International Project Management – 2015

Maintenance & Service App

Project By:

Marc-Kevin Plewka (11008132)

Alpana Chaphalkar (11007146)

Ankit Dixit (11007129)

Abhijith Darshan Ravindra (11007138)

Jaydeep Galani (11007162)

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1. Abstract

This Project report is on a concept to create an App to support bike manufacturer's retailer's maintenance teams. The report includes a detailed explanation of the Application, its functions, and its workflow. Furthermore, it is shown, how the app helps to increase the service quality of the retailers.

Also there is brief illustration of the target state, structure plan, the stake holders, etc. The risk management is clearly talked about and also the future work. But the main goal or the idea of this concept is for retailers to be more efficient in their customer service.

2. Introduction

2.1 The Task

We are the members of an IT consultancy company. Our customer is an explicit bike manufacturer. The task of the project is to create a concept for an App that helps the retailer's maintenance team to identify broken bike parts faster and order them automatically from the manufacturer.

2.2 The Solution

The normal process for the maintenance team today is to simply remove the broken part from the vehicle. In the case, there is a unique id on this part, the mechanic can easily enter this id in the PC. In the case, there is not a unique id, he has to search the part manually to order it. This needs time.
For the solution, there are two major use cases.

First use case

The first is an application that is able to communicate with standard diagnoses systems which are already in use of manufacturer's maintenance service. For this case, an augment reality frontend device is needed. This could be a data glasses or simply a smartphone with a camera. The information delivered from the diagnoses system can be used to tell the app the area or the exact broken part. Based on this information, the app will show spare part schematics. It will display the diagnoses information and also some more details like if the part is available in the storage or order details.

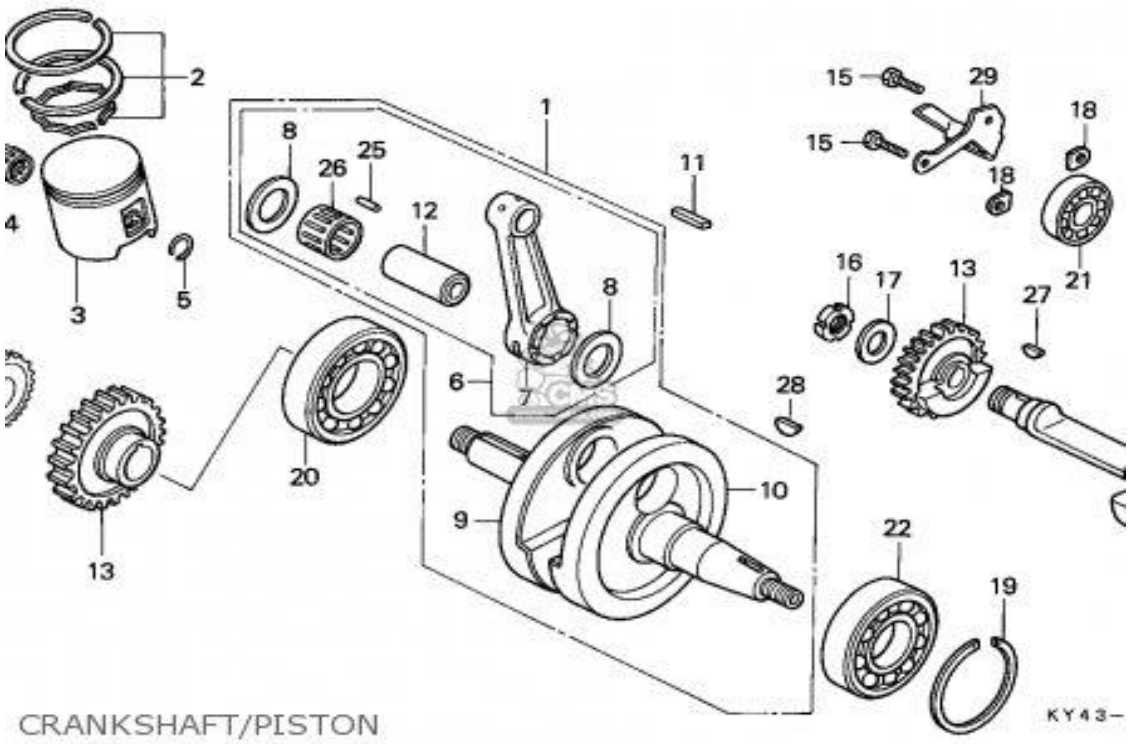
Second use case

In case you do not get enough information from diagnostic system we need a fall back solution to help the mechanics to easily identify the broken part and to make this process faster. Because there are many similar parts in a vehicle, you cannot simply take a photo from the part itself. The recognition rate would be very low. Instead, you can group the parts and subsume them to small abstract groups. Every group gets his own QR code to identify it. The QR itself could be added on a sticker and be putted on the outer side of the group. Based on this QR code the App can show an exploration schematic of the group like the picture below. In this interactive schematic the mechanic can choose the needed part. Because of the mix of the best possible automatic recognition and human interaction, the system will reach a recognition rate of nearly a hundred percent and will help the mechanic to stay at the car and in the workflow. He is no longer forced to look up these information in the computer or in books. This case can also be used to integrate a new service.

Third use case

In a next step an emergency maintenance service can be established. It is a possibility to provide faster service for customers, where the mechanic is driving to the location of a breakdown. In many cases, the motorbike can easily be repaired.

Finally, the App can provide a solution, to identify the broken parts and order them directly. The App would communicate with a central manufacturer's data systems to see if the part is available with nearby suppliers/dealers or other workshops and the part could be delivered to the place of the emergency immediately.



3. Project Overview

Very often, a mechanic has to reorder broken parts of vehicles. Sometimes, when there is no unique id or the supplier changed the part, he is not able to find the part directly in the order system. He has to search manually. The App delivers a possibility to make this process faster and easier for the mechanic. It helps the mechanic to find these parts quicker, which allows him to be more efficient in maintenance service. In another use case, the mechanic maybe has to reserve some time at the end of his work time to do all ordering stuff, because he couldn't reach the computer, while he was working at a vehicle. This time span would be fully eliminated by using the app.

4. Project Goal

The goal of the project is to provide a smartphone, a tablet and a data glasses solution, to automate the spare part identification, search and ordering with the intention to minimize the time, which maintenance mechanics are not able to stay in their workflow.

5. Project Description

5.1 Assumptions

- Diagnostic Systems: Every retailer or authorized workshops have diagnostic systems available from the manufacturer
- Central Information systems: The manufacturer has a central information system that has all the data related to inventory of retailer or authorized workshops
- Common API for ordering systems: The manufacturer has provided common API to retailers in order to keep ordering process synchronized
- Provided data for Communication with diagnostic testers: The manufacturer has provided all necessary instruction modules to communicate with diagnostic testers.

5.2 General Rules

- First the app will try to use the output of the diagnostic system
- Based on the output it can show spare part schematics
- The manufacturer has to provide all the schematics
- It will display additional information like storage availability / ordering
- If the diagnostic system is not able to give required information, the app is able to use a fall back solution
- Without diagnostic input, the app can only work with group identifier stickers (QR, Barcode)
- The App works with every Android Smartphone / Data glasses camera system
- The stickers are made of material, where dirt doesn't stick
- After the user scanned the code, the schematic will be shown
- The user can than choose the needed part
- He will be redirected to a page to set the number of parts and to confirm the order

5.3 Technology Used

Diagnostic System:

A diagnostic system is already available in every maintenance station. The App has to implement an interface to communicate with the diagnostic system. The results of the app will depend on the quality of the diagnoses. As more detailed the information is, as better the app can choose the needed schematics and part details.

QR-Code, Barcode:

QR-Codes is a common way to save information in a digital consistent way. They are well known and used in many industry fields yet. Also barcodes are quite common. They are used in supermarkets to identify all products. It is possible to adopt these technologies for this project.

Data glasses

A useful frontend device would be a data glasses. The advantage is, that such devices can be used without touching it. Because the app will be used in a mostly dirty environment, a touch screen would have been cleaned more often than a glasses. Also the schematics could be better integrated into the workflow like in an augment reality application. A further development step could be to integrate real 3D schematics into the users view on the vehicle. In this way the virtual parts could be turned and rotated to get a better view on the problem.

Smartphones

Smartphones are prevalent in our society today. Nearly everybody has one or knows how to use it. A training for the employees will not be necessary. Another problem is the work environment. It is often very dirty in maintenance stations and the mechanics have dirty fingers. Therefore, no employee wants to use his own smartphone. It is mandatory, that the employer will provide smartphones.

The displays can be prevented from dirt by using dirt resistant films or equal technologies, so the display and the App will still be usable.

Smartphone-camera system

The most Smartphones today have cameras with 10 megapixel or above. This is enough for scanning a QR- or Barcode. Also older devices deliver a usable resolution. There are no technical challenges.

5.4 Working

- When the diagnostic system identified the problem or the broken part, the app can simply display all details.
- In the case, the system fails, the mechanic has to look manually for the broken part.
- To support him there, the app uses a QR Code system to identify parts and show its information.
- When the part is extracted from the bike, the mechanic scans the group code.
- A schematic is displayed, where the mechanic chooses the exact part.
- Based on the part a new view opens to specify and confirm the order.
- The App starts communication with the ordering system of the retailer to put the order into the system.

Advantages:

- Mechanics have less workload in comparison to the manual solution.
- Mechanics can stay at the vehicle and in the workflow to be more efficient.
- Emergency service can be provided and parts can be ordered immediately from the street, and the mechanic must not tip in the order manually when he is back from the emergency → mechanics are more efficient, because they have more time for maintenance service.
- Customer are pleased, because of faster service.

6. Project State

6.1 Current state

Currently, there is only the manual way to order parts.

- The current process does not include any process automation.
- Parts are searched manually.
- Parts are chosen by mechanics.
- The order has to be manually tipped into the order system.

6.2 Target state

The target is to automate the part identifying and ordering as much as possible.

Must have

- API for communication with diagnostic system.
- API for communication with the ordering system.
- API for communication with storage system.

- API for communication with the manufacturer's database.
- Android support.
- Smartphone and tablet support.
- Displaying schematics.

Should have

- QR-Code/Barcode to summarize a group of parts.
- Visual Code Scanning.
- Data glasses support.

Nice to have

- Real 3D schematics integrated into augment reality device.

