4/2022

ID	Activity	Resource	Labor			Material			Total Cost
			Hours	Rate	Total	Units	Cost	Total	
1.2.3.1	Assess all famous and suitable locations for tourists around KSA	PM+PMT(Engineering)	160	143.2168	22914.68	1	9000	9000	31914.68
1.2.3.2	Create locations analysis plan	PM+PMT(Engineering)	80	68.75	5500	1	2500	2500	8000
1.2.3.3	Implement locations analysis plan	PM+PMT(Engineering)	80	285.979	22878.32	1	8000	8000	30878.32
1.2.3.4	Identify potential locations	PM+PMT(Engineering)	80	81.25	6500	1	1500	1500	8000
1.2.3.5	Summarize the potential locations	PM+PMT(Engineering)	80	68.75	5500	1	1500	1500	7000

Quality Requirements: Refer to Quality Plan

Acceptance Criteria: Refer to Quality and inspection requirement

Technical Information: Refer to Equipment specification

Agreement Information: Refer to Project Contract # 665229431

Table 33. WBS Dictionary workpackage 7

WBS DICTIONARY

Project Title: Making a Tourists Experience Through 3D Printers Around KSA **Date Prepared: 04/Dec/2021**

Work Package Name: Evaluate Potential Risks and Rewards			Code of Accounts: 1.2.4						
Description of Work: To identify the risk, prioritize and prepare the response plan			Assumptions and Constraints: Refer to Approved Scope of Work						
Milestones: 1. Plan Risk Responses			Due Dates: 13/5/2022						
ID	Activity	Resource	Labor			Material			Total Cost
			Hours	Rate	Total	Units	Cost	Total	
1.2.4.1	Assess needed resources availability	PM+PMT	40	25.000	1000	1	746.5217	746.522	1746.522
1.2.4.2	Identify Risks	PM+ PMT + All other Departments	40	21.832	873.261	1	0	0.000	873.261
1.2.4.3	Perform Qualitative Risk Analysis	PM+ PMT +All other Departments	80	12.500	1000	1	746.5217	746.522	1746.522
1.2.4.4	Perform Quantitative Risk Analysis	PM+ PMT+ All other Departments	80	12.500	1000	1	-126.739	-126.739	873.261
1.2.4.5	Develop and Create Probability and Impact assessment	PM+ PMT + All other Departments	16	54.579	873.261	1	0	0.000	873.261
1.2.4.6	Develop and Create Probability and Impact Matrix	PM+ PMT+ All other Departments	16	54.579	873.261	1	0	0.000	873.261
1.2.4.7	Plan Risk Responses	PM+ PMT+ All other Departments	80	12.500	1000	1	746.5217	746.522	1746.522
1.2.4.8	Develop and Create Plan Risk Management	PM+ PMT+ All other Departments	64	13.645	873.261	1	0	0.000	873.261

1.2.4.9	Develop and Create Risk Register	PM+ PMT+ All other Departments	8	109.158	873.261	1	0	0.000	873.261
1.2.4.0	Develop and Create Risk Report	PM+ PMT+ All other Departments	8	109.158	873.261	1	0	0.000	873.261
1.2.4.1	Develop and create Risk Audit Plan	PM+PMT + All other Departments + QC/QA Engineers	8	218.315	1746.522	1	0	0.000	1746.522
1.2.4.2	Forecast financial returns	PM+ Financial Specialist	48	20.833	1000	1	746.522	746.522	1746.522
1.2.4.3	Review and modify the Risk plan	PM+ PMT+ All other Departments	40	43.663	1746.522	1	0	0.000	1746.522
1.2.4.4	Confirm decision to proceed	PM	80	21.832	1746.522	1	0	0.000	1746.522
Quality Requirements: Refer to Quality Plan									
Acceptance Criteria: Refer to Quality and inspection requirement									
Technical Information: Refer to Equipment specification									
Agreement Information: Refer to Project Contract # 665229431									

Table 34. WBS Dictionary workpackage 8

WBS DICTIONARY

Project Title: Making a Tourists Experience Through 3D Printers Around KSA **Date**

Prepared: 04/Dec/2021

Work Package Name: Conduct Procurements

Code of Accounts: 1.3.1

Description of Work: Perform the actual procurements activity till received the Printers

Assumptions and Constraints: Refer to Approved Scope of Work

Milestones:

1. Follow Up with Vendor
2. Close the contract with Vendors

Due Dates: 11/5/2022

ID	Activity	Resource	Labor			Material			Total Cost
			Hours	Rate	Total	Units	Cost	Total	
1.3.1.1	Contact the vendors	PM + Procurement Specialist	160	282.2112	45153.79	1	25000	25000	70153.7857
1.3.1.2	Collect the offers	PM + Procurement Specialist	160	313.4612	50153.79	1	20000	20000	70153.7857
1.3.1.3	Review the offers	PM + Procurement Specialist	40	3134.612	125384.5	1	50000	50000	175384.464
1.3.1.4	Negotiation for Price, Delivery and warranty	PM + Procurement Specialist	80	689.4223	55153.79	1	15000	15000	70153.7857
1.3.1.5	Follow Up with Manufacturer or Vendor	PM + Procurement Specialist	160	407.2112	65153.79	1	5000	5000	70153.7857
1.3.1.6	Filling and update Contractor Status Report	PM + Procurement Specialist	8	8769.223	70153.79	1	0	0	70153.7857
1.3.1.7	Conduct Procurement Audit	PM + Procurement Specialist	32	3288.459	105230.7	1	0	0	105230.679
1.3.1.8	Filling and update Contact Closeout Report	PM + Procurement Specialist	8	8769.223	70153.79	1	0	0	70153.7857



1.3.1.9	Filling and update Product Acceptance Form	PM + Procurement Specialist	8	8769.223	70153.79	1	0	0	70153.7857
1.3.1.0	Close the contract with Vendors	PM + Procurement Specialist	80	815.3835	65230.68	1	0	0	65230.6786
Quality Requirements: Refer to Quality Plan									
Acceptance Criteria: Refer to Quality and inspection requirement									
Technical Information: Refer to Equipment specification									
Agreement Information: Refer to Project Contract # 665229431									

Table 35. WBS Dictionary workpackage 9

WBS DICTIONARY

Project Title: Making a Tourists Experience Through 3D Printers Around KSA **Date Prepared:** 04/Dec/2021

Work Package Name: Installation of 3D printers

Code of Accounts: 1.3.2

Description of Work: Perform the actual procurements activity till received the Printers

Assumptions and Constraints: Refer to Approved Scope of Work

Milestones:

1. Receive the 15 3D Printers
2. Install exterior fixture

Due Dates: 15/11/2022

ID	Activity	Resource	Labor			Material			Total Cost
			Hours	Rate	Total	Units	Cost	Total	
1.3.2.1	Receive the 15 3D Printers	PMT + Procurement Specialist	960	20.83333	20000	15	2000	30000	150000
1.3.2.2	Electrical installation	PMT+ Technicians	160	11794.69	1887150	15	20000	300000	2187150
1.3.2.3	Install interior fixture	PMT+ Technicians	160	12107.19	1937150	15	16666.67	250000	2187150
1.3.2.4	Install exterior fixture	PMT+ Technicians	160	12107.19	1937150	15	16666.67	250000	2187150

Quality Requirements: Refer to Quality Plan

Acceptance Criteria: Refer to Quality and inspection requirement

Technical Information: Refer to Equipment specification

Agreement Information: Refer to Project Contract # 665229431

Table 36. WBS Dictionary workpackage 10

WBS DICTIONARY

Project Title: Making a Tourists Experience Through 3D Printers Around KSA **Date Prepared:** 04/Dec/2021

Work Package Name: Direct and Manage Project Work **Code of Accounts:** 1.3.3

Description of Work: To manage entire projects works and activity

Assumptions and Constraints: Refer to Approved Scope of Work

Milestones:

1. Manage Team
2. Manage Communications
3. Monitor and Control Project Work

Due Dates: 6/12/2022

ID	Activity	Resource	Labor			Material			Total Cost
			Hours	Rate	Total	Units	Cost	Total	
1.3.3.1	Manage Team	PM+PMT	1440	4.861111	7000	1	2508.333	2508.333	9508.333
1.3.3.2	Filling Team Member Status Report	PM+PMT	1440	1.388889	2000	1	1803.333	1803.333	3803.333
1.3.3.3	Submit Project status Report	PM+PMT	1440	2.083333	3000	1	2705	2705.000	5705.000
1.3.3.4	Perform and submit Variance Analysis	PM+PMT	1440	1.388889	2000	1	1803.333	1803.333	3803.333
1.3.3.5	Perform and submit Earned Value Analysis	PM+PMT	1440	1.388889	2000	1	1803.333	1803.333	3803.333
1.3.3.6	Conduct Risk Audit	All Departments + PM + PMT	40	75	3000	1	2705	2705.000	5705.000
1.3.3.7	Manage Communications	PMT	1440	4.861111	7000	1	2508.333	2508.333	9508.333
1.3.3.8	Implement Risk Responses	PMT	1440	2.430556	3500	1	2205	2205.000	5705.000
1.3.3.9	Manage Stakeholder Engagement	PM+PMT	1440	5.208333	7500	1	2008.333	2008.333	9508.333
1.3.3.0	Monitor and Control Project Work	PM+PMT	1440	2.5	3600	1	2105	2105.000	5705.000
1.3.3.1	Perform Integrated Change Control	PM+PMT	1440	1.736111	2500	1	1303.333	1303.333	3803.333

1.3.3.2	Control Scope	PM+PMT	1440	2.083333	3000	1	2705	2705.000	5705.000
1.3.3.3	Control Schedule	PM+PMT+ Planning Engineer	1440	1.388889	2000	1	1803.333	1803.333	3803.333
1.3.3.4	Control Costs	PM+PMT+ Financial Specialist	1440	4.861111	7000	1	2508.333	2508.333	9508.333
1.3.3.5	Control Quality	PM+PMT	1440	2.083333	3000	1	2705	2705.000	5705.000
1.3.3.6	Control Resources	PM+PMT+ Recruitment Specialist	1440	1.388889	2000	1	1803.333	1803.333	3803.333
1.3.3.7	Monitor Communications	PMT	1440	1.388889	2000	1	1803.333	1803.333	3803.333
1.3.3.8	Filling and update Issue Log	PMT	1440	1.388889	2000	1	1803.333	1803.333	3803.333
1.3.3.9	Filling and update Decision Log	PMT	1440	1.388889	2000	1	1803.333	1803.333	3803.333
1.3.3.0	Filling and update Change Request	PMT	1440	1.388889	2000	1	1803.333	1803.333	3803.333
1.3.3.1	Filling and update Change Log	PMT	1440	1.388889	2000	1	1803.333	1803.333	3803.333
1.3.3.2	Filling and update Lessons Learned Register	PMT	1440	1.388889	2000	1	1803.333	1803.333	3803.333
1.3.3.3	Filling and update Quality Audit	PMT	40	50	2000	1	1803.333	1803.333	3803.333
1.3.3.4	Conduct and submit Team Performance assessment	PM+ Recruitment Specialist	80	37.5	3000	1	2705	2705.000	5705.000
1.3.3.5	Monitor Risks	PMT	1440	17.36111	25000	1	13033.33	13033.333	38033.333

Quality Requirements: Refer to Quality Plan

Acceptance Criteria: Refer to Quality and inspection requirement

Technical Information: Refer to Equipment specification

Agreement Information: Refer to Project Contract # 665229431

Table 37. WBS Dictionary workpackage 11

WBS DICTIONARYBB1:K15

Project Title: Making a Tourists Experience Through 3D Printers Around KSA **Date Prepared:** 04/Dec/2021

Work Package Name: Inspect and operate all 3D printers after installation

Code of Accounts: 1.4.1

Description of Work: Inspect the equipment to make sure the operation will perform smoothly

Assumptions and Constraints: Refer to Approved Scope of Work

Milestones:

1. Inspect the all installed 15 3D printers
2. Confirm the quality of installation and operation for all 15 3D printers

Due Dates: 29/11/2022

ID	Activity	Resource	Labor			Material			Total Cost
			Hours	Rate	Total	Units	Cost	Total	
1.4.1.1	Inspect the all installed 15 3D printers	QA/QC Engineers + Technicians	40	262.5	10500	3	2666.667	8000	18500
1.4.1.2	Ensure all the installed 3D printers are worked properly	QA/QC Engineers + Technicians	40	262.5	10500	3	2666.667	8000	18500
1.4.1.3	Confirm the quality of installation and operation for all 15 3D printers	QA/QC Engineers + Technicians	40	262.5	10500	3	2666.667	8000	18500

Quality Requirements: Refer to Quality Plan

Acceptance Criteria: Refer to Quality and inspection requirement

Technical Information: Refer to Equipment specification

Agreement Information: Refer to Project Contract # 665229431

Table 38. WBS Dictionary workpackage 12

WBS DICTIONARY

Project Title: Making a Tourists Experience Through 3D Printers Around KSA **Date Prepared:** 04/Dec/2021

Work Package Name: Provide Training

Code of Accounts: 1.4.2

Description of Work: Inspect the equipment to make sure the operation will perform smoothly

Assumptions and Constraints: Refer to Approved Scope of Work

Milestones: 1. Provide Training for the equipment operators

Due Dates: 20/12/2022

ID	Activity	Resource	Labor			Material			Total Cost
			Hours	Rate	Total	Units	Cost	Total	
1.4.2.1	Provide Training for the equipment operators.	PMT+ Training Specialist	120	133.3333	16000	2	3250	6500	22500

Quality Requirements: Refer to Quality Plan

Acceptance Criteria: Refer to Quality and inspection requirement

Technical Information: Refer to Equipment specification

Agreement Information: Refer to Project Contract # 665229431

Table 39. WBS Dictionary workpackage 13

WBS DICTIONARY

Project Title: Making a Tourists Experience Through 3D Printers Around KSA **Date Prepared:** 04/Dec/2021

Work Package Name: Handover the equipment to ministry

Code of Accounts: 1.5.1

Description of Work: To handover the Printers to client

Assumptions and Constraints: Refer to Approved Scope of Work

Milestones:

Due Dates: 6/12/2022

ID	Activity	Resource	Labor			Material			Total Cost
			Hours	Rate	Total	Units	Cost	Total	
1.5.1	Handover the equipment to ministry	PM	40	90	3600	0	0	0	3600

Quality Requirements: Refer to Quality Plan

Acceptance Criteria: Refer to Quality and inspection requirement

Technical Information: Refer to Equipment specification

Agreement Information: Refer to Project Contract # 665229431

Table 40. WBS Dictionary workpackage 14

WBS DICTIONARY

Project Title: Making a Tourists Experience Through 3D Printers Around KSA **Date Prepared:** 04/Dec/2021

Work Package Name: Collection the Lesson and learned

Code of Accounts: 1.5.2

Description of Work: To handover the Printers to client

Assumptions and Constraints: Refer to Approved Scope of Work

Milestones: 1. Filling and update Lessons Learned Summary

Due Dates: 6/12/2022

ID	Activity	Resource	Labor			Material			Total Cost
			Hours	Rate	Total	Units	Cost	Total	
1.5.2.1	Filling and update Lessons Learned Summary	PMT	1440	2.291667	3300	0	0	0	3300

Quality Requirements: Refer to Quality Plan

Acceptance Criteria: Refer to Quality and inspection requirement

Technical Information: Refer to Equipment specification

Agreement Information: Refer to Project Contract # 665229431

Table 41. WBS Dictionary workpackage 15

WBS DICTIONARY

Project Title: Making a Tourists Experience Through 3D Printers Around KSA **Date Prepared:** 04/Dec/2021

Work Package Name: Prepare the Closeout Report

Code of Accounts: 1.5.3

Description of Work: Preparing final report to closeout the project

Assumptions and Constraints: Refer to Approved Scope of Work

Milestones: 1. Filling and update Lessons Learned Summary

Due Dates: 26/12/2022

ID	Activity	Resource	Labor			Material			Total Cost
			Hours	Rate	Total	Units	Cost	Total	
1.5.3.1	Filling and update Project or Phase Closeout	PM+PMT	32	93.75	3000	2	1122	2244	5244

Quality Requirements: Refer to Quality Plan

Acceptance Criteria: Refer to Quality and inspection requirement

Technical Information: Refer to Equipment specification

Agreement Information: Refer to Project Contract # 665229431

Table 42. WBS Dictionary workpackage 16

Identifying Requirement traceability matrix:

This is a forward RTM: Requirements might need to be changed based on customer's need and demand. Project team should keep a log of all changes in customer's modifications demands, reprioritizing, introduction of new business rules, and all other related requirements (Software, 2013).

Requirements Traceability Matrix								
Requirements Information					Relationship Traceability			
ID	Requirement	Source	Category	Priority	Business Objective	Deliverable	Verification	Validation
REQ1	Study the proper and safe location based on a study within the tourist areas for Installing 3D printers.	Ministry of Tourism	Non-Functional	Level1	Enhance the experience of the tourists in the famous places around Saudi Arabia. Introduce the new technologies in the tourism sector. Provide a unique service to the tourists in Saudi Arabia.	Proposed the suitable and famous locations for 15 3D printers to be used by tourists and the public.	Number of visitors per a year for the selected places Number of hazard observations for the selected places	The number of visitors per a year for every proposed place must be more than 10K The number of observed hazards in the proposed places is zero
REQ2	Find and propose the proper vendors based on the technical specifications, technical requirements, and all other requirements from the customer.		Non-Functional	Level1	Attract tourists from the world to visit Saudi Arabia.	Evaluate, assess and Propose the most suitable 3D printers according to the proper requirements and specifications.	Number of Non-conformity according to specifications and requirements	All the technical specifications and other requirements are meet (zero Non-Conformity).

Table 43. Requirements Traceability Matrix (Dionisio, 2017)

Inter-Requirements Traceability Matrix

ID	Business Requirement	Priority	Source	ID	Technical Requirements	Priority	Source
REQ1	Study the proper and safe location based on a study within the tourist areas for Installing 3D printers.	Level1	Ministry of Tourism	REQ1	All the agreed places must have a good internet network or at least the site is suitable to have one. All the agreed places must-have source of electricity or at least the place is suitable to have one.	Level1	United Smart Tech. Co
REQ2	Find and propose the proper vendors based on the technical specifications, technical requirements, and all other requirements from the customer.	Level1		REQ2	The vendors must have ISO 9001 Certificate. The products of the vendors must comply with international standards from ISO and IEC.	Level1	
REQ3	Receive all the 3D printers and their accessories.	Level2		REQ3	All the purchased printers must be delivered to the agreed places covered and protected from any source of damage during transportation by following all the procedures and regulations.	Level2	
REQ4	Inspect all the 3D printers and their accessories	Level1		REQ4	All the received printers and their accessories must not have any damage or defect.	Level1	
REQ5	Install 15 3D printers in the agreed places.	Level2		REQ5	All printers and their accessories must be installed professionally and carefully following all the procedures and regulations.	Level2	

REQ6	Test 15 3D printers after installation.	Level1		REQ6	All the printers must work well after installing. The assurance of well-functioning will be done by checking: Accessibility of the printers Authentication and authorization Availability Data quality Human error Information security Internal controls Interoperability Maintainability Performance Privacy Productivity Reliability Serviceability Standards System errors Vendor lock-in	Level1
REQ7	Provide training for the equipment operators.	Level2		REQ7	The training must cover all aspects of the following: Operation Maintenance for Hardware and Software parts Safety	Level1
REQ8	Handover the equipment to Ministry.	Level3		REQ8		Level3

Table 44. Inter-Requirements Traceability Matrix (Dionisio, 2017)

Specifying the methods used in requirement collection:

There are many methods used to collect the data. The suitable method for collecting data will depend on different factors such as and not limited to:

- Types of data.
- The location of the data source.
- The amount of data to be collected.
- The number of sources for each type of data.

The below table shows the method that can be used to collect for each requirement for the project:

ID	Requirements	Collection Methods
R1	Study the proper and safe location based on a study within the tourist areas for installing 3D printers	Requirement Workshops, Brainstorming, Document Analysis, Focus Group, Interview, Survey/Questionnaire, and Interface analysis
R2	Find and propose the proper vendors based on the technical specifications, technical requirements, and all other requirements from the customer.	Requirement Workshops, Brainstorming, Document Analysis,

Focus Group,
Interview,
Survey/Questionnaire,
and Interface analysis

Prototyping and Observation
Interview,
Survey/Questionnaire,
and Interface analysis

Brainstorming,
Interview,
Focus Group,
and Survey/Questionnaire.
and Interface analysis

User Observation
Interview,
Survey/Questionnaire,

Prototyping and Observation
Interview,
and Survey/Questionnaire.
and Interface analysis

Use Cases and Scenarios and
Role-play
Brainstorming,
Focus Group,
and Survey/Questionnaire.

R3 Receive all the 3D printers and their accessories

R4 Inspect all the 3D printers and their accessories

R5 Install 15 3D printers in the agreed places

R6 Test 15 3D printers after installation

R7 Provide training for the equipment operators

R8

Handover the equipment to the Ministry

User Observation
Brainstorming,
Focus Group,
and Survey/Questionnaire.

Table 45. requirement_collection (Software, 11 Requirements Gathering Techniques for Agile Product Teams, 2021)

Development the hierarchical structure of the objectives of the project connected to the strategy:

Hierarchical structure of the objectives of the project connected to the strategy

Mission: To become one of the main partners for the Saudi Ministry of Tourism to provide a creative, innovative, and exceptional tourism experience while creating a better journey that benefits both our customers and the end-users.

Vision: To be part of creating environment support that aids the Saudi Ministry of Tourism in achieving 2030 vision by providing tourism experience that contributes to enhancing tourism in the KSA.

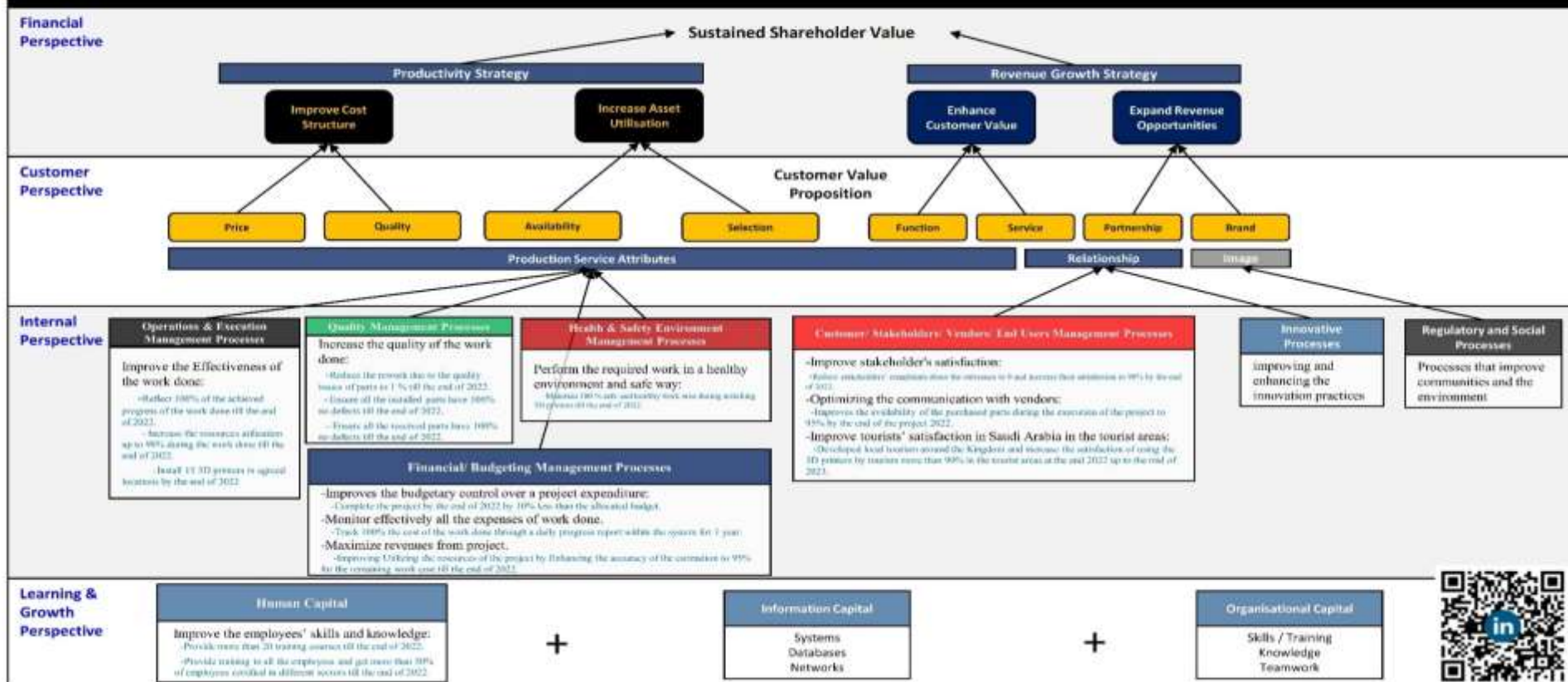


Figure 36. hierarchical structure of the objectives of the project connected to the strategy

Development, defining and preparing a scope statement (its limits - specifying what it does not include):

Project ID	MOT-12546	Date	2/12/2021
Project Name	Making a Tourists Experience Through 3D Printers Around KSA		
Project Objectives	SMART Objectives	Success Criteria	
	Complete the project by the end of 2022 by 10% less than the allocated budget.	Zero-based budgeting	
	Track 100% of the cost of the work done through a daily progress report within the system for one year.	Zero missing cost report for the work done	
	Improve utilizing the project's resources by enhancing the estimation accuracy to 95% for the remaining work cost until the end of 2022.	Providing four updated reports quarterly	
	Reduce stakeholders' complaints about the outcomes to 0 and increase their satisfaction to 98% by the end of 2022.	Zero Stakeholders compliant	
	Improve Availability of the purchased parts during the execution of the project to 95% by the end of the project 2022.	Zero-time deal from vendors for equipment's and accessories	
	Developed local tourism around the Kingdom and increased the satisfaction of using the 3D printers by more than 90% in the tourist areas from the end of 2022 to mid-2023.	Zero Complaints from tourists	
	Reduce the rework due to the quality issues of parts to 1 % by the end of 2022.	Less than 1% rework	
	Ensure all the installed parts have 100% no defects till the end of 2022.	Zero defects for installed parts	
	Ensure all the received parts have 100% no defects till the end of 2022.	Zero defects for received parts	
	Maintain 100 % safe and healthy work area till the end of 2022.	Zero accidents and incidents	
	Reflect 100% of the achieved progress of the work done till the end of 2022.	Zero missing reports for the work done	
	Increase the resources utilization up to 98% during the work done till the end of 2022.	Utilization >=98%	
	Provide more than 20 training courses till the end of 2022.	Provided training >= 20	
	Provide training to all the employees and get more than 50% of employees certified in different sectors till the end of 2022.	No. of certified employees >= 50% of company employees	

**Product
Scope
Definition**
The 3D printers must have:

- A beautiful design.
- Fast printing speed with high accuracy and precision.
- Feature allows the end-users to use it manually for the shapes of the products inside the system or automatically by connecting with the end user's mobile phones.
- An option for selecting different colors for the products.
- Easy payment methods for the end-users.
- Safe product delivery.

The system requirements must be (Team, 2021):
-Accessibility.

- **Have Authentication and authorization.** Authentication refers to assessing data as valid, and authorization provides clearance for users to access it.
- **Able to show the Availability of the system for improvement.** how long a software or resource is available for users to operate
- **Able to provide Data quality used for operational and decision-making processes.**
- **Able to detect the Human error.**
- **Able to provide Information security for the connected users and all payments methods.**
- **Have Internal controls for specific users who can access the decryption keys for encrypted users and highly classified data.**
- **Interoperability must offer comprehensive compatibility for different operating systems.**
- **Maintainability.**
- **Able to show the performance of the printers.**
- **Privacy for end-users' information.**
- **Able to make the end-users more productive.**
- **Reliability.**
- **Serviceability of the system.** The system must not shut down completely when software upgrades or changes.
- **Follow the security and architectural Standards requirements**
- **Able to show the System errors and technical causes of an error code to communicate this discrepancy with the user.**
- **Vendor lock-in which means it is open-sourced.**

Project Requirements	1-Study the proper and safe location based on a study within the tourist areas for Installing 3D printers. 2- Find and propose the proper vendors based on the technical specifications, technical requirements, and all other requirements from the customer. 3-Receive all the 3D printers and their accessories. 4-Design and define the proper 3D printers' specifications. 5-Inspect all the 3D printers and their accessories. 6-Install 15 3D printers in the agreed places. 7-Test 15 3D printers after installation. 8-Provide training for the equipment operators. 9-Handover the equipment to the Ministry.
Project Boundaries	The project will be only within the Kingdom of Saudi Arabia in the famous areas, having more tourists, safe, suitable for 3D printers, and approved by the Ministry of tourism. All other locations are out of scope. The 3D printers must be friendly and not have dimensions bigger than (3M x 2M x 1.5M) (high x width x thickness).
Project Deliverables	- Establish standard 3D printers that include a variety of souvenirs, carefully selected for the sights and country culture, with high quality. - Increasing the percentage of domestic tourism satisfaction in the Kingdom by 20% compared to the previous five years. - Provide the proper and safe locations based on a study within the tourist areas for Installing 15 3D printers. - Design and define the proper 3D printers' specifications. - Find and propose the proper vendors based on the technical specifications, technical requirements, and all other requirements from the customer. - Install 15 3D printers in the agreed places. - Testing 15 3D printers. - Train all 15 3D printers' operators.

Product Acceptance Criteria	Product Operating Conditions: • Surrounding operation temperature: 15–45°C (for PLA printing). • Maximum environment humidity: 60%. • Dust-free environment. • A stable and firm base preventing the transfer of vibrations from the printer to the surrounding area. • Original power source. • The printer must be placed 1 m or more from any heat source. • The printer must be placed in a well-ventilated area. Product Specifications: • Touch screen. • Print bed/ head. • Front/Side doors. • Electromechanical lock strike plate. • Power connector for a 240 V power source. • Filament entry point/filament detector. • Card reader holder. • Ethernet port. • Printing technology FFF (Fused Filament Fabrication). • Printing area (1.1 M × 1.4 M × 1 M). • Dimensions (2.5 M × 1.8 M × 1.4 M). • Weight (250Kg).
Project Constraints	Cost: -The project cost 9,689,970.786SAR. Time: -Time and schedule to complete the project within 52 weeks. Scope: -Find, study, analysis and propose the proper and suitable places to install 15 3D printing. -I was provided and approved by stakeholders. -Design and define the proper 3D printers' specifications. -Training the Operators of the 3D printers.

