ABSTRACT :

Many travelers take renting a car for granted especially during the pandemic when isolation is a priority. Customers prefer convenient and timely service, but it's not uncommon for car rentals to lag.

In present system all booking work done manually and it takes very hard work to maintain the information of booking and cars. Finding which vehicle is available for booking takes a lot of time. It only makes the process more difficult and hard. The aim of the project is to automate the work performed in the car rental management system like generating daily bookings, records of car available for booking, rental charges for cars, store record of the customer.

Car rental management system is a car booking software that provides a complete solution to all day-to-day car booking office running needs. This system helps to keep the information of Customer online. It allows the admin to check the customer information any time by using this system. Using this one can also keep the information of number of bookings in current month or in last 6 month or in last year. This helps the management to track their business and earning in particular month or in any year. Based on this information they can take decision regarding their business development.

If a driver decides to rent a car beforehand, they go to a car rental website or app and find a vehicle that meets their needs. Then, they book it and pay for the chosen rental period. On the appointed day, this customer arrives at the car rental location to pick up the chosen car. An agent makes copies of their IDs, explains the terms of the lease, instructs them on any special features of the car, and finally hands them the keys. When the customer drops off the car, the agent checks its mileage and inspects for any damages.

GOALS :

- The system aims at the maintenance and management of the details of car rental agencies and its customers.
- This project aims at offering the best of car services to clients in need.
- This project makes the overall car service work easily accessible for all and reliable as well.
- This will be able to manage all the information about car, booking, insurance, customer details etc…
- It will track all the details about the customer, supplier and insurance.
- The user should sign up / sign in to the site and select the car from the list provided in that location and the date of pickup and drop.
- Payment can be done either online or offline.
- The user will get the confirmation message once the car is booked.
- Thus Car rental management system provides a total solution to the field of auto rental industry.

STAKEHOLDERS:

- Project Manager
- Users
- Car rental agencies
- Employees
- Admin
- Developer
- Designer
- Supplier

STEP 1: Establishing the project scope and objective

1.1) Identifying the objectives and measures of Effectiveness.

- Online car rental management system is a user-friendly web based rental car booking system that is designed to help auto rental agencies to run their business in a more effective and profitable way.
- It simplifies the entire booking system to ensure your car rental rates remain high through the year, which will boost the revenue of the entire business.

1.2) Establishing a project authority

The project manager will be appointed as project authority.

1.3) Identify the stakeholders in the project and their interests

The stake holders like users, owner, developer, organizer of the car rental management will be more affected if any problem arises in the software.

1.4) Modify objectives in the light of stakeholder analysis

- We have to develop the product based on the stakeholder needs.
- If they want any new features, the team shall add it or if any problem arises, the team should manage those problems.

1.5) Establish methods of communication with all parties

- So we have to maintain a good software and proper communication between the user and the developer.
- For that we have to make communications through email or any personal apps etc.

STEP 2: Establishing the project infrastructure

2.1) Establish link between project and any strategic plan

There are many strategic plans in the society but online car rental management system is the good project that can be helpful to anyone in their needed situations for any cause.

2.2) Identify installation and procedures

- It can be installed through internet.
- Installation process is quite easier and is highly secure too.

2.3) Identify project team organization

Then we have to divide the work into sub modules and assign the work to the employees where they fit in.

STEP 3: Analysis of project characteristics

3.1) Distinguish the project

- It is a product based project.
- We can achieve success by delivering the project in the right time on the basis of time and cost.
- We can spread the information through the ads.

3.2) Analyse other projects characteristics

- In the market there are other projects with some of the characteristics of our project.
- We can book the car either online or also on the spot.
- We can also cancel the booking before two days.
- Beyond that refund will be given.

3.3) Identify high level project risks

- In this project maintaining the database and booking and canceling functionalities fall under high level risk prone areas.
- If any problem arises from these features the total software will be under risk.

3.4) Take into account user requirements concerning implementation

- So we have to communicate with the users and came to know about the problem.
- Based on their needs we have to implement our project.
- The requirements should be properly tested and then converted into functionality.