7. Requirements

7.1 Software requirements

- JDK
- Android SDK
- Android ADT (Advanced Development Toolkit)
- IDE (eclipse, Android Studio)
- MVC frame work
- Windows

7.2 Hardware requirements

- Internet connection
- Smartphone and Tablets with integrated Camera
- WLAN
- Workstations
- Switches
- Routers
- Servers
- Laptops

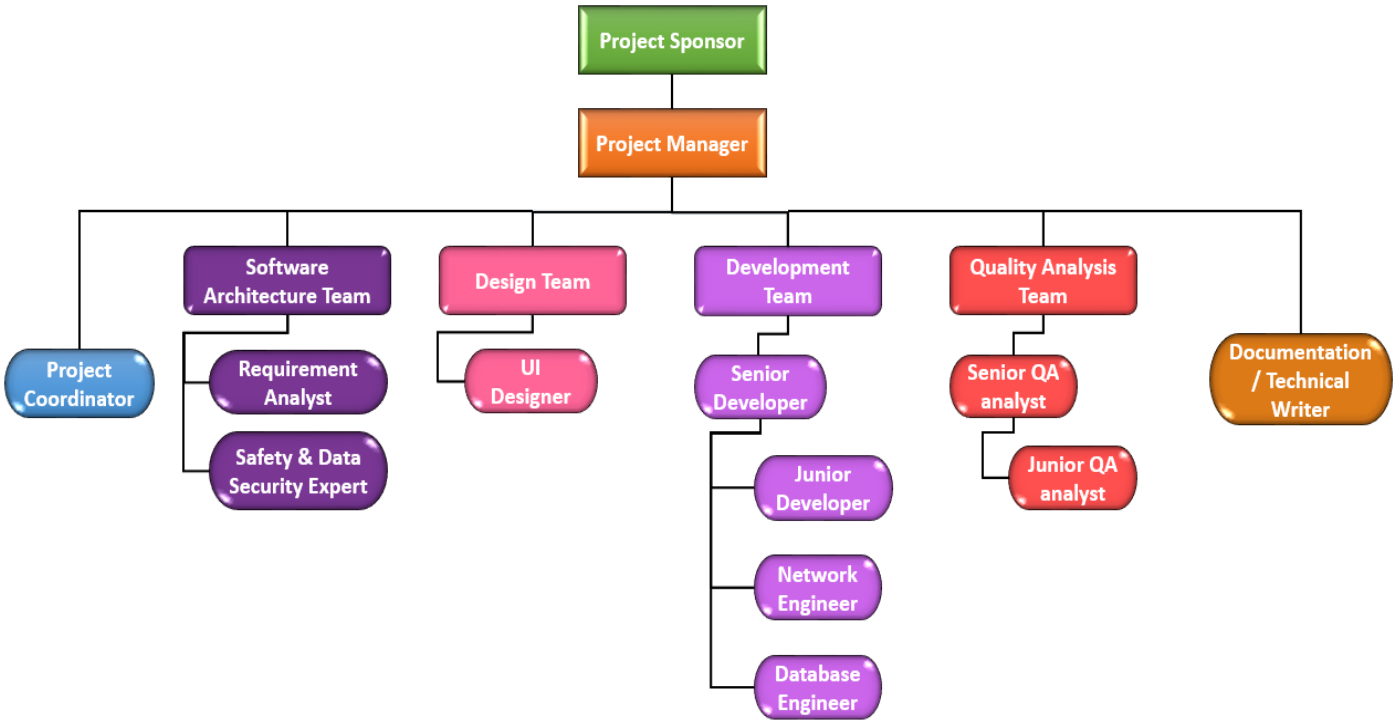
7.3 User interface requirements

- Description or short manual should be displayed first.
- Status of communication partners should be assured.
- Two options should be shown (diagnoses or manual scan).
- First leads directly to schematic, second will open camera view.
- Group schematic of parts is shown.
- Schematics are interactive (zoom, move, mark single parts).
- A detailed spare part view should be integrated (inclusive order details).

8. Project Structure Plan

8.1 Proposed Organization Structure

- For implementation of Maintenance & Service App project, the Pure Project Organization structure is used. So, under the leadership of a full-time project manager, different teams operate as separate units.
- Pure Project Organization is also termed as projectized organization, where project is the dominant form of business and functional departments of project are responsible for providing support for its teams.
- Project manager will clearly define the roles, responsibilities, tasks associated with each team. Based on Project Manager's line of command, each project team member is responsible for his own time management within the defined timeframes. In this way, Project manager leads and co-ordinates a team that works on its own responsibility.
- The dedicated different teams of project work as a one team for the project. Resources devote their full attention to the project. In this organization structure, high level of motivation and cohesiveness is observed amongst different teams because resources share a common goal.
- Creation of the dedicated project team as an independent unit, because the dedicated project team operate separately of its parent organization and each project is directly or indirectly important to the organization. There is a flexibility in decision making because of clear line of authority.
- Since the proposed project is a medium-high sized project which requires dedicated team of expertise, the Pure Project Organization Structure has been selected.
- Following is the graphical representation of project organization structure of proposed project:



Graphical Representation of Project Organisation Structure

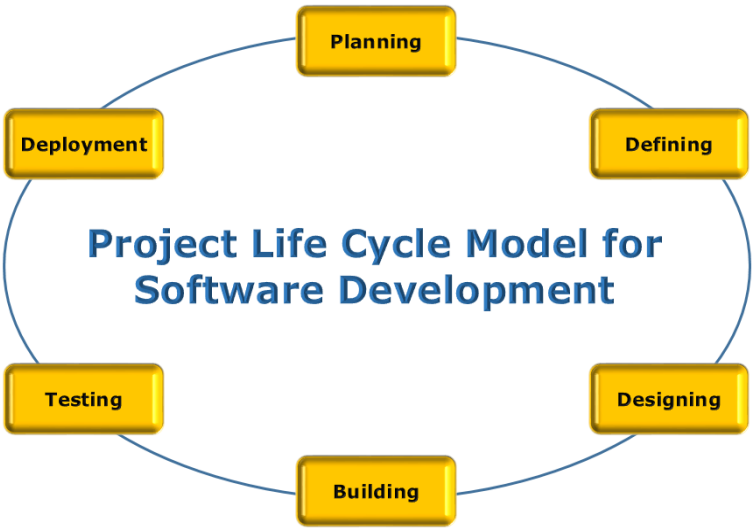
8.2 Project Life Cycle Model

Project Life Cycle Model defines a methodology used by a project to make sure that high quality deliverables are delivered. The motto of defining project life cycle model is to produce a high quality deliverables that meets or exceeds user requirements within estimated time and cost. Such type of project life cycle model represents a framework which basically defines the activities performed at each phase in the project life cycle and in which manner or order they are performed.

Since the proposed project is related to software development, the various life cycle models related to software development project are:

- Waterfall Model (classical or traditional model)
- Spiral Model (risk reduction oriented model)
- Agile Methodologies (e.g. Scrum, Kanban)
- Iterative & incremental Model (Agile model with repeated iterations of short durations)
- V Model (Verification and Validation Model)
- V Model XT (Developed for German Government)

The following image displays the various common phases of a Project Life Cycle for the Software development:



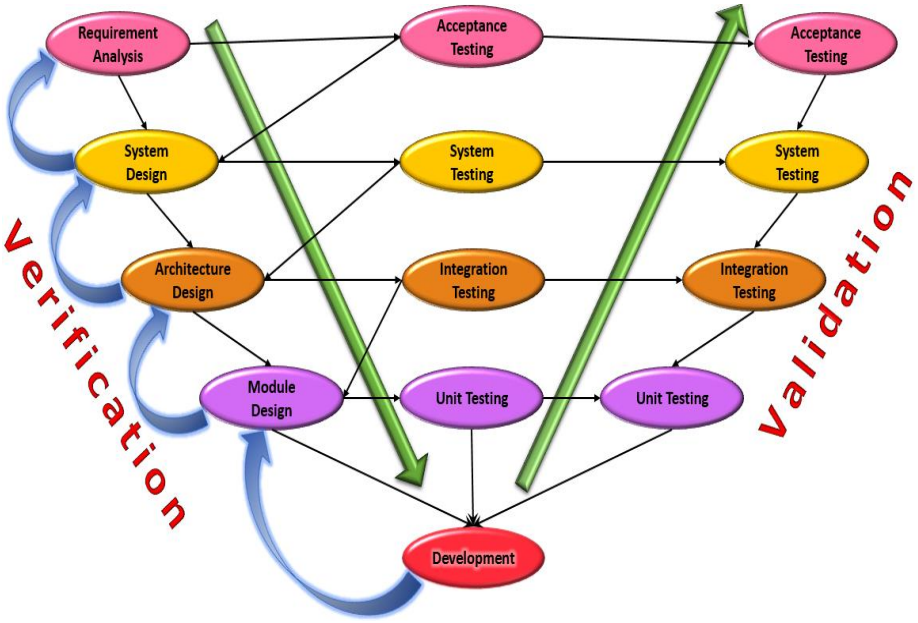
Common Phases of Project Life Cycle Model

Project Life Cycle Model for the Implemented Project:

- The proposed project is based on V model. The V Model is a sequential way of executing the activities like waterfall model. Hence, in this model each phase must be finished before the next phase starts.
- Testing of the delivered product in each development phase is planned in parallel with a corresponding development phase and because of this feature a lot of time is saved.
- The advantage of using V model is tracking of defects pro-actively. Since defects are found at early stage, the downward flow of the defects is prevented unlike the waterfall model.
- The user requirements of proposed project are quite clear and also there is a very less chance of change in user requirements after development & testing phases.
- Moreover, before development phase begins there is a feedback system from each succeeding phase to each preceding phase which makes sure that user requirements are fulfilled successfully.

- Although the budget for developing project based on V model might cost more, but the quality of delivered product within user preferable time would be much higher, because the resources used in V model are expertise in their respective fields.
- Using V model it's easy to manage the project tasks due to the rigidity feature of the model.
- Chances of human risks, technical risks, project planning risks get minimized by using V model.
- Proposed project is medium-sized and V model is one of the best model for medium-sized project.
- Above all explanations justifies that the V model is suitable for the proposed project.