Project Assumptions	- The project follows a Six Sigma DMAIC approach. The corporate has medium-level experience in doing projects according to this methodology. This project assumes that all stakeholders will understand and accept the six sigma-related work products and deliverables. -All the 3D printers' machines will be delivered by the supplier with their needed accessories to the agreed places. -The design of 3D printers and the technical specifications need to be specified. The corporate has limited experience in technical designing for the 3D printers. This project assumes that all technical specifications and designing parameters and parts will be specified between USTC and specialized company for that.																								
Initial Project Organization	<table> <tr> <th>Stakeholder:</th><th>Project Team</th></tr> <tr> <td>Ministry of Tourism</td><td>Omer Alghamdi</td></tr> <tr> <td>Ministry of Transport and logistic services</td><td>Steven</td></tr> <tr> <td>3D printer Vendors</td><td>Robert</td></tr> <tr> <td>Tourists and End-Users</td><td>Donald</td></tr> <tr> <td></td><td>Rahaf Alshehri</td></tr> <tr> <td></td><td>Fathuldeen Mohammed</td></tr> <tr> <td></td><td>Abdulaziz Al Quzi</td></tr> <tr> <td></td><td>Arwa Alaorini</td></tr> <tr> <td></td><td>Mahmoud Hassan</td></tr> <tr> <td></td><td>Marah Alotaibi</td></tr> <tr> <td></td><td>Ali Samater</td></tr> </table>	Stakeholder:	Project Team	Ministry of Tourism	Omer Alghamdi	Ministry of Transport and logistic services	Steven	3D printer Vendors	Robert	Tourists and End-Users	Donald		Rahaf Alshehri		Fathuldeen Mohammed		Abdulaziz Al Quzi		Arwa Alaorini		Mahmoud Hassan		Marah Alotaibi		Ali Samater
Stakeholder:	Project Team																								
Ministry of Tourism	Omer Alghamdi																								
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	Arwa Alaorini																								
	Mahmoud Hassan																								
	Marah Alotaibi																								
	Ali Samater																								

Schedule Milestones

Task Description	Start	Finish
Requirement Analysis	Sat 1/1/22	Mon 2/21/22
Gathering information	Sat 1/1/22	Thu 2/17/22
Information is collected	Thu 1/6/22	Thu 1/6/22
Designs and Drawings for the 3D printers booths	Thu 2/17/22	Thu 2/17/22
Team Forming	Mon 1/3/22	Fri 1/28/22
Project Team is formed	Fri 1/28/22	Fri 1/28/22
Issue Project Charter	Tue 1/25/22	Mon 2/21/22
All requirements are reviewed	Mon 2/14/22	Mon 2/14/22
Project Charter is created	Mon 2/21/22	Mon 2/21/22
Planning	Tue 2/15/22	Fri 5/13/22
Define the Available vendors within market	Tue 2/15/22	Thu 3/31/22
Provide the potential vendors	Fri 2/25/22	Fri 2/25/22
Identify Needed Resources(Materials and Supplies and money)	Tue 2/15/22	Wed 4/13/22
Provide Procurement Vision and specifications	Wed 2/23/22	Wed 2/23/22
Provide WBS	Tue 3/15/22	Tue 3/15/22
Provide RBS	Mon 3/14/22	Mon 3/14/22
Provide WBS Dictionary	Tue 3/15/22	Tue 3/15/22
Provide Project Schedule	Mon 3/28/22	Mon 3/28/22
Provide Project Cost	Mon 3/28/22	Mon 3/28/22
Provide Project Management Plan	Wed 4/13/22	Wed 4/13/22
Provide Training Plan	Tue 4/5/22	Tue 4/5/22
Plan the delivery method for the received 3D printers to the agreed location	Fri 4/1/22	Fri 4/1/22
Evaluate and assess the proper locations for installing 15 3D printers	Wed 3/16/22	Tue 4/12/22
Identify potential locations	Tue 4/12/22	Tue 4/12/22
Evaluate Potential Risks and Rewards	Wed 4/13/22	Fri 5/13/22
Provide Risk Response Plan	Thu 5/12/22	Thu 5/12/22
Implementation	Wed 3/2/22	Tue 12/6/22

	Conduct Procurements	Wed 3/2/22	Wed 5/11/22
	Follow Up with Vendor	Tue 4/26/22	Tue 4/26/22
	Close the Contract with Vendor	Wed 5/11/22	Wed 5/11/22
	Installation of 3D printers	Wed 5/4/22	Tue 11/15/22
	Receive the Printers	Tue 10/18/22	Tue 10/18/22
	Install exterior fixture	Tue 11/15/22	Tue 11/15/22
	Direct and Manage Project Work	Wed 3/30/22	Tue 12/6/22
	Manage Team	Tue 12/6/22	Tue 12/6/22
	Manage Communications	Tue 12/6/22	Tue 12/6/22
	Monitor and Control Project Work	Tue 12/6/22	Tue 12/6/22
	Testing	Wed 11/16/22	Tue 12/20/22
	Inspect and operate all 3D printers after installation	Wed 11/16/22	Tue 11/29/22
	Inspect all 15 3D printers	Tue 11/22/22	Tue 11/22/22
	Confirm the quality of installation and operation	Tue 11/29/22	Tue 11/29/22
	Provide Training	Wed 11/30/22	Tue 12/20/22
	Provide training for the equipment operators.	Tue 12/20/22	Tue 12/20/22
	Closing	Wed 3/30/22	Tue 12/27/22
	Collection the Lesson and learned	Wed 3/30/22	Tue 12/6/22
	provide Lessons Learned Summary	Tue 12/6/22	Tue 12/6/22
	Prepare the Closeout Report	Wed 12/21/22	Mon 12/26/22
	Provide Project or Phase Closeout	Mon 12/26/22	Mon 12/26/22
Fund Limitation	In general, the fund of the project will be on the progress of the submitted deliverables. 10% of the project's fund will be issued at the beginning by the Ministry of tourism.		

Approval Requirements

Project Sponsor

Signature:

Date:

Print Name:

Title:

Role:

Signature:

Date:

Print Name:

Title:

Role:

Other Project Stakeholders

Signature:

Date:

Print Name:

Title:

Role:

Signature:

Date:

Print Name:

Title:

Role:

Requesting Manager and Project Manager

Signature:

Date:

Print Name:

Title:

Role:

Signature:

Date:

Print Name:

Title:

Role: _____

**Approve Customer
Benefits provided by
the project's products
(Customer
Acceptance):**

Signature: _____

Date: _____

Print Name: _____

Title: _____

Role: _____

Signature: _____

Date: _____

Print Name: _____

Title: _____

Role: _____

**Approve Return On
Investment (ROI):**

Signature: _____

Date: _____

Print Name: _____

Title: _____

Role: _____

Signature: _____

Date: _____

Print Name: _____

Title: _____

Role: _____

**Approve Delivery of
Project Documents:**

Signature: _____

Date: _____

Print Name: _____

Title: _____

Role: _____

Signature: _____

Date: _____

Print Name: _____

Title: _____

Role: _____

**Approve Performance
of the Project Team:**

Signature: _____

Date: _____

Print Name: _____

Title: _____

Role: _____

Signature: _____

Date: _____

Print Name: _____

Title: _____

Role: _____

Develop, define and explain the concepts of scope creep and give an example:

Scope Creep

It is a change in the scope of the project, the process of expanding it and deviating from the specified scope, or "infiltration", beyond what was originally agreed upon, which affects the outputs of the entire project. (Meckol, 2019).

Those changes also affect the project schedule, budget, costs, resource allocation. Scope creep is one of the most common project management risks.

According to PMI's The pulse of profession 2018, 52% of all projects face scope creep in one way or another. (Arcon, 2021)

The problem comes with any unauthorized changes that can affect productivity, unfulfilled outputs and over budgets. The completed project can look very different from what was originally envisioned. (Santos, 2021)

Example of scope creep

The process of changing the number of final outputs of the project can be considered as scope creep such as requesting 30 3D printers instead of 15, or that two essential specifications and features of the 3D printers are agreed upon, and later the specifications are changed to become five or six features

Main causes

- Unauthorized changes are one of the most frequent causes of scope creep.
- Key project stakeholders changing requirements.
- Internal miscommunication and disagreements between parties.
- Poorly defined project scope.

Control Scope Creep (Harned, 2017)

- Scope management plan
- Understand the project requirements and align with the client
- Create a detailed project plan and stick to it
- Talk about how changes impact the project schedule
- Say "No" when needed
- Build clear communication plan with all parties
- Keep all stockholders updated

Illustration of product analysis management:

The below diagram is illustration of Product breakdown structure and its parts generally.

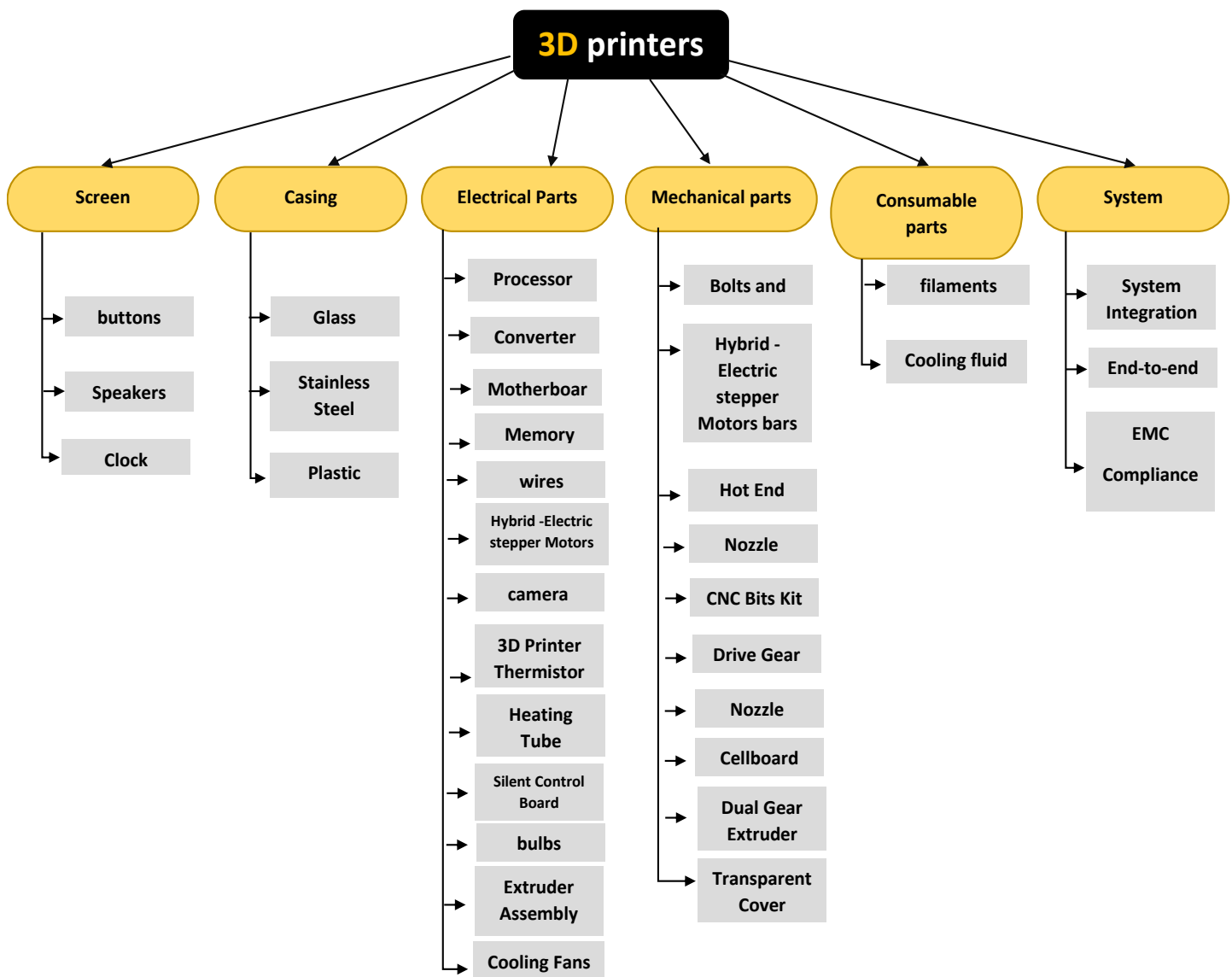


Figure 37. Product Breakdown structure

SMART 3D PRINTER

Product Analysis

IN THE PRODUCT ANALYSIS PROCESS, WE WILL EXPLAIN THE TYPE OF MANUFACTURING, THE AGREED CHARACTERISTICS, AND THE FEATURES REQUIRED FOR THE FINAL PRODUCT.

PRODUCT DEFINING

3D PRINTER



PRODUCT SPECIFICATIONS

- TOUCH SCREEN.
- PRINT BED/ HEAD.
- FRONT/SIDE DOORS.
- ELECTROMECHANICAL LOCK STRIKE PLATE.
- POWER CONNECTOR FOR A 240 V POWER SOURCE.
- FILAMENT ENTRY POINT/FILAMENT DETECTOR.
- CARD READER HOLDER.
- ETHERNET PORT.
- PRINTING TECHNOLOGY FFF (FUSED FILAMENT FABRICATION).
- PRINTING AREA (1.1 M × 1.4 M × 1 M).
- DIMENSIONS (2.5 M × 1.8 M × 1.4 M).
- WEIGHT (250KG).

PRODUCT OPERATING CONDITIONS

- SURROUNDING OPERATION TEMPERATURE: 15–45°C (FOR PLA PRINTING).
- MAXIMUM ENVIRONMENT HUMIDITY: 60%.
- DUST-FREE ENVIRONMENT.
- A STABLE AND FIRM BASE PREVENTING THE TRANSFER OF VIBRATIONS FROM THE PRINTER TO THE SURROUNDING AREA.
- ORIGINAL POWER SOURCE.
- THE PRINTER MUST BE PLACED 1 M OR MORE FROM ANY HEAT SOURCE.
- THE PRINTER MUST BE PLACED IN A WELL-VENTILATED AREA.

PRODUCT MANUFACTURING

OUTSOURCING

ACCESSORIES

- X POWER SOURCE 240 V/40 A.
- 1X SPOOL HOLDER
- 1X GLASS PRINT BED
- 1X SPATULA
- 1X PRINT BED GLUE STICK

PRODUCT PROTOTYPE

NEXT PAGE



SMART 3D PRINTER PROTOTYPE

1

ABILITY TO CONNECT TO PERSONAL MOBILE

THIS FEATURE ALLOWS THE USERS TO PRINT THEIR PROJECTS OR PROTOTYPES



2

TOUCH SCREEN

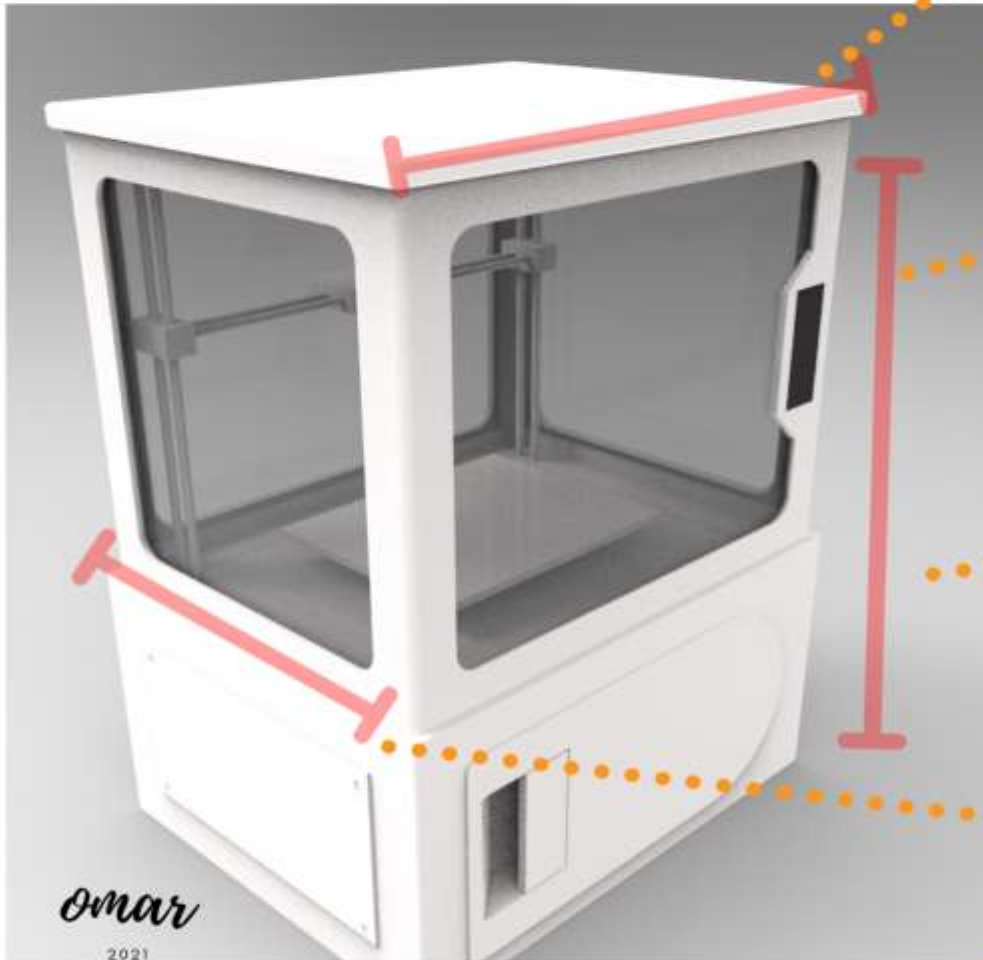
THE SMART PRINTERS' ARE DESIGNED WITH A FRIENDLY TOUCH SCREEN



SMART 3D PRINTER

3D PRINTERS GENERAL SHAPE
SPECIFICATIONS AND DIMENSIONS:

WIGHT
WIDTH
THICKNESS
HIGHT



WIDTH
1.8 METER

HIGHT
2.5 METER

**MACHINE
WEIGHT**
250KG

THICKNESS
1.4 METER



AVAILABLE COLORS

BLACK
GRAY
WHITE



SMART 3D PRINTER PROTOTYPE

TECHNICAL SPECIFICATIONS OF THE SYSTEM:

1

- AUTHENTICATION AND AUTHORIZATION
- AVAILABILITY
- DATA QUALITY
- HUMAN ERROR
- INFORMATION SECURITY
- INTERNAL CONTROLS
- INTEROPERABILITY
- MAINTAINABILITY
- PERFORMANCE
- PRIVACY
- PRODUCTIVITY
- RELIABILITY
- SERVICEABILITY
- STANDARDS
- SYSTEM ERRORS
- VENDOR LOCK-IN



2

MULTIPLE PAYMENTS METHODS

THE SMART PRINTERS ARE DESIGNED WITH MULTIPLE PAYMENTS' METHODS



SMART 3D PRINTER

PRODUCT OPERATING CONDITIONS

Fridays 6:30pm - 10pm

1

**SURROUNDING
OPERATION
TEMPERATURE: 4-
45°C (FOR PLA
PRINTING)**

2

**MAXIMUM
ENVIRONMENT
HUMIDITY: 60%**



3

**DUST-FREE
ENVIRONMENT**

4

**A STABLE AND FIRM
BASE PREVENTING
THE TRANSFER OF
VIBRATIONS FROM
THE PRINTER TO
THE SURROUNDING
AREA**

5

**ORIGINAL POWER
SOURCE**

6

**THE PRINTER MUST
BE PLACED 1 M OR
MORE FROM ANY
HEAT SOURCE**

7

**THE PRINTER MUST
BE PLACED IN A
WELL-VENTILATED
AREA**

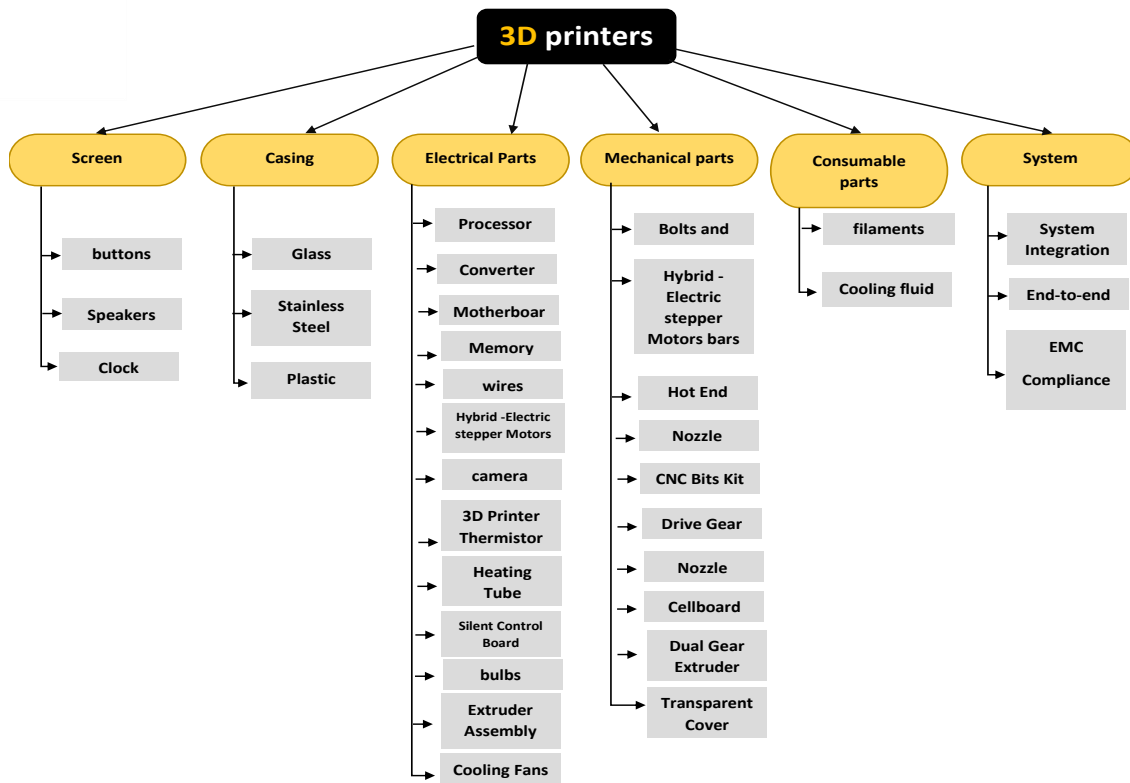


Illustration of the transformation of the work packages in Work Breakdown Structure to activities:

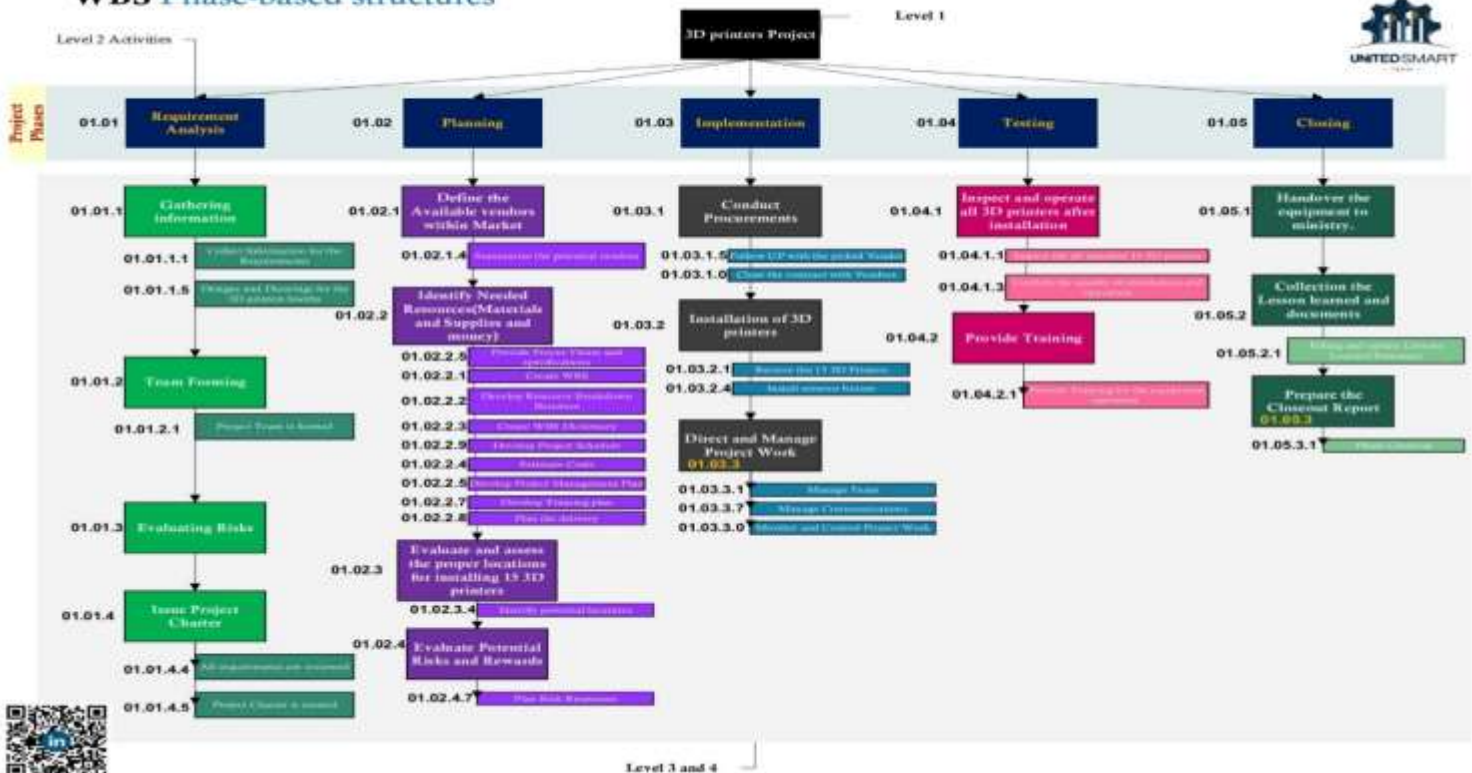
A WBS, as defined in the *PMBOK® Guide*—Third Edition, is "a deliverable-oriented hierarchical decomposition of the work to be executed by the project team to accomplish the project objectives and create the required deliverables. It organizes and defines the total scope of the project. Each descending level represents an increasingly detailed definition of the project work. The WBS is decomposed into work packages. The deliverable orientation of the hierarchy includes both internal and external deliverables". (Brotherton, 2008)

To have a good view of the project in general and what needed to be done to deliver the project, our project was divided into different phases called project life cycle as shown in the previous to help the project manager, teams, and related stakeholders gain a complete picture of the project and assisting the project manager and the team in creating work breakdown structure (WBS) and schedule for the project.

Form the Project life cycle; we create a work breakdown structure (WBS) and product breakdown structure (PBS) as shown in the below two pictures:



WBS Phase-based structures



Then we segregate the WBS and its work packages into four levels as per the following:

Level 1:

3D printer's installation project as the primary point to start.

Level 2:

We created this level as per project phases to consider the work packages in high level as follows:

- Requirement analysis
- Planning
- Implementation
- Testing
- Closing

By this distribution, we can decompose the task to a different level for easily identifying and tracking during project phases.

Level 3:

We decompose each phase to different work packages at this level to monitor the activity during each project phase based on the gathered information and Product breakdown structure (PBS). We segregate the activity into 16 main tasks (work packages). Each work package includes sub-tasks in the lower level to allow the project team to focus on activity and monitor the project's progress.

- Requirement analysis
 - Gatherings the information

- Team forming
- Evaluation the risks
- Issue the project charter
- **Planning**
 - Defined the available vendors in the market.
 - Identify the needed recourses
 - Evaluate and assess the proper location to install the 3D printers
 - Evaluate the potential risk and rewards
- **Implementation**
 - Conduct the procurement
 - Installing the 3D printers
 - Direct and manage the project work
- **Testing**
 - Inspect and operate all 3D printers after installation
 - Provide training to operators.
- **Closing**
 - Handover the printers to Ministry
 - Collect and document the lessons and learning.
 - Prepare and submit the closeout report

Level 4:

At this level, we decompose the work packages into small activities for daily activity in the project and list to more than 100 activities (Milestones and tasks) distributed to the project team, identifying the responsibility to make sure the project activity is adequately conducted to successfully deliver the project to the client.

Development of the functions list or the activities included in each work package in WBS:

The tasks list of the work breakdown structures was created based on the activities of the project deliverables and the all needed activities that contribute in the success of delivering the project outputs and outcomes and provide a good framework for managing, controlling and directing the project.

Here below in table we have all the activities of the project deliverables:

WBS- Project Phase 1	
WBS	Task Description
1.1	Requirement Analysis
1.1.1	Gathering information
1.1.1.1	Collect Information for the Requirements
1.1.1.4	Identify available skills, information and support
1.1.1.5	Designs and Drawings for the 3D printers' booths
1.1.1.6	Identify needed resources
1.1.2	Team Forming
1.1.2.1	Form Project Team
1.1.3	Evaluating Risks
1.1.3.1	Assess needed resource availability
1.1.3.2	Review personal suitability
1.1.3.3	Determine financial requirements
1.1.4	Issue Project Charter
1.1.4.2	Confirm decision to proceed
1.1.4.4	Review all requirements

WBS- Project Phase 3	
WBS	Task Description
1.3	Implementation
1.3.1	Conduct Procurements
1.3.1.1	Contact the vendors
1.3.1.2	Collect the offers

WBS- Project Phase 2	
WBS	Task Description
1.2	Planning
1.2.1	Define the Available vendors within Market
1.2.1.1	Access available information
1.2.1.3	Identify potential vendors
1.2.1.4	Summarize the potential vendors
1.2.1.5	Create procurement analysis plan
1.2.1.7	Identify Vendors market niche
1.2.2	Identify Needed Resources (Materials and Supplies and money)
1.2.2.1	Collect Requirements
1.2.2.2	Define Scope
1.2.2.3	Validate Scope
1.2.2.1	Create WBS
1.2.2.2	Define Activities
1.2.2.4	Estimate Activity Resources
1.2.2.5	Sequence Activities
1.2.2.7	Estimate Activity Durations
1.2.2.9	Identify staffing requirements
1.2.2.0	Identify needed raw materials
1.2.2.1	Identify needed utilities
1.2.2.7	Identify management staff resources
1.2.2.8	Plan Resource Management
1.2.2.5	Summarize operating expenses and financial projections

1.3.1.3	Review the offers
1.3.1.4	Negotiation for Price, Delivery and warranty
1.3.1.5	Follow Up with Vendor
1.3.1.0	Close the contract with Vendors
1.3.2	Installation of 3D printers
1.3.2.1	Receive the 15 3D Printers
1.3.2.2	Electrical installation
1.3.2.3	Install interior fixture
1.3.2.4	Install exterior fixture
1.3.3	Direct and Manage Project Work
1.3.3.1	Manage Team
1.3.3.7	Manage Communications
1.3.3.8	Implement Risk Responses
1.3.3.9	Manage Stakeholder Engagement
1.3.3.0	Monitor and Control Project Work
1.3.3.1	Perform Integrated Change Control
1.3.3.2	Control Scope
1.3.3.3	Control Schedule
1.3.3.4	Control Costs
1.3.3.5	Control Quality
1.3.3.6	Control Resources
1.3.3.7	Monitor Communications
1.3.3.5	Monitor Risks

1.2.2.7	Develop Training plan
1.2.2.8	Plan the delivery method for the received 3D printers to the agreed location
1.2.3	Evaluate and assess the proper locations for installing 15 3D printers
1.2.3.1	Assess all famous and suitable locations for tourists around KSA
1.2.3.2	Create locations analysis plan
1.2.3.3	Implement locations analysis plan
1.2.3.4	Identify potential locations
1.2.3.5	Summarize the potential locations
1.2.4	Evaluate Potential Risks and Rewards
1.2.4.1	Assess needed resources availability
1.2.4.2	Identify Risks
1.2.4.3	Perform Qualitative Risk Analysis
1.2.4.4	Perform Quantitative Risk Analysis
1.2.4.7	Plan Risk Responses
1.2.4.2	Forecast financial returns
1.2.4.3	Review and modify the Risk plan
1.2.4.4	Confirm decision to proceed

WBS- Project Phase 4	
WBS	Task Description
1.4	Testing
1.4.1	Inspect and operate all 3D printers after installation
1.4.1.1	Inspect the all installed 15 3D printers
1.4.1.2	Ensure all the installed 3D printers are worked properly
1.4.1.3	Confirm the quality of installation and operation for all 15 3D printers
1.4.2	Provide Training
1.4.2.1	Provide Training for the equipment operators.