3.5) Select general life cycle approach

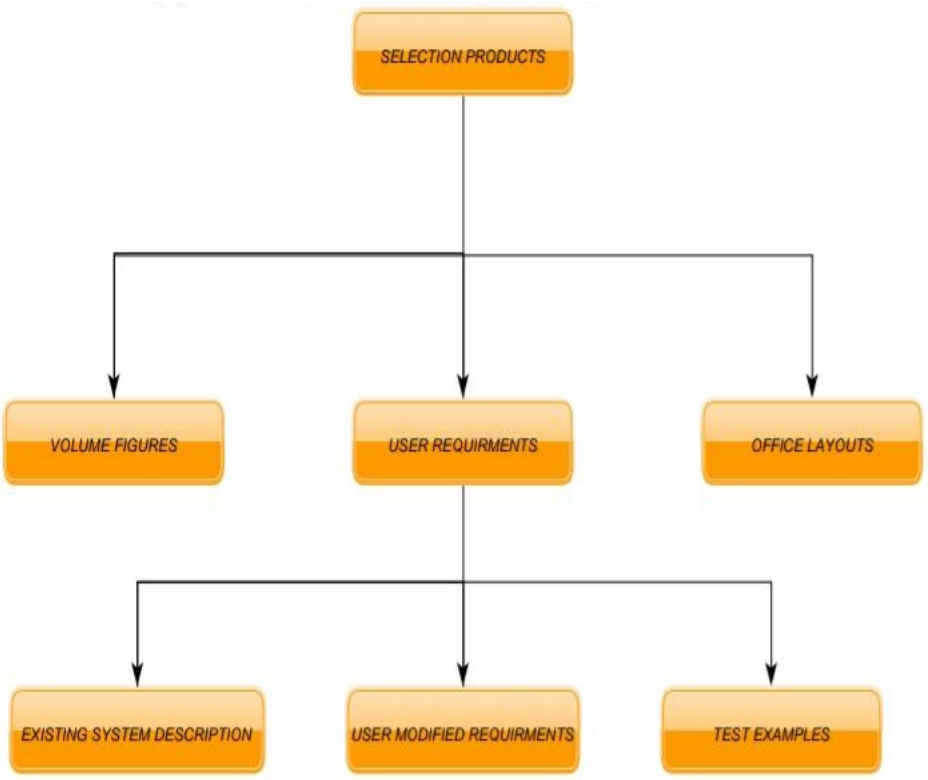
- For this type of project Incremental life cycle process model is suitable.
- Because in this we can add extra features like changing the car, for extension of time, quick check out etc.

3.6) Review overall resource estimates

- After completing the above steps we need to estimate the time and cost for the completion of the project.
- All the resources should be defined correctly.

STEP 4: Identifying project products and activities

4.1) identify project products and activities
In this project the main products are booking a car for a specific time period.