The following graphics represents the V model for proposed project:

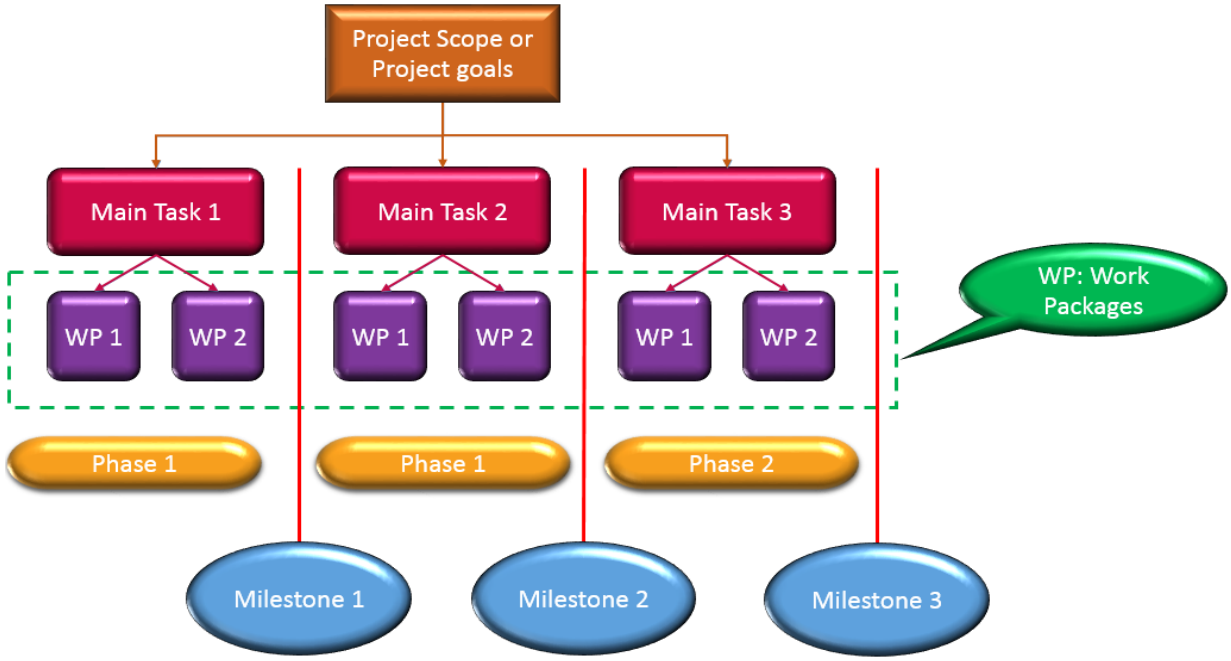


V Model for Proposed Project

8.3 Project Structure Plan

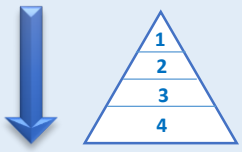
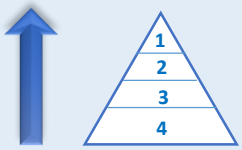
- Project structure plan divides the project goal into manageable sub-tasks and provides a complete overview of the important elements of project. It establishes the necessary basis for the further project management tasks.
- A Work Breakdown Structure (WBS) is the foundation of project structure plan. In general, WBS is a hierarchical list of tasks and deliverables that forms the total scope of the project. The lowest level nodes of hierarchy of WBS are termed as Work Packages and these work packages are assigned to resources and can be measured in time. So, project structure plan consists of WBS which is described in result oriented as well as workflow oriented manner.
- According to the workflow oriented approach of describing the project structure plan, the project plan is divided into phases. Each phase is associated with certain goal. Milestone implies a significant event, development or accomplishment in project plan. These milestones help to verify that the project is on track. Milestone is an essential component of good project management plan. In general, completion of a phase in a project plan represents a milestone. If a project plan is not divided into phases it is worth identifying special & important events to label milestones because milestones can be used to measure project success.

  Following figure illustrates the terminologies related to Work Breakdown Structure and Project Structure Plan:

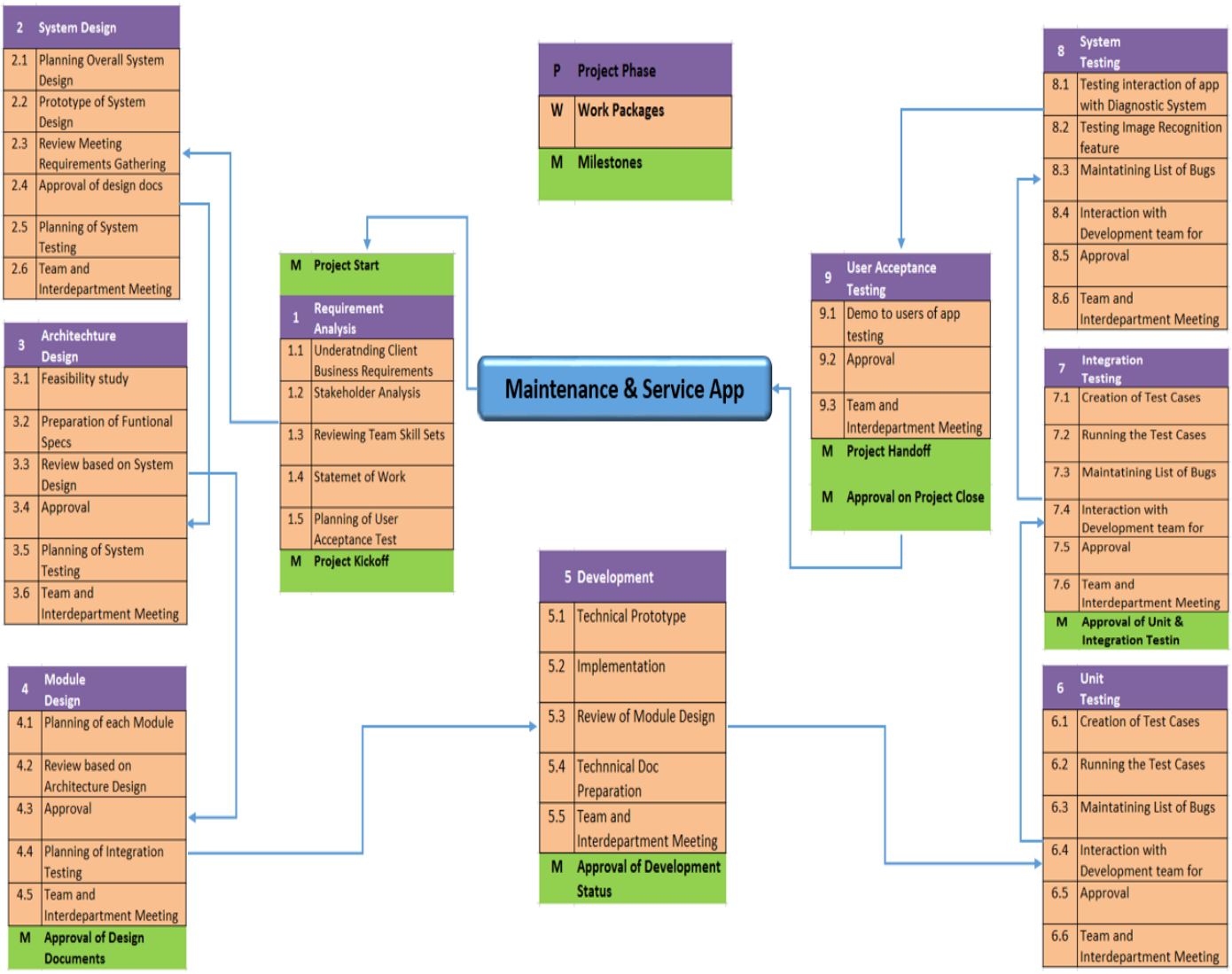


Generic Project Structure Plan

- There are 2 approaches of project planning and these are: 1) Top-Down 2) Bottom-Up. The proposed project follows Top-Down approach for planning project structure.

Approach	Description	Visual Presentation
Top-Down	Top-down planning is also called as strategy. In this approach, the decision making process happens at the senior level. So, project objectives or goals are defined by the top management and expectations are communicated clearly with all other lower level members of the team.	
Bottom-Up	Bottom-up planning is also called as tactics. In this approach lower level team members work together on same level and provide results during each stage of the project phase. Project plans are developed at the lowest level and then they are forwarded to each next higher level till they reach to top management for approval.	

- The project structure plan for the proposed project is as follows:



Project Structure Plan

8.4 Resource Management

Following are the Resources and their descriptions for the proposed project:

Resources	Number of Resources	Responsibilities
Project Manager	1	▪ Making sure that the project team meets the assigned deadlines ▪ Securing the acceptance and approval from the project sponsor and stakeholders ▪ Coordination of every department ▪ Developing the project plan ▪ Tracking & Reporting the project status ▪ Evaluating the project risks ▪ Tracking escalations if any ▪ Monitoring the project budget ▪ Monitoring the time schedule

Project Coordinator		1	▪ Serves complete project Team ▪ Facilitates co-ordination ▪ Manages team meetings, seminars ▪ Alerting project team to follow timelines, special events ▪ Assigning of hardware components to team members ▪ Tracking of vacation calender ▪ Helping or directing team members to solve the problems faced
Software Architecture Team:			
	Software Architect	1	▪ Takes care of the system architecture inside the project ▪ Responsible to check which systems, hardware, software platforms and tools are suitable for using in our project ▪ Architectural considerations and the cost analysis of the system ▪ Responsible for the selection and quality assessment architecture once architecture is deployed
	Safety & Data Security Expert	1	Makes sure that all software security regulations like the product safety, declaration of conformity, privacy policy and others are fulfilled.
Design Team:			
	UI Designer	2	▪ Designing of smooth UI (transitions, fonts, logos,etc.) ▪ Making sure the UI is simple and easy ▪ Providing status report
Development Team:			
	Senior Developer	2	▪ Act as a leader within the team. ▪ Monitor functioning of software, make modifications to ensure system operates in conformance with specifications and solve production issues. ▪ Work with development team members to define & implement architecture direction. ▪ Design, Develop Client Software in accordance with Client specification. ▪ Design, Develop backend / data processing / logic for the software. ▪ Advice, Mentor, Assist Engineers and Junior Developers to meet deadlines. ▪ To ensure timely releases of high quality code. ▪ Make sure the code is verified and meets requirements before passed to testing.
	Junior Developer	3	▪ Making sure the code quality is high. ▪ Making sure assigned activities are performed follows timelines and meeting deadlines

			▪ Marking and providing status as development of codes progresses
	Network Engineer	2	▪ Takes care for the communication framework ▪ Designing and deploying of interface ▪ Feasibility study between application and diagnostic system ▪ Providing status report
	Database Engineer	2	▪ Designing and deploying database ▪ Provide the traffic light switching times with which the framework has to communicate. ▪ Feasibility study between database and application communication framework ▪ Providing status report
Quality Analysis (QA) Team:			
	Senior QA analyst	2	▪ Creation of test cases for unit, integration and user acceptance tests ▪ Assigning activities to Junior QA analysts ▪ Keeping number of bugs or defects as minimum as possible ▪ Providing status report of defects and testing tasks ▪ Providing support for the deployed application on client site ▪ Making sure all test cases have been passed to deployment
	Junior QA analyst	3	▪ Making sure that assigned activities follows timelines and meets deadlines ▪ Marking status report of defects and testing tasks ▪ Providing support for the deployed application on client site, if necessary
Documentation/ Technical Writer:			▪ Creates the project paperwork such as user & debug manual, change history and training documents.