WBS- Project Phase 5	
WBS	Task Description
1.5	Closing
1.5.1	Handover the equipment to ministry.
1.5.2	Collection the Lesson and learned
1.5.3	Prepare the Closeout Report

Table 46. WBS deliverables functions list.

Here below in table we have all needed activities that contribute in the success of delivering the project outputs and outcomes and provide a good framework for managing, controlling and directing the project:

WBS- Project Phase 1	
WBS	Task Description
1.1	Requirement Analysis
1.1.1	Gathering information
1.1.1.2	Identify the stakeholders
1.1.1.3	Define internal requirements
1.1.1.7	Identify project Estimated Cost
1.1.1.8	Identify High level project Milestones
1.1.2	Team Forming
1.1.3	Evaluating Risks
1.1.4	Issue Project Charter
1.1.4.1	Conduct meeting with all stakeholders
1.1.4.3	Develop Assumption Log
1.1.4.5	Develop Project Charter
1.1.4.6	Develop Stakeholders Register
1.1.4.7	Develop Stakeholders Analysis

WBS- Project Phase 3	
WBS	Task Description
1.3	Implementation
1.3.1	Conduct Procurements
1.3.1.6	Filling and update Contractor Status Report
1.3.1.7	Conduct Procurement Audit
1.3.1.8	Filling and update Contact Closeout Report
1.3.1.9	Filling and update Product Acceptance Form
1.3.2	Installation of 3D printers
1.3.3	Direct and Manage Project Work
1.3.3.2	Filling Team Member Status Report
1.3.3.3	Submit Project status Report
1.3.3.4	Perform and submit Variance Analysis
1.3.3.5	Perform and submit Earned Value Analysis

WBS- Project Phase 2	
WBS	Task Description
1.2	Planning
1.2.1	Define the Available vendors within Market
1.2.1.2	Develop Procurement strategy
1.2.1.6	Develop Procurement Management plan
1.2.1.8	Develop and Create Contractor Status Report
1.2.1.9	Develop and Create procurement Audit Forms
1.2.1.0	Develop and Create Contact Closeout Report
1.2.1.1	Develop and Create Product Acceptance Form
1.2.2	Identify Needed Resources (Materials and Supplies and money)
1.2.2.4	Project Scope Statements
1.2.2.5	Create and define Product Vision and Specifications
1.2.2.6	Develop and Create Project Road Map
1.2.2.7	Create and define Product Backlog
1.2.2.8	Plan Scope Management
1.2.2.9	Create Activity List
1.2.2.0	Create and develop Milestone List
1.2.2.3	Define Activity Attributes
1.2.2.6	Develop Duration Estimating Worksheet
1.2.2.8	Create Source Selection Criteria
1.2.2.2	Develop Resource Breakdown Structure
1.2.2.3	Create WBS Dictionary
1.2.2.4	Create and develop Network Diagram
1.2.2.5	Develop Responsibility Assignments Matrix
1.2.2.6	Develop Team Charter
1.2.2.9	Develop Project Schedule
1.2.2.0	Develop Schedule Management plan
1.2.2.1	Develop Requirements Management Plan
1.2.2.2	Develop Requirements Documentation
1.2.2.3	Requirements Traceability Matrix

1.3.3.6	Conduct Risk Audit
1.3.3.8	Filling and update Issue Log
1.3.3.9	Filling and update Decision Log
1.3.3.0	Filling and update Change Request
1.3.3.1	Filling and update Change Log
1.3.3.2	Filling and update Lessons Learned Register
1.3.3.3	Filling and update Quality Audit
1.3.3.4	Conduct and submit Team Performance assessment

WBS- Project Phase 4	
WBS	Task Description
1.4	Testing
1.4.1	Inspect and operate all 3D printers after installation
1.4.2	Provide Training

1.2.2.4	Estimate Costs
1.2.2.6	Define Cost Baseline
1.2.2.7	Create and develop Variance Analysis report
1.2.2.8	Create and develop Earned Value Analysis report
1.2.2.9	Plan Cost Management
1.2.2.0	Develop Plan Stakeholder Engagement
1.2.2.1	Develop Plan Communications Management
1.2.2.2	Develop Quality Metrics
1.2.2.3	Plan Quality Management
1.2.2.4	Develop Change Management Plan
1.2.2.5	Develop Project Management Plan
1.2.2.6	Create and develop Release Plan
1.2.3	Evaluate and assess the proper locations for installing 15 3D printers
1.2.4	Evaluate Potential Risks and Rewards
1.2.4.5	Develop and Create Probability and Impact assessment
1.2.4.6	Develop and Create Probability and Impact Matrix
1.2.4.8	Develop and Create Plan Risk Management
1.2.4.9	Develop and Create Risk Register
1.2.4.0	Develop and Create Risk Report
1.2.4.1	Develop and create Risk Audit Plan

WBS- Project Phase 5	
WBS	Task Description
1.5	Closing
1.5.1	Handover the equipment to ministry.
1.5.2	Collection the Lesson and learned
1.5.2.1	Filling and update Lessons Learned Summary
1.5.3	Prepare the Closeout Report
1.5.3.1	Filling and update Project or Phase Closeout

Table 47. WBS project management activity list.

Here below we have the full tasks of the project from the previous two tables combined together:

WBS- Project Phase 1	
WBS	Task Description
1.1	Requirement Analysis
1.1.1	Gathering information
1.1.1.1	Collect Information for the Requirements
1.1.1.2	Identify the stakeholders
1.1.1.3	Define internal requirements
1.1.1.4	Identify available skills, information and support
1.1.1.5	Designs and Drawings for the 3D printers' booths
1.1.1.6	Identify needed resources
1.1.1.7	Identify project Estimated Cost
1.1.1.8	Identify High level project Milestones
1.1.2	Team Forming
1.1.2.1	Form Project Team
1.1.3	Evaluating Risks
1.1.3.1	Assess needed resource availability
1.1.3.2	Review personal suitability
1.1.3.3	Determine financial requirements
1.1.4	Issue Project Charter
1.1.4.1	Conduct meeting with all stakeholders
1.1.4.2	Confirm decision to proceed
1.1.4.3	Develop Assumption Log
1.1.4.4	Review all requirements
1.1.4.5	Develop Project Charter
1.1.4.6	Develop Stakeholders Register
1.1.4.7	Develop Stakeholders Analysis

WBS- Project Phase 3	
WBS	Task Description
1.3	Implementation
1.3.1	Conduct Procurements
1.3.1.1	Contact the vendors
1.3.1.2	Collect the offers
1.3.1.3	Review the offers
1.3.1.4	Negotiation for Price, Delivery and warranty
1.3.1.5	Follow Up with Vendor

WBS- Project Phase 2	
WBS	Task Description
1.2	Planning
1.2.1	Define the Available vendors within Market
1.2.1.1	Access available information
1.2.1.2	Develop Procurement strategy
1.2.1.3	Identify potential vendors
1.2.1.4	Summarize the potential vendors
1.2.1.5	Create procurement analysis plan
1.2.1.6	Develop Procurement Management plan
1.2.1.7	Identify Vendors market niche
1.2.1.8	Develop and Create Contractor Status Report
1.2.1.9	Develop and Create procurement Audit Forms
1.2.1.10	Develop and Create Contact Closeout Report
1.2.1.11	Develop and Create Product Acceptance Form
1.2.2	Identify Needed Resources (Materials and Supplies and money)
1.2.2.1	Collect Requirements
1.2.2.2	Define Scope
1.2.2.3	Validate Scope
1.2.2.4	Project Scope Statements
1.2.2.5	Create and define Product Vision and Specifications
1.2.2.6	Develop and Create Project Road Map
1.2.2.7	Create and define Product Backlog
1.2.2.8	Plan Scope Management
1.2.2.9	Create Activity List
1.2.2.10	Create and develop Milestone List
1.2.2.11	Create WBS
1.2.2.12	Define Activities
1.2.2.13	Define Activity Attributes
1.2.2.14	Estimate Activity Resources
1.2.2.15	Sequence Activities
1.2.2.16	Develop Duration Estimating Worksheet
1.2.2.17	Estimate Activity Durations
1.2.2.18	Create Source Selection Criteria
1.2.2.19	Identify staffing requirements
1.2.2.20	Identify needed raw materials
1.2.2.21	Identify needed utilities
1.2.2.22	Develop Resource Breakdown Structure
1.2.2.23	Create WBS Dictionary

1.3.1.6	Filling and update Contractor Status Report
1.3.1.7	Conduct Procurement Audit
1.3.1.8	Filling and update Contact Closeout Report
1.3.1.9	Filling and update Product Acceptance Form
1.3.1.0	Close the contract with Vendors
1.3.2	Installation of 3D printers
1.3.2.1	Receive the 15 3D Printers
1.3.2.2	Electrical installation
1.3.2.3	Install interior fixture
1.3.2.4	Install exterior fixture
1.3.3	Direct and Manage Project Work
1.3.3.1	Manage Team
1.3.3.2	Filling Team Member Status Report
1.3.3.3	Submit Project status Report
1.3.3.4	Perform and submit Variance Analysis
1.3.3.5	Perform and submit Earned Value Analysis
1.3.3.6	Conduct Risk Audit
1.3.3.7	Manage Communications
1.3.3.8	Implement Risk Responses
1.3.3.9	Manage Stakeholder Engagement
1.3.3.0	Monitor and Control Project Work
1.3.3.1	Perform Integrated Change Control
1.3.3.2	Control Scope
1.3.3.3	Control Schedule
1.3.3.4	Control Costs
1.3.3.5	Control Quality
1.3.3.6	Control Resources
1.3.3.7	Monitor Communications
1.3.3.8	Filling and update Issue Log
1.3.3.9	Filling and update Decision Log
1.3.3.0	Filling and update Change Request
1.3.3.1	Filling and update Change Log
1.3.3.2	Filling and update Lessons Learned Register
1.3.3.3	Filling and update Quality Audit
1.3.3.4	Conduct and submit Team Performance assessment
1.3.3.5	Monitor Risks

WBS- Project Phase 4	
WBS	Task Description

1.2.2.4	Create and develop Network Diagram
1.2.2.5	Develop Responsibility Assignments Matrix
1.2.2.6	Develop Team Charter
1.2.2.7	Identify management staff resources
1.2.2.8	Plan Resource Management
1.2.2.9	Develop Project Schedule
1.2.2.0	Develop Schedule Management plan
1.2.2.1	Develop Requirements Management Plan
1.2.2.2	Develop Requirements Documentation
1.2.2.3	Requirements Traceability Matrix
1.2.2.4	Estimate Costs
1.2.2.5	Summarize operating expenses and financial projections
1.2.2.6	Define Cost Baseline
1.2.2.7	Create and develop Variance Analysis report
1.2.2.8	Create and develop Earned Value Analysis report
1.2.2.9	Plan Cost Management
1.2.2.0	Develop Plan Stakeholder Engagement
1.2.2.1	Develop Plan Communications Management
1.2.2.2	Develop Quality Metrics
1.2.2.3	Plan Quality Management
1.2.2.4	Develop Change Management Plan
1.2.2.5	Develop Project Management Plan
1.2.2.6	Create and develop Release Plan
1.2.2.7	Develop Training plan
1.2.2.8	Plan the delivery method for the received 3D printers to the agreed location
1.2.3	Evaluate and assess the proper locations for installing 15 3D printers
1.2.3.1	Assess all famous and suitable locations for tourists around KSA
1.2.3.2	Create locations analysis plan
1.2.3.3	Implement locations analysis plan
1.2.3.4	Identify potential locations
1.2.3.5	Summarize the potential locations
1.2.4	Evaluate Potential Risks and Rewards
1.2.4.1	Assess needed resources availability
1.2.4.2	Identify Risks
1.2.4.3	Perform Qualitative Risk Analysis
1.2.4.4	Perform Quantitative Risk Analysis
1.2.4.5	Develop and Create Probability and Impact assessment
1.2.4.6	Develop and Create Probability and Impact Matrix
1.2.4.7	Plan Risk Responses

1.4	Testing
1.4.1	Inspect and operate all 3D printers after installation
1.4.1.1	Inspect the all installed 15 3D printers
1.4.1.2	Ensure all the installed 3D printers are worked properly
1.4.1.3	Confirm the quality of installation and operation for all 15 3D printers
1.4.2	Provide Training
1.4.2.1	Provide Training for the equipment operators.

1.2.4.8	Develop and Create Plan Risk Management
1.2.4.9	Develop and Create Risk Register
1.2.4.0	Develop and Create Risk Report
1.2.4.1	Develop and create Risk Audit Plan
1.2.4.2	Forecast financial returns
1.2.4.3	Review and modify the Risk plan
1.2.4.4	Confirm decision to proceed

WBS- Project Phase 5	
WBS	Task Description
1.5	Closing
1.5.1	Handover the equipment to ministry.
1.5.2	Collection the Lesson and learned
1.5.2.1	Filling and update Lessons Learned Summary
1.5.3	Prepare the Closeout Report
1.5.3.1	Filling and update Project or Phase Closeout
1.5.4	Opening Ceremony

Note	
WBS	Task Description
####	Read Activities related to the project Management internally
####	Black Activities related to the project deliverables
####	Work package
####	Milestones

Table 48. WBS deliverables & project management activity list.

Illustration of the relationships between the activities:

The relationships between the tasks of the project could be one of these:

- Finish to start (FS).
- Start to Finish (SF).
- Start to start (SS).
- Finish to finish (FF).

Our project has:

12 Start to start (SS) relationships.

159 Finish to start (FS) relationships.

ID	Name	Duration	Predecessors
1	Task Description	257 days?	
2	Requirement Analysis	36 days	
3	Gathering information	35 days	
4	Collect Information for the Requirements	5 days	
5	Information is collected	0 days	4
6	Identify the stakeholders	3 days	4
7	Define internal requirements	2 days	4
8	Identify available skills, information and support	3 days	7FS-2d
9	Designs and Drawings for the 3D printers' booths	30 days	4
10	Designs and Drawings for the 3D printers' booths	0 days	9
11	Identify needed resources	2 days	7
12	Identify project Estimated Cost	3 days	11FS-2d
13	Identify High level project Milestones	4 days	11FS-2d
14	Team Forming	20 days	
15	Form Project Team	20 days	7FS-6d
16	Project Team is formed	0 days	15
17	Evaluating Risks	20 days	
18	Assess needed resource availability	10 days	11
19	Review personal suitability	20 days	18SS
20	Determine financial requirements	10 days	19SS+2d
21	Issue Project Charter	20 days	
22	Conduct meeting with all stakeholders	10 days	20FS-4d

23	Confirm decision to proceed	5 days	22
24	Develop Assumption Log	5 days	22
25	Review all requirements	5 days	24SS
26	All requirements are reviewed	0 days	25
27	Develop Project Charter	5 days	25
28	Project Charter is created	0 days	27
29	Develop Stakeholders Register	5 days	22
30	Develop Stakeholders Analysis	5 days	29
31	Planning	64 days	
32	Define the Available vendors within Market	33 days	
33	Access available information	20 days	30SS
34	Develop Procurement strategy	3 days	33SS+4d
35	Identify potential vendors	5 days	34SS
36	Summarize the potential vendors	2 days	35FS-2d
37	Provide the potential vendors	0 days	36
38	Create procurement analysis plan	20 days	35SS
39	Develop Procurement Management plan	3 days	38SS
40	Identify Vendors market niche	3 days	39
41	Develop and Create Contractor Status Report	2 days	39
42	Develop and Create procurement Audit Forms	2 days	39
43	Develop and Create Contact Closeout Report	3 days	39
44	Develop and Create Product Acceptance Form	4 days	39
45	Identify Needed Resources (Materials and Supplies and money)	42 days	
46	Collect Requirements	20 days	24,25
47	Define Scope	5 days	46SS+5d
48	Validate Scope	2 days	47SS
49	Project Scope Statements	1 day	48SS
50	Create and define Product Vision	1 day	49
51	Provide Procurement Vision and specifications	0 days	50
52	Develop and Create Project Road Map	1 day	49
53	Create and define Product Backlog	1 day	49
54	Plan Scope Management	5 days	49
55	Create Activity List	1 day	54
56	Create and develop Milestone List	1 day	54
57	Create WBS	10 days	54
58	Provide WBS	0 days	57
59	Define Activities	2 days	54FS+1d
60	Define Activity Attributes	1 day	54FS+1d
61	Estimate Activity Resources	1 day	54FS+2d
62	Sequence Activities	1 day	54FS+2d

63	Develop Duration Estimating Worksheet	1 day	54FS+2d
64	Estimate Activity Durations	3 days	63
65	Create Source Selection Criteria	1 day	62
66	Identify staffing requirements	2 days	62
67	Identify needed raw materials	1 day	62
68	Identify needed utilities	3 days	62FS+2d
69	Develop Resource Breakdown Structure	1 day	68
70	Provide RBS	0 days	69
71	Create WBS Dictionary	1 day	68FS+1d
72	Provide WBS Dictionary	0 days	71
73	Create and develop Network Diagram	1 day	68FS+2d
74	Develop Responsibility Assignments Matrix	1 day	68
75	Develop Team Charter	1 day	68
76	Identify management staff resources	1 day	75
77	Plan Resource Management	2 days	75
78	Develop Project Schedule	5 days	71FS+4d
79	Provide Project Schedule	0 days	78
80	Develop Schedule Management plan	3 days	78
81	Develop Requirements Management Plan	1 day	78
82	Develop Requirements Documentation	1 day	78
83	Requirements Traceability Matrix	1 day	78
84	Estimate Costs	2 days	71FS+7d
85	Provide Project Cost	0 days	84
86	Summarize operating expenses and financial projections	1 day	84
87	Define Cost Baseline	1 day	84
88	Create and develop Variance Analysis report	1 day	84
89	Create and develop Earned Value Analysis report	1 day	84
90	Plan Cost Management	2 days	89
91	Develop Plan Stakeholder Engagement	1 day	89
92	Develop Plan Communications Management	1 day	89
93	Develop Quality Metrics	1 day	92
94	Plan Quality Management	2 days	92
95	Develop Change Management Plan	1 day	92
96	Develop Project Management Plan	10 days	92
97	Provide Project Management Plan	0 days	96
98	Create and develop Release Plan	1 day	92
99	Develop Training plan	3 days	98
100	Provide Training Plan	0 days	99
101	Plan the delivery method for the received 3D printers to the agreed location	1 day	98
102	Plan the delivery method for the received 3D printers to the agreed location	0 days	101

103	Evaluate and assess the proper locations for installing 15 3D printers	20 days	
104	Assess all famous and suitable locations for tourists around KSA	20 days	71
105	Create locations analysis plan	10 days	71FS+10d
106	Implement locations analysis plan	10 days	71FS+10d
107	Identify potential locations	10 days	71FS+10d
108	Identify potential locations	0 days	107
109	Summarize the potential locations	10 days	71FS+10d
110	Evaluate Potential Risks and Rewards	23 days	
111	Assess needed resources availability	5 days	109
112	Identify Risks	5 days	109
113	Perform Qualitative Risk Analysis	10 days	109FS+2d
114	Perform Quantitative Risk Analysis	10 days	109FS+2d
115	Develop and Create Probability and Impact assessment	2 days	109FS+2d
116	Develop and Create Probability and Impact Matrix	2 days	109FS+2d
117	Plan Risk Responses	10 days	114
118	Provide Risk Response Plan	0 days	117
119	Develop and Create Plan Risk Management	8 days	114
120	Develop and Create Risk Register	1 day	114
121	Develop and Create Risk Report	1 day	114
122	Develop and create Risk Audit Plan	1 day	121
123	Forecast financial returns	6 days	121
124	Review and modify the Risk plan	5 days	121
125	Confirm decision to proceed	10 days	121
126	Implementation	200 days	
127	Conduct Procurements	51 days	
128	Contact the vendors	20 days	44
129	Collect the offers	20 days	44
130	Review the offers	5 days	129
131	Negotiation for Price, Delivery and warranty	10 days	129
132	Follow UP with Vendor	20 days	129
133	Follow Up with Vendor	0 days	132
134	Filling and update Contractor Status Report	1 day	129
135	Conduct Procurement Audit	4 days	132
136	Filling and update Contact Closeout Report	1 day	132
137	Filling and update Product Acceptance Form	1 day	129
138	Close the contract with Vendors	10 days	136
139	Close the Contract with Vendor	0 days	138
140	Installation of 3D printers	140 days	
141	Receive the 15 3D Printers	120 days	138FS-6d
142	Receive the Printers	0 days	141

143	Electrical installation	20 days	141
144	Install interior fixture	20 days	141
145	Install exterior fixture	20 days	141
146	Install exterior fixture	0 days	145
147	Direct and Manage Project Work	180 days	
148	Manage Team	180 days	128
149	Manage Team	0 days	148
150	Filling Team Member Status Report	180 days	128
151	Submit Project status Report	180 days	128
152	Perform and submit Variance Analysis	180 days	128
153	Perform and submit Earned Value Analysis	180 days	128
154	Conduct Risk Audit	5 days	143
155	Manage Communications	180 days	128
156	Manage Communications	0 days	155
157	Implement Risk Responses	180 days	128
158	Manage Stakeholder Engagement	180 days	128
159	Monitor and Control Project Work	180 days	128
160	Monitor and Control Project Work	0 days	159
161	Perform Integrated Change Control	180 days	128
162	Control Scope	180 days	128
163	Control Schedule	180 days	128
164	Control Costs	180 days	128
165	Control Quality	180 days	128
166	Control Resources	180 days	128
167	Monitor Communications	180 days	128
168	Filling and update Issue Log	180 days	128
169	Filling and update Decision Log	180 days	128
170	Filling and update Change Request	180 days	128
171	Filling and update Change Log	180 days	128
172	Filling and update Lessons Learned Register	180 days	128
173	Filling and update Quality Audit	5 days	143
174	Conduct and submit Team Performance assessment	10 days	143SS
175	Monitor Risks	180 days	128
176	Testing	25 days	
177	Inspect and operate all 3D printers after installation	10 days	
178	Inspect the all installed 15 3D printers	5 days	145
179	Inspect all 15 3D printers	0 days	178
180	Ensure all the installed 3D printers are worked properly	5 days	145
181	Confirm the quality of installation and operation for all 15 3D printers	5 days	180
182	Confirm the quality of installation and operation	0 days	181

183	Provide Training	15 days	
184	Provide Training for the equipment operators.	15 days	181
185	Provide Training for the equipment operators.	0 days	184
186	Closing	195 days	
187	Handover the equipment to ministry.		
188	Collection the Lesson and learned	180 days	
189	Filling and update Lessons Learned Summary	180 days	128
190	provide Lessons Learned Summary	0 days	189
191	Prepare the Closeout Report	4 days?	
192	Filling and update Project or Phase Closeout	4 days	184
193	Provide Project or Phase Closeout	0 days	192
194	Opening Ceremony	1 day	192

Table 49. WBS activity relationship and dependencies.

Development of the logical diagram of the project activities, and identify the critical path:

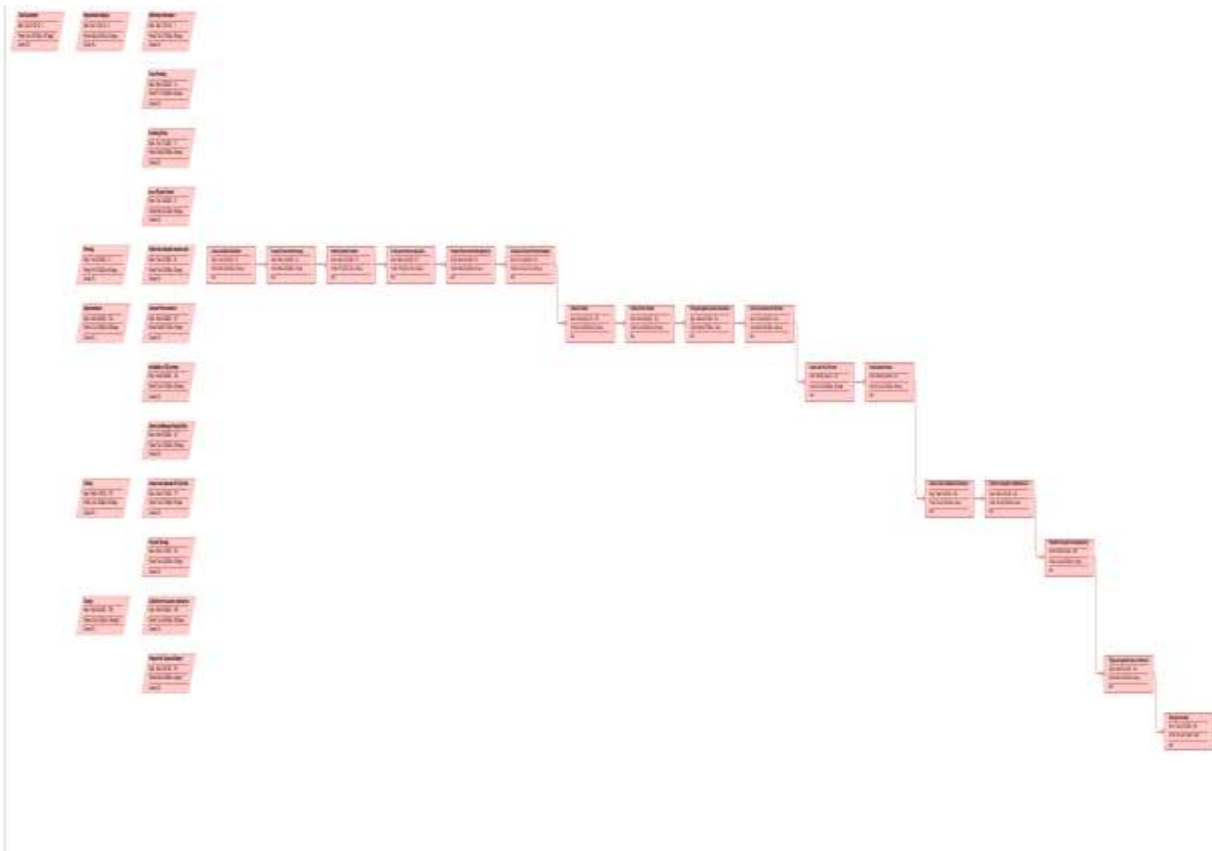


Figure 38. logical diagram of the project activities (Critical path)

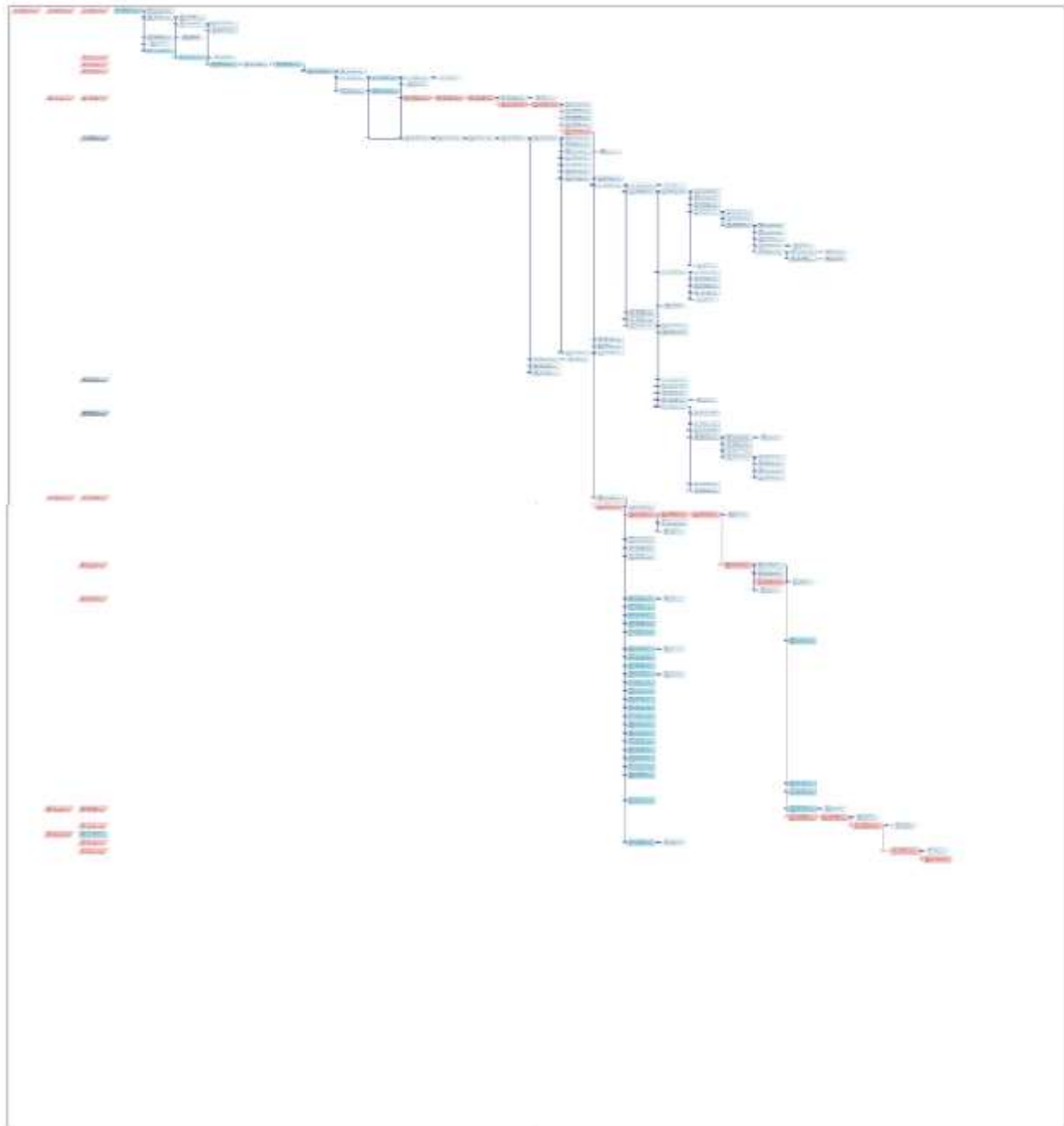


Figure 39. logical diagram of the project activities with (Critical path)

Gantt chart and Milestones model:

- **Gantt Chart**

Gantt chart is project management tool used for scheduling and planning. Adding each tasks and subtasks to the chart along with duration and processor allow the project manager to determine the duration of the project.