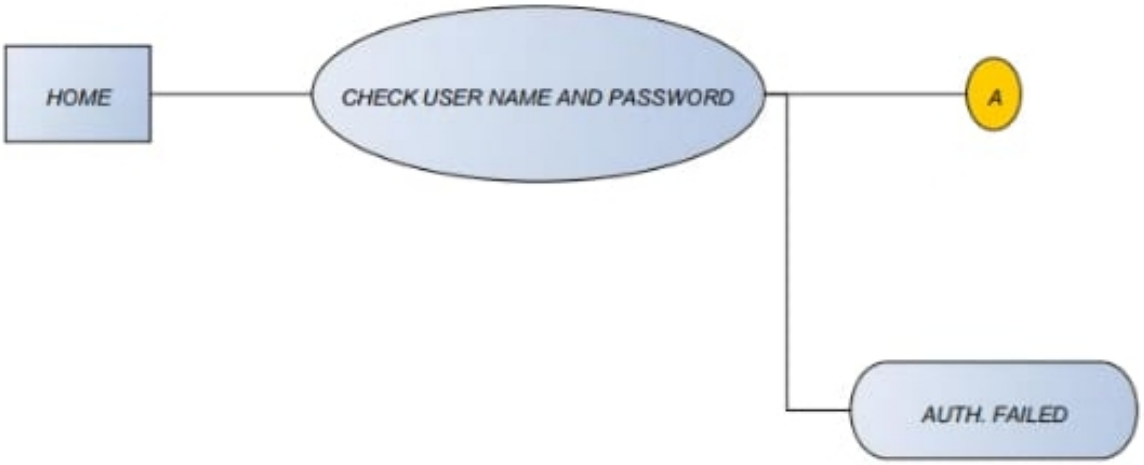


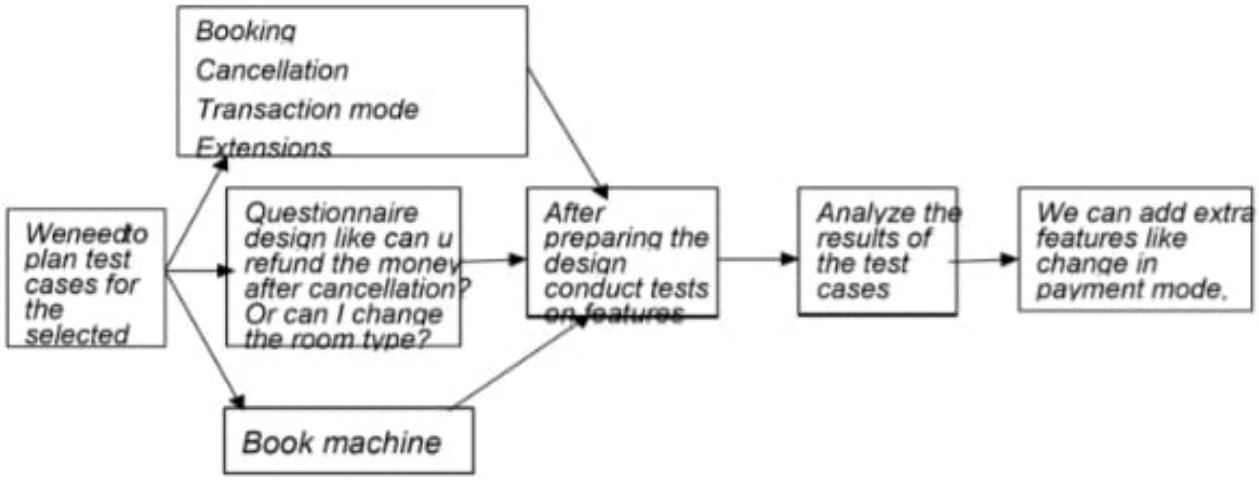
4.2) Document generic product flows :

4.3) Recognize product instances

- Here first of all we want to take care of our customers and their needs.
- And then security for our system.
- The products like dash board, reports and reviews, car fuel status, auto import reservations, car mileage and quick check in and check out.

4.4) Produce ideal activity network





4.5) Modify the ideas to take into account for stages and checkpoints

- So we need to develop these products without any fail
- The basic product flow be like after logging in to our website it will be displaying the car model and make year, capacity, check in and check out details, any additional features, payment mode and status of the cars available and payment status.
- So if we want modify any feature according to user's need, then we have to divide it into stages and checkpoints.

STEP 5: Estimate the effort for each activity

5.1) Carry out bottom-up or top-down estimates

- The maximum effort should be done in the testing of all the features of the system.
- It will be done in either top down or bottom up estimates.
- First we have to prepare the home page and the logging in page and then the details of the car available in that area and all other extra information regarding rental car booking.
- It should be finished in 6 days and the remaining details like payment mode, cancellation and refund should be done in another 6 days.
- So the elapsed time needed for preparing those feature of online car rental management system is 6 days.
- Because the manager should divide the work among the staffs and they should be able to complete this work in the span of 6 days.

5.2) Revise plan to create controllable activities

- Then after preparing all the above features and then revise the functionalities of those features whether they are working or not.
- If we want to make any changes then we have to control the flow of activities. In order to control it, we should divide it into sub-sub tasks, like : Design - 1 week, Development - 4 weeks, Testing - 2 week.

STEP 6: Identify activity risks

6.1) Identify and quantity risks for activities

- In online car rental management, the highly risk prone area is security and database back up .
- In booking and cancellation of cars, there might be a risk of wrong details recorded and the correct details may not get updated.
- There may be a risk in payment mode and transactions too .

6.2) Plan risk reduction and contingency measures

- We have to maintain a proper backup system and security standards.
- On booking the cars we have to enter all the details correct.

6.3) Adjust overall plan and estimate to take account on risks

So by planning these activities we can adjust the risk occurring by somewhat better extent.

STEP 7: Allocate the resources

7.1) Identify and allocate resources to activities

- Design - 2 Members, Development - 4 Members and Testing - 2 Members.
- Then we have to revise the plans and estimate the allocated resources activities.
- By using incremental model we can allocate and add the features to our system.

7.2) Revise plans and estimate to take into account resource constraints

After revising all the plans we can deliver the project to the users.