8.5 Network Plan

The Network Plan is a clear graphical overview of the order and application flow of all project activities from the project structure plan. Network Plan mainly describes following:

- resource requirements
- resource availability
- order of all activities according to their technical, logical dependencies and independencies
- time line for all activities
- time buffers
- milestones
- cost for performing every activity

In network plan, all the things are sorted according to the result as well as workflow oriented description of activities. Since costs, resources and activities are influencing each other, planning this network is an iterative process. Goal of planning such a network is to find a cheap, fast, and effective way to carry out the project tasks.

Project Network Plan for proposed project

The network plan of proposed project have project phases, main activity, work packages and milestones and these activities are assigned to the project team members. The network plan consists of sequence of activities which are performed during the process of project completion. The proposed network plan defines the activities as well as their priorities and the time duration required to execute these activities. This technique is efficient and useful for points which are missed during the project planning. The time bound activities in proposed network plan are used to calculate the overall project duration. The dependencies, timescale and workflow are also determined by proposed network planning. In general, milestone occurrences are parallel to the activities in network planning.

Gantt chart for proposed project

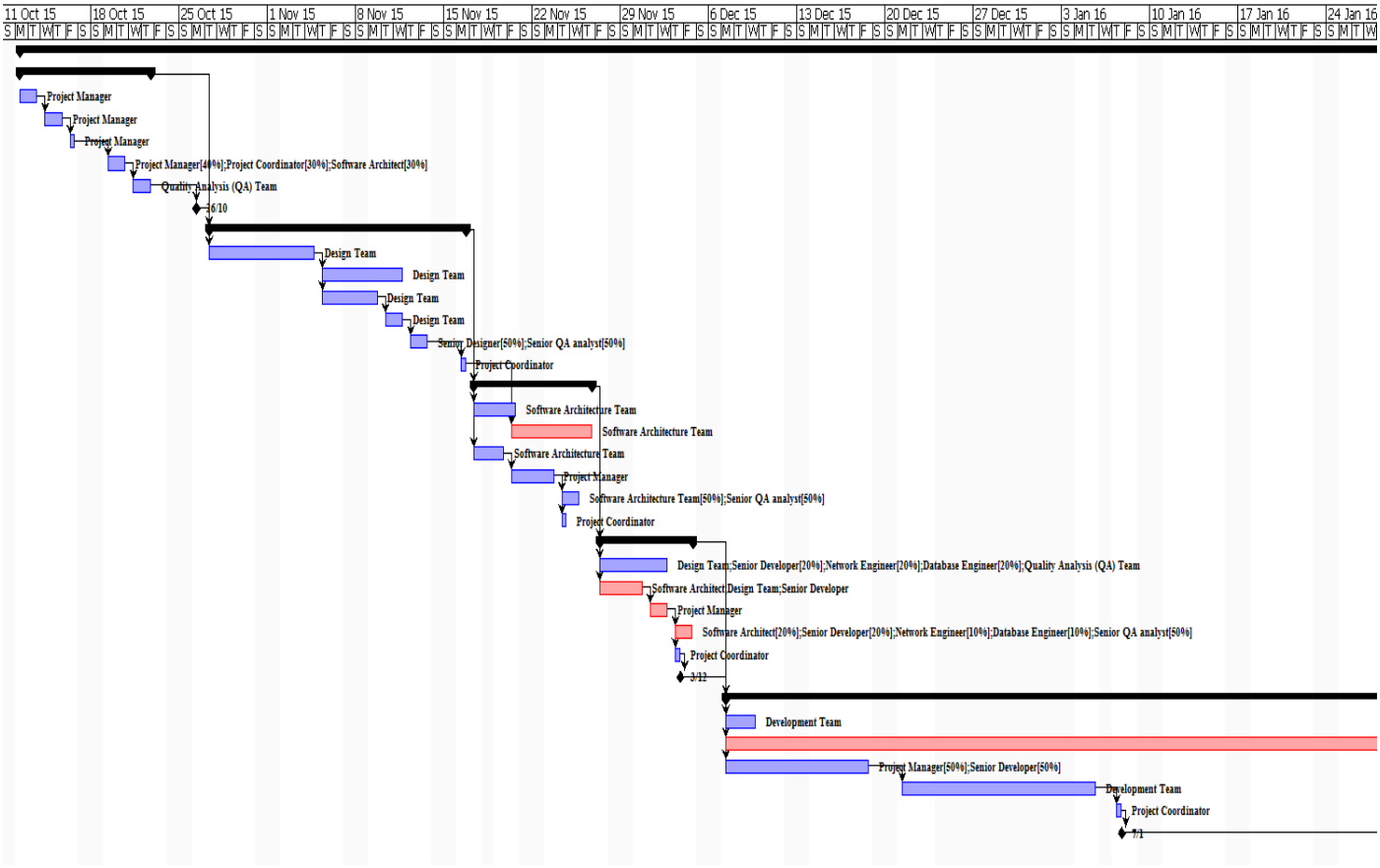
A Gantt chart is a widely used bar chart in project management because it is one of efficient way of showing activities, milestones displayed against time. Following useful things can be managed by Gantt chart:

- Scheduling and monitoring activities within a project.
- Communicating plans or status of a project.
- Steps of the project or process, their sequence and their duration.
- Dependant and independent activities and their priorities.
- Useful for doing cost analysis.

Network Plan & Gantt chart for the proposed project is shown below:

		Name	Duration	Start	Finish	Predecessors	Resource Names
1		**Project Start**	**138 days**	**12/10/15 8:00 AM**	**5/5/16 5:00 PM**		
2		**Requirements Gathering**	**9 days**	**12/10/15 8:00 AM**	**22/10/15 5:00 PM**		
3		Underatnding Client Business Requirements	2 days	12/10/15 8:00 AM	13/10/15 5:00 PM		Project Manager
4		Stakeholder Analysis	2 days	14/10/15 8:00 AM	15/10/15 5:00 PM	3	Project Manager
5		Reviewing Team Skill Sets	1 day	16/10/15 8:00 AM	16/10/15 5:00 PM	4	Project Manager
6		Statemet of Work	2 days	19/10/15 8:00 AM	20/10/15 5:00 PM	5	Project Manager[40%];Project Coordinator[30%];Software Architect[30%]
7		Planning of User Acceptance Test	2 days	21/10/15 8:00 AM	22/10/15 5:00 PM	6	Quality Analysis (QA) Team
8		Project Kickoff	0 days	26/10/15 8:00 AM	26/10/15 8:00 AM	7	
9		**System Design**	**15 days**	**27/10/15 8:00 AM**	**16/11/15 5:00 PM**	**2**	
10		Planning Overall System Design	7 days	27/10/15 8:00 AM	4/11/15 5:00 PM	8	Design Team
11		Prototype of System Design	5 days	5/11/15 8:00 AM	11/11/15 5:00 PM	10	Design Team
12		Review Meeting Requirements Gathering Phase	3 days	5/11/15 8:00 AM	9/11/15 5:00 PM	10	Design Team
13		Approval of design docs	2 days	10/11/15 8:00 AM	11/11/15 5:00 PM	12	Design Team
14		Planning of System Testing	2 days	12/11/15 8:00 AM	13/11/15 5:00 PM	13	Senior Designer[50%];Senior QA analyst[50%]
15		Team and Interdepartment Meeting	1 day	16/11/15 8:00 AM	16/11/15 5:00 PM	14	Project Coordinator
16		**Architecture Design**	**7 days**	**17/11/15 8:00 AM**	**26/11/15 5:00 PM**	**9**	
17		Feasibility study	3 days	17/11/15 8:00 AM	20/11/15 5:00 PM	15	Software Architecture Team
18		Preparation of Funtional Specs	5 days	20/11/15 8:00 AM	26/11/15 5:00 PM	15	Software Architecture Team
19		Review based on System Design	2 days	17/11/15 8:00 AM	19/11/15 5:00 PM	15	Software Architecture Team
20		Approval	2 days	20/11/15 8:00 AM	23/11/15 5:00 PM	19	Project Manager
21		Planning of System Testing	2 days	24/11/15 8:00 AM	25/11/15 5:00 PM	20	Software Architecture Team[50%],Senior QA analyst[50%]
22		Team and Interdepartment Meeting	1 day	24/11/15 8:00 AM	24/11/15 5:00 PM	20	Project Coordinator
23		**Module Design**	**6 days**	**27/11/15 8:00 AM**	**4/12/15 5:00 PM**	**16**	
24		Planning of each Module	4 days	27/11/15 8:00 AM	2/12/15 5:00 PM	20	Design Team;Senior Developer[20%];Network Engineer[20%];Database Engineer[20%];Quality Anal...
25		Review based on Architecture Design	2 days	27/11/15 8:00 AM	30/11/15 5:00 PM	20	Software Architect;Design Team;Senior Developer
26		Approval	2 days	1/12/15 8:00 AM	2/12/15 5:00 PM	25	Project Manager
27		Planning of Integration Testing	2 days	3/12/15 8:00 AM	4/12/15 5:00 PM	26	Software Architect[20%];Senior Developer[20%];Network Engineer[10%];Database Engineer[10%];...
28		Team and Interdepartment Meeting	1 day	3/12/15 8:00 AM	3/12/15 5:00 PM	26	Project Coordinator
29		Approval of Design Documents	0 days	3/12/15 5:00 PM	3/12/15 5:00 PM	28	Project Manager
30		**Development**	**50 days**	**7/12/15 8:00 AM**	**24/2/16 5:00 PM**	**23**	
31		Technical Prototype	3 days	7/12/15 8:00 AM	9/12/15 5:00 PM	29	Development Team
32		Implementation	50 days	7/12/15 8:00 AM	24/2/16 5:00 PM	29	Development Team
33		Review of Module Design	10 days	7/12/15 8:00 AM	18/12/15 5:00 PM	29	Project Manager[50%];Senior Developer[50%]
34		Technnical Doc Preparation	5 days	21/12/15 8:00 AM	5/1/16 5:00 PM	33	Development Team
35		Team and Interdepartment Meeting	1 day	7/1/16 8:00 AM	7/1/16 5:00 PM	34	Project Coordinator
36		Approval of Development Status	0 days	7/1/16 5:00 PM	7/1/16 5:00 PM	35	Project Manager
37		**Unit Testing**	**15 days**	**25/2/16 8:00 AM**	**16/3/16 5:00 PM**	**30**	
38		Creation of Test Cases	10 days	25/2/16 8:00 AM	9/3/16 5:00 PM	36	Quality Analysis (QA) Team
39		Running the Test Cases	3 days	10/3/16 8:00 AM	14/3/16 5:00 PM	38	Quality Analysis (QA) Team
40		Maintatining List of Bugs	3 days	10/3/16 8:00 AM	14/3/16 5:00 PM	38	Quality Analysis (QA) Team
41		Interaction with Development team for Bugs	3 days	10/3/16 8:00 AM	14/3/16 5:00 PM	38	Quality Analysis (QA) Team
42		Approval	1 day	15/3/16 8:00 AM	15/3/16 5:00 PM	41	Project Manager
43		Team and Interdepartment Meeting	1 day	16/3/16 8:00 AM	16/3/16 5:00 PM	42	Project Coordinator
44		**Integration Testing**	**15 days**	**17/3/16 8:00 AM**	**8/4/16 5:00 PM**	**37**	
45		Creation of Test Cases	10 days	17/3/16 8:00 AM	1/4/16 5:00 PM	42	Quality Analysis (QA) Team
46		Running the Test Cases	3 days	4/4/16 8:00 AM	6/4/16 5:00 PM	45	Quality Analysis (QA) Team
47		Maintatining List of Bugs	3 days	4/4/16 8:00 AM	6/4/16 5:00 PM	45	Quality Analysis (QA) Team
48		Interaction with Development team for Bugs	3 days	4/4/16 8:00 AM	6/4/16 5:00 PM	45	Quality Analysis (QA) Team
49		Approval	1 day	7/4/16 8:00 AM	7/4/16 5:00 PM	48	Project Manager
50		Team and Interdepartment Meeting	1 day	8/4/16 8:00 AM	8/4/16 5:00 PM	49	Project Coordinator
51		Approval of Unit & Integration Testing	0 days	7/4/16 5:00 PM	7/4/16 5:00 PM	49	Project Manager
52		**System Testing**	**16 days**	**11/4/16 8:00 AM**	**2/5/16 5:00 PM**	**44**	
53		Testing interaction of app with Diagnostic Syst...	15 days	11/4/16 8:00 AM	29/4/16 5:00 PM	51	Quality Analysis (QA) Team
54		Testing Image Recognition feature	7 days	11/4/16 8:00 AM	19/4/16 5:00 PM	51	Quality Analysis (QA) Team
55		Maintatining List of Bugs	4 days	11/4/16 8:00 AM	14/4/16 5:00 PM	51	Quality Analysis (QA) Team
56		Interaction with Development team for Bugs	15 days	11/4/16 8:00 AM	29/4/16 5:00 PM	51	Quality Analysis (QA) Team
57		Approval	1 day	2/5/16 8:00 AM	2/5/16 5:00 PM	53	Project Manager
58		Team and Interdepartment Meeting	1 day	2/5/16 8:00 AM	2/5/16 5:00 PM	53	Project Coordinator
59		**User Acceptance Testing**	**3 days**	**3/5/16 8:00 AM**	**5/5/16 5:00 PM**	**52**	
60		Demo to users of app testing	2 days	3/5/16 8:00 AM	4/5/16 5:00 PM	57	Quality Analysis (QA) Team
61		Approval	1 day	5/5/16 8:00 AM	5/5/16 5:00 PM	60	Project Manager
62		Team and Interdepartment Meeting	1 day	5/5/16 8:00 AM	5/5/16 5:00 PM	60	Project Coordinator
63		Project Handoff	0 days	5/5/16 5:00 PM	5/5/16 5:00 PM	62	Project Manager
64		Approval on Project Close	0 days	5/5/16 5:00 PM	5/5/16 5:00 PM	63	Project Manager

Network Plan



Gantt chart

9. Stakeholder Analysis

9.1 About Stakeholders

A stakeholder in an organization is (by definition) any group or individual who can affect or is affected by the achievement of the organization's objectives. (Freeman 1984).

9.2 Stakeholder Management

Stakeholder Management is an important discipline that successful architecture practitioners can use to win support from others. It helps them to ensure that their projects succeed where others fail. (pubs.opengroup.org)

Successful Stakeholder Management Strategy:

- Stakeholders who are more powerful should be identified early and their concerns are kept in main focus to design the services; this ensures satisfaction and in-turn would enhance the product
- For major success of the product/service, the consultant organization should win more support from key stakeholder ensuring they are provided with more resources.
- Frequent communication with the stakeholders ensures that the team understands the process fully and would gain active support from stakeholders.
- The team can foresee likely feedbacks to the product and can shape proper activities that would focus on positive effects while circumventing any negative effects.

- The team can recognize contradictory ideas among stakeholders early and cultivate proper strategy to resolve it.

9.3 Who Are The Stakeholders?

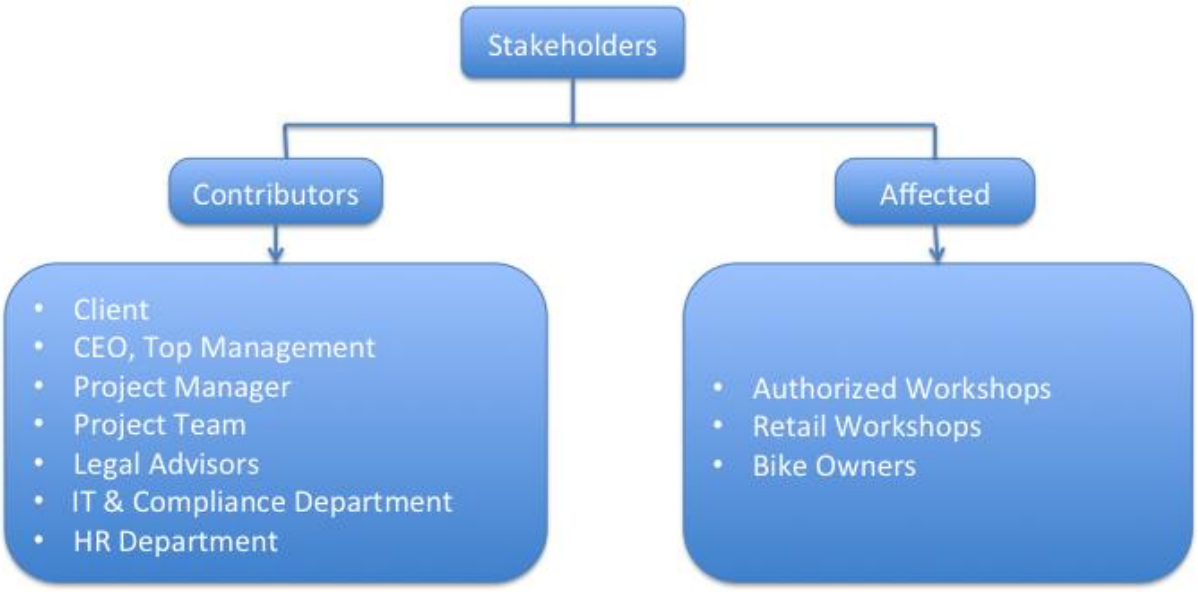


Figure (a) *Stakeholders Diagram*

Stakeholders who are involved directly (Primary)

- Client
- CEO and Top Management
- Project Manager
- Project Team:
- UI Designers, Developers, Testing team, Network engineer
- Retail workshops
- Authorized workshops
- HR Department
- IT Service Department

Stakeholders who are involved indirectly (Secondary)

- Legal Advisors
- Bike Owners

9.4 Information about Stakeholders:

1. Client/Sponsor:

Client/Sponsor is the key spender for the project. The client makes most important decisions on the functionality. In relation to the service and maintenance app, the client provides necessary data related to the bike parts, service instructions and functional modules related to the diagnostic testers.

2. CEO and Top Management:

CEO and Top Management are the primary responsible entities for the project, particularly in kick-off phase. They set the true vision for the project. In addition, they are responsible for effective working environment for the employees. CEO and Top Management want to improvise the service and maintenance process for any bike workshop and hence would be concerned with success of the maintenance and service app.

3. Project Manager:

The Project Manager is the person responsible for the planning and management of the project. In Service and Maintenance Project APP, project manager can minimize any risk considerably, by maintaining an environment for open communication, ensuring every noteworthy member has an opportunity to express beliefs and distresses.

4. Project Team:

The project team is responsible for tasks such as planning modules, developing, documentation, testing of Service and Maintenance APP. This team consists of Developers, UI Designers, QA Analyst, Technical Writer, and Network Engineer.

a. UI design Team:

Since the APP will be used by Service / Workshop personnel, it should be kept in mind that the APP should be made simple and easy as they may not be tech savvy. UI Designers focus mainly on making the buttons and clickable / interaction areas to be sizeable, easy to see in low light conditions and do not hamper the performance of the APP. This is mainly relevant to visual perception & interaction of the APP User.

b. Development Team:

The role of Developers is to code the APP for an Android based Ecosystem and make sure the requirements are met in the APP. The Service Personnel should be able to click the picture of a faulty bike part and easily place an order for that part in one click.

c. QA Team (Testing Team):

The job of the QA Team is to create various scenarios for the APP to be tested there by finding bugs in the code and report it back to the development team to get it fixed. The QA team also checks if the APP is robust and works across multiple devices and the result is consistent across all devices in terms of performance.

d. Network Management:

The Network Engineers make sure that the multiple departments in the project are connected. Ensure Client Meetings over VOIP and inter department communication are handled seamlessly. Allocate bandwidth and manage connectivity between the client’s server and the project team.