The Gantt chart must also have the critical path of the project. The critical represent the longest sequence of the tasks that if one of them was delayed it will affect the completion date of the project.

Below Gantt chart represents the schedule and the critical path of Making a Tourist Experience Through 3D Printer Around KSA project. (See Appendix

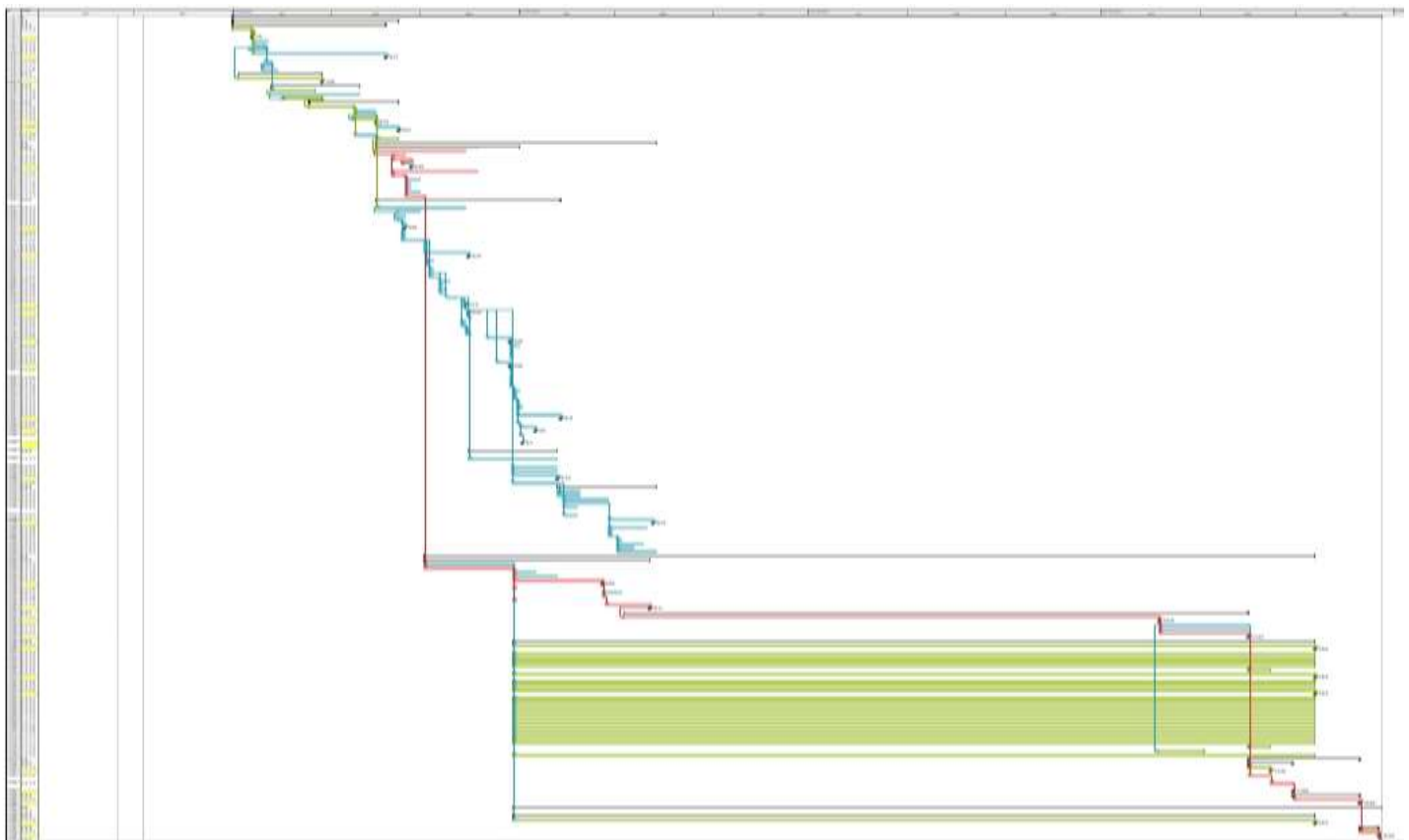
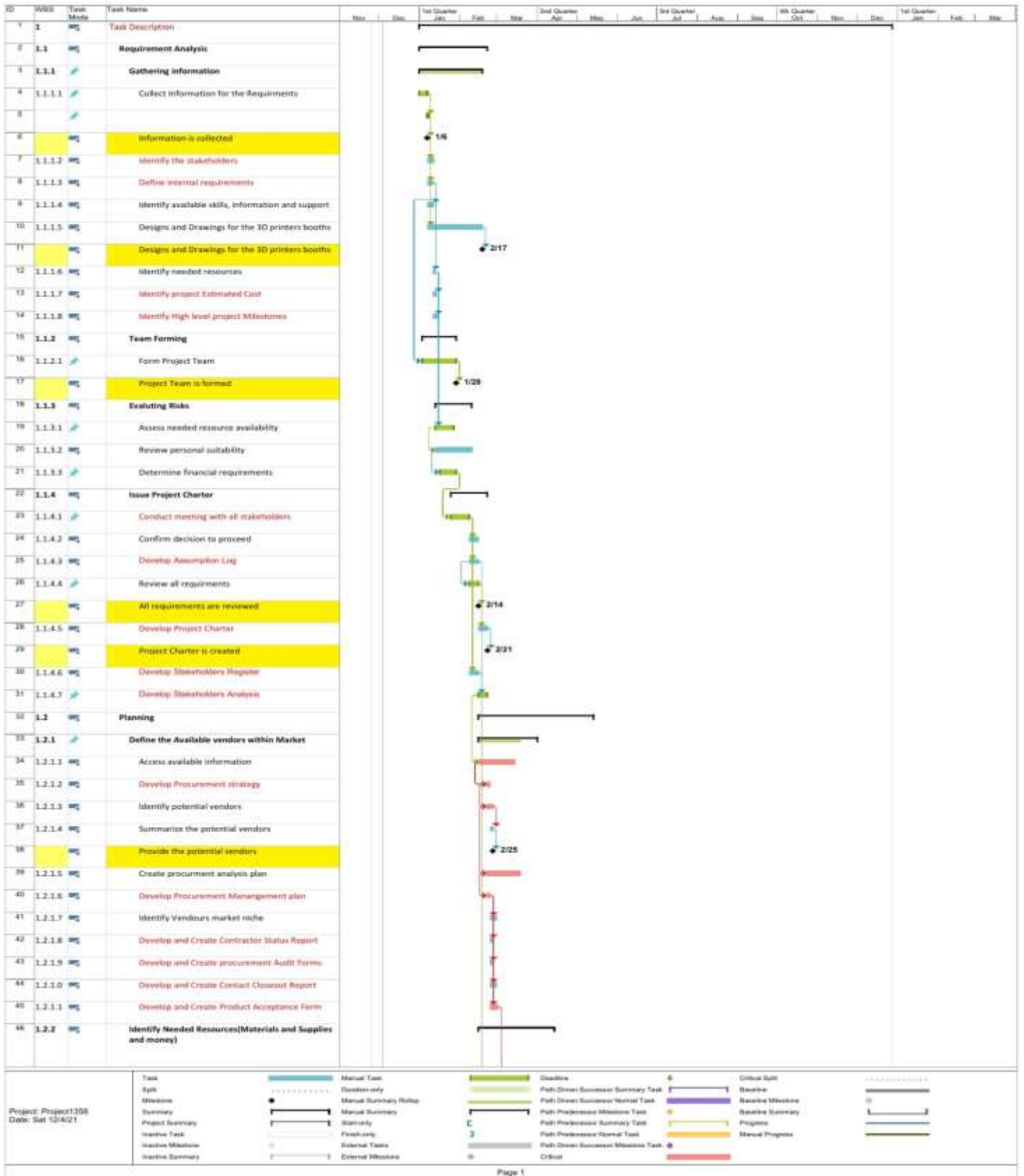


Figure 40. Gantt Chart of the project activities with (Critical path)

From above Gantt chart we can see that project starts 1 Jan 22 and ends 27 Dec 22, and below the critical path activity:

Requirement Analysis
Gathering information
Team Forming
Evaluating Risks
Issue Project Charter
Planning
Define the Available vendors within Market
Access available information
Develop Procurement strategy
Identify potential vendors
Create procurement analysis plan
Develop Procurement Management plan
Develop and Create Product Acceptance Form
Implementation
Conduct Procurements
Collect the offers
Follow UP with Vendor
Filling and update Contact Closeout Report
Close the contract with Vendors
Installation of 3D printers
Receive the 15 3D Printers
Install exterior fixture
Direct and Manage Project Work
Testing
Inspect and operate all 3D printers after installation
Ensure all the installed 3D printers are worked properly
Confirm the quality of installation and operation for all 15 3D printers
Provide Training
Provide Training for the equipment operators.
Closing
Collection the Lesson and learned
Prepare the Closeout Report
Filling and update Project or Phase Closeout
Opening Ceremony

Table 50. WBS critical path.









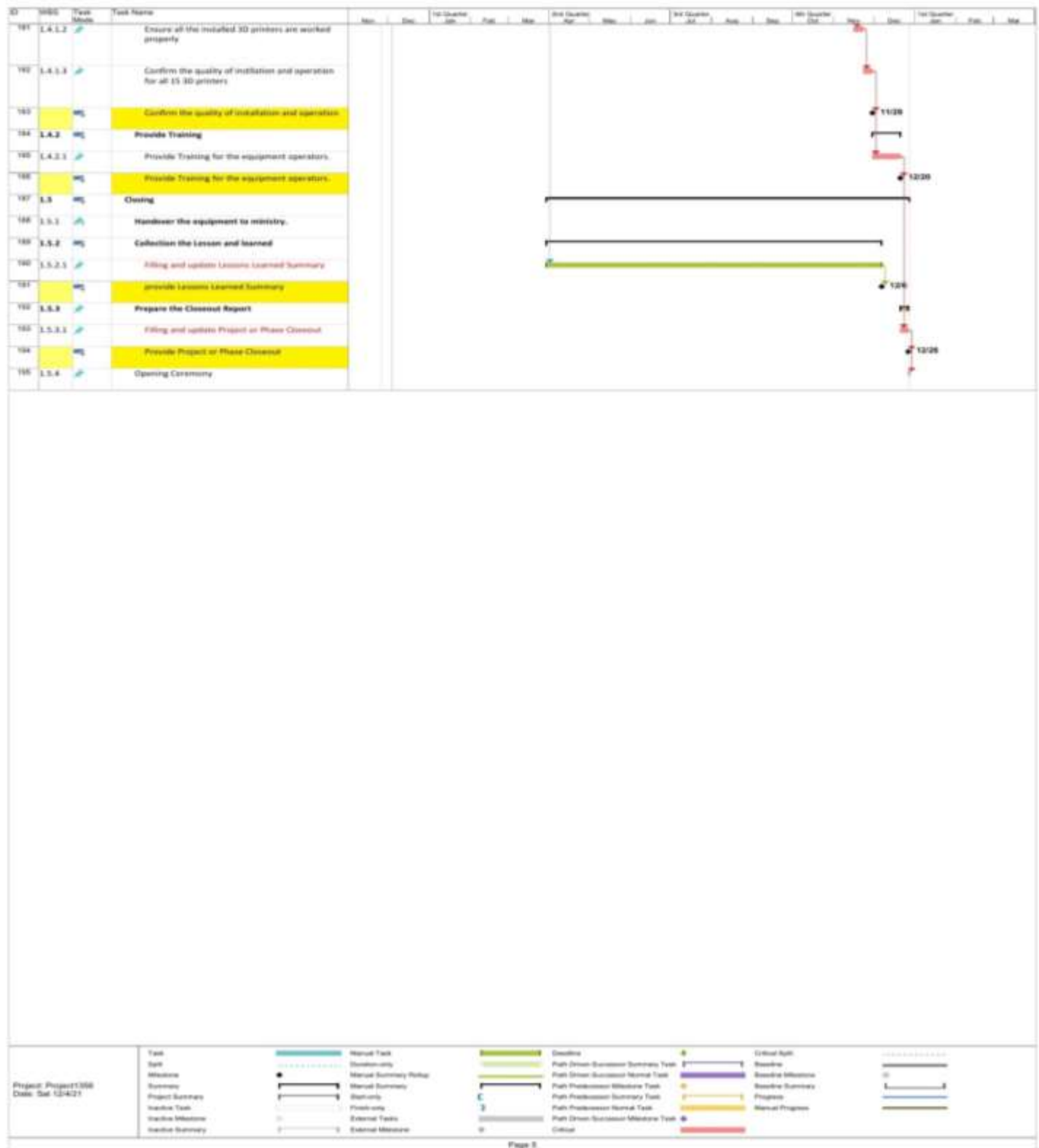


Figure 41. Zoom in Gantt Chart of the project activities with (Critical path)

- **Milestone Model**

Milestone is another tracking project tool; it allows the project manager to ensure the key deliverables of the project are completed. Below is the milestone diagram of the Making a Tourist Experience Through 3D Printer Around KSA project that were agreed with the stakeholders in the project charter.

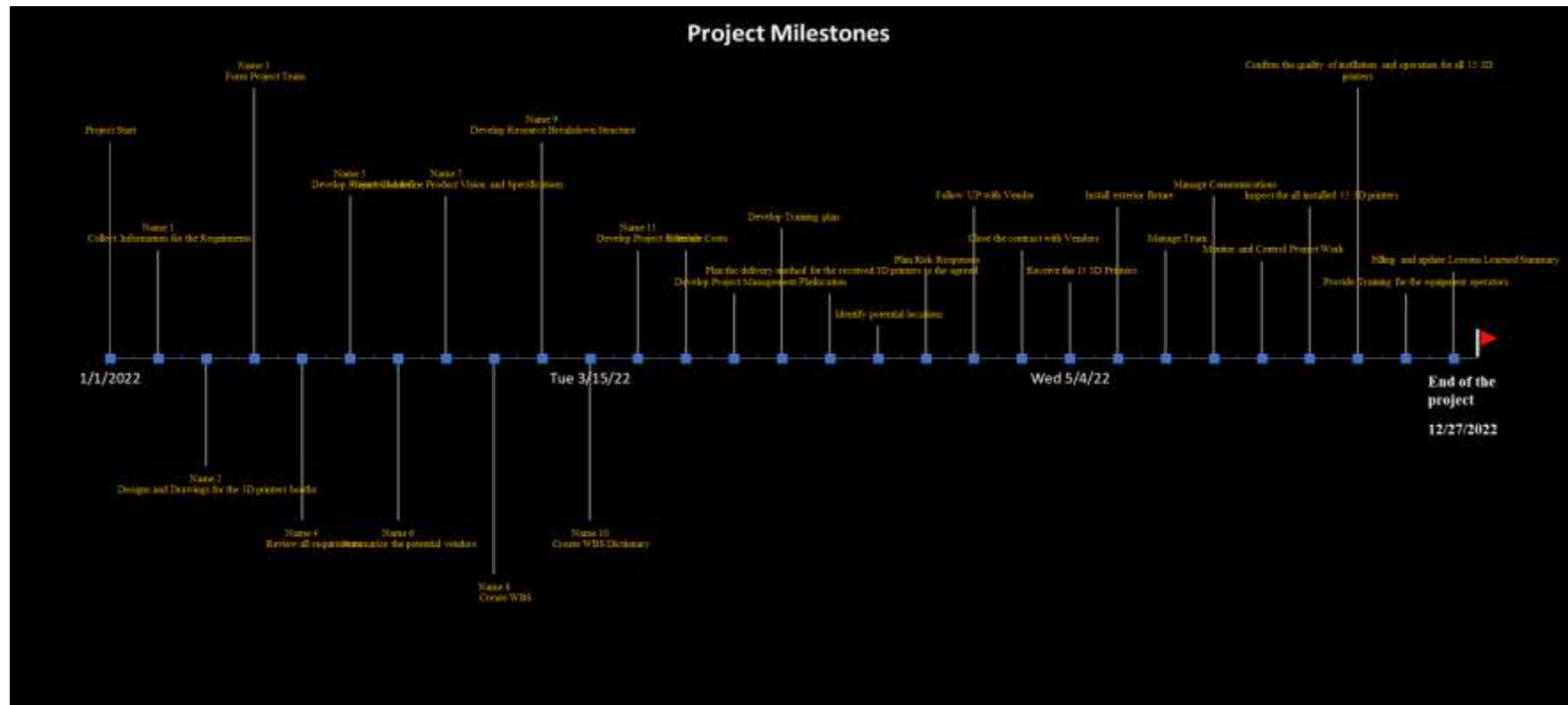


Figure 42. Project Milestone Model

Clarifying Deming model for quality:

Deming Model

Deming cycle model is one of most effective tools for continues quality improvement (Petersen, 1999). Deming cycle have four sequences as below:

- 1- Plan
- 2- Do
- 3- Study
- 4- Act

Having a continues quality and performance improvements helps in executing less defects in the final product and allow the manager to control and analysis the deficiency before accruing. Below is and overview of the implemented cycle throughout the project

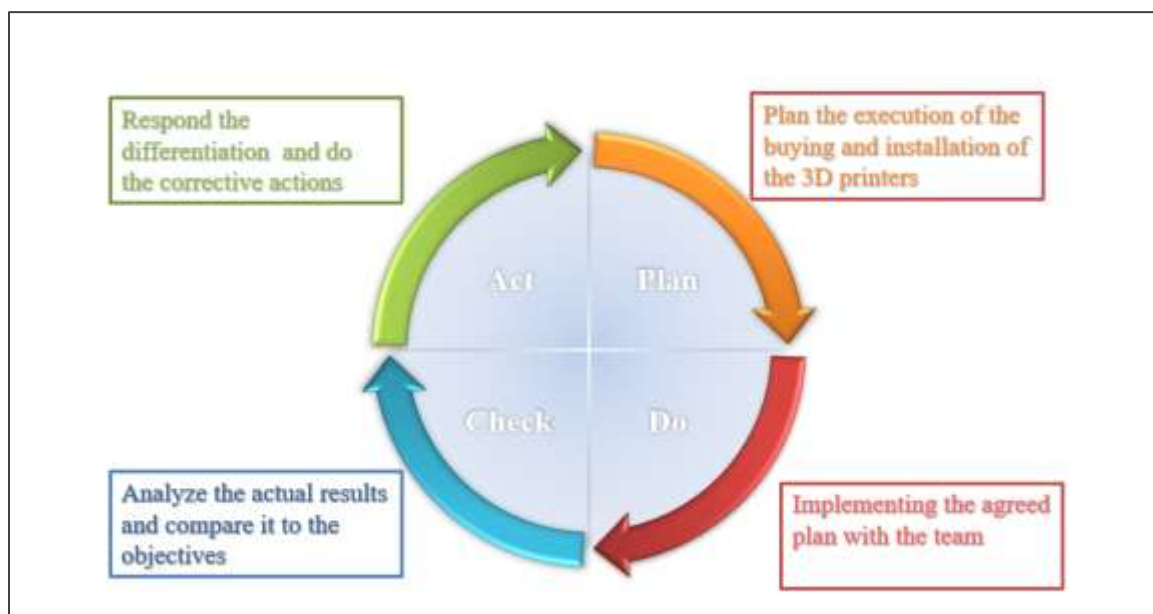


Figure 43. Deming Cycle

DEMING MODEL 14 POINTS

DEMING MODEL FOR QUALITY MANAGEMENT AIMS TO INCREASE THE COMPANY QUALITY AND PRODUCTIVITY THROUGH 14 ESSENTIAL POINTS WHICH ARE THE CORE CONCEPT OF IMPLEMENTING TOTAL QUALITY MANAGEMENT. THE 14 POINTS ARE:

PART 1

CREATE CONSTANCY OF PURPOSE FOR IMPROVING PRODUCTS AND SERVICES.

UST Research and development manager work with the QHSE manager and other departments to ensure constant improvement of work, products, and services quality.

PART 2

ADOPT THE NEW PHILOSOPHY.

UST company has it's own flexible, professional, up to date and change-driven philosophy.

PART 3

CEASE DEPENDENCE ON INSPECTION TO ACHIEVE QUALITY.

UST doesn't depend only on inspection to achieve a high quality. They provide high-quality equipment and professional training for their employees which is enhancing, directly and indirectly, the quality of the products, services, and work.

PART 4

END THE PRACTICE OF AWARDING BUSINESS ON PRICE ALONE; INSTEAD, MINIMIZE TOTAL COST BY WORKING WITH A SINGLE SUPPLIER.

UST has a system for approved suppliers for all needed for their products and services.



DEMING MODEL 14 POINTS

PART 5

IMPROVE CONSTANTLY AND FOREVER EVERY PROCESS FOR PLANNING, PRODUCTION AND SERVICE.

UST Research and development manager work with the QHSE manager and other departments Managers to ensure constant improvement of work, products, and services quality.

PART 6

INSTITUTE TRAINING ON THE JOB.

UST company HR Manager works with the operation manager to plan training programs for the human resources to impart the necessary skills to carry the job efficiently and effectively.

PART 7

ADOPT AND INSTITUTE LEADERSHIP.

UST company project managers work with the HR manager to create a management system that motivates manpower to provide their needs and own pride for their work. This will lead to meeting both customers' and stakeholders' needs.

PART 8

DRIVE OUT FEAR.

UST company Managers encourage employees to give their feedback. This will help the managers catch the problems and capture the problems before accruing or getting bigger.



DEMING MODEL 14 POINTS

PART 9

BREAK DOWN BARRIERS BETWEEN STAFF AREAS.

All UST company departments that are involved in the project works as one team, this will happen by conducting regular meetings and, having an effective communication plan, extensive planning between the department, and analyzing the goals to ensure that they don't create barriers.

PART 10

ELIMINATE SLOGANS, EXHORTATIONS, AND TARGETS FOR THE WORKFORCE.

UST company projects management team encourages the workforce to do their work smartly instead of blaming them and instructing them to do the work with zero defects. He will increase the quality of the work done by using automation and loyal suppliers.

PART 11

ELIMINATE NUMERICAL QUOTAS FOR THE WORKFORCE AND NUMERICAL GOALS FOR MANAGEMENT.

UST Company Works towards development goals and enlarge it in terms of developing quality, achieving customer satisfaction, and obtaining a base of customers and stakeholders who are confident in the company's work in the future. and motivating the workforce to seek a larger perspective other than the financial.



DEMING MODEL 14 POINTS

PART 12

REMOVE BARRIERS THAT ROB PEOPLE OF PRIDE OF WORKMANSHIP, AND ELIMINATE THE ANNUAL RATING OR MERIT SYSTEM.

The HR manager created and maintained a pride dashboard in the workshop by acknowledging the manpower job and ensuring their importance to the company. This will allow manpower to create a high-quality product, enhance their pride in workmanship, and increase company reaps benefit and the customer is being satisfied.

PART 13

INSTITUTE A VIGOROUS PROGRAM OF EDUCATION AND SELF-IMPROVEMENT FOR EVERYONE.

HR Manager worked well with other managers to plan training programs for the human resources to impart the necessary skills to carry the job efficiently and effectively.

PART 14

PUT EVERYBODY IN THE COMPANY TO WORK ACCOMPLISHING THE TRANSFORMATION.

The project manager creates a plan of actions to accomplish the transformation and carry out the quality mission of the project, creating purposes toward improving the service provided.



Develop SIPOC model, and Ishikawa for one of the issues of the project outputs:

SIPOC Model

SIPOC is a high-level tabular process review in the customer perspective, where S is for supplier, I for input, P for process, O for output, and C for customer (Flowcharting the SIPOC Way, 2021).

For the project making a tourist experience through 3D printer around KSA, after meeting with all the stakeholders and brainstorming below SIPOC were implemented and presented to the client as below.

SIPOC DIAGRAM TEMPLATE

S	S SUPPLIER who is providing input to a process	I	I INPUT resource provided by supplier for incorporation to process	P	P PROCESS steps taken to convert input to output	O	O OUTPUT resource resulting from process	C	C CUSTOMER receiver of newly created output
----------	--	----------	---	----------	---	----------	---	----------	--

PROCESS TITLE:

Analyzing potential places

SUPPLIERS		INPUT		PROCESS		OUTPUT		CUSTOMER	
	United Tech Company		customers and End-user's meetings and interviews	1	Collecting needs and requirements		Potential places for installing 3D printers		Engineering Consultant Company
	Customers and End-Users		Information	2	Study and analysis the Potential places		All needed requirements for installing 3D printers in the Potential places.		Engineering Consultant Company
	United Tech Company		Visiting the potential places	3	Evaluate the potential places				
				4	Collect all the needed requirements for installing the 3D printers in the potential places				
				5	Provide Detailed places information				

Table 51. SIPOC for Analyzing potential places

SIPOC DIAGRAM TEMPLATE

S	SUPPLIERS who is providing input to a process	I	INPUT resource provided by supplier for incorporation to process	P	PROCESS steps taken to convert input to output	O	OUTPUT resource resulting from process	C	CUSTOMER receiver of newly created output
PROCESS TITLE:	Designing and Specifying 3D printers' technical requirements and specifications								
SUPPLIERS	United Tech Company	INPUT	customers and End-user's meetings and interviews	1	Collecting needs and requirements	OUTPUT	Needs and requirements List	CUSTOMER	United Tech Company
	customers and End-Users		Information	2	Study and analysis the needs and requirements		All important and needed requirements.		United Tech Company
	United Tech Company		Visiting the potential places	3	Evaluate the needs and requirements		Priority list for all important and needed requirements		United Tech Company
				4	Prototype developments and customer validation		Provide technical information, specification drawings and needs		United Tech Company

Table 52. SIPOC for Designing and Specifying 3D printers' technical requirements and specifications

SIPOC DIAGRAM TEMPLATE

S	SUPPLIER S who is providing input to a process	I	INPUT resource provided by supplier for incorporation to process	P	PROCESS steps taken to convert input to output	O	OUTPUT resource resulting from process	C	CUSTOMER receiver of newly created output
PROCESS TITLE:	Manufacturing 3D printers and its accessories								
SUPPLIERS				PROCESS					
	United Tech Company	INPUT	3D printers technical, requirements and drawings	1	Specifying Manufacturer or vendor	OUTPUT	Approved Manufacturer or vendor	CUSTOMER	Ministry of Tourism
	3D printer approved Manufacturer or vendor		Information	2	Collecting needs and requirements		Provide technical information, specification drawings and needs		United Tech Company
				3	Study and analysis the needs and requirements				
				4	Evaluate the needs and requirements				
			3D printers technical, requirements and drawings	5	Prototype developments		Prototype		Ministry of Tourism + United Tech Company
	Ministry of Tourism + United Tech Company	Visits and meetings	6	Customer validation	3D printers and its accessories approval				
	United Tech Company	Approved prototype and technical specifications	7	Production of 3D printers and Assembly	3D printers and its accessories				

Ishikawa Diagram for **Poor Quality Product**

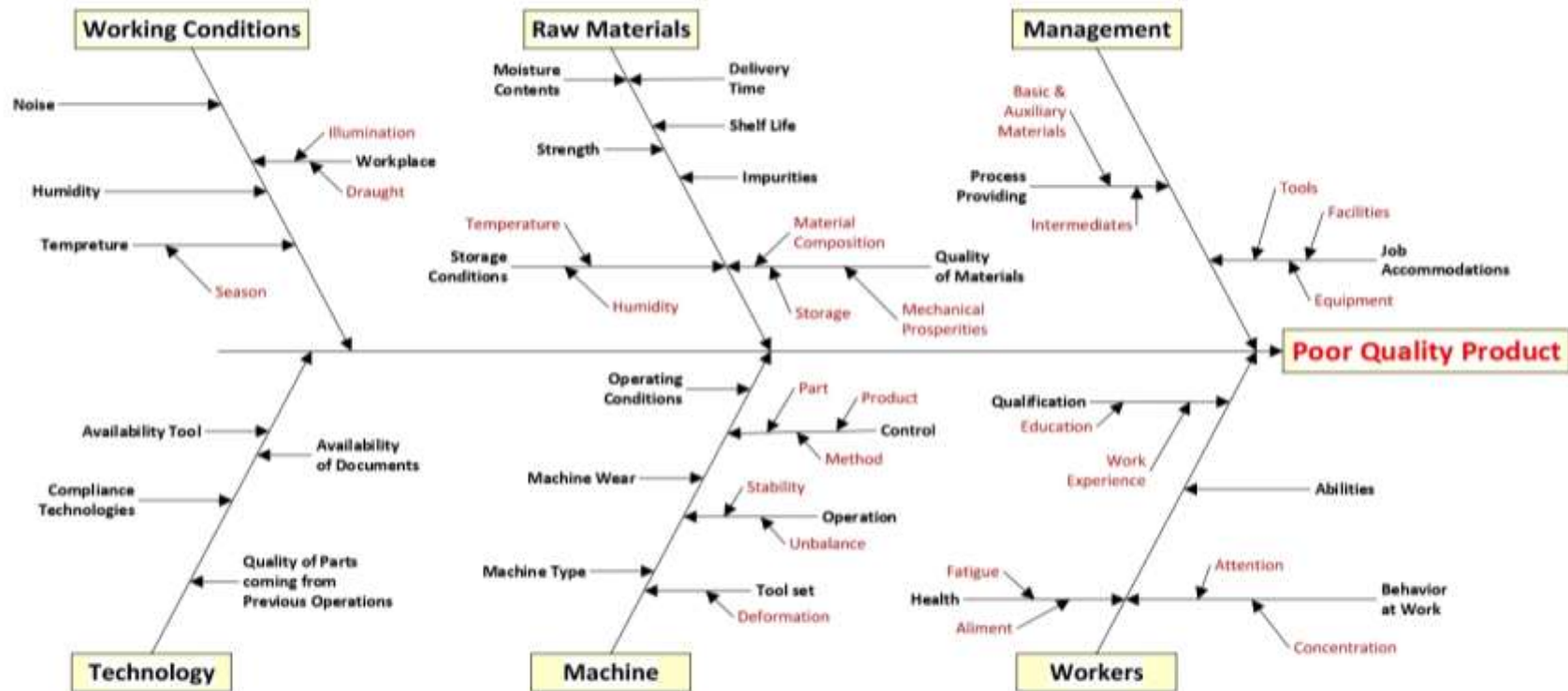


Figure 44. Ishikawa Diagram

Cost breakdown structure and project budget in accordance with WBS:

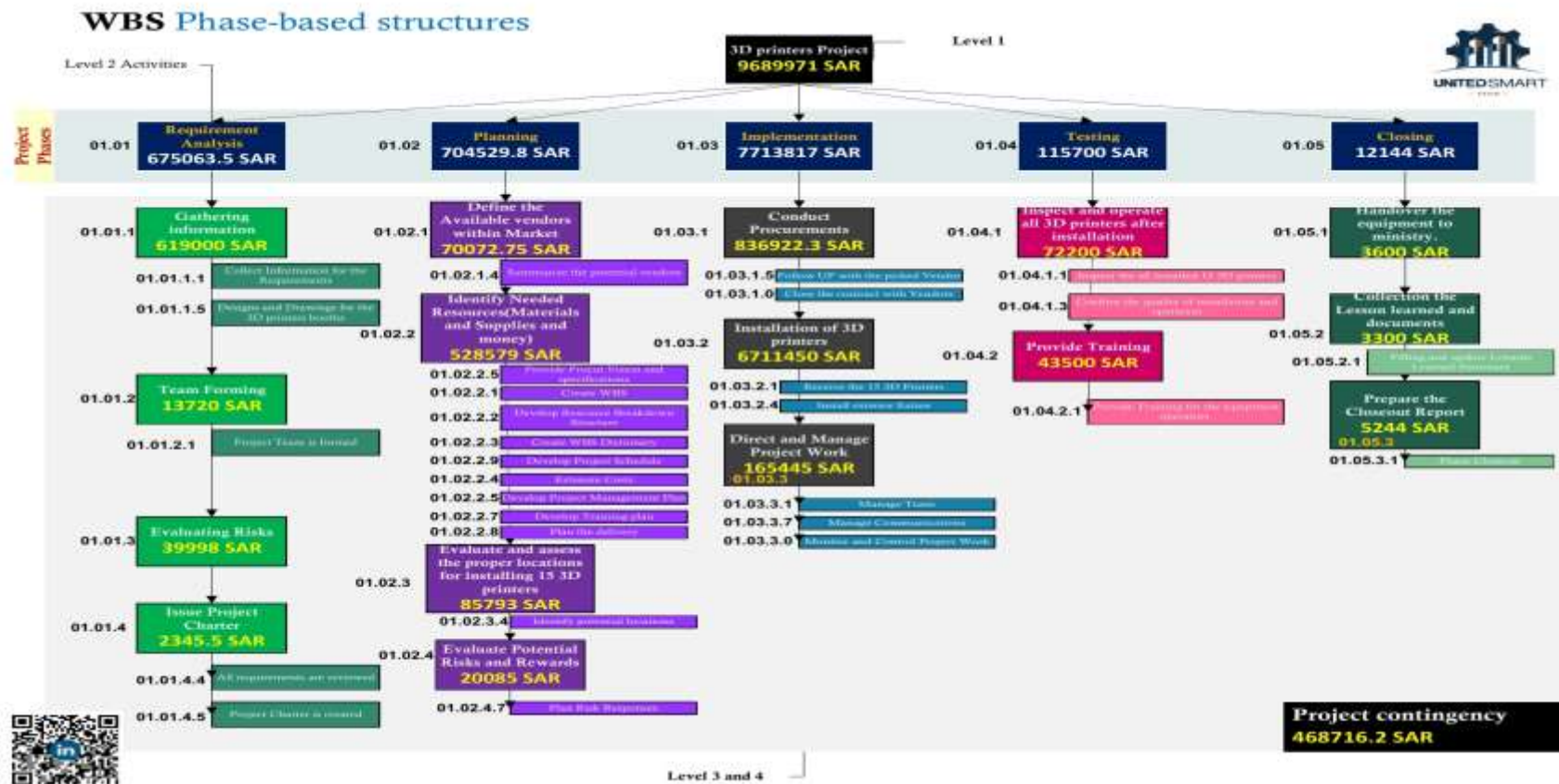


Figure 45. Cost Breakdown structure

Work Packages	Budget Cost (SAR)				
	Material	Manpower	Subcontractors	Others	total
Gathering information	20000	84000	500000	15000	619000
Team Forming	0	10000	0	3720	13720
Evaluating Risks	15000	18000	5764	1234	39998
Issue Project Charter	394	1400	0	551.5	2345.5
Define the Available vendors within Market	0	65629.75	3456	987	70072.75
Identify Needed Resources (Materials and Supplies and money)	44556	476000	2345	5678	528579
Evaluate and assess the proper locations for installing 15 3D printers	0	55000	15000	15793	85793
Evaluate Potential Risks and Rewards	0	16487	3598	0	20085
Conduct Procurements	654769.32	89600	87966	4587	836922.3
Installation of 3D printers	500000	2632000	3500000	79450	6711450
Direct and Manage Project Work	0	132000	0	33445	165445
Inspect and operate all 3D printers after installation	26700	35000	10500	0	72200
Provide Training	4500	30000	7800	1200	43500
Handover the equipment to ministry.	0	800	0	2800	3600
Collection the Lesson and learned	0	1800	0	1500	3300
Prepare the Closeout Report	200	800	3888	356	5244
Project contingency					468716.2
Grand total	1266119.32	3648516.75	4140317	166301.5	9,689,971 SAR

Table 54. Cost breakdown structure and project budget in accordance with WBS

Earned Value Management of the project after the expiration of 20 % of its duration and after the completion of 50 % of its outputs, each separately:

Earned Value Management of the project after the expiration of 20 % of its duration

Project cost at 20 %			
EV	SAR	911,722.08	
AC	SAR	810,351.85	
CV	SAR	101,370.23	
ETC	SAR	8,309,532.49	
TCPI		11.19286602	
EAC	SAR	9,119,884.34	
SV	SAR	(8,309,532.49)	
PV	SAR	9,221,254.57	
SPI		5.42	
Project Budget	SAR	9,689,970.79	
Project contingency	SAR	468,716.22	

Table 55. Summary of earned Value Management of the project after the expiration of 20% of its duration

Task Description	BAC[SA R]	Work progress %	Cumulative cost										
			EV	AC	CV	ETC	VAC	TCPI	EAC	SV	CPI	PV	SPI
Requirement Analysis													
Gathering information	619000	100%	619000	612900	6100.001	0	6100.00	0	612900	0	1.009953	619000	1
Collect Information for the Requirements	17000	100%	17000	16842.86	157.143	0	157.14	0	16842.86	0	1.00933	17000	1
Define internal requirements	17000	100%	17000	16842.86	157.143	0	157.14	0	16842.86	0	1.00933	17000	1
Identify available skills, information and support	17000	100%	17000	16842.86	157.143	0	157.14	0	16842.86	0	1.00933	17000	1
Designs and Drawings for the 3D printers’ booths	500000	100%	500000	495000	5000	0	5000.00	0	495000	0	1.010101	500000	1
Identify the stakeholders	17000	100%	17000	16842.86	157.143	0	157.14	0	16842.86	0	1.00933	17000	1
Identify needed resources	17000	100%	17000	16842.86	157.143	0	157.14	0	16842.86	0	1.00933	17000	1
Identify project Estimated Cost	17000	100%	17000	16842.86	157.143	0	157.14	0	16842.86	0	1.00933	17000	1
Identify High level project Milestones	17000	100%	17000	16842.86	157.143	0	157.14	0	16842.86	0	1.00933	17000	1
Team Forming	13720	100%	13720	9000	4720	0	4720.00	0	9000	0	1.524444	13720	1
Form Project Team	13720	100%	13720	9000	4720	0	4720.00	0	9000	0	1.524444	13720	1
Evaluating Risks	39998	100%	39998	25154	14844	0	14844.00	0	25154	0	1.590125	39998	1
Determine financial requirements	13332.67	100%	13332.67	12700	632.6667	0	632.67	0	12700	0	1.049816	13332.67	1
Assess needed resource availability	13332.67	100%	13332.67	12700	632.6667	0	632.67	0	12700	0	1.049816	13332.67	1
Review personal suitability	13332.67	100%	13332.67	12700	632.6667	0	632.67	0	12700	0	1.049816	13332.67	1
Issue Project Charter	2345.50	100%	2345.5	1776	569.5	0	569.50	0	1776	0	1.320664	2345.5	1
Conduct meeting with all stakeholders	1000.00	100%	1000	960	40	0	40.00	0	960	0	1.041667	1000	1
Confirm decision to proceed	224.25	100%	224.25	224	0.25	0	0.25	0	224	0	1.001116	224.25	1
Review all requirements	224.25	100%	224.25	224	0.25	0	0.25	0	224	0	1.001116	224.25	1
Develop Project Charter	224.25	100%	224.25	224	0.25	0	0.25	0	224	0	1.001116	224.25	1
Develop Assumption Log	224.25	100%	224.25	224	0.25	0	0.25	0	224	0	1.001116	224.25	1
Develop Stakeholders Register	224.25	100%	224.25	220	4.25	0	4.25	0	220	0	1.019318	224.25	1
Develop Stakeholders Analysis	224.25	100%	224.25	220	4.25	0	4.25	0	220	0	1.019318	224.25	1
Planning			0		0	0		#DIV/0!	0	0	#DIV/0!	0	#DIV/0!
Define the Available vendors within Market	70072.75	40%	28029.1	28029.1	0	42043.65		1	70072.75	-42043.7	1	70072.75	0.4
Access available information	6370.25	40%	2548.1	2267.809	280.291	3822.15	700.73	0.931677	6089.959	-3822.15	1.123596	6370.25	0.4
Create procurement analysis plan	6370.25	40%	2548.1	2234.684	313.4163	3822.15	783.54	0.924214	6056.834	-3822.15	1.140251	6370.25	0.4
Identify potential vendors	6370.25	40%	2548.1	1528.86	1019.24	3822.15	2548.10	0.789474	5351.01	-3822.15	1.666667	6370.25	0.4
Summarize the potential vendors	6370.25	40%	2548.1	2038.48	509.62	3822.15	1274.05	0.882353	5860.63	-3822.15	1.25	6370.25	0.4
Develop and Create Contractor Status Report	6370.25	40%	2548.1	2114.923	433.177	3822.15	1082.94	0.898204	5937.073	-3822.15	1.204819	6370.25	0.4

Develop and Create Procurement Audit Forms	6370.25	40%	2548.1	1783.67	764.43	3822.15	1911.08	0.833333	5605.82	-3822.15	1.428571	6370.25	0.4
Develop and Create Contact Closeout Report	6370.25	40%	2548.1	2038.48	509.62	3822.15	1274.05	0.882353	5860.63	-3822.15	1.25	6370.25	0.4
Develop and Create Product Acceptance Form	6370.25	40%	2548.1	1707.227	840.873	3822.15	2102.18	0.819672	5529.377	-3822.15	1.492537	6370.25	0.4
Identify Vendors market niche	6370.25	40%	2548.1	1911.075	637.025	3822.15	1592.56	0.857143	5733.225	-3822.15	1.333333	6370.25	0.4
Develop Procurement Management plan	6370.25	40%	2548.1	2089.442	458.658	3822.15	1146.65	0.892857	5911.592	-3822.15	1.219512	6370.25	0.4
Procurement strategy	6370.25	40%	2548.1	1834.632	713.468	3822.15	1783.67	0.842697	5656.782	-3822.15	1.388889	6370.25	0.4
Identify Needed Resources (Materials and Supplies and money)	528579	37%	195574.2	133492.8	62081.47	333004.8	167787.77	0.842866	466497.5	-333005	1.465055	528579	0.37
Develop Project Management Plan	79953.22	37%	29582.69	26624.42	2958.27	50370.53	7995.32	0.944528	76994.95	-50370.5	1.111111	79953.22	0.37
Plan Scope Management	8883.68	37%	3286.96	2892.53	394.4354	5596.719	1066.04	0.934164	8489.245	-5596.72	1.136364	8883.681	0.37
Collect Requirements	13325.52	37%	4930.44	4289.49	640.9576	8395.078	1732.32	0.929067	12684.56	-8395.08	1.149425	13325.52	0.37
Define Scope	13325.52	37%	4930.44	3895.05	1035.393	8395.078	2798.36	0.890208	12290.13	-8395.08	1.265823	13325.52	0.37
Create WBS	8883.68	37%	3286.96	2169.39	1117.567	5596.719	3020.45	0.833554	7766.114	-5596.72	1.515152	8883.681	0.37
Validate Scope	13325.52	37%	4930.44	2465.22	2465.221	8395.078	6662.76	0.773006	10860.3	-8395.08	2	13325.52	0.37
Define Activities	13325.52	37%	4930.44	2711.74	2218.699	8395.078	5996.48	0.79096	11106.82	-8395.08	1.818182	13325.52	0.37
Sequence Activities	13325.52	37%	4930.44	4338.79	591.6531	8395.078	1599.06	0.934164	12733.87	-8395.08	1.136364	13325.52	0.37
Estimate Activity Durations	13325.52	37%	4930.44	1232.61	3697.832	8395.078	9994.14	0.694215	9627.689	-8395.08	4	13325.52	0.37
Identify management staff resources	13325.52	37%	4930.44	1676.35	3254.092	8395.078	8794.84	0.720659	10071.43	-8395.08	2.941176	13325.52	0.37
Identify staffing requirements	13325.52	37%	4930.44	986.09	3944.354	8395.078	10660.42	0.680346	9381.167	-8395.08	5	13325.52	0.37
Identify needed raw materials	13325.52	37%	4930.44	4215.53	714.9142	8395.078	1932.20	0.921524	12610.61	-8395.08	1.169591	13325.52	0.37
Identify needed utilities	13325.52	37%	4930.44	1824.26	3106.179	8395.078	8395.08	0.729927	10219.34	-8395.08	2.702703	13325.52	0.37
Develop Schedule Management plan	13325.52	37%	4930.44	4324.00	606.4445	8395.078	1639.04	0.932629	12719.08	-8395.08	1.140251	13325.52	0.37
Plan Cost Management	8883.68	37%	3286.96	2563.83	723.1316	5596.719	1954.41	0.885578	8160.549	-5596.72	1.282051	8883.681	0.37
Estimate Costs	8883.68	37%	3286.96	2583.55	703.4098	5596.719	1901.11	0.88835	8180.271	-5596.72	1.272265	8883.681	0.37
Summarize operating expenses and financial projections	8883.68	37%	3286.96	1479.13	1807.829	5596.719	4886.02	0.755849	7075.852	-5596.72	2.222222	8883.681	0.37
Plan Quality Management	8883.68	37%	3286.96	2527.67	759.2882	5596.719	2052.13	0.88054	8124.392	-5596.72	1.30039	8883.681	0.37
Plan Resource Management	8883.68	37%	3286.96	2593.41	693.549	5596.719	1874.46	0.889743	8190.132	-5596.72	1.267427	8883.681	0.37
Estimate Activity Resources	8883.68	37%	3286.96	2925.40	361.5658	5596.719	977.20	0.939317	8522.115	-5596.72	1.123596	8883.681	0.37
Develop Plan Communications Management	8883.68	37%	3286.96	1853.85	1433.115	5596.719	3873.28	0.796138	7450.565	-5596.72	1.77305	8883.681	0.37
Develop Plan Stakeholder Engagement	8883.68	37%	3286.96	1150.44	2136.525	5596.719	5774.39	0.723722	6747.155	-5596.72	2.857143	8883.681	0.37
Change Management Plan	8883.68	37%	3286.96	414.16	2872.805	5596.719	7764.34	0.660807	6010.876	-5596.72	7.936508	8883.681	0.37
Create Project Road Map	8883.68	37%	3286.96	2882.67	404.2963	5596.719	1092.69	0.932629	8479.384	-5596.72	1.140251	8883.681	0.37

Develop Requirements Management Plan	8883.68	37%	3286.96	2592.43	694.535	5596.719	1877.12	0.889603	8189.146	-5596.72	1.267909	8883.681	0.37
Develop Requirements Documentation	8883.68	37%	3286.96	2810.35	476.6095	5596.719	1288.13	0.921524	8407.071	-5596.72	1.169591	8883.681	0.37
Requirements Traceability Matrix	8883.68	37%	3286.96	2230.53	1056.43	5596.719	2855.21	0.841214	7827.251	-5596.72	1.473622	8883.681	0.37
Project Scope Statements	8883.68	37%	3286.96	2892.53	394.4354	5596.719	1066.04	0.934164	8489.245	-5596.72	1.136364	8883.681	0.37
Create WBS Dictionary	8883.68	37%	3286.96	2859.66	427.305	5596.719	1154.88	0.929067	8456.376	-5596.72	1.149425	8883.681	0.37
Create Activity List	8883.68	37%	3286.96	2596.70	690.262	5596.719	1865.57	0.890208	8193.419	-5596.72	1.265823	8883.681	0.37
Activity Attributes	8883.68	37%	3286.96	2169.39	1117.567	5596.719	3020.45	0.833554	7766.114	-5596.72	1.515152	8883.681	0.37
Create and develop Milestone List	8883.68	37%	3286.96	1643.48	1643.481	5596.719	4441.84	0.773006	7240.2	-5596.72	2	8883.681	0.37
Create and develop Network Diagram	8883.68	37%	3286.96	1807.83	1479.133	5596.719	3997.66	0.79096	7404.548	-5596.72	1.818182	8883.681	0.37
Develop Duration Estimating Worksheet	8883.68	37%	3286.96	2892.53	394.4354	5596.719	1066.04	0.934164	8489.245	-5596.72	1.136364	8883.681	0.37
Develop Project Schedule	8883.68	37%	3286.96	821.74	2465.221	5596.719	6662.76	0.694215	6418.459	-5596.72	4	8883.681	0.37
Define Coat Baseline	8883.68	37%	3286.96	1117.57	2169.395	5596.719	5863.23	0.720659	6714.286	-5596.72	2.941176	8883.681	0.37
Develop Quality Metrics	8883.68	37%	3286.96	657.39	2629.569	5596.719	7106.94	0.680346	6254.111	-5596.72	5	8883.681	0.37
Develop Responsibility Assignments Matrix	8883.68	37%	3286.96	2810.35	476.6095	5596.719	1288.13	0.921524	8407.071	-5596.72	1.169591	8883.681	0.37
Develop Team Charter	8883.68	37%	3286.96	1216.18	2070.786	5596.719	5596.72	0.729927	6812.895	-5596.72	2.702703	8883.681	0.37
Develop Resource Breakdown Structure	8883.68	37%	3286.96	2882.67	404.2963	5596.719	1092.69	0.932629	8479.384	-5596.72	1.140251	8883.681	0.37
Create and develop Variance Analysis report	8883.68	37%	3286.96	2563.83	723.1316	5596.719	1954.41	0.885578	8160.549	-5596.72	1.282051	8883.681	0.37
Create and develop Earned Value Analysis report	8883.68	37%	3286.96	2583.55	703.4098	5596.719	1901.11	0.88835	8180.271	-5596.72	1.272265	8883.681	0.37
Create Source Selection Criteria	8883.68	37%	3286.96	1479.13	1807.829	5596.719	4886.02	0.755849	7075.852	-5596.72	2.222222	8883.681	0.37
Create and define Product Vision and specifications	4441.84	37%	1643.48	1263.84	379.6441	2798.359	1026.07	0.88054	4062.196	-2798.36	1.30039	4441.84	0.37
Create and define Product Backlog	4441.84	37%	1643.48	1296.71	346.7745	2798.359	937.23	0.889743	4095.066	-2798.36	1.267427	4441.84	0.37
Create and develop Release Plan	4441.84	37%	1643.48	1462.70	180.7829	2798.359	488.60	0.939317	4261.057	-2798.36	1.123596	4441.84	0.37
Develop Training plan	4441.84	37%	1643.48	1296.71	346.7745	2798.359	937.23	0.889743	4095.066	-2798.36	1.267427	4441.84	0.37
Plan the delivery method for the received 3D printers to the agreed location	8883.68	37%	3286.96	2925.40	361.5658	5596.719	977.20	0.939317	8522.115	-5596.72	1.123596	8883.681	0.37
Evaluate and assess the proper locations for installing 15 3D printers	85793	0%	0		0	85793	#DIV/0!	1	85793	-85793	#DIV/0!	85793	0
Assess all famous and suitable locations for tourists around KSA	31914.68	0%	0	0	0	31914.68	#DIV/0!	1	31914.68	-31914.7	#DIV/0!	31914.68	0
Create locations analysis plan	8000.00	0%	0	0	0	8000	#DIV/0!	1	8000	-8000	#DIV/0!	8000	0
Implement locations analysis plan	30878.32	0%	0	0	0	30878.32	#DIV/0!	1	30878.32	-30878.3	#DIV/0!	30878.32	0
Identify potential locations	8000.00	0%	0	0	0	8000	#DIV/0!	1	8000	-8000	#DIV/0!	8000	0

Summarize the potential locations	7000.00	0%	0	0	0	7000	#DIV/0!	1	7000	-7000	#DIV/0!	7000	0
Evaluate Potential Risks and Rewards	20085	65%	13055.25		13055.25	7029.75	#DIV/0!	0.35	7029.75	-7029.75	#DIV/0!	20085	0.65
Assess needed resources availability	1746.52	65%	1135.239	999.0104	136.2287	611.2826	209.58	0.817757	1610.293	-611.283	1.136364	1746.522	0.65
Identify Risks	873.26	65%	567.6196	141.9049	425.7147	305.6413	654.95	0.41791	447.5462	-305.641	4	873.2609	0.65
Perform Qualitative Risk Analysis	1746.52	65%	1135.239	385.9813	749.2578	611.2826	1152.70	0.449294	997.2639	-611.283	2.941176	1746.522	0.65
Perform Quantitative Risk Analysis	873.26	65%	567.6196	113.5239	454.0957	305.6413	698.61	0.402299	419.1652	-305.641	5	873.2609	0.65
Plan Risk Responses	873.26	65%	567.6196	485.3147	82.30484	305.6413	126.62	0.787845	790.956	-305.641	1.169591	873.2609	0.65
Develop and Create Plan Risk Management	873.26	65%	567.6196	210.0192	357.6003	305.6413	550.15	0.460829	515.6605	-305.641	2.702703	873.2609	0.65
Develop and Create Risk Register	1746.52	65%	1135.239	995.6047	139.6344	611.2826	214.82	0.814048	1606.887	-611.283	1.140251	1746.522	0.65
Develop and Create Risk Report	873.26	65%	567.6196	442.7433	124.8763	305.6413	192.12	0.709939	748.3846	-305.641	1.282051	873.2609	0.65
Develop and Create Probability and Impact assessment	873.26	65%	567.6196	446.149	121.4706	305.6413	186.88	0.7156	751.7903	-305.641	1.272265	873.2609	0.65
Develop and Create Probability and Impact Matrix	873.26	65%	567.6196	255.4288	312.1908	305.6413	480.29	0.4947	561.0701	-305.641	2.222222	873.2609	0.65
Forecast financial returns	1746.52	65%	1135.239	872.9989	262.2402	611.2826	403.45	0.69979	1484.282	-611.283	1.30039	1746.522	0.65
Develop and Create Risk Audit plan	1746.52	65%	1135.239	895.7037	239.5355	611.2826	368.52	0.718465	1506.986	-611.283	1.267427	1746.522	0.65
Review and modify the Risk plan	1746.52	65%	1135.239	1010.363	124.8763	611.2826	192.12	0.830368	1621.645	-611.283	1.123596	1746.522	0.65
Confirm decision to proceed	1746.52	65%	1135.239	895.7037	239.5355	611.2826	368.52	0.718465	1506.986	-611.283	1.267427	1746.522	0.65
Implementation		0%	0	0	0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	0	#DIV/0!
Conduct Procurements	836922.32	0%	0	0	0	836922.3	#DIV/0!	1	836922.3	-836922	#DIV/0!	836922.3	0
Contact the vendors	70153.79	0%	0	0	0	70153.79	#DIV/0!	1	70153.79	-70153.8	#DIV/0!	70153.79	0
Collect the offers	70153.79	0%	0	0	0	70153.79	#DIV/0!	1	70153.79	-70153.8	#DIV/0!	70153.79	0
Review the offers	175384.46	0%	0	0	0	175384.5	#DIV/0!	1	175384.5	-175384	#DIV/0!	175384.5	0
Negotiation for Price, Delivery and warranty	70153.79	0%	0	0	0	70153.79	#DIV/0!	1	70153.79	-70153.8	#DIV/0!	70153.79	0
Follow UP with Vendor	70153.79	0%	0	0	0	70153.79	#DIV/0!	1	70153.79	-70153.8	#DIV/0!	70153.79	0
Filling and update Contractor Status Report	70153.79	0%	0	0	0	70153.79	#DIV/0!	1	70153.79	-70153.8	#DIV/0!	70153.79	0
Conduct Procurement Audit	105230.68	0%	0	0	0	105230.7	#DIV/0!	1	105230.7	-105231	#DIV/0!	105230.7	0
Filling and update Contact Closeout Report	70153.79	0%	0	0	0	70153.79	#DIV/0!	1	70153.79	-70153.8	#DIV/0!	70153.79	0
Filling and update Product Acceptance Form	70153.79	0%	0	0	0	70153.79	#DIV/0!	1	70153.79	-70153.8	#DIV/0!	70153.79	0
Close the contract with Vendors	65230.68	0%	0	0	0	65230.68	#DIV/0!	1	65230.68	-65230.7	#DIV/0!	65230.68	0
Installation of 3D printers	6711450	0%	0	0	0	6711450	#DIV/0!	1	6711450	-6711450	#DIV/0!	6711450	0
Receive the 15 3D Printers	150000.00	0%	0	0	0	150000	150000.00	1	150000	-150000		150000	0

Electrical installation	2187150.00	0%	0	0	0	2187150	2187150.00	1	2187150	-2187150		2187150	0
Install interior fixture	2187150.00	0%	0	0	0	2187150	2187150.00	1	2187150	-2187150		2187150	0
Install exterior fixture	2187150.00	0%	0	0	0	2187150	2187150.00	1	2187150	-2187150		2187150	0
Direct and Manage Project Work	165445	0%	0	0	0	165445	#DIV/0!	1	165445	-165445	#DIV/0!	165445	0
Manage Team	9508.33	0%	0	0	0	9508.333	#DIV/0!	1	9508.333	-9508.33	#DIV/0!	9508.333	0
Filling Team Member Status Report	3803.33	0%	0	0	0	3803.333	#DIV/0!	1	3803.333	-3803.33	#DIV/0!	3803.333	0
Submit Project status Report	5705.00	0%	0	0	0	5705	#DIV/0!	1	5705	-5705	#DIV/0!	5705	0
Perform and submit Variance Analysis	3803.33	0%	0	0	0	3803.333	#DIV/0!	1	3803.333	-3803.33	#DIV/0!	3803.333	0
Perform and submit Earned Value Analysis	3803.33	0%	0	0	0	3803.333	#DIV/0!	1	3803.333	-3803.33	#DIV/0!	3803.333	0
Conduct Risk Audit	5705.00	0%	0	0	0	5705	#DIV/0!	1	5705	-5705	#DIV/0!	5705	0
Manage Communications	9508.33	0%	0	0	0	9508.333	#DIV/0!	1	9508.333	-9508.33	#DIV/0!	9508.333	0
Implement Risk Responses	5705.00	0%	0	0	0	5705	#DIV/0!	1	5705	-5705	#DIV/0!	5705	0
Manage Stakeholder Engagement	9508.33	0%	0	0	0	9508.333	#DIV/0!	1	9508.333	-9508.33	#DIV/0!	9508.333	0
Monitor and Control Project Work	5705.00	0%	0	0	0	5705	#DIV/0!	1	5705	-5705	#DIV/0!	5705	0
Perform Integrated Change Control	3803.33	0%	0	0	0	3803.333	#DIV/0!	1	3803.333	-3803.33	#DIV/0!	3803.333	0
Control Scope	5705.00	0%	0	0	0	5705	#DIV/0!	1	5705	-5705	#DIV/0!	5705	0
Control Schedule	3803.33	0%	0	0	0	3803.333	#DIV/0!	1	3803.333	-3803.33	#DIV/0!	3803.333	0
Control Costs	9508.33	0%	0	0	0	9508.333	#DIV/0!	1	9508.333	-9508.33	#DIV/0!	9508.333	0
Control Quality	5705.00	0%	0	0	0	5705	#DIV/0!	1	5705	-5705	#DIV/0!	5705	0
Control Resources	3803.33	0%	0	0	0	3803.333	#DIV/0!	1	3803.333	-3803.33	#DIV/0!	3803.333	0
Monitor Communications	3803.33	0%	0	0	0	3803.333	#DIV/0!	1	3803.333	-3803.33	#DIV/0!	3803.333	0
Filling and update Issue Log	3803.33	0%	0	0	0	3803.333	#DIV/0!	1	3803.333	-3803.33	#DIV/0!	3803.333	0
Filling and update Decision Log	3803.33	0%	0	0	0	3803.333	#DIV/0!	1	3803.333	-3803.33	#DIV/0!	3803.333	0
Filling and update Change Request	3803.33	0%	0	0	0	3803.333	#DIV/0!	1	3803.333	-3803.33	#DIV/0!	3803.333	0
Filling and update Change Log	3803.33	0%	0	0	0	3803.333	#DIV/0!	1	3803.333	-3803.33	#DIV/0!	3803.333	0
Filling and update Lessons Learned Register	3803.33	0%	0	0	0	3803.333	#DIV/0!	1	3803.333	-3803.33	#DIV/0!	3803.333	0
Filling and update Quality Audit	3803.33	0%	0	0	0	3803.333	#DIV/0!	1	3803.333	-3803.33	#DIV/0!	3803.333	0
Conduct and submit Team Performance assessment	5705.00	0%	0	0	0	5705	#DIV/0!	1	5705	-5705	#DIV/0!	5705	0
Monitor Risks	38033.33	0%	0	0	0	38033.33	#DIV/0!	1	38033.33	-38033.3	#DIV/0!	38033.33	0
Testing		0%	0	0	0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	0	#DIV/0!
Inspect and operate all 3D printers after installation	72200	0%	0	0	0	72200	#DIV/0!	1	72200	-72200	#DIV/0!	72200	0

Inspect the all installed 15 3D printers	18500	0%	0	0	0	18500	#DIV/0!	1	18500	-18500	#DIV/0!	18500	0
Ensure all the installed 3D printers are worked properly	18500	0%	0	0	0	18500	#DIV/0!	1	18500	-18500	#DIV/0!	18500	0
Confirm the quality of installation and operation for all 15 3D printers	18500	0%	0	0	0	18500	#DIV/0!	1	18500	-18500	#DIV/0!	18500	0
Provide Training	43500	0%	0	0	0	43500	#DIV/0!	1	43500	-43500	#DIV/0!	43500	0
Provide Training for the equipment operators.	22500	0%	0	0	0	22500	#DIV/0!	1	22500	-22500	#DIV/0!	22500	0
Closing		0%	0	0	0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	0	#DIV/0!
Handover the equipment to ministry.	3600	0%	0	0	0	3600	#DIV/0!	1	3600	-3600	#DIV/0!	3600	0
Collection the Lesson and learned	3300	0%	0	0	0	3300	#DIV/0!	1	3300	-3300	#DIV/0!	3300	0
Filling and update Lessons Learned Summary	3300	0%	0	0	0	3300	#DIV/0!	1	3300	-3300	#DIV/0!	3300	0
Prepare the Closeout Report	5244	0%	0	0	0	5244	#DIV/0!	1	5244	-5244	#DIV/0!	5244	0
Filling and update Project or Phase Closeout	5244	0%	0	0	0	5244	#DIV/0!	1	5244	-5244	#DIV/0!	5244	0
Subtotal			911722.1	810351.9	101370.2	8309532	#DIV/0!	11.19287	9119884	-8309532	#DIV/0!	9221255	5.42