STEP 8: Review or Publicize plan

By planning, the proper project planning to product delivery we can deliver a quality product to the end users. Documenting our whole planning and obtaining an agreement from the project management to handle it to the next phase is required. So that we can review all the aspects of our project features and can do a quality project.

STEP 9: Execute plan

In this step we have to execute our plan based on the document we have prepared. If any error is found then we have to review the features of our product and then execute the plan again.

STEP 10: Lower Level Plans

In this phase we will take the responses and reviews of the lower level people like end users and stakeholders. We will develop the plan according to their needs. Then we will execute those plans and review the aspects of the features.

STRATEGIC ASSESSMENT:

Well defined goals:

- The online car rental system allows the user of the system access all the details such as location , name, etc..
- It helps the customer to book tickets for there distinction place and help them to reach safely on their requirements
- The system can also be used for both professional and business trips.
- This system maintains centralized repository to make necessary travel from place to place arrangement and to retrieve information easily.

Timing: it approximately takes two months

RESOURCING:

If we want to add any additional resources like refund, spot payment instead of net banking we can allocate those features based on the users point of view

• Then we have to revise the route plans and estimate the allocated resources activities

• By using incremental model we can allocate and add the features to our system

TECHNICAL ASSESSMENT:

The car rental Management System is a web based application. The main purpose of "Car Rental Management System" is to provide a convenient and Easy way for a customer to book their cab at any time for their purpose of needs. To run this System Software and Hardware Requirements are necessary. Requirements which are needed are given below briefly,

Hardware Requirements:

Processor At least 2.0 GHZ

RAM- At least 2GB

Software Requirements:

Operating System - Windows.

Front End - PHP, HTML, CSS, JavaScript.

Back End - PHPmyadmin

Web Browser - Google Chrome, Firefox, Bing and any compatible update browser

COST -BENEFIT ANALYSIS:

Development cost: Salary for all the workers and expenditures of transport charges are involved in this.

Setup costs: Includes the cost of implementation of system such as hardware requirements, software requirements and also file conversion, recruitment and employee training.

Operational cost: cost required to operate system, after it is installed.

Three categories of benefits:

- **Direct benefits:** Directly obtained benefit by making use of the online car rental management system.
- **Accessible indirect benefits:** These benefits are obtained due to updation or upgrading the performance of current system. It is also referred as "secondary benefits".

Example: "use of user – friendly screen", which promotes reduction in errors, thus increases the benefit.

- **Intangible benefits**: These benefits are longer term, difficult to quantify. It is also referred as "indirect benefits".

Example: Enhanced job interest leads reduction of staff turnover, inturn leads to the lower recruitment costs.

NET PROFIT :

YEAR	CASH FLOW
0	-6,00,000
1	1,00,000
2	1,00,000
3	2,00,000
4	2,00,000
5	3,00,000
NET PROFIT	**3,00,000**

'Year 0' represents all costs before system is operation . 'Cash-flow '
Is value of income less outgoing .Net profit value of all the cash-flows for the lifeline of the application .

COST BENEFIT ANALYSIS-PAYBACK PERIOD :

YEAR	CASH-FLOW	ACCUMULATED
0	-6,00,000	-6,00,000
1	1,00,000	-5,00,000
2	1,00,000	-4,00,000
3	2,00,000	-2,00,000
4	2,00,000	0
5	3,00,000	3,00,000

COST BENEFIT ANALYSIS - RETURN ON INVETSMENT [ROI] :

$$ROI = \frac{\text{Average annual profit}}{\text{Total investment}} \times 10$$

Average annual profit = 3,00,000/5 = 60,000
ROI = 60,000/6,00,000 x 100
= 10 %

COST BENEFIT ANALYSIS – DISCOUNT FACTOR AND NET PRESENT VALUE :

DISCOUNT FACTOR:

Discount factor = 1 / (1 +r)^t

r is the interest rate (10% is 0.10)

t is the number of years.