5. Retail Works=hops:

Retail Workshops are independent businesses that provide the service and maintenance of the bike. They are the end users in case of Service and Maintenance APP, likely to get most of the benefits.

6. Authorized Workshops:

Authorized Workshops are specialized workshops in collaboration with the manufacturer, which provides the service and maintenance of the bike. They are the end users in case of Service and Maintenance APP, likely to get most of the benefits.

7. Legal Team:

Legal Team represents the consulting firm and takes care of legal aspects such as disputes, lawsuits from clients.

8. HR Department:

This department is responsible for selection of skilled professional and also hiring new employees, if required.

9. IT Service Department:

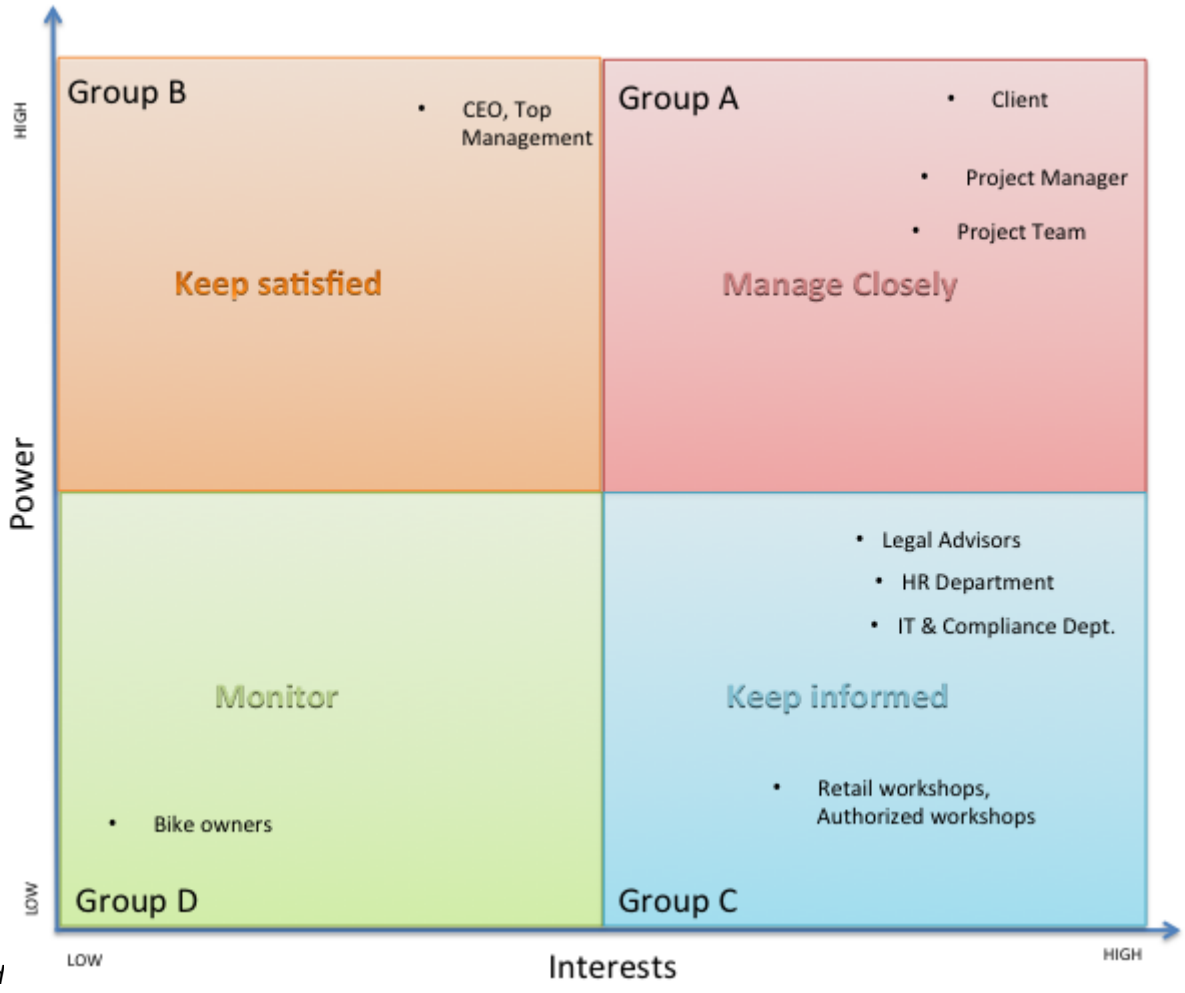
IT service department is the staff responsible for provision of all technology related infrastructural components and services.

10. Bike Owners:

Owners of Bike are secondary stakeholders who are benefited as a result of time and cost saving of the service and maintenance of their vehicles.

9.5 Prioritizing Stakeholders

To prioritize the stakeholders the power/interest grid has been made and each of the stakeholders are marked on the



grid

Depending on the position of the stakeholder on the grid, following care should be taken:

- **High power, high interest:**

  These entities are most interested and full participation is must to ensure success. These entities make sure that project reaches to an optimum level of satisfaction. They are to be managed closely

- **High power, less interest:**

  These entities are less affected by the effort but have significant power to influence it if, they become interested. These entities are consulted on main issues or progresses related to the project and are provided with possible positive outcomes. They are to be kept satisfied

- **Low power, high interest:**

  These entities come into motion when there are significant issues arising during the project. These entities have to work for or against these issues, which concerns them directly or indirectly. So keep them informed.

- **Low power, less interest:**

  These entities are least bothered about the project and just come into picture due to indirect participation. They are partially affected by the project. They are monitored.

9.6 Communication with Stakeholders:

Interaction with stakeholders can be based on identification from the power/interest grid for stakeholders

- **High power, high interest:**

  Closely manage these entities via meetings, product logs, and issue-resolution logs.

- **High power, low interest:**

  Keep them satisfied by sharing key successful outcomes and intermediate goals via meetings.

- **Low power, high interest:**

  To be kept informed if any issue arises. Ask for assistance related to issue.

- **Low power, low interest:**

  Inform via newsletter, mobile media.

10. Risk Management

10.1 What is Risk Management?

Risk is an uncertain event that if it occurs has an effect on one or more project objectives namely scope, time and cost. Risk Management helps in identifying and categorizing risks that may occur and lead to significant impact on the project. Basically it's a thing which makes difference between success and failure of the project. It helps project management team to be prepared beforehand against the risks which may arise and hamper the progress of project later on by minimising or completely eliminating its impact. The steps to manage risk are:

- Identifying Risks
- Filtering Risks
- Planning and Controlling Risks

10.2 Identifying Risks

The first step in project risk management is to identify the risks early in project which requires an open mind set that focuses on future scenarios that may occur. In a project various types of risks can occur which can be classified into different categories like general risks, human based risks, technical risks etc. Similarly, we have identified and classified risks that might occur in our project which are mentioned below:

- **General Risks**

  R1. Competitive Market

  Due to the competitive market in IT industry, there might be a possibility wherein similar projects are under development or are already developed and are cost effective. If this situation arises, client may then compromise with our payment and push us to reduce our budget to the extent which might hamper our planning.

  R2.Time Estimation Issue

  Time estimation is one of the most important and critical part of our project. As we are using classical V-model for our planning, any sort of underestimation of one task may result in unnecessary delays of other dependent tasks which may intern lead in late delivery of project.

  R3. Not knowing what is at stake

  Often risk assessments are conducted where there is no clear understanding of what really is at stake if the project fails. So, if our team doesn't have clear picture of how much money and resource are involved, this might act as a risk for our project.

- **Human Based Risks**

  R4. Team with different skill sets

  For success of a project, project planning team should have skill sets that match with the requirements of client. This can be a potential risk for our project if we have persons of skill sets that are totally different from the project needs and can affect the quality of our product.

  R5. Unanticipated requirement changes

  Changes in requirements are part of every project and if they are unanticipated by the team, it can lead to serious delays in planning and implementation processes.

R6. Staff Turnover

Staff turnover is experienced by every company in the market. Important persons leaving the company or even movement within the organization can cause havoc on the project.

R7. Poor inter-project communication

Poor Inter-project communication can hamper the progress of project to a larger extent. In our project, we have different roles and responsibilities that are handled by different departments. These departments are dependent on each other and if there is lack of communication in between, there can be problems like clarity of requirements, changes in design or code on later stages of project which can affect the timeline.

- **Technical & Legal Risks**

R8. Interoperability

As our project in building an App which contains features like interaction with diagnostic systems, image recognition of parts there can be certain technical issues with using different standard libraries during implementation process which our developers might not have faced before. This is a risk which if occurred can lead to unnecessary delays in project.

R9.Security

Security of our data is another important thing which cannot be ignored. Any breach in our system can result in hacking our important information or data loss.

R10. Project Downtime

During server maintenance and upgrades, there might be delay in development and testing process.

R11. Loss of power or internet at key roll-out

Loss is connectivity at key roll-out stages of project is a risk which can affect the trust of our client on us and can hamper our business in market.

R12. Accident and fatalities

Our App has feature that will recognise the faulty part through image recognition for mechanics working in service stations. There might a situation which results in accident or fatalities to customer because of some mistake done by mechanic while replacing the part. This is a sensitive issue and can be considered as risk for us if the service persons blames us and are not ready to take the responsibility for their mistake.