Table 56. Earned Value Management of the project after the expiration of 20% of its duration

Earned Value Management of the project after the expiration of 50 % of its duration:

Project cost at 20 %	
EV	SAR 1,849,478.31
AC	SAR 1,614,205.65
CV	SAR 235,272.66
ETC	SAR 7,371,776.27
TCPI	9.940581603
EAC	SAR 8,985,981.91
SV	SAR (7,371,776.27)
PV	SAR 9,221,254.57
SPI	7.75
Project Budget	SAR 9,689,970.79
Project contingency	SAR 468,716.22

Table 57. Summary of earned Value Management of the project after the expiration of 50% of its duration

Task Description	BAC[SAR]	Work progress %	Cumulative cost										
			EV	AC	CV	ETC	VAC	TCPI	EAC	SV	CPI	PV	SPI
Requirement Analysis													
Gathering information	619000	100%	619000	612900	6100.001	0	6100.00	0	612900	0	1.009953	619000	1
Collect Information for the Requirements	17000	100%	17000	16842.86	157.143	0	157.14	0	16842.86	0	1.00933	17000	1
Define internal requirements	17000	100%	17000	16842.86	157.143	0	157.14	0	16842.86	0	1.00933	17000	1
Identify available skills, information and support	17000	100%	17000	16842.86	157.143	0	157.14	0	16842.86	0	1.00933	17000	1
Designs and Drawings for the 3D printers' booths	500000	100%	500000	495000	5000	0	5000.00	0	495000	0	1.010101	500000	1
Identify the stakeholders	17000	100%	17000	16842.86	157.143	0	157.14	0	16842.86	0	1.00933	17000	1
Identify needed resources	17000	100%	17000	16842.86	157.143	0	157.14	0	16842.86	0	1.00933	17000	1
Identify project Estimated Cost	17000	100%	17000	16842.86	157.143	0	157.14	0	16842.86	0	1.00933	17000	1
Identify High level project Milestones	17000	100%	17000	16842.86	157.143	0	157.14	0	16842.86	0	1.00933	17000	1
Team Forming	13720	100%	13720	9000	4720	0	4720.00	0	9000	0	1.524444	13720	1
Form Project Team	13720	100%	13720	9000	4720	0	4720.00	0	9000	0	1.524444	13720	1
Evaluating Risks	39998	100%	39998	25154	14844	0	14844.00	0	25154	0	1.590125	39998	1
Determine financial requirements	13332.67	100%	13332.67	12700	632.6667	0	632.67	0	12700	0	1.049816	13332.67	1
Assess needed resource availability	13332.67	100%	13332.67	12700	632.6667	0	632.67	0	12700	0	1.049816	13332.67	1
Review personal suitability	13332.67	100%	13332.67	12700	632.6667	0	632.67	0	12700	0	1.049816	13332.67	1
Issue Project Charter	2345.50	100%	2345.5	1776	569.5	0	569.50	0	1776	0	1.320664	2345.5	1
Conduct meeting with all stakeholders	1000.00	100%	1000	960	40	0	40.00	0	960	0	1.041667	1000	1
Confirm decision to proceed	224.25	100%	224.25	224	0.25	0	0.25	0	224	0	1.001116	224.25	1
Review all requirements	224.25	100%	224.25	224	0.25	0	0.25	0	224	0	1.001116	224.25	1
Develop Project Charter	224.25	100%	224.25	224	0.25	0	0.25	0	224	0	1.001116	224.25	1
Develop Assumption Log	224.25	100%	224.25	224	0.25	0	0.25	0	224	0	1.001116	224.25	1
Develop Stakeholders Register	224.25	100%	224.25	220	4.25	0	4.25	0	220	0	1.019318	224.25	1
Develop Stakeholders Analysis	224.25	100%	224.25	220	4.25	0	4.25	0	220	0	1.019318	224.25	1
Planning			0		0	0		#DIV/0!	0	0	#DIV/0!	0	#DIV/0!
Define the Available vendors within Market	70072.75	70%	49050.93	49050.93	0	21021.83		1	70072.75	-21021.8	1	70072.75	0.7
Access available information	6370.25	70%	4459.175	3968.666	490.5093	1911.075	700.73	0.795756	5879.741	-1911.08	1.123596	6370.25	0.7
Create procurement analysis plan	6370.25	70%	4459.175	3910.696	548.4785	1911.075	783.54	0.777001	5821.771	-1911.08	1.140251	6370.25	0.7
Identify potential vendors	6370.25	70%	4459.175	2675.505	1783.67	1911.075	2548.10	0.517241	4586.58	-1911.08	1.666667	6370.25	0.7
Summarize the potential vendors	6370.25	70%	4459.175	3567.34	891.835	1911.075	1274.05	0.681818	5478.415	-1911.08	1.25	6370.25	0.7
Develop and Create Contractor Status Report	6370.25	70%	4459.175	3701.115	758.0598	1911.075	1082.94	0.71599	5612.19	-1911.08	1.204819	6370.25	0.7

Develop and Create Procurement Audit Forms	6370.25	70%	4459.175	3121.423	1337.753	1911.075	1911.08	0.588235	5032.498	-1911.08	1.428571	6370.25	0.7
Develop and Create Contact Closeout Report	6370.25	70%	4459.175	3567.34	891.835	1911.075	1274.05	0.681818	5478.415	-1911.08	1.25	6370.25	0.7
Develop and Create Product Acceptance Form	6370.25	70%	4459.175	2987.647	1471.528	1911.075	2102.18	0.564972	4898.722	-1911.08	1.492537	6370.25	0.7
Identify Vendors market niche	6370.25	70%	4459.175	3344.381	1114.794	1911.075	1592.56	0.631579	5255.456	-1911.08	1.333333	6370.25	0.7
Develop Procurement Management plan	6370.25	70%	4459.175	3656.524	802.6515	1911.075	1146.65	0.704225	5567.599	-1911.08	1.219512	6370.25	0.7
Procurement strategy	6370.25	70%	4459.175	3210.606	1248.569	1911.075	1783.67	0.604839	5121.681	-1911.08	1.388889	6370.25	0.7
Identify Needed Resources (Materials and Supplies and money)	528579	80%	422863.2	288633	134230.2	105715.8	167787.77	0.440582	394348.8	-105716	1.465055	528579	0.8
Develop Project Management Plan	79953.22	80%	63962.58	57566.32	6396.26	15990.64	7995.32	0.714286	73556.96	-15990.6	1.111111	79953.22	0.8
Plan Scope Management	8883.68	80%	7106.94	6254.11	852.8333	1776.736	1066.04	0.675676	8030.847	-1776.74	1.136364	8883.681	0.8
Collect Requirements	13325.52	80%	10660.42	9274.56	1385.854	2665.104	1732.32	0.657895	11939.67	-2665.1	1.149425	13325.52	0.8
Define Scope	13325.52	80%	10660.42	8421.73	2238.688	2665.104	2798.36	0.543478	11086.83	-2665.1	1.265823	13325.52	0.8
Create WBS	8883.68	80%	7106.94	4690.58	2416.361	1776.736	3020.45	0.423729	6467.32	-1776.74	1.515152	8883.681	0.8
Validate Scope	13325.52	80%	10660.42	5330.21	5330.208	2665.104	6662.76	0.333333	7995.313	-2665.1	2	13325.52	0.8
Define Activities	13325.52	80%	10660.42	5863.23	4797.188	2665.104	5996.48	0.357143	8528.333	-2665.1	1.818182	13325.52	0.8
Sequence Activities	13325.52	80%	10660.42	9381.17	1279.25	2665.104	1599.06	0.675676	12046.27	-2665.1	1.136364	13325.52	0.8
Estimate Activity Durations	13325.52	80%	10660.42	2665.10	7995.313	2665.104	9994.14	0.25	5330.208	-2665.1	4	13325.52	0.8
Identify management staff resources	13325.52	80%	10660.42	3624.54	7035.875	2665.104	8794.84	0.274725	6289.646	-2665.1	2.941176	13325.52	0.8
Identify staffing requirements	13325.52	80%	10660.42	2132.08	8528.333	2665.104	10660.42	0.238095	4797.188	-2665.1	5	13325.52	0.8
Identify needed raw materials	13325.52	80%	10660.42	9114.66	1545.76	2665.104	1932.20	0.632911	11779.76	-2665.1	1.169591	13325.52	0.8
Identify needed utilities	13325.52	80%	10660.42	3944.35	6716.063	2665.104	8395.08	0.284091	6609.458	-2665.1	2.702703	13325.52	0.8
Develop Schedule Management plan	13325.52	80%	10660.42	9349.19	1311.231	2665.104	1639.04	0.670241	12014.29	-2665.1	1.140251	13325.52	0.8
Plan Cost Management	8883.68	80%	7106.94	5543.42	1563.528	1776.736	1954.41	0.531915	7320.153	-1776.74	1.282051	8883.681	0.8
Estimate Costs	8883.68	80%	7106.94	5586.06	1520.886	1776.736	1901.11	0.538793	7362.795	-1776.74	1.272265	8883.681	0.8
Summarize operating expenses and financial projections	8883.68	80%	7106.94	3198.13	3908.819	1776.736	4886.02	0.3125	4974.861	-1776.74	2.222222	8883.681	0.8
Plan Quality Management	8883.68	80%	7106.94	5465.24	1641.704	1776.736	2052.13	0.519751	7241.976	-1776.74	1.30039	8883.681	0.8
Plan Resource Management	8883.68	80%	7106.94	5607.38	1499.565	1776.736	1874.46	0.542299	7384.115	-1776.74	1.267427	8883.681	0.8
Estimate Activity Resources	8883.68	80%	7106.94	6325.18	781.7639	1776.736	977.20	0.694444	8101.917	-1776.74	1.123596	8883.681	0.8
Develop Plan Communications Management	8883.68	80%	7106.94	4008.32	3098.628	1776.736	3873.28	0.364431	5785.053	-1776.74	1.77305	8883.681	0.8
Develop Plan Stakeholder Engagement	8883.68	80%	7106.94	2487.43	4619.514	1776.736	5774.39	0.277778	4264.167	-1776.74	2.857143	8883.681	0.8
Change Management Plan	8883.68	80%	7106.94	895.48	6211.47	1776.736	7764.34	0.22242	2672.211	-1776.74	7.936508	8883.681	0.8
Create Project Road Map	8883.68	80%	7106.94	6232.79	874.1542	1776.736	1092.69	0.670241	8009.526	-1776.74	1.140251	8883.681	0.8
Develop Requirements Management Plan	8883.68	80%	7106.94	5605.25	1501.697	1776.736	1877.12	0.541947	7381.983	-1776.74	1.267909	8883.681	0.8
Develop Requirements Documentation	8883.68	80%	7106.94	6076.44	1030.507	1776.736	1288.13	0.632911	7853.174	-1776.74	1.169591	8883.681	0.8
Requirements Traceability Matrix	8883.68	80%	7106.94	4822.77	2284.172	1776.736	2855.21	0.437522	6599.509	-1776.74	1.473622	8883.681	0.8
Project Scope Statements	8883.68	80%	7106.94	6254.11	852.8333	1776.736	1066.04	0.675676	8030.847	-1776.74	1.136364	8883.681	0.8
Create WBS Dictionary	8883.68	80%	7106.94	6183.04	923.9028	1776.736	1154.88	0.657895	7959.778	-1776.74	1.149425	8883.681	0.8
Create Activity List	8883.68	80%	7106.94	5614.49	1492.458	1776.736	1865.57	0.543478	7391.222	-1776.74	1.265823	8883.681	0.8
Activity Attributes	8883.68	80%	7106.94	4690.58	2416.361	1776.736	3020.45	0.423729	6467.32	-1776.74	1.515152	8883.681	0.8

Create and develop Milestone List	8883.68	80%	7106.94	3553.47	3553.472	1776.736	4441.84	0.333333	5330.208	-1776.74	2	8883.681	0.8
Create and develop Network Diagram	8883.68	80%	7106.94	3908.82	3198.125	1776.736	3997.66	0.357143	5685.556	-1776.74	1.818182	8883.681	0.8
Develop Duration Estimating Worksheet	8883.68	80%	7106.94	6254.11	852.8333	1776.736	1066.04	0.675676	8030.847	-1776.74	1.136364	8883.681	0.8
Develop Project Schedule	8883.68	80%	7106.94	1776.74	5330.208	1776.736	6662.76	0.25	3553.472	-1776.74	4	8883.681	0.8
Define Coat Baseline	8883.68	80%	7106.94	2416.36	4690.583	1776.736	5863.23	0.274725	4193.097	-1776.74	2.941176	8883.681	0.8
Develop Quality Metrics	8883.68	80%	7106.94	1421.39	5685.556	1776.736	7106.94	0.238095	3198.125	-1776.74	5	8883.681	0.8
Develop Responsibility Assignments Matrix	8883.68	80%	7106.94	6076.44	1030.507	1776.736	1288.13	0.632911	7853.174	-1776.74	1.169591	8883.681	0.8
Develop Team Charter	8883.68	80%	7106.94	2629.57	4477.375	1776.736	5596.72	0.284091	4406.306	-1776.74	2.702703	8883.681	0.8
Develop Resource Breakdown Structure	8883.68	80%	7106.94	6232.79	874.1542	1776.736	1092.69	0.670241	8009.526	-1776.74	1.140251	8883.681	0.8
Create and develop Variance Analysis report	8883.68	80%	7106.94	5543.42	1563.528	1776.736	1954.41	0.531915	7320.153	-1776.74	1.282051	8883.681	0.8
Create and develop Earned Value Analysis report	8883.68	80%	7106.94	5586.06	1520.886	1776.736	1901.11	0.538793	7362.795	-1776.74	1.272265	8883.681	0.8
Create Source Selection Criteria	8883.68	80%	7106.94	3198.13	3908.819	1776.736	4886.02	0.3125	4974.861	-1776.74	2.222222	8883.681	0.8
Create and define Product Vision and specifications	4441.84	80%	3553.47	2732.62	820.8521	888.3681	1026.07	0.519751	3620.988	-888.368	1.30039	4441.84	0.8
Create and define Product Backlog	4441.84	80%	3553.47	2803.69	749.7826	888.3681	937.23	0.542299	3692.058	-888.368	1.267427	4441.84	0.8
Create and develop Release Plan	4441.84	80%	3553.47	3162.59	390.8819	888.3681	488.60	0.694444	4050.958	-888.368	1.123596	4441.84	0.8
Develop Training plan	4441.84	80%	3553.47	2803.69	749.7826	888.3681	937.23	0.542299	3692.058	-888.368	1.267427	4441.84	0.8
Plan the delivery method for the received 3D printers to the agreed location	8883.68	80%	7106.94	6325.18	781.7639	1776.736	977.20	0.694444	8101.917	-1776.74	1.123596	8883.681	0.8
Evaluate and assess the proper locations for installing 15 3D printers	85793	68%	58339.24		58339.24	27453.76	#DIV/0!	0.32	27453.76	-27453.8	#DIV/0!	85793	0.68
Assess all famous and suitable locations for tourists around KSA	31914.68	68%	21701.98	0	21701.98	10212.7	#DIV/0!	0.32	10212.7	-10212.7	#DIV/0!	31914.68	0.68
Create locations analysis plan	8000.00	68%	5440	0	5440	2560	#DIV/0!	0.32	2560	-2560	#DIV/0!	8000	0.68
Implement locations analysis plan	30878.32	68%	20997.26	0	20997.26	9881.062	#DIV/0!	0.32	9881.062	-9881.06	#DIV/0!	30878.32	0.68
Identify potential locations	8000.00	68%	5440	0	5440	2560	#DIV/0!	0.32	2560	-2560	#DIV/0!	8000	0.68
Summarize the potential locations	7000.00	68%	4760	0	4760	2240	#DIV/0!	0.32	2240	-2240	#DIV/0!	7000	0.68
Evaluate Potential Risks and Rewards	20085	82%	16469.7		16469.7	3615.3	#DIV/0!	0.18	3615.3	-3615.3	#DIV/0!	20085	0.82
Assess needed resources availability	1746.52	82%	1432.148	1260.29	171.8577	314.3739	209.58	0.646552	1574.664	-314.374	1.136364	1746.522	0.82
Identify Risks	873.26	82%	716.0739	179.0185	537.0554	157.187	654.95	0.226415	336.2054	-157.187	4	873.2609	0.82
Perform Qualitative Risk Analysis	1746.52	82%	1432.148	486.9303	945.2176	314.3739	1152.70	0.249584	801.3042	-314.374	2.941176	1746.522	0.82
Perform Quantitative Risk Analysis	873.26	82%	716.0739	143.2148	572.8591	157.187	698.61	0.215311	300.4017	-157.187	5	873.2609	0.82
Plan Risk Responses	873.26	82%	716.0739	612.2432	103.8307	157.187	126.62	0.602208	769.4302	-157.187	1.169591	873.2609	0.82
Develop and Create Plan Risk Management	873.26	82%	716.0739	264.9473	451.1266	157.187	550.15	0.258398	422.1343	-157.187	2.702703	873.2609	0.82
Develop and Create Risk Register	1746.52	82%	1432.148	1255.994	176.1542	314.3739	214.82	0.640889	1570.368	-314.374	1.140251	1746.522	0.82
Develop and Create Risk Report	873.26	82%	716.0739	558.5377	157.5363	157.187	192.12	0.499445	715.7246	-157.187	1.282051	873.2609	0.82
Develop and Create Probability and Impact assessment	873.26	82%	716.0739	562.8341	153.2398	157.187	186.88	0.506358	720.0211	-157.187	1.272265	873.2609	0.82
Develop and Create Probability and Impact Matrix	873.26	82%	716.0739	322.2333	393.8407	157.187	480.29	0.285261	479.4202	-157.187	2.222222	873.2609	0.82

Forecast financial returns	1746.52	82%	1432.148	1101.322	330.8261	314.3739	403.45	0.48725	1415.696	-314.374	1.30039	1746.522	0.82
Develop and Create Risk Audit plan	1746.52	82%	1432.148	1129.965	302.1832	314.3739	368.52	0.509886	1444.339	-314.374	1.267427	1746.522	0.82
Review and modify the Risk plan	1746.52	82%	1432.148	1274.612	157.5363	314.3739	192.12	0.666173	1588.985	-314.374	1.123596	1746.522	0.82
Confirm decision to proceed	1746.52	82%	1432.148	1129.965	302.1832	314.3739	368.52	0.509886	1444.339	-314.374	1.267427	1746.522	0.82
Implementation			0	0	0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	0	#DIV/0!
Conduct Procurements	836922.32	75%	627691.7	627691.7	0	209230.6	0.00	1	836922.3	-209231	1	836922.3	0.75
Contact the vendors	70153.79	36%	25255.36	25255.36	0	44898.42	0.00	1	70153.79	-44898.4	1	70153.79	0.36
Collect the offers	70153.79	36%	25255.36	25255.36	0	44898.42	0.00	1	70153.79	-44898.4	1	70153.79	0.36
Review the offers	175384.46	36%	63138.41	63138.41	0	112246.1	0.00	1	175384.5	-112246	1	175384.5	0.36
Negotiation for Price, Delivery and warranty	70153.79	36%	25255.36	25255.36	0	44898.42	0.00	1	70153.79	-44898.4	1	70153.79	0.36
Follow UP with Vendor	70153.79	36%	25255.36	25255.36	0	44898.42	0.00	1	70153.79	-44898.4	1	70153.79	0.36
Filling and update Contractor Status Report	70153.79	36%	25255.36	25255.36	0	44898.42	0.00	1	70153.79	-44898.4	1	70153.79	0.36
Conduct Procurement Audit	105230.68	36%	37883.04	37883.04	0	67347.63	0.00	1	105230.7	-67347.6	1	105230.7	0.36
Filling and update Contact Closeout Report	70153.79	36%	25255.36	25255.36	0	44898.42	0.00	1	70153.79	-44898.4	1	70153.79	0.36
Filling and update Product Acceptance Form	70153.79	36%	25255.36	25255.36	0	44898.42	0.00	1	70153.79	-44898.4	1	70153.79	0.36
Close the contract with Vendors	65230.68	36%	23483.04	23483.04	0	41747.63	0.00	1	65230.68	-41747.6	1	65230.68	0.36
Installation of 3D printers	6711450	0%	0	0	0	6711450	#DIV/0!	1	6711450	-6711450	#DIV/0!	6711450	0
Receive the 15 3D Printers	150000.00	0%	0	0	0	150000	150000.00	1	150000	-150000		150000	0
Electrical installation	2187150.00	0%	0	0	0	2187150	2187150.00	1	2187150	-2187150		2187150	0
Install interior fixture	2187150.00	0%	0	0	0	2187150	2187150.00	1	2187150	-2187150		2187150	0
Install exterior fixture	2187150.00	0%	0	0	0	2187150	2187150.00	1	2187150	-2187150		2187150	0
Direct and Manage Project Work	165445	0%	0	0	0	165445	#DIV/0!	1	165445	-165445	#DIV/0!	165445	0
Manage Team	9508.33	0%	0	0	0	9508.333	#DIV/0!	1	9508.333	-9508.33	#DIV/0!	9508.333	0
Filling Team Member Status Report	3803.33	0%	0	0	0	3803.333	#DIV/0!	1	3803.333	-3803.33	#DIV/0!	3803.333	0
Submit Project status Report	5705.00	0%	0	0	0	5705	#DIV/0!	1	5705	-5705	#DIV/0!	5705	0
Perform and submit Variance Analysis	3803.33	0%	0	0	0	3803.333	#DIV/0!	1	3803.333	-3803.33	#DIV/0!	3803.333	0
Perform and submit Earned Value Analysis	3803.33	0%	0	0	0	3803.333	#DIV/0!	1	3803.333	-3803.33	#DIV/0!	3803.333	0
Conduct Risk Audit	5705.00	0%	0	0	0	5705	#DIV/0!	1	5705	-5705	#DIV/0!	5705	0
Manage Communications	9508.33	0%	0	0	0	9508.333	#DIV/0!	1	9508.333	-9508.33	#DIV/0!	9508.333	0
Implement Risk Responses	5705.00	0%	0	0	0	5705	#DIV/0!	1	5705	-5705	#DIV/0!	5705	0
Manage Stakeholder Engagement	9508.33	0%	0	0	0	9508.333	#DIV/0!	1	9508.333	-9508.33	#DIV/0!	9508.333	0
Monitor and Control Project Work	5705.00	0%	0	0	0	5705	#DIV/0!	1	5705	-5705	#DIV/0!	5705	0
Perform Integrated Change Control	3803.33	0%	0	0	0	3803.333	#DIV/0!	1	3803.333	-3803.33	#DIV/0!	3803.333	0
Control Scope	5705.00	0%	0	0	0	5705	#DIV/0!	1	5705	-5705	#DIV/0!	5705	0
Control Schedule	3803.33	0%	0	0	0	3803.333	#DIV/0!	1	3803.333	-3803.33	#DIV/0!	3803.333	0
Control Costs	9508.33	0%	0	0	0	9508.333	#DIV/0!	1	9508.333	-9508.33	#DIV/0!	9508.333	0
Control Quality	5705.00	0%	0	0	0	5705	#DIV/0!	1	5705	-5705	#DIV/0!	5705	0
Control Resources	3803.33	0%	0	0	0	3803.333	#DIV/0!	1	3803.333	-3803.33	#DIV/0!	3803.333	0

Monitor Communications	3803.33	0%	0	0	0	3803.333	#DIV/0!	1	3803.333	-3803.33	#DIV/0!	3803.333	0
Filling and update Issue Log	3803.33	0%	0	0	0	3803.333	#DIV/0!	1	3803.333	-3803.33	#DIV/0!	3803.333	0
Filling and update Decision Log	3803.33	0%	0	0	0	3803.333	#DIV/0!	1	3803.333	-3803.33	#DIV/0!	3803.333	0
Filling and update Change Request	3803.33	0%	0	0	0	3803.333	#DIV/0!	1	3803.333	-3803.33	#DIV/0!	3803.333	0
Filling and update Change Log	3803.33	0%	0	0	0	3803.333	#DIV/0!	1	3803.333	-3803.33	#DIV/0!	3803.333	0
Filling and update Lessons Learned Register	3803.33	0%	0	0	0	3803.333	#DIV/0!	1	3803.333	-3803.33	#DIV/0!	3803.333	0
Filling and update Quality Audit	3803.33	0%	0	0	0	3803.333	#DIV/0!	1	3803.333	-3803.33	#DIV/0!	3803.333	0
Conduct and submit Team Performance assessment	5705.00	0%	0	0	0	5705	#DIV/0!	1	5705	-5705	#DIV/0!	5705	0
Monitor Risks	38033.33	0%	0	0	0	38033.33	#DIV/0!	1	38033.33	-38033.3	#DIV/0!	38033.33	0
Testing		0%	0	0	0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	0	#DIV/0!
Inspect and operate all 3D printers after installation	72200	0%	0	0	0	72200	#DIV/0!	1	72200	-72200	#DIV/0!	72200	0
Inspect the all installed 15 3D printers	18500	0%	0	0	0	18500	#DIV/0!	1	18500	-18500	#DIV/0!	18500	0
Ensure all the installed 3D printers are worked properly	18500	0%	0	0	0	18500	#DIV/0!	1	18500	-18500	#DIV/0!	18500	0
Confirm the quality of installation and operation for all 15 3D printers	18500	0%	0	0	0	18500	#DIV/0!	1	18500	-18500	#DIV/0!	18500	0
Provide Training	43500	0%	0	0	0	43500	#DIV/0!	1	43500	-43500	#DIV/0!	43500	0
Provide Training for the equipment operators.	22500	0%	0	0	0	22500	#DIV/0!	1	22500	-22500	#DIV/0!	22500	0
Closing		0%	0	0	0	0	#DIV/0!	#DIV/0!	0	0	#DIV/0!	0	#DIV/0!
Handover the equipment to ministry.	3600	0%	0	0	0	3600	#DIV/0!	1	3600	-3600	#DIV/0!	3600	0
Collection the Lesson and learned	3300	0%	0	0	0	3300	#DIV/0!	1	3300	-3300	#DIV/0!	3300	0
Filling and update Lessons Learned Summary	3300	0%	0	0	0	3300	#DIV/0!	1	3300	-3300	#DIV/0!	3300	0
Prepare the Closeout Report	5244	0%	0	0	0	5244	#DIV/0!	1	5244	-5244	#DIV/0!	5244	0
Filling and update Project or Phase Closeout	5244	0%	0	0	0	5244	#DIV/0!	1	5244	-5244	#DIV/0!	5244	0
Subtotal													
			1849478	1614206	235272.7	7371776	#DIV/0!	9.940582	8985982	-7371776	#DIV/0!	9221255	7.75

Table 58. Earned Value Management of the project after the expiration of 50% of its duration

Explanation of the concept of Resource Leveling and Smoothing:

We can use Resource leveling and Resource smoothing based on the conditions we have in our project. Resources leveling, we can use it if we have limited resources, and we can extend the project's due date (schedule). On the other side, we use the Resource smoothing techniques when we can't extend the project's schedule, and the critical path has to be the same at that moment; we have to increase the optimization of the resources within the project using the Resource Smoothing technique.

Summary table comparing the Resource Leveling and Resource Smoothing:

Area	Resource Leveling	Resource Smoothing
Primary Constraint	Resource Availability	Time
Project Timeline	Start and End Dates can be changed.	End date can't be adjusted.
Critical Path	Can be adjusted.	Can't be changed mostly.
Tasks	Can be delayed after the float period.	Delay accepted within float period.
Usage	Over allocation resources.	Uneven allocation of resources.
Usage	On the beginning of the resource optimization process.	After completing resource leveling.

Table 59. Comparing the Resource Leveling and Resource

And the following picture from PMBOK® Guide is a sample of the concept.