10.3 Filtering Risks

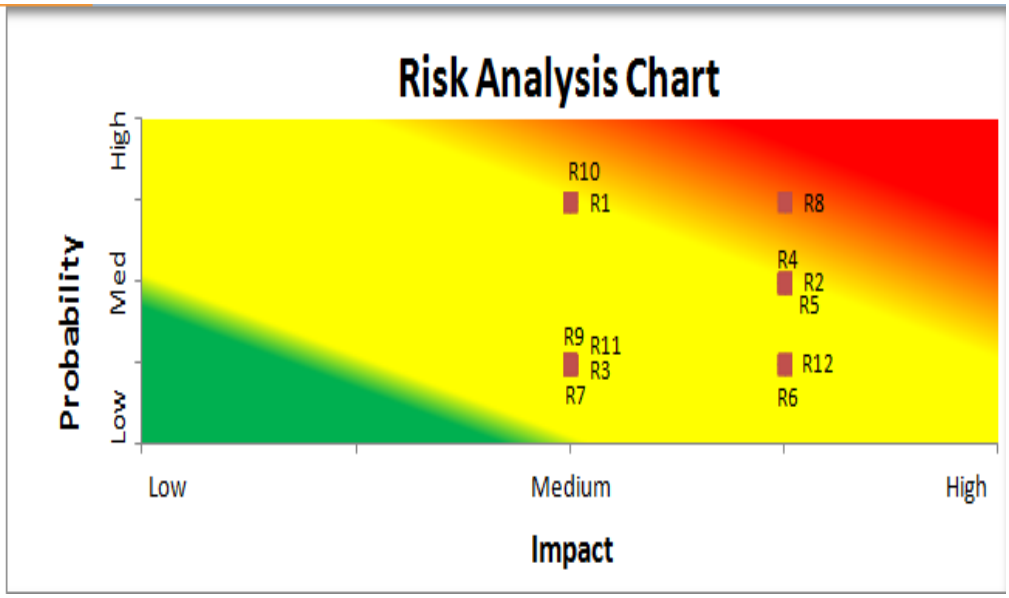
Once risks are identified and listed down by the project management team, the next step is to filter them. A risk can be filtered by judging the probability of the risk to occur and also considering that what impact it would have on the project if it occurs.

Probability * Impact = Risk Score!

Similarly, for our project of ‘Maintenance & Service App.’, we have also identified risks and filtered them by considering both probability and its impact on our project. The below chart gives an overview of all the risks.

Risk Factor	Risk Description	Probability	Impact
	General Risks		
R1	Competitive Market	High	Medium
R2	Time Estimation Issue	Medium	High
R3	Not knowing what is at stake	Low	Medium
	Human based Risks		
R4	Team with different skill sets	Medium	High
R5	Unanticipated requirement changes	Medium	High
R6	Staff Turnovers	Low	Medium
R7	Poor Inter-Project Communication	Low	Medium
	Technical & legal Risks		
R8	Interoperability	High	High
R9	Security	Low	Medium
R10	Project Downtime	High	Medium
R11	Loss of Power or Internet at Key Roll-Outs	Low	Medium
R12	Accident and fatalities	Low	High

Risk Factor	Impact	Probability
R1	2	3
R2	3	2
R3	2	1
R4	3	2
R5	3	2
R6	3	1
R7	2	1
R8	3	3
R9	2	1
R10	2	3
R11	2	1
R12	3	1



Risk Analysis Chat

10.4 Planning and Controlling Risks

The last and the most important part of risk analysis is to plan a solution in advance so that if the risk occurs, its impact can be nullified or minimized to the extent where our project is affected the least. So for our project, we have thought of some solutions and methods that can help us to control risks. We have also prepared Risk Matrix Grid for every category of risks.

Solution for General Risks

R1. Competitive Market

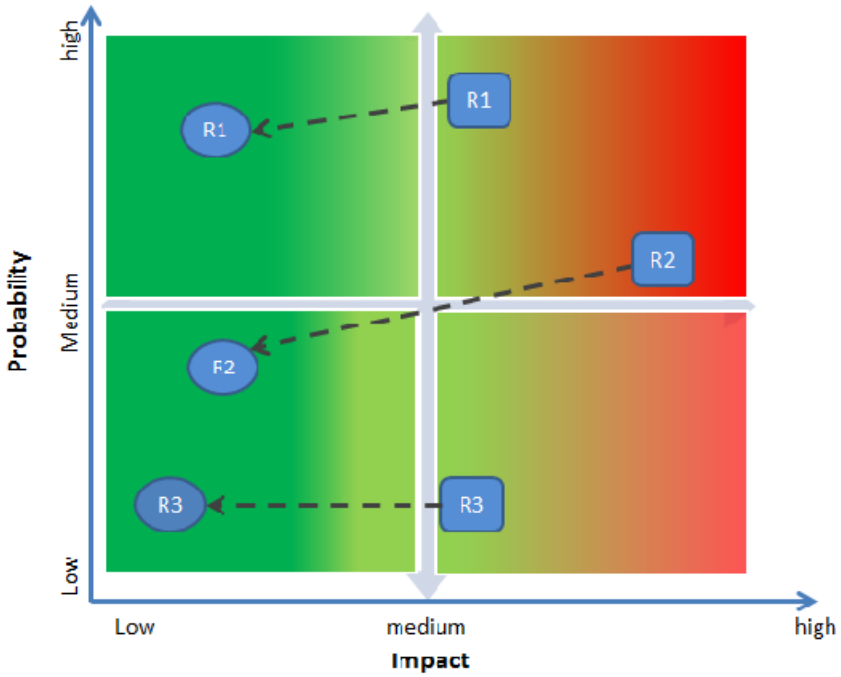
Solution for this risk would be understanding the market in the initial stage itself and optimizing the cost and budget accordingly.

R2. Time estimation issue

To counter this risk, we identified processes which are on our critical path and also tried to keep buffer time in between tasks which are not on critical path.

R3. Not knowing what is at stake

This risk can be managed by giving exact clarity to project management team about how much money and resources are involved in the project and what loss the company will face if the project fails.



General Risk Matrix Grid

Solution for Human based Risks

R4. Team with different skill sets

To nullify this risk, we have included process to review our team skills very early in our planning so that we can accumulate persons whose skills suits best with our client's requirement.

R5. Unanticipated requirement changes

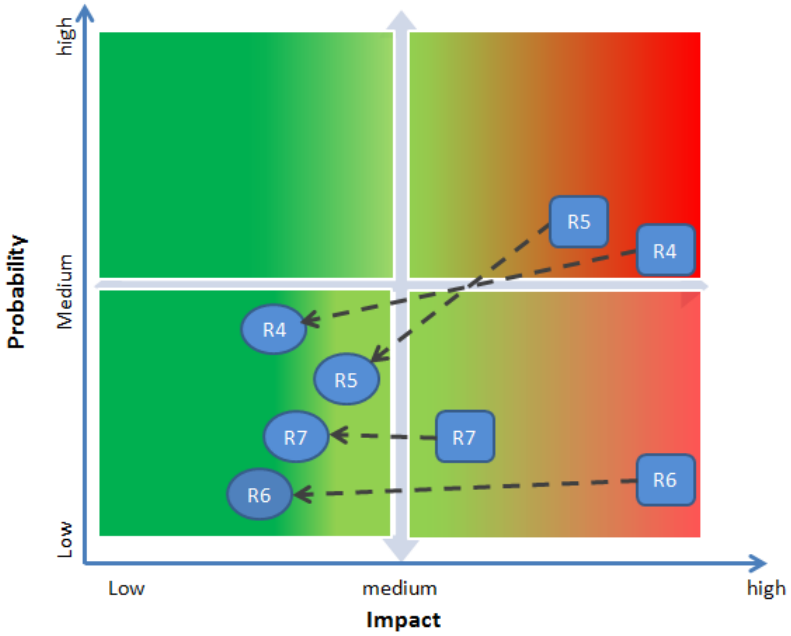
This risk can be minimized by including certain clauses in the contract stating that after a specific phase in project, any change in requirement will result in penalty of 10 % of the maximum total project cost to the client so that the client and the project planning team are on the same ground from the beginning itself.

R6. Staff Turnover

Solution for this risk can be by putting the cross training plan in the buffer time available prior to actually losing the staff member. Following the good documentation quality standards can also help to minimize the impact of this risk.

R7. Poor inter-project communication

To compensate communication issues between departments, we have kept provision for team meeting in each phases of our project and assigned specific resource, i.e. Project Co-ordinator whose responsibilities are to organize and monitor these meeting for optimizing the process.



Human Based Risk Matrix Grid

Solution for Technical & Legal Risks

R8. Interoperability

To neutralize this risk, we have incorporated step of technical prototype before actual implementation starts so that our technical team can gets clear picture of bugs related to operability early and have enough time to rectify them which can reduce time delays on later stages of development.

R9. Security

We have allocated IT security specialists to negate this risk whose roles and responsibilities are to build secure firewalls and take the regular backups of sensitive data to avoid any data loss issue.

R10. Project downtime

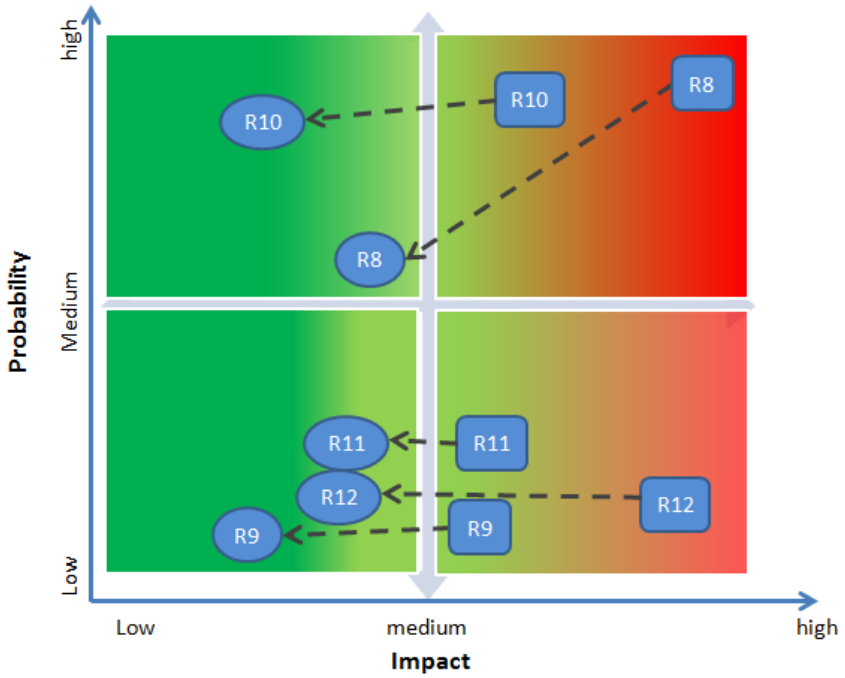
Planning server upgrades and maintenance during off-hours so that development and testing phases are not affected.

R11. Loss of power or internet at key roll-out

During key roll-outs, we have to keep backup plans like taking the screen-shots prior to roll-out so that if this kind of situation arises, we have at least something with us to present to our client.