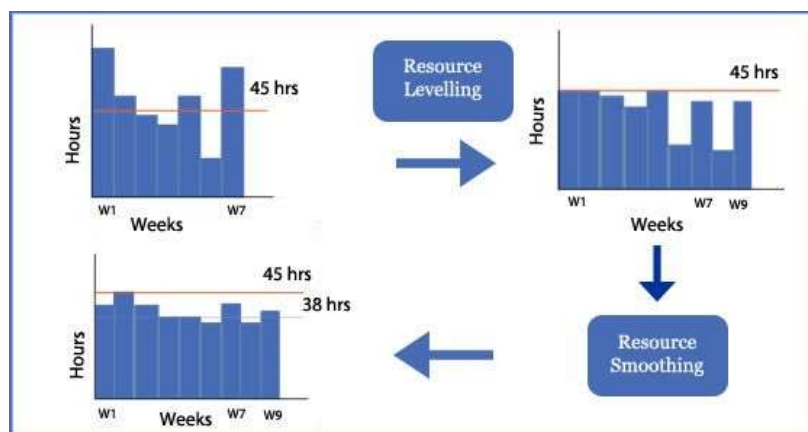


Figure 46. Resource Leveling and Resource Smoothing

Distributing the project resources of equipment and tools:

Mechanical Tools	
Polisher	Bolster
Safety Belt	Boning Rod
Safety Goggles	Brick Hammer
Sprit Level	Chisel
Straight Edge Brushes	Circular Saw
Tile Cutter	Cordless Drill
Welding Machine Set	Core Cutter Machine
Utility Knife	Drilling Machine
Phillips Screwdrivers	End Frames
Straight-Blade Screwdrivers	Forklift
Allen Wrench Set (Hex Set)	Framing Hammer
Tongue-and-Groove Pliers	Framing Square
Wire Strippers	Gloves
Needle-Nose Pliers	Hand Drill
Linesman Pliers	Helmet
Diagonal Cutting Pliers	Jack Hammer
Wire Crimpers	Jack Plane (M.S.)
Jaw Adjustable Wrench	Ladder
Punch down Tool	Line Level
Tools Bags	Mason's Square
Measuring Wheel	Masonry Trowel
	Measurement Tape

Electrical Tools	Safety Tools and Equipment's
Flashlight	Safety Glasses
Non-Contact Voltage Tester	Hearing Protection
Voltmeter or Multimeter	Respirators and Face Masks
Software's	Face Shield
Microsoft office	Fall arresters
MS Project	Personal Protective Equipment
SAP	overalls
Solid work	eye and hearing protection
Transportation	dust masks
Cars	safety shoes
Calling devices	First Aid boxes
Mobile phones	

Table 60. Tools and Equipment's

#	Role	Job Description
1	CEO	Manage United Smart Tech Co. overall operations, set and update the strategy, make all high-level decisions, and face challenges and risks.
2	Project Director	Overseen different projects, monitor progress, provide leadership and directions to project managers, meet with stakeholders and clients, manage risks & constraints, and ensure compliance (goconstruct, n.d.).
3	Project Manager	Plan and monitor project, prepare budget, update stakeholders on project status, coordinate internal & external resources, manage projects timeline, and lead project team.
4	Project Manager	
5	Project Manager	
6	General Manager	Manage all the reporting and related departments, ensure synergy, plan sectors budget, ensure meeting strategy plan, and allocating resources.
7	QHSE Manager	Design and insure following the policy & procedure, responsible of office safety, manage & monitor risk register, undertake QHSE inspections internally & with third parties, and control related aspects (Charlott, 2020).
8	QA Engineer	Review quality specifications, check technical design documents, prevent defects, develop testing, and analyze results (u-tor, 2020).
9	QC Engineer	Ensure quality of the products, maintain & organize all records, and determine products are meeting the standards.
10	Safety Engineer	Inspect workplace of safety violations and ensure the safety of the work environment generally.
11	Information Technology Manager	Manage server infrastructure & network, protect data, provide hardware & software, develop tools based on business needs, and monitor United Smart Tech Co. website (indeed, n.d.).
12	IT Specialist	Support business on technical requirements, follow cyber security standards, and provide service related to IT managers duties.
13	IT Specialist	
14	IT Specialist	
15	Marketing and Supply Chain Manager	Manage logistics, develop vendor relationship, source right products, manage promotions, protect & improve the brand, and develop market plan.
16	Procurement Specialist	Negotiate with suppliers, oversee product storage & handling, and maintain vendor relationship.
17	Marketing Specialist	Execute the market plan, promote products, and manage internal & external communication.
18	Marketing Specialist	
19	HR and National Government Relations	Develop government relationship, monitor all government related transactions, represent the company, comply to regulations, create human resource plan, initiate upskilling & training calendar, and acquire talents.
20	Recruitment Specialist	Interview & hire based on business requirements, handle contracts, and build potential candidate pool.
21	Government Relations Officer	Ensure company compliance to regulations, maintain government relations, and update the company with relevant law.
22	Training Specialist	Tailer courses based on business need and contact related educational centers.
23	Finance Manager	Create business plan, provide financial report, manage budgeting forecast, monitor cash flow, keep financial health, and advise in investment (team, n.d.).
24	Financial Analyst	Analyze targets, track performance, operate transactions, identify financial status, prepare reports & projections, and auditing.
25	Financial Analyst	
26	Financial Analyst	
27	Operation Manager	Strategize operations for maximum efficiency, design processes, and manage engineering related maintenance.
28	Planning Engineer	Assess labor & material costs and participate in engineering projects.
29	Installing Engineer	Install, monitor, and repair tools, machines, and engines.
30	Site Engineer	Oversee construction sites and advise on technical & quality matters.
31	Research and Development Manager	Identify potential market, develop innovation environment, improve technology, ensure growth, and strive toward value proposition (zippia, n.d.).

Table 61. jobs description

Tools and Equipment's	Role	Tools and Equipment's	Role
	CEO		Recruitment Specialist
	Cars		Cars
	Mobile phones		Mobile phones
	Microsoft office		Microsoft office
	PPE		MS Project
	Project Director		SAP
	Cars		Cars
	Mobile phones		Mobile phones
	Microsoft office		Procurement Specialist
	Project Manager		Cars
	Microsoft office		Mobile phones
	MS Project		Microsoft office
	Cars		MS Project
	Mobile phones		SAP
	PPE		Cars
	General Manager		Mobile phones
	Cars		Marketing Specialist
	Mobile phones		Cars
	Microsoft office		Mobile phones
	MS Project		Microsoft office
	SAP		MS Project
	Cars		SAP
	Mobile phones		Cars
	PPE		Mobile phones
	QHSE Manager		HR and National Government Relations
	Cars		Recruitment Specialist
	Mobile phones		Government Relations Officer
	Microsoft office		Training Specialist
	Project Manager		Cars
	Microsoft office		Mobile phones
	MS Project		Microsoft office
	SAP		MS Project
	Cars		SAP
	Mobile phones		Cars
	PPE		Mobile phones
	QA Engineer		Finance Manager
	Cars		Financial Analyst
	Mobile phones		Cars
	Microsoft office		Mobile phones
	Microsoft office		Microsoft office
	MS Project		MS Project
	SAP		SAP
	Cars		Cars
	Mobile phones		Mobile phones
	PPE		Operation Manager
	Safety Engineer		Planning Engineer
	Cars		Installing Engineer
	Mobile phones		Site Engineer
	Microsoft office		Microsoft office
	Microsoft office		MS Project

MS Project	Cars
SAP	Mobile phones
Cars	PPE
Mobile phones	SAP
PPE	Solid work

Tools and Equipment's	Role	Tools and Equipment's	Role
	Technicians		Information Technology Manager
	Bolster		Cars
	Boning Rod		Mobile phones
	Brick Hammer		Microsoft office
	Chisel		MS Project
	Circular Saw		SAP
	Cordless Drill		Cars
	Core Cutter Machine		Mobile phones
	Drilling Machine		IT Specialist
	End Frames		Cars
	Forklift		Mobile phones
	Framing Hammer		Microsoft office
	Framing Square		MS Project
	Gloves		SAP
	Hand Drill		Cars
	Helmet		Mobile phones
	Jack Hammer		Marketing and Supply Chain Manager
	Jack Plane(M.S.)		Cars
	Ladder		Mobile phones
	Line Level		Microsoft office
	Mason's Square		MS Project
	Masonry Trowel		SAP
	Measurement Tape		Cars
	Measuring Wheel		Mobile phones
	Polisher		Research and Development Manager
	Safety Belt		Cars
	Safety Goggles		Mobile phones
	Sprit Level		Microsoft office
	Straight Edge Brushes		MS Project
	Tile Cutter		SAP
	Welding Machine Set		Cars
	Utility Knife		Mobile phones
	Phillips Screwdrivers		
	Straight-Blade Screwdrivers		
	Allen Wrench Set (Hex Set)		
	Tongue-and-Groove Pliers		
	Wire Strippers		
	Needle-Nose Pliers		
	Linesman Pliers		
	Diagonal Cutting Pliers		
	Wire Crimpers		
	Jaw Adjustable Wrench		
	Punch down Tool		

Tools Bags
Flashlight
Non-Contact Voltage Tester
Voltmeter or Multimeter
Safety Glasses
Hearing Protection
Respirators and Face Masks
Face Shield
Fall arresters
Personal Protective Equipment
overalls
eye and hearing protection
dust masks
safety shoes
First Aid boxes
Cars
Mobile phones

Table 62. Distribution of tools and equipment's on the manpower

Distributing the project resources of equipment and tools:

Conducting the procurement process and selecting contractors

The procurement process is the method by which goods or services are acquired. The process must be meticulously managed to ensure that the best value is obtained, the correct goods or services are purchased, a high level of quality is received, deadlines are met, and positive relationships between the procurer and the supplier are maintained. Establishing a procurement strategy from the start is critical to achieving success. The strategy is likely to priorities issues such as the following (Adem, 2021):

Speed.

Cost.

Quality.

Specific constraints on the project.

Risk.

Ownership of property.

Financing.

Program.

The term 'procurement' is frequently used in the construction industry to refer to the process of selecting the primary contractor for the construction of the works. The most frequently used procurement routes in the United Kingdom for selecting the prime contractor are as follows (Adem, 2021):

Contracts in the conventional sense.

Design and construction in a single stage.

Design and construction in two stages.

Contract of management.

PFI.

Procurement, on the other hand, can refer to any supply contract, including the selection of consultants, subcontractors, and manufacturers. On some projects, all first-tier suppliers may be selected as an integrated project team under a single contract. However, the supply chain has become increasingly complex in recent years, with multiple tiers, and large or complex projects can involve a plethora of suppliers, some of whom may be completely unknown to management at the top of the chain (Adem, 2021).

This means that the supply chain, not just the primary client, is procuring. Depending on the client's level of experience, procurement may be managed in-house or by an external project manager or client representative. However, a large portion of procurement on a construction project is almost always managed by the prime contractor or subcontractors. This procurement may be carried out by specialized construction purchasers (Dawn, 2018).

Generally, most procurement processes consist of a number of stages, although they are referred to by a variety of different names.

These processes may be repeated several times throughout the project's lifecycle as different suppliers are procured (Dawn, 2018).

Assessing the procurement requirement

It is critical to ascertain the feasibility of a project in the first instance. This may entail developing a statement of need and then fleshing it out with all stakeholders in a business case.

Considering alternatives:

The project's business case should then be developed and options evaluated. This may include the development of a strategic brief, feasibility studies, and option appraisals for construction projects.

A project execution plan may also be developed, outlining the project's management strategy, defining who does what and how, and defining the policies, procedures, and priorities that will be followed, as well as the contracting and procurement strategy. For additional information, see Project execution plan.

Defining the problem:

After that, concept designs and then detailed designs can be developed and examined to determine how they will respond to the client's business needs.

Establishing a procurement route:

A procurement route should be chosen that is optimal for the project's requirements, balancing time, cost, and quality. The project's delivery and risk management responsibilities vary according to the route chosen. The construction industry has evolved a plethora of distinct procurement channels for completing construction projects. To learn more about the various types, see Procurement route (Ricky Darnall, 2010).

Putting the strategy into action:

The process of procuring goods and services is commonly referred to as the tender process. Typically, this will entail the following:

Documentation preparation for tenders.

Tender invitation.

Tender submissions.

Evaluation of tenders.

Settlement.

Contracts are drafted and executed.

For more information, see Tender process. Execution of projects (Ricky Darnall, 2010).

Once the suppliers are in place, a project management and contract administration process will need to be established to ensure that the contract's obligations are met (Aaron, 2019).

Evaluation post-occupancy:

Post-occupancy evaluations can be especially beneficial to repeat developers and may be required by some funding bodies.

Choosing the appropriate contractors is one of the most time-consuming aspects of contractor management. That is why numerous large organizations dedicate entire departments to it. While it is not always difficult to find someone, who wishes to be awarded the work, you must be confident in the following (Aaron, 2019):

They will meet deadlines.

They are knowledgeable and competent.

They will abide by all applicable safety regulations.

You want the best contractor at the best price, and you also want to ensure that the project is signed, sealed, and delivered on time. If you choose the wrong contractor, it can have a significant impact on the success of the project and increase workplace safety risks.

This is where contract management firms with specialized expertise can assist. They are able to compile a pre-qualified contractor list that has been pre-screened for the appropriate capability in relation to your organization's requirements, so all you have to do is choose.

Consider the Following When Selecting Contractors

It is critical to select competent contractors regardless of the project's size or urgency. Workplace health and safety requirements do not begin when the contractor arrives on-site; they must be in place throughout the duration of the engagement.

When selecting contractors, the following factors should be considered:

- Level of experience in the industry/business.
- Familiarity with the hazards unique to your industry.
- Policies governing safety, risk assessments, and training records.
- Professional Indemnity, Public Liability, and Workers Compensation insurance coverage.
- Methods of communication prior to and during the work.
- Subcontractors and their qualifications.
- Any enforcement actions that have been taken Requirements for supervision.
- Process for notifying individuals of problems and incidents (Aaron, 2019).

Supplier Comparison Model and Scoring Model

The success of an enterprise is not contingent upon all cooperating parties. The efficiency of a subject in its entirety is not its primary source of competitive advantage. It is the effectiveness of the various activities that an enterprise engages in in order to deliver its product to the market. These actions result in the formation of a supply chain. The supply chain's primary objective is to maximize value for customers at the lowest possible cost and with the greatest possible speed (Kawa, 2015).

Procurement is a critical aspect of supply chain management. For the majority of manufacturing firms, the cost of products and services acquired from external suppliers is significant. On average, manufacturers spend 55% of revenues on goods and services, compared to 6% on labor and 3% on overhead. Purchased materials

and services account for up to 80% of total product costs in high-technology firms (Kawa, 2015).

The procurement process's objective must be to harmonize buyers' and suppliers' internal processes in order to avoid resource waste throughout the supply chain. It is possible when a strong emphasis is placed on establishing and maintaining positive relationships with suppliers. Optimization in the delivery area may result in significant cost savings. It is worth noting that the size of a business may result in greater losses due to inefficient purchasing processes (Kawa, 2015).

Reliable suppliers enable manufacturers to reduce inventory and improve product quality, which is one of the primary reasons for the rise in concern about appropriate suppliers. One of the purchasing function's primary responsibilities is the evaluation and selection of suppliers. According to some researchers, evaluating and selecting suppliers is critical due to their impact on supply chain performance (Kawa, 2015).

Procurement professionals' work does not end with the signing of the contract. Indeed, it has only just begun. Developing vendor relationships is a critical skill, as is managing vendor performance. For many, a supplier scorecard serves as a means of ensuring the vendor evaluation process is objective (Hawkins, 2013).

Supplier scorecards enable businesses to quantify, monitor, and manage the performance of their vendors. We'll cover everything you need to know about supplier scorecards in this blog post. To begin, we'll define, justify, and implement

supplier scorecards. Then, a step-by-step guide and templates will assist you in creating your own scorecard. Finally, I'll discuss best practices for vendor scorecards (Hawkins, 2013).

The structure of your supplier scorecard will vary according to the nature of the engagement. However, it is critical to ensure that your scorecard template format is sufficiently versatile to be used by the majority of vendors. This allows you to compare performance across multiple categories and eliminates the need to manage dozens of different templates (Hawkins, 2013).

Maintain simplicity throughout the process. Bear in mind that each scorecard represents a time and effort investment on the part of both you and your stakeholders. Ideally, you want to strike the optimal balance between making the scorecard simple to complete and accurately portraying the supplier's performance. For the majority, the scorecard is a tool for optimizing the relationship, not for completely overhauling it (Hulsen, 2019).

How to create your own vendor scorecard in three easy steps:

1. Compile reference materials:

To begin, gather the original RFP discovery documents, the vendor's response to the RFP, and the contract. Make effective use of the research that went into these documents to guide your evaluation. If your RFP included weighted scoring, determine which factors were given the most weight. Then, examine the contract to

determine if any service level agreements are included (SLAs). Keep a running list of these items as you discover them.

2. Establish performance categories and a hierarchy of importance:

Consider which factors contribute to the success of your project using the list you've just created. Consider the following for each item: Will there be issues if the vendor does not perform this function well? Is this having an effect on the larger business?

After responding to these questions, prioritize the most critical factors and group them according to category. A supplier scorecard should typically include at least three categories: quality, delivery, and service. To keep things simple, keep each of these categories to three measurable items.

3. Utilize your grading system:

Now that you've determined what you're going to track, you must decide how you're going to grade. If you're new to vendor evaluations, you might want to start with yes or no questions. Have deliveries been made on time? Were they correct? Is the quality satisfactory? Occasionally, inquiries are more nuanced. For example, were vendor interactions professional and courteous? A scale of one to five might be more appropriate in this case (Hawkins, 2013).

Whatever method you use to evaluate vendors, it's critical to define what constitutes a good score and what constitutes a bad score. These definitions assist in ensuring that all reviewers use the same criteria when rating their interactions (Hulsen, 2019).

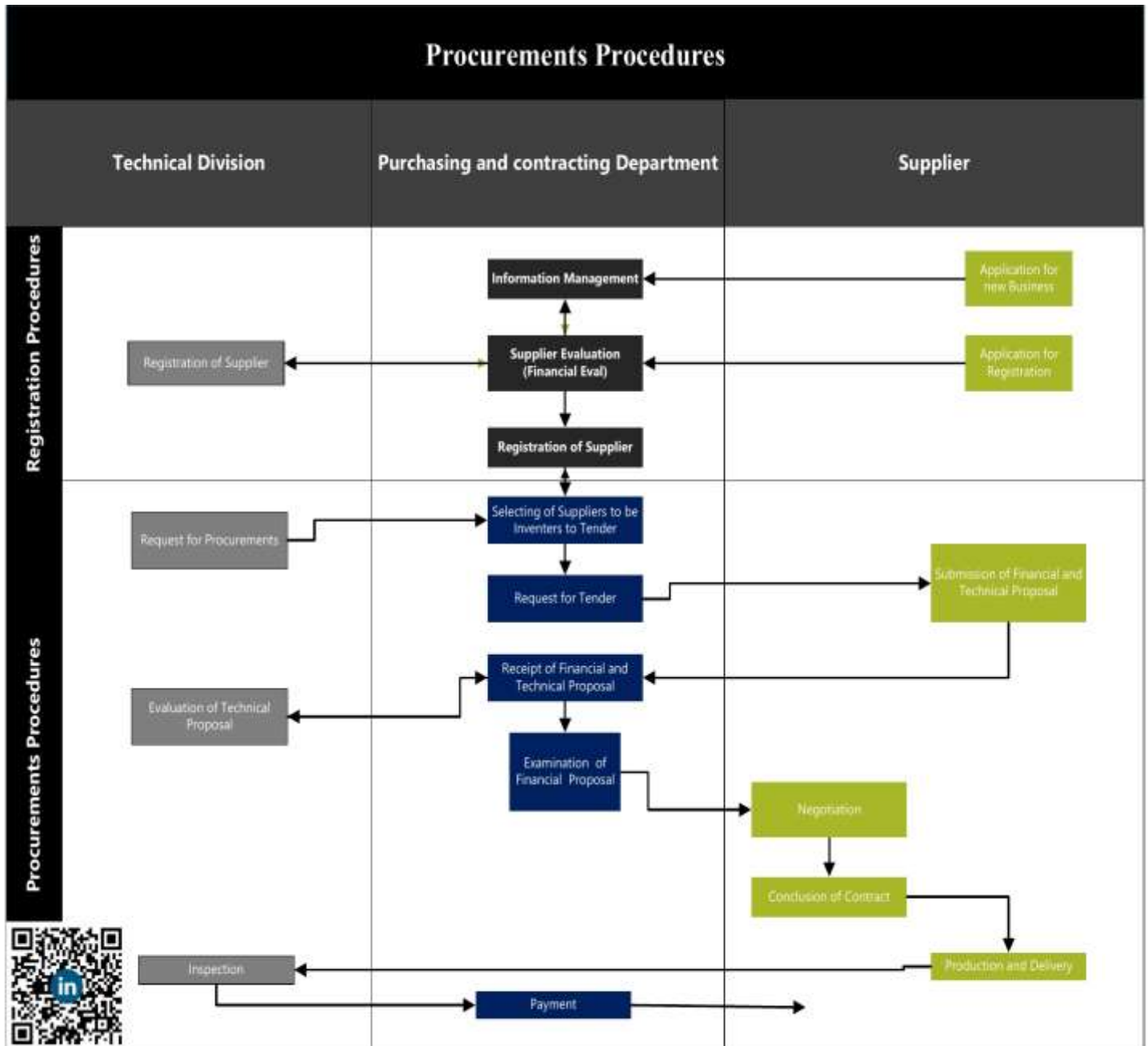


Figure 47. Procurement Procedure

preparing agenda- Invitation and virtual record of a virtual meeting:

Meeting Agenda – [Virtual Meeting]

Meeting Information			
Objective:	Discuss the Project Strategy and Organization structure		
Date:	13/09/2021	Location:	Online using zoom
Time:	7:30 PM	Meeting Type:	Virtual
Call-In Number:	-	Call-In Code:	-
Called By:	Omar Al-ghamdi	Facilitator:	Omar Al-ghamdi
Timekeeper:		Note Taker:	Mahmoud Hassan
Attendees:	Omar Alghamdi, Arwa Alaorini , Marah Alotaibi , Rahaf Alshehri, Ali Samater, Shahad Almalki, Fathuldeen Mohammed, Abdulaziz Al Quzi, Naif Al-amodi, Mahmoud Hassan		
PREPARATION FOR MEETING			
Please Read:			
Please Bring:			
ACTION ITEMS FROM PREVIOUS MEETING		RESPONSIBLE	DUE DATE
1	Project Objectives	Arwa/Omar	
2	Project Mission	Ali/Rahaf	
3	Project Vision	Naif/Marah	
AGENDA ITEMS		PRESENTER	TIME ALLOTTED
1	Discuss project strategy	Arwa/Moahmoud	10 Mins
2	Organization structure of teams and project work units.	Rahaf/Fathuldeen	15 Mins
3	Prepare the project charter model	Omar/Naif	20 Mins
4	Establish the millstones	Shahad/Marah	15 Mins
NEW ACTION ITEMS		RESPONSIBLE	DUE DATE
1	Develop Project Charter	Omar/Naif	1 week from the issuing date
2	Develop Organization Structure	Rahaf/Fathuldeen	1 week from the issuing date
3	Develop Project Millstones	Shahad/Marah	1 week from the issuing date
OTHER NOTES OR INFORMATION			

Table 63. Meeting Agenda

Identifying performance measurement course and submit reports, in addition to explaining the reason:

Performance Measurement Models and Frameworks

Performance Measurement is the process of collecting, analyzing and/or reporting information regarding the performance of an individual, group, organization, system or component.

This section covers why measuring performance is important and followed by explaining the aspects in which performance will be measured and how, when to submit the periodic reports to the concerned parties to monitor performance and keep it in track.

Performance measures	Unit of measure	Responsibility	Schedule (Freq)	Audience	Reason
Return on Investment (ROI)	\$	Financial Analyst	Quarterly	Ministry of Tourism/ Project Director/ Finance Manger	It is useful for measuring the success over time and helping in taking future business decisions. Also, used by businesses to determine profitability of an expenditure (Hawkins, n.d.).
Revenue growth	%	Financial Analyst	Quarterly	Ministry of Tourism/ Project Director/ Finance Manger	It is useful for making improvement, the faster the growth of revenues the sooner the improvement can be done (levelupgrowth, 2018).
Profit Margin	%	Financial Analyst	Quarterly	Ministry of Tourism/ Project Director/ Finance Manger	It is useful indicator to show how many your business is making (designingbuildings, 2020).
Cost performance Index (CPI)	\$	Project Manager	Monthly	Project Director	It is useful measure of financial effectiveness and efficiency of a project
Return on Capital Employed	\$	Financial Analyst	Monthly	Project Director/ Finance Manger	useful when comparing the performance of companies in capital (HAYES, 2021).

Budget at Completion (BAC)	\$	Financial Analyst	Semi-Annual	Ministry of Tourism/ Finance Manger	It is useful to track the actual cost of a project against its forecasted budget (wrike, n.d.).
Estimate at Completion (EAC)	\$	Financial Analyst	Quarterly	Ministry of Tourism/ Finance Manger	It is showing current expectation of total cost at the end of a project (Team, 2020).
Contingency Budget	\$	Risk Manager	Semi-Annual	Ministry of Tourism	It is useful to compensate for the uncertainty inherent in cost and time estimates, as well as unpredictable risk exposure (Wigmore, 2019).
Process Errors	%	QC Manger	Weekly	Project Manger	It is useful to indicate of the effectiveness and efficiency of the processes
Defects Rate	%	QA Manager	Monthly	Project Manger	It is useful to indicate the quality of the processes or products
Schedule performance	%	Project Engineer	Semi-Monthly	Project Manger	It is helpful for calling attention to issues before they worsen. If a project is falling behind schedule, the SPI will reflect this and indicate changes need to be made (Yarbrough, 2021).
Employee Satisfaction	%	HR Analysts	Quarterly	HR and National Government Relation / Project Manger	It is useful to indicate for strengthen retention and engagement (asuresoftware, 2019).
Employee Turnover	%	HR Analysts	Quarterly	Project Manger	It is useful to indicate the satisfaction of the employees and the features that are provided by organization
Project Completions	%	Project Manger	Semi-Monthly	Ministry of Tourism /Project Director	It is useful to indicate the progress of the
Resource Utilization	%	Project Engineer	Monthly	Project Manger	It is useful indicator for maintaining productivity
Customer Satisfaction	%	Customer Service	Monthly	Research and development manager/ Project Director	It is useful to indicate for strengthen retention and engagement (asuresoftware, 2019).

Customer Retention	%	Customer Service	Monthly	Research and development manager/ Project Director	It is useful to increases your customers' lifetime value and boosts your revenue (Eggspert, 2018).
Customer Acquisition	%	Customer Service	Monthly	Research and development manager/ Project Director	It useful and allows brands to build a client base (Marketing, 2021).
Customer Profitability	\$	Customer Service	Monthly	Research and development manager/ Project Director	it helps businesses identify how to improve service offerings and strengthen customer relationships (memory, 2021).
Market Share	%	Customer Service	Monthly	Research and development manager/ Project Director	it is a key indicator of a company's competitiveness. When a company increases its market share, this can improve its profitability (HAYES, investopedia, 2021).

Table 64. Performance measurement course and submit reports

Development of Change Request model, including (impact analysis- alternatives analysis- recommendation):

- Develop a change request form including “Impact analysis - analysis of alternatives – recommendation”

Purpose of Change Request

The change request form is the primary tool used for requesting, approving, and documenting changes to the project and is an important piece of the change management process. So, the Project Manager of our project ensure the proper change management control is enforced during the project to ensure the project remains within approved constraints, scope, and continues to deliver expected benefits (Team, n.d.).

Change Request Participants and Approvers:

In our project, the change request form should typically be filled out by the individual or stakeholder requesting the change such as the client, although it may be filled out by our Project Manager to record the requested change.

Before the change can be approved, our Project Manager will lead the project team to analyze and document (on the form) the impact of the proposed change. Considering that the approver should be the Sponsor of the project (Chinni, 2020).

Why we need a Change Request Form?

As mentioned above the change request form is the part of the change management process, which is a discipline that helps us prepare, equip and support change. Change happens, and if one doesn’t respond to it, the change can derail the project. It’s always better to address change sooner than later. The change request template

is the first step towards collected the data that will determine how we will deal with change, so it doesn't create issues or problems in our workflow.

Additionally, the change request form is one of the building blocks that makes up the structure of the larger change management process. It helps to make sure that change is thoroughly and smoothly implemented and scheduled. But an outside scope change takes time to implement and we will have a big impact on various aspects of our project (eku, n.d.).

Example of a Change Request:

For example, the project of installing a server and networking computers is likely to change as the client makes requests after a contract has been agreed on and signed. In order to make sure those requests are feasible and advisable; the change request acts as a means to capture the change and how it will impact the project. Only then can one make an educated decision on whether to move forward with the change or not.

The proposal for change, that is a request to alter a product or system, is usually brought up by the client, though it can also come from another team member who sees an opportunity for improvement or increased efficiency (Chinni, 2020).

What is in a Change Request form?

Change Number: Change request number for tracking.

Requestor: User who requested the change.

Category: The category of the change.

Short description: A synopsis of the change request.

Detailed description: Explain the problem.

Recommendations: Solution for the problem.

Priority: To define how quickly this change should be approved and implemented.

Impact: To measure the effect of a change on the project aspects/elements. Details of Scope Impact, Quality Impact, Requirements Impact, Cost Impact, Schedule Impact, and Process/Documents Impact.

Risk: The risk level for the change. The risk of a change. High, Medium or Low is a possible option. Justification for proposed change: Indicate the reason for the change.

State: The state of the change request. It can include New, Under Review, Approved, Deferred, or Rejected.

Disposition: Explanation by CCB for approved, deferred, or rejected changes.

Types of Change Requests:

1. Corrective actions are process changes that realign current performance with the plan.

2. Preventive actions are process improvements that focus on future performance. Defect repair actions modify a nonconforming product or component (Olga Bugajenko, n.d.).

There are basically three types of change requests and there is other two major change request type which are inside the scope and outside the scope. An inside the scope change is one that involves small corrections to the existing requirement. There is little impact on the cost or Either way, a change request form is a tool to see what kind of change we're dealing with, how it will impact our project and then whether it will be done or not. It's a way to manage the process by capturing the relevant information.

A change request should also be shared with our entire team. They can all respond to the three core questions at the heart of any change request: **What is the change? What is the benefit? How important is it?**

We also need to think of what a project would be like without a change request form. Imagine the chaos that would ensue if every time someone wanted to change something, they texted us or pulled us aside or, worse, didn't even include you in their thoughts. As a project leader, you want to know the concerns or needs of the client and team, and then put them into a process to control the outcome. That's a change request (Team I. E., 2021).

Change Request<Template>

Part I – General Information				
Project Name	Project Manager	Project Sponsor		
Change Number	Change Number	Short Description	Requestor	
Priority	Risk	Category		
		☐ Scope	☐ Schedule	☐ Cost
		☐ Requirements	☐ Quality	☐ External

Detailed Description of the Change Request
Proposed Solution / Recommendations
Impact / Justification of Proposed Change

(Chinni, 2020)

Part II – Change Request Results			
Overall State	☐ Approve	☐ Defer	☐ Reject
Disposition Comments			

(Team, n.d.)

Part III – Change Control Board Signatures				
Name	Role	Disposition	Date	Signature
	Project Manager			
	Sponsor			

(Team, n.d.)

Table 65. Change Request<Template>

Impact analysis is a key aspect of responsible requirements management. It provides an accurate understanding of the implications of a proposed change, which helps the teams make informed business decisions about which proposals to approve.

The analysis examines the proposed change to identify components that might have to be created, modified, or discarded and to estimate the effort associated with implementing the change.

Skipping impact analysis doesn't change the size of the task. It just turns the size into a surprise. In product development surprises are rarely good news. Before a developer says, "Sure, no problem" in response to a change request, he or she should spend a little time on impact analysis.

Impact Analysis Procedure

Impact analysis has three aspects:

- Understand the possible implications of making the change. Change often produces a large ripple effect. Stuffing too much functionality into a product can reduce its performance to unacceptable levels.
- Identify all the files, models, and documents that might have to be modified if the team incorporates the requested change.
- Identify the tasks required to implement the change, and estimate the effort needed to complete those tasks.
- Traceability data that links the affected requirement to other downstream deliverables helps greatly with impact analysis. On complex projects with thousands of artifacts, to manually determine what and who is affected by a change is time-consuming and error-prone. Alternatively, you could adopt a product development solution like Jama Connect, which includes built-in functionality for end-to-end traceability and impact analysis, and automatically highlights the items and people that are impacted when a change occurs.

Lastly, impact analysis is essential on projects where quality and safety are an issue such as in healthcare, automotive, and aerospace projects. In these situations, it's critical to understand the specific set of requirements and features that need to be retested after a change is implemented.

Steps in a typical impact analysis process look like this:

1. Identify the sequence in which the tasks must be performed and how they can be interleaved with currently planned tasks.
2. Determine whether the change is on the project's critical path. If a task on the critical path slips, the project's completion date will slip. Every change consumes resources, but if you can plan a change to avoid affecting tasks that are currently on the critical path, the change won't cause the entire project to slip.
3. Estimate the impact of the proposed change on the project's schedule and cost.
4. Evaluate the change's priority by estimating the relative benefit, penalty, cost, and technical risk compared to other discretionary requirements.
5. Report the impact analysis results to all stakeholders so that they can use the information to help them decide whether to approve or reject the change request.

In most cases, this procedure shouldn't take more than a couple of hours to complete. This may seem like a lot of time to a busy developer, but it's a small investment in making sure the project wisely invests its limited resources. If we can adequately assess the impact of a change without such a systematic evaluation, go right ahead; just make sure you aren't stepping into quicksand (eku, n.d.).

Alternatives Analysis:

Alternatives analysis stands for Projects, Methods, Material, Man power, Machines, Tools etc. is the best form to explain the application of alternatives analysis

Alternative project analysis:

Alternative project analysis is really useful while choosing projects. The same objective can be accomplished in different ways by different projects. Alternative projects analysis helps to choose the right projects. The ones which will provide the

maximum return on investment (ROI) in the shortest possible time (payback period).

Alternative methods analysis

Within a project, the critical path can be worked by the alternative methods of ‘precedence diagramming’ or ‘arrow diagramming’. For schedule compression one has to choose between the alternative methods of ‘fast tracking’ and ‘crashing’. The curing process during construction can be achieved by the alternative methods of ‘normal curing’ and ‘steam curing’. In software development the alternative methods of software testing can be manual or automated. For workforce mobilization we have the alternative methods of outsourcing, offshoring, subcontracting, joint development etc. There are ample opportunities for alternative methods analysis within projects. The right method selection is a major factor for our project success.

Alternative tools analysis:

Tool selection is a major factor for project success. For scheduling itself there are a magnitude of tools available. So is the case with project progress monitoring using project dashboards. Analyzing alternative tools will not only help to identify the right tools but also will help to reduce costs.

Alternative material analysis:

While preparing the bill of quantities (BOQ) of projects, alternative material analysis helps to optimize project costs (pmri, n.d.).

Alternative manpower analysis:

For global projects, alternative manpower analysis helps to optimize the cost of manpower by sourcing manpower from the cheapest locations.

Alternative machines analysis:

Alternative machines analysis helps to choose the most economical machines. It also helps to create alternate capacities.

The application of alternatives analysis starts from the pre-initiation stages in our project till the decommissioning of the product /service the project delivered (pmri, n.d.).

Recommendations:

We have set up a clear policy of recommendation in terms of the change request or any recommendation is required in all the project stages. As we prepare a report that involves describing a situation, evaluating possible alternatives and proposing a solution to a problem. ... Whether we're writing a project, performance or risk assessment (pmri, n.d.).

So, in our project, the project recommendations are usually intended to ensure that there is specific team along with the Project Manager accountability for and ownership of accomplishing project management objectives. The recommendations provide the project leadership with direction to strengthen the project management culture.

However, we have several recommendations that we've set up for our project along with the sponsor and the experts in order to have the right directions of any future challenge that we might encounter.

Recommendation 1. Develop The project management culture by providing clear, consistent, executive communication and leadership regarding the project importance of project management objectives and their accomplishment.

Recommendation 2. Establish project ownership and accountability by senior management for strategic objective accomplishment in scope, budget, schedule, and quality.

Recommendation 3. Establish measurable project strategic objectives for scope, budget, schedule, and quality and measure their accomplishment.

Recommendations for Roles and Responsibilities of the Project Manager.

These recommendations address the concerns that project management at the project is inconsistent. There is no widely shared understanding of the role of the project manager or the project team; project management practices vary widely and the extent to which projects are actively managed at all is variable. The intent of the recommendations detailed below is to increase the consistency and discipline with which best project

Recommendation 4. Establish project roles, responsibilities, and authority of project managers, project teams, technical managers, technical leaders, and team members. Strengthen the project manager's level of authority.

Recommendation 5. Strengthen the consistency of project management across the project by establishing consistent project management procedures.

Recommendation 6. Revise project management policies, guidelines, and manuals to reflect these consistent project management requirements.

Recommendation 7. Establish measurable performance objectives for project managers that are aligned with the departmental strategic objectives and project managers' roles,

responsibilities, and authority.

Recommendation 8. Develop and maintain project status information regarding project scope, schedule, and budget.

Recommendation 9. Strengthen scope management by revising policies and procedures to establish greater accountability and reporting mechanisms.

Recommendation 10. Establish a standardized process for project schedule planning and management (pmri, n.d.).

Recommendation 11. Establish and manage project budgets.

Recommendation 12. Use quantitative information to evaluate project labor requirements and establish work standards by activity to support project scheduling and budgeting.

Recommendation 13. Perform multi-project resource loading to evaluate the "deliverability of the program" and support overall program management (pmri, n.d.).

Recommendation 14. Create a department-wide organizational focal point for all project management at The Department.

Recommendation 15. Establish project management as a visible and attractive Departmental career path.

Recommendation 16. Continue to emphasize and amplify training and professional development for project managers. This recommendation builds on the existing level of commitment to training for project managers and team members.

Identifying Risks (threats) and opportunities, and giving examples:

Define the risks (threats) and show examples:

The Risk identification is the process of identifying and assessing threats in our organization, its operations, and its workforce. For example, risk identification may include assessing IT security threats such as malware and ransomware, accidents, natural disasters, and other potentially harmful events that could disrupt business operations. Companies that develop robust risk management plans are likely to find they're able to minimize the impact of threats, when and if they should occur.

So, in our company we follow the global known steps in terms of risk identifications which are the five core steps that easily help us to do the risk identification and management process. These steps include risk identification, risk analysis, risk evaluation, risk treatment, and risk monitoring.

Risk Identification: The purpose of risk identification is to reveal what, where, when, why, and how something could affect a company's ability to operate. For example, a business located in central California might include "the possibility of wildfire" as an event that could disrupt business operations.

Risk Analysis: This step involves establishing the probability that a risk event might occur and the potential outcome of each event. Using the California wildfire example, safety managers might assess how much rainfall has occurred in the past 12 months and the extent of damage the company could face should a fire occur (Team I. E., 2021).

Risk Evaluation: Risk evaluation compares the magnitude of each risk and ranks them according to prominence and consequence. For example, the effects of a

possible wildfire may be weighed against the effects of a possible mudslide.

Whichever event is determined to have a higher probability of happening and causing damage, it would rank higher.

Risk Treatment: Risk treatment is also referred to as Risk Response Planning. In this step, risk mitigation strategies, preventative care, and contingency plans are created based on the assessed value of each risk. Using the wildfire example, risk managers may choose to house additional network servers offsite, so business operations could still resume if an onsite server is damaged. The risk manager may also develop evacuation plans for employees (Team I. E., 2021).

Risk Monitoring: Risk management is a non-stop process that adapts and changes over time. Repeating and continually monitoring the processes can help assure maximum coverage of known and unknown risks.

However, the risk identification enables our project to develop plans to minimize harmful events before they arise. The objective of this step is to identify all possible risks that could harm our project operations, such as the 3d printers and the places of the project itself.

In addition, we have safety management professionals that clearly understand the risk identification is not a one-time process. Instead, the process should be rigorous, thoughtful, and ongoing.

The objective of the risk identification process is to ensure that all potential project risks are identified. The strategies for dealing with these risks will be devised during later risk management steps.

Therefore, the below mentioned examples are the common risks we have identified during our project:

1. Technology risk

The technological aspect of running a project is a complex deliverable because there is a high turnover of new and advanced technologies. The tech aspect of a project poses a critical threat to data security, organization services, compliance and information security. Risks associated with technology are more challenging because implementing new IT programs often requires fresh personnel training and software acquisition. There are also other technological-related risks like service outages that might lead to delays and project failure.

2. Communication risk

Effective and timely communication is a significant work ethic that you must strictly observe when you are in charge of a project. Setting up meetings with stakeholders, such as project donors, helps you track any changes, reassign tasks and foster a cohesive team environment. With all the communication channels and gadgets at our disposal, sometimes team members neglect the critical components of effective communication, leading to loss of data or misinformation and eventual project disruption.

3. Scope creep risk

Uncontrolled and unauthorized change to the initial intended project scope may lead to the extra cost of additional features, products or functions. Almost all projects face this risk, and sometimes it poses an irreversible challenge because some of the added functions are significant to the project and desirable to the project's success (Olga Bugajenko, n.d.).

4. Cost risk

A shortage or mismanagement of project funds resulting from an inflated budget or other constraints is a threat to the project's completion. When the project cost is higher than the budgeted funds, the risk might shift to other operations and workforce segments. The reduction of the funds may also contribute to an occurrence of a scope risk.

5. Operational risk

A project may stall or terminate if there is a poor implementation of critical operations and core processes such as production or procurement. The risks could result in a direct or indirect loss owing to inadequacy or failed qualitative, quantitative or strategies. Depending on the project type, **operational risks are:**

IT system risk.

Human and process direct implementation risk.

Human and process indirect implementation risk.

Financial capacity risk.

6. Health and safety risk

Health and safety is a type of risk that can compromise a company's compliance rules. An organization should have its health and safety standards monitored and evaluated regularly to identify potential risks that can lead the company to losses or fines. The risk can also lead to staff or customers' health complications where a company's reputation might be at stake. The management is responsible for establishing continuous health and safety risk monitoring in the company premises and its products or services.

7. Skills resource risk

Leveraging on internal staff is a potentially high-project risk because sometimes the project activities are staggered in different waves at various locations, requiring in-house personnel attendance. The overlap of the waves becomes a potential distress source. Staff incompetence in various project divisions is another risk that may contribute to the additional cost of personnel retraining or transfers.

8. Performance risk

When a project is unlikely to achieve the results as intended, there is a perceived performance risk. The risk has an inherent impact on the overall performance of the business. Such a problem may lead to the additional need for financing, a likely penalty for non-performance and it may also leverage the competitors' performance (Olga Bugajenko, n.d.).

9. Market risk

When a project fails to meet the stated results, market risk is likely to occur. Competitors might take the advantage to cripple the business and eliminate it from the market. Another market risk could occur in commodity and foreign market trends, which might not favor the project's initial estimates. Liquidity, credit and fluctuation of interest rates also pose as a potential market distracter to the project's product sales.

10. External hazards risk

A likely adverse event beyond the control of the project management is a potential risk. Such risks manifest in various types and forms, including terrorism, storms, floods, vandalism, earthquakes and civil unrest. A project may stall or discontinue when such events occur. By employing appropriate monitoring measures, organizations can prevent heavy damage or losses resulting from an unforeseen external hazard (theiapm, n.d.).

Preparing of Risk register:

PROJECT NAME	CREATED BY	DATE CREATED
3D Printer Project	Project Team	09/01/2021

REF ID	RISK DESCRIPTION	RISK CATEGORY	RISK PROBABILITY	RISK IMPACT	RISK SUB-CATEGORY	STATUS	OWNER	RISK RATING	Possible Response	DATE CLOSED
1.1	Unfamiliar areas of the installation process take more time than expected in the design	Technical	4	3	Project executing	Open	Project Manager	12	Avoid	
1.2	Optimistic estimation of the schedule	Technical	2	2	Project executing	Open	Project Manager	4	Avoid	
1.3	Delay in critical activity cascading delays in dependent tasks	Management	3	5	Project executing	Open	Project Manager	15	Mitigate	
1.4	Facilities are not available on scheduled time	Facilitation	4	2	Project executing	Open	Facilities Supervisor	8	Transfer	
1.5	Customers add new requirement	Management	5	2	Project executing	Open	Project Manager	10	Accept	
1.6	Suppliers delays the readiness of the 3D printers	Supply chain	4	3	Logistics	Open	Operation Manager	12	Mitigate	

2.1	Design errors	Technical	3	2	Design	Open	Technical Manager	6	Avoid	
2.2	Defected and dysfunctional 3D printers	Technology	2	4	Software	Open	IT Manager	8	Transfer	
2.3	The X-Y resolution r of the 3D printer not between 15-80 μ m	Technical	4	4	Design	Open	Technical Manager	16	Mitigate	
2.4	Interface is complicated to use by the public	Marketing	2	3	Training and Awareness	Open	Market Manager	6	Mitigate	
2.5	Typical printing speed is less than 120 mm/s	Technology	2	2	Software	Open	IT Manager	4	Avoid	
3.1	Lack of effective management responses	Management	4	2	Project executing	Open	Risk Manager	8	Mitigate	
3.2	Poor support of the development process	Management	3	3	R&D	Open	R&D Manager	9	Mitigate	
3.3	Collaboration Team	Management	4	2	Team Development	Open	Project Manager	8	Avoid	
3.4	Ineffective communication between stakeholders	Management	5	3	Project executing	Open	Project Manager	15	Mitigate	
3.5	Poor leadership	Management	3	4	Project executing	Open	Project Manager	12	Avoid	
4.1	Human Errors (labors, Employee)	Human Resource	2	2	Training and Awareness	Open	HR Manager	4	Mitigate	
4.2	Logistics failure	Supply chain	5	2	Logistics	Open	Operation Manager	10	Avoid	
4.3	Loss of agreed supplier	Supply chain	4	2	Logistics	Open	Project Manager	8	Avoid	
4.4	Theft and fraud	Legal and Security	3	2	Security	Open	Security Manager	6	Transfer	
4.5	Legal and compliance risks	Legal and Security	3	3	Legal	Open	Project Manager	9	Avoid	

5.1	Natural Disasters	Management	4	4	Crisis and disasters	Open	Program Manager	16	Transfer	
5.2	Electrical shock while installing 3D printers	Health and Safety	3	2	Safety	Open	HSE Manager	6	Avoid	
5.3	Noise hazard	Health and Safety	2	1	Health	Open	HSE Manager	2	Avoid	
5.4	Manpower injuries	Health and Safety	3	2	Safety	Open	HSE Manager	6	Mitigate	

Table 66. Risk register and assessment

**RISK
RATING
KEY**

LOW 0 – ACCEPTABLE OK TO PROCEED	MEDIUM 1 – ALARP as low as reasonably practicable TAKE MITIGATION EFFORTS	HIGH 2 – GENERALLY UNACCEPTABLE SEEK SUPPORT	EXTREME 3 – INTOLERABLE PLACE EVENT ON HOLD
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LIKELIHOOD	SEVERITY			
	ACCEPTABLE LITTLE TO NO EFFECT ON EVENT	TOLERABLE EFFECTS ARE FELT, BUT NOT CRITICAL TO OUTCOME	UNDESIRABLE SERIOUS IMPACT TO THE COURSE OF ACTION AND OUTCOME	INTOLERABLE COULD RESULT IN DISASTER
IMPROBABLE RISK IS UNLIKELY TO OCCUR	LOW – 1 –	MEDIUM – 4 –	MEDIUM – 6 –	HIGH – 10 –
POSSIBLE RISK WILL LIKELY OCCUR	LOW – 2 –	MEDIUM – 5 –	HIGH – 8 –	EXTREME – 11 –
PROBABLE RISK WILL OCCUR	MEDIUM – 3 –	HIGH – 7 –	HIGH – 9 –	EXTREME – 12 –

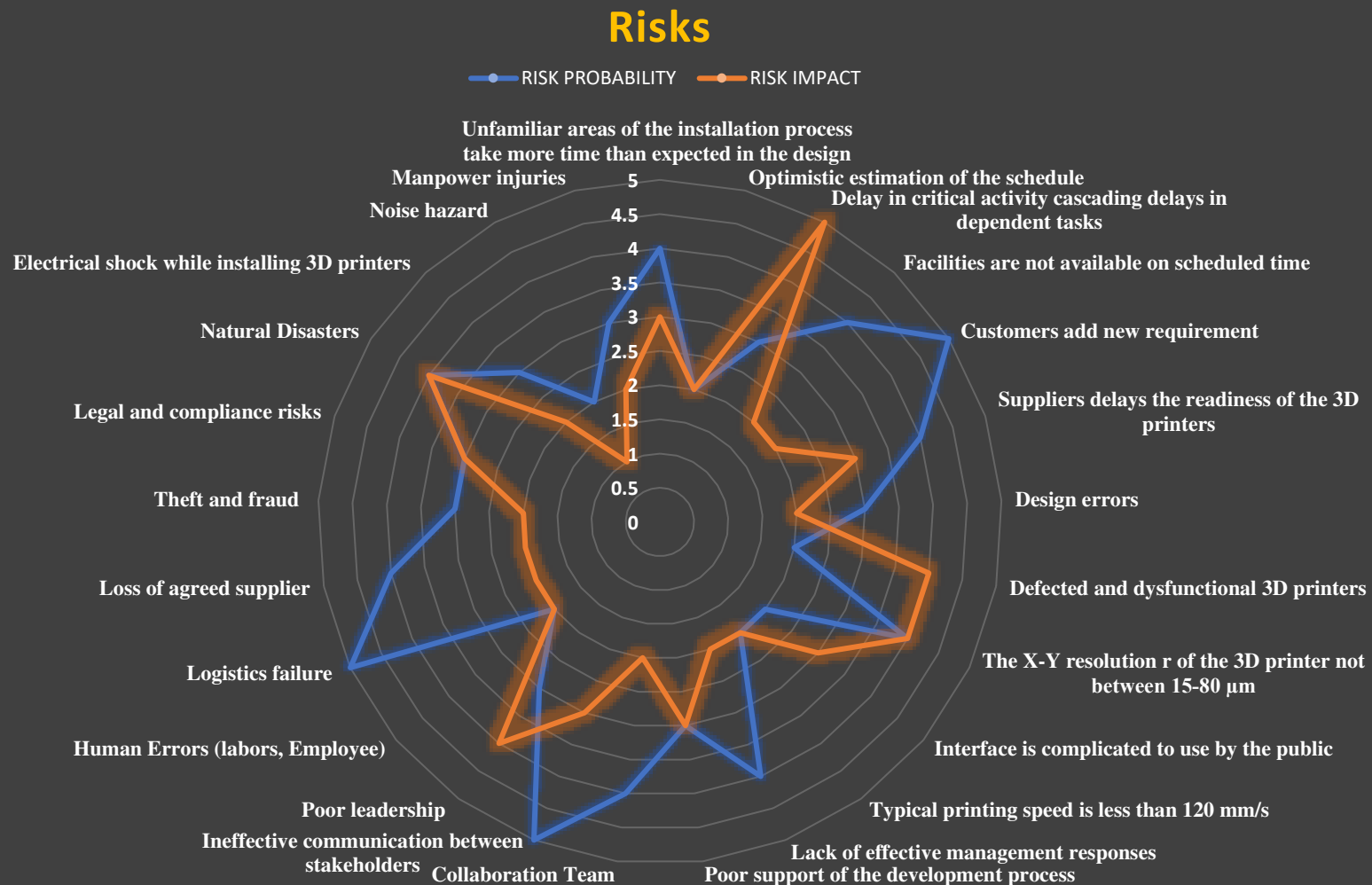


Figure 48. Risks Probability and Impact

Qualitative Risk Analysis:

Risk Assessment for 3D printer project:

IMPACT				Probability			
Score	Rating	Financial Impact (SAR)	Risk Description	Score	Rating	Certainty	Risk Description
5	Critical	> 5 Mn	1.5 Customer add new requirement 3.4 Ineffective communication between stakeholders 4.2 Logistics failure	5	Expected	> 90%	1.3 Delay in critical activity cascading delays in dependent tasks
4	Significant	3 to 4 Mn	1.1 Unfamiliar areas of the installation process take more time than expected in the design 1.4 Facilities are not available on scheduled time 1.6 Suppliers delays the readiness of the 3D printers 2.3 The X-Y resolution r of the 3D printer not between 15-80 μ m	4	Highly Likely	< 90%	2.2 Defected and dysfunctional 3D printers 2.3 The X-Y resolution r of the 3D printer not between 15-80 μ m 3.5 Poor leadership 5.1 Natural Disasters

			3.1 Lack of effective management responses 3.3 Collaboration Team 4.3 Loss of agreed supplier 5.1 Natural Disasters			
3	High	2 to 3 Mn	1.3 Delay in critical activity cascading delays in dependent tasks 2.1 Design errors 3.2 Poor support of the development process 3.5 Poor leadership 4.4 Theft and fraud 4.5 Legal and compliance risks 5.2 Electrical shock while installing 3D printers 5.4 Manpower injuries	3	Likely	<60%
2	Moderate	1 to 2 Mn	1.2 Optimistic estimation of the schedule	2	Slightly	<30%
						1.1 Unfamiliar areas of the installation process take more time than expected in the design 1.6 Suppliers delays the readiness of the 3D printers 2.4 Interface is complicated to use by the public 3.2 Poor support of the development process 3.4 Ineffective communication between stakeholders 4.5 Legal and compliance risks

			2.2 Defected and dysfunctional 3D printers 2.4 Interface is complicated to use by the public 2.5 Typical printing speed is less than 120 mm/s 4.1 Human Errors (labors, Employee) 5.3 Noise hazard				1.4 Facilities are not available on scheduled time 1.5 Customers add new requirement 2.1 Design errors 2.5 Typical printing speed is less than 120 mm/s 3.1 Lack of effective management responses 3.3 Collaboration team 4.1 Human Errors (labors, Employee) 4.2 Logistics failure 4.3 Loss of agreed supplier 4.4 Theft and fraud 5.2 Electrical shock while installing 3D printers 5.4 Manpower injuries
1	Low	<1 Mn		1	Not Likely	<10%	5.3 Noise hazard

Table 67. Qualitative risk assessment

Specifying Risk response strategies:

Risk Responses in our project were divided to different categories based on the type of the risk and its impact perspectives as the following:

- Management.
- Schedule.
- Quality.
- Operation.
- Health and Safety.

Risk Area	Risk Event	Response	Contingency Plan	Responsible
Schedule	Unfamiliar areas of the installation process take more time than expected in the design	Avoid	This can be avoided by doing a detailed study and plan of the project and physical and technical observations	Project Manager
	Optimistic estimation of the schedule	Avoid	Maintain an ongoing "actual hours" database of the recorded time spent on each aspect of the project, and refer to old project to get accurate and reliable project schedule	Project Manager
	Delay in critical activity cascading delays in dependent tasks	Mitigate	Hold meetings with the team member to maintain timely manner, collect the right resources, and set a clear goals and scope	Project Manager
	Facilities are not available on scheduled time	Transfer	Transferred to the ministry of tourist by starting the installation project only when the facilities are ready for the installation process	Project Manager
	Customers add new requirement	Accept	This can be an opportunity to the company to meet all the customer requirement and gain the customer loyalty and satisfaction	Project Manager
	Suppliers delays the readiness of the 3D printers	Mitigate	Issuing the PO before enough time, agreed EDD time, continues follow ups	Project Manager

Table 68. Schedule risks response plan

Risk Area	Risk Event	Response	Contingency Plan	Responsible
Quality	Design errors	Avoid	Doing a detailed study of the requirements and consultant from engineering 3rd party company	Project manager, Quality manager
	Defected and dysfunctional 3D printers	Transfer	The supplier is responsible to provide a replacement and ensuring that all the 3D printers work perfectly	Quality manager
	The X-Y resolution r of the 3D printer not between 15-80 μ m	Mitigate	Testing the 3D printers before installation to reduce the error margin, have the supplier signature on all the technical requirements to be met, perform procurement audit	Quality manager
	Interface is complicated to use by the public	Mitigate	Reduce the amount of the controls on the screen. use graphs and reasonable colors, optimize the number of elements on the screen	IT team
	Typical printing speed is less than 120 mm/s	Avoid	Testing the 3D printers before installation to reduce the error margin, have the supplier signature on all the technical requirements to be met, perform procurement audit	Quality manager

Table 69. Quality risks response plan

Risk Area	Risk Event	Response	Contingency Plan	Responsible
Management	Lack of effective management responses	Mitigate	Hold periodical meetings, develop effective communication management plan	Project manager
	Poor support of the development process	Mitigate	Manage Stakeholder Engagement, Develop Project Charter	Project manager
	Inefficient team structure	Avoid	Develop Responsibility Assignments Matrix, Develop Team Charter, Study the required manpower experiences and conduct a clear organizational structure	Project manager
	Collaboration Team	Avoid	Set a clear goal and vision of the project, motivate the team toward higher success rate of achieving the goals	Project manager
	Ineffective communication between stakeholders	Mitigate	Hold periodical meetings, develop effective communication management plan	Project manager
	Poor leadership	Avoid	Effective leader selection process, hire an external coach or consultant	HR manager

Table 70. Management risks response

Risk Area	Risk Event	Response	Contingency Plan	Responsible
Operation	Human Errors (labors, Employee)	Mitigate	Detailed training to reduce the human errors, find the root cause of the human errors and make it easy to spot and correct them	HR manager
	Logistics failure	Avoid	Sign a contract with 3rd party logistics company to arrange the logistics and transportation, contract with local suppliers for not essential materials, track and trace all the shipment to ensure materials delivered on time, analyze lead time	Operation manager
	Loss of agreed supplier	Avoid	Use more than one supplier, build loyal relationships with multiple businesses, develop formal contract with the suppliers	Operation manager
	Theft and fraud	Transfer	Buy fraud and theft insurance to cover the financial damage	Project manager
	Legal and compliance risks	Avoid	Apply for all the required permits and legal documents before the starting the implementation phase	Operation manager

Table 71. Operation risks response plan

Risk Area	Risk Event	Response	Contingency Plan	Responsible
Health and Safety	Natural Disasters	Transfer	Buy natural disaster insurance to cover the financial damage	Safety manager
	Electrical shock while installing 3D printers	Avoid	Restriction signs, monitoring equipment's, provide proper PPE to manpower, shutdown power source before working	Safety manager
	Noise hazard	Avoid	Noise hazard assessment, provide proper PPE to manpower, soundproof headphones	Safety manager
	Manpower injuries	Mitigate	Provide health insurance, health compensation for work accidents	HR manager

Table 72. Health and Safety risks

Preparing Stakeholder engagement assessment matrix:

Legends:	
● High	<u>Desired</u>
● Low	<u>Current</u>

Ministry of Tourism	Power	Interest	Unaware	Resistant	Neutral	Supportive	Leading
Ministry of Tourism	●	●				<u>CD</u>	
General Authority of Civil Aviation	●	●			<u>C</u>	<u>D</u>	
Alghamdi Omer	●	●			<u>C</u>	<u>D</u>	
Steven	●	●					<u>CD</u>
Robert	●	●			<u>C</u>	<u>D</u>	
Donald	●	●					<u>CD</u>
Alshehri Rahaf	●	●					<u>CD</u>
Mohammed Fathuldeen	●	●					<u>CD</u>
Al Quzi Abdulaziz	●	●		<u>C</u>		<u>D</u>	
Alaorini Arwa	●	●					<u>CD</u>
Hassan Mahmoud	●	●					<u>CD</u>
Alotaibi Marah	●	●					<u>CD</u>
Samater Ali	●	●					<u>CD</u>
Almalki Shahad	●	●		<u>C</u>			<u>D</u>
Al-amoudi Naif	●	●					<u>CD</u>
Members Team	●	●					<u>CD</u>
Ahmad	●	●					<u>CD</u>
printer Vendors D3	●	●		<u>C</u>		<u>D</u>	
Tourists	●	●	<u>C</u>			<u>D</u>	
Subcontractors	●	●		<u>C</u>		<u>D</u>	
Electric Co Saudi	●	●	-	<u>C</u>		<u>D</u>	

Table 73. Stakeholder engagement assessment matrix

Training Plan:

United Smart Tech Co. include a training package as part of the sale deal. The training will be in the company training room that has a 3D printer to train the customers on. The plan is to start the training after the customer sign the contract and before the launching of the printers in the location and that has to be booked based on the calendar availabilities. The training program is going to go as the following:

The What	The Who	Thw How
About the 3D printer	Marketing Specialist	Brochure
Product features overview	Marketing Specialist	Video Demo
How to use the 3D printer	Installing Engineer	Classroom
Technical aspects	Installing Engineer	Classroom
How to fix the 3D printer	Site Engineer	Classroom
Coding and customizing	IT Specialist	Classroom
Frequent questions	Whom May Apply	The website

Table 74. Training plan

Recommendations:

We build our project in virtual environmental and after completing the project task we recommend the following:

- 1- Study and evaluate the bid document received from client to cover all scope and avoid any slippage.
- 2- Select and active negotiate the best contract type to win and execute the project.
- 3- Initiate the startup document for project and gain the approval from sponsor and senior management.
- 4- Focus on project planning and papered on proper way to provide clear road map to execute the project.
- 5- Estimate the project cost, schedule and resources to make sure the project will conclude in right method.
- 6- Include all logistic cost to your cost estimate and consider the potential change or market acceleration and inflation.
- 7- Consider all risk and include the contingency to cover the risks.
- 8- Do not be overestimate as this lead to lose the projects, be reasonable and use the experience team to support for evaluate the risk and impact.
- 9- Invest good time to consider the project risk and opportunity to limit the risk probity and impact and capitalize the opportunity.
- 10- Working with project team to understand the scope and identified the scope limitation and boundary.
- 11- Select the best method to execute the project by applying the best practice of project management.

- 12- Select the right human resources with wide experience and from different related filed to drive the project delivery.
- 13- Invest in training and develop of project team skills to maximize the project benefit.
- 14- Build good relationship and common understanding with stakeholders and project team to align and gain their support to success deliver the project.
- 15- Review, study and evaluate the lesson learned from previous project to avoid the mistake and apply the best execution method.
- 16- During the execution keep project team monitor the progress and report the potential delay on project to work on recovery plan.
- 17- Expedite the activity not dependent to other activity to save the cost.
- 18- Explore different way to execute like (Complete and go, Overtime, adding resources) to improve the project delivery.
- 19- Apply of change of management knowledge on project to control the scope and budget.
- 20- Focusing to deliver the service with good quality will result for good reputation.
- 21- Challenges is normal in projects environmental, need to evaluate analysis and know the root cause to solve.
- 22- Collect the lesson learned during all project life and archive for future use.
- 23- Close the project in proper way by making sure the project handed over to client, record the acceptance.
- 24- Prepare the final report and include all project achievement and number for senior management review and official close out.

Conclusion:

Installing 3D printers for public use is unique project as this technology has not reached maturity to use commercially, however we built the project assuming the 3D printers can fit for this function by selection equipment has easy access and simple operation guidance to allowing the public to use.

We are applying the project management knowledge to our project and conclude the following:

- 1- The project should start with clear idea, objective, and scope.
- 2- Selection of equipment should meet the requirement and project objective.
- 3- Selected location shall be easy access by public to exploit the benefits of project and enriching the customer experience.
- 4- Project manager shall work with his team to enhance the project success factors.
- 5- Not all projects shall follow same role and project team need to be flexible to deal with project conditions and surprises.
- 6- Risk identifying and response plan will keep project on track and to avoid failures possibility.
- 7- Strongly manage stockholder communication and expectation additional to build level of trust will give project confidently to continue and achieve the delivery goal with minimum resistance.
- 8- Formal acceptance from client during project handover will allow project team to closeout the project smoothly.
- 9- Monitoring progress invoicing and cash flow of project very important to avoid the financial issues and significant impact to project.
- 10- Closeout of project and handover to client should conduct by professional and formal way to avoid future dispute and liability.

Finally, during we are applying the project management knowledge we explorer the challenge and un expected situations will lead the project to identify different method of implementation and experience of project team member will be the base of success.

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