R12. Accident and fatalities

Legal risks like this can largely effect the company's reputation in market and result in business loss. So, considering these types of risks in the very early stages of project and preparing against them by mentioning clauses in contract which might help the company to not fall in such legal issues later on.



Technical & Legal Risks Matrix Green

11. Cost Analysis

11.1 Introduction

Budget allocation for a project is an important and a tedious job. The Financial Analysts are usually in a dilemma whether to satisfy the Client or the Company.

The Client would always prefer a high quality product at a low cost and the Company always prefers to be paid more in order to show profits, keep the employees satisfied, etc. (An employee would always show dissent about the fact that he/she is getting paid less for the amount of effort they feel, they're putting in at work. This would lead to low productivity and in turn leading to a mediocre product release)

Since this project upon completion is delivered to the client to be implemented internally and amongst their business partners, we as a consulting company don't have to worry about Cost-Benefit Analysis.

Our main goal is to present a budget plan to the client, showing them, what would be the staffing cost? And what would be the infrastructure cost? (In case any project specific infrastructure is needed)

So we have proposed a budget with a minimum, ideal and maximum limit.

11.2 Staffing Cost

Designation	Required Personnel	Grade	Work Exp	Hourly	Daily	Monthly	Incentives (10%)	Eff. Monthly	EOP
Project Mangaer	1	L4	15	50.25	402.00	8844.00	884.40	9728.40	55476.00
Project Co-Ordinator	1	L3	9	37.56	300.48	6610.56	661.06	7271.62	41466.24
Software Architect	1	L3	9	37.56	300.48	6610.56	661.06	7271.62	41466.24
Data Security Expert	1	L3	9	37.56	300.48	6610.56	661.06	7271.62	41466.24
Senior UI Designer	1	L2	4	30.76	246.08	5413.76	541.38	5955.14	33959.04
Senior Developer	2	L2	4	30.76	492.16	10827.52	1082.75	11910.27	67918.08
Network Engineer	2	L2	4	30.76	492.16	10827.52	1082.75	11910.27	67918.08
Database Engineer	2	L2	4	30.76	492.16	10827.52	1082.75	11910.27	67918.08
Senior Quality Analyst	2	L2	4	30.76	492.16	10827.52	1082.75	11910.27	67918.08
UI Designer	2	L1	2	24.65	394.40	8676.80	867.68	9544.48	54427.20
Junior Developer	3	L1	2	24.65	591.60	13015.20	1301.52	14316.72	81640.80
Junior Quality Analyst	3	L1	2	24.65	5324.40	117136.80	11713.68	128850.48	734767.20
Technical Writers	2	L1	2	24.65	394.40	8676.80	867.68	9544.48	54427.20
Total Staffing Cost	23			415.33	10222.96	224905.12	22490.51	247395.63	1410768.48

Figure (a) *This figure shows the maximum staffing cost required for the project. The staffing cost here is calculated based on the years of work experience each personnel has; in a formula based excel sheet.*

(Total Max. Staffing Cost = 1,410,768.48)

*All costs are in Euros

Designation	Required Personnel	Grade	Work Exp	Hourly	Daily	Monthly	Incentives (10%)	Eff. Monthly	EOP
Project Mangaer	1	L4	10	40.25	322.00	7084.00	708.40	7792.40	44436.00
Project Co-Ordinator	1	L3	5	33.56	268.48	5906.56	590.66	6497.22	37050.24
Software Architect	1	L3	5	33.56	268.48	5906.56	590.66	6497.22	37050.24
Data Security Expert	1	L3	5	33.56	268.48	5906.56	590.66	6497.22	37050.24
Senior UI Designer	1	L2	2	28.76	230.08	5061.76	506.18	5567.94	31751.04
Senior Developer	2	L2	2	28.76	460.16	10123.52	1012.35	11135.87	63502.08
Network Engineer	2	L2	2	28.76	460.16	10123.52	1012.35	11135.87	63502.08
Database Engineer	2	L2	2	28.76	460.16	10123.52	1012.35	11135.87	63502.08
Senior Quality Analyst	2	L2	2	28.76	460.16	10123.52	1012.35	11135.87	63502.08
UI Designer	2	L1	0	20.65	330.40	7268.80	726.88	7995.68	45595.20
Junior Developer	3	L1	0	20.65	495.60	10903.20	1090.32	11993.52	68392.80
Junior Quality Analyst	3	L1	0	20.65	4460.40	98128.80	9812.88	107941.68	615535.20
Technical Writers	2	L1	0	20.65	330.40	7268.80	726.88	7995.68	45595.20
Total Staffing Cost	23			367.33	8814.96	193929.12	19392.91	213322.03	1216464.48

Figure (b) *This figure shows the minimum staffing cost required for the project. The staffing cost here is calculated based on the years of work experience each personnel has; in a formula based excel sheet.*

(Total Min. Staffing Cost = 1,216,464.48)

*All costs are in Euros

Designation	Required Personnel	Grade	Work Exp	Hourly	Daily	Monthly	Incentives (10%)	Eff. Monthly	EOP
Project Mangaer	1	L4	14	48.25	386.00	8492.00	849.20	9341.20	53268.00
Project Co-Ordinator	1	L3	7	35.56	284.48	6258.56	625.86	6884.42	39258.24
Software Architect	1	L3	8	36.56	292.48	6434.56	643.46	7078.02	40362.24
Data Security Expert	1	L3	8	36.56	292.48	6434.56	643.46	7078.02	40362.24
Senior UI Designer	1	L2	4	30.76	246.08	5413.76	541.38	5955.14	33959.04
Senior Developer	2	L2	4	30.76	492.16	10827.52	1082.75	11910.27	67918.08
Network Engineer	2	L2	2	28.76	460.16	10123.52	1012.35	11135.87	63502.08
Database Engineer	2	L2	3	29.76	476.16	10475.52	1047.55	11523.07	65710.08
Senior Quality Analyst	2	L2	4	30.76	492.16	10827.52	1082.75	11910.27	67918.08
UI Designer	2	L1	1	22.65	362.40	7972.80	797.28	8770.08	50011.20
Junior Developer	3	L1	1	22.65	543.60	11959.20	1195.92	13155.12	75016.80
Junior Quality Analyst	3	L1	2	24.65	5324.40	117136.80	11713.68	128850.48	734767.20
Technical Writers	2	L1	1	22.65	362.40	7972.80	797.28	8770.08	50011.20
Total Staffing Cost	23			400.33	10014.96	220329.12	22032.91	242362.03	1382064.48

Figure (c) *This figure shows the ideal staffing cost required for the project. The staffing cost here is calculated based on the years of work experience each personnel has; in a formula based excel sheet.*

(Total Ideal Staffing Cost = 1,382,064.48)

*All costs are in Euros

11.2 Infrastructure Cost

Hardware	Brand / Type	Quantity	Item Cost	Eff. Cost
Workstations	DELL Precision 5810 MT	10	1375.99	13759.9
Laptops	DELL Precision M4600	6	749.90	4499.4
Networking Cables	RJ45*	200	78.08	78.08
Networking Cables	Optical Fiber*	300	194.44	194.44
Routers	Cisco 7500 Series	1	7906.37	7906.37
Testing Tablet1	Samsung Galaxy Tab 3	1	104.66	104.66
Testing SP1	Samsung Galaxy Edge+	1	899.99	899.99
Testing Tablet2	Lenevo Yoga Tab 3	1	199.99	199.99
Testing Tablet3	Huwaei Tab T1	1	179.00	179
Testing SP2	Google Nexus 6	1	374.99	374.99
Testing SP3	Motorola Moto X Style	1	499.99	499.99
Total Cost			11688.42	27821.83

*RJ45 per 50m = 19.52
*Optical Fiber Bulk Multimode Full Duplex 1000ft (300m) = 194.44

Figure (c) *This figure shows the infrastructure cost required for the project.*

(Total Infrastructure Cost = 27,821.83)

*All costs are in Euros

11.3 Summary

Cost Type	Client Billable	Cost to Company
Staffing Cost	€1,410,768.48	
Infrastrcture Cost	€27,821.83	
*Miscellaneous	€143,859.31	
*Legal Expenses		€143,859.31
Consulting Fee	€431,577.09	
Total Project Cost	€1,870,167.40	€143,859.31

Figure(d) *This figure shows the total project cost and the costs to company.*

*All costs are in Euros

*****Miscellaneous - This would be applied in scenario of Human based risk.

*Legal Expenses - Retainer for the corporate legal team. They would be used during the signing of contract stage and in case of Legal Risk.

The actual total project cost would be €1,870,167.41 (In case of Human Based Risk the effective total project cost would be €2,014,026.71) & the cost to company for establishing the project would be €143,859.31

12. References

Abstract to Requirements (Documented by Marc-Kevin Plewka):

1. http://www.cmsnl.com/honda-nsr125f-1989-italykph_model3537/partslist/E__1000.html

Project Structure Plan (Documented by Alpana Chaphalkar)

1. http://www.tutorialspoint.com/sdlc/sdlc_v_model.htm
2. http://www.slideshare.net/VaibhavDash1/v-model-52246215?related=2
3. http://www.slideshare.net/smaske96/project-and-organizational-structure
4. http://www.slideshare.net/pmsmbsvit/chap-3-organization-structure?qid=d91b8e02-06de-44d3-911a-9e3db581e3fd&v=qf1&b=&from_search=10
5. http://www.slideshare.net/pmsmbsvit/chap-6-developing-a-project-plan

Stakeholder Analysis (Documented by Jaydeep Galani)

1. http://ctb.ku.edu/en/table-of-contents/participation/encouraging-involvement/identify-stakeholders/main
2. http://transformed.businesscatalyst.com/media/articles/stakeholder_analysis.html

Risk Management (Documented by Ankit Dixit)

1. http://www.vbhconsulting.com/Articles/Top%20IT%20Project%20Risks%20and%20What%20to%20do%20about%20them-3.pdf
2. https://www.projectsmart.co.uk/10-golden-rules-of-project-risk-management.php

Cost Analysis (Documented by Abhijith Darshan Ravindra)

1. All costs were extrapolated and assumed according to real world scenarios. We were able to get a picture of pay scale for the personnel based on the no. of years of work experience and designation from www.payscale.com

Credits

Consulted with **Koyel Priyadarshini** (Programme Consultant Financial Operations, **Torry Harris Consultancy**)

Consulted with **Sreenivas KK** (Director of Technology in Software Architecture, **NESS Technology Services**)