In the case of 10% rate,

0 year discount factor = 1 / (1 + 0.10)^ 0 = 1.0000

1 year discount factor = 1 / (1 + 0.10)^ 1 = 0.9091

2 year discount factor = 1 / (1 + 0.10)^ 2 = 0.8264

3 year discount factor = 1 / (1 + 0.10)^ 3 = 0.7513

4 year discount factor = 1 / (1 + 0.10)^ 4 = 0.6830

5 year discount factor = 1 / (1 + 0.10)^ 5 = 0.6209

APPLYING DISCOUNT FACTORS AND CALCULATING NVP :

YEAR	CASH-FLOW	DISCOUNT FACTOR	DISCOUNTED CASH FLOW
0	-6,00,000	1.000	-6,00,000
1	1,00,000	0.9091	1,81,820
2	1,00,000	0.8264	2,47,920
3	2,00,000	0.7513	2,25,390
4	2,00,000	0.6380	2,55,200
5	3,00,000	0.6209	3,72,540
			82,870

RISK ANALYSIS:

In online car rental management system, the highly risk prone area is security and database back up.

- In Most booking and cancellation of the car there might be a risk of wrong details recorded and the correct details may not get updated.
- In payment mode and transactions also there may be a risk of data breach.
  So we have to maintain a proper backup system and security standards.
- On booking the car we have to enter our all correct details.

So by planning these activities we can avoid the occurrence of risk to somewhat better extent.

INTRODUCTION :

Many travelers take renting a car for granted especially during the pandemic when isolation is a priority. Customers prefer convenient and timely service, but it's not uncommon for car rentals to lag.

In present system all booking work done manually and it takes very hard work to maintain the information of booking and cars. Finding which vehicle is available for booking takes a lot of time. It only makes the process more difficult and hard. The aim of the project is to automate the work performed in the car rental management system like generating daily bookings, records of car available for booking, rental charges for cars, store record of the customer.

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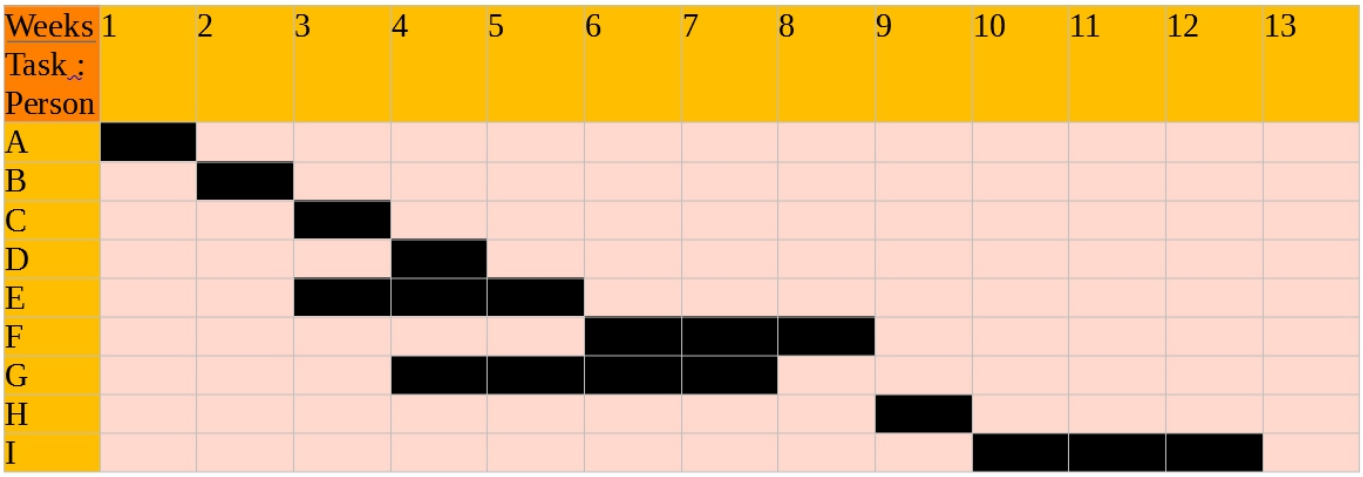
ACTIVITY PLANING :

An activity is typically one stage of a project management plan. Each activity consists of one or more actions that, upon completion, will lead to the next project stage. Taken together as a series, the activities will result in the final deliverable. Each activity has a defined start and end, as well as a deadline or time period within which it must be completed.

When we are planning a project, one of the key steps is to define the activities required to bring that project to fruition. This generally involves creating an activity list, which is exactly what it sounds like — a list of all the actions required for the project. Here we have take the topic car rental system, the activity planning are :

- ✧ Feasibility Assessment
- ✧ Resource Allocation
- ✧ Detailed costing
- ✧ Motivation
- ✧ Coordination

The final outcome of the planning process of the car rental system is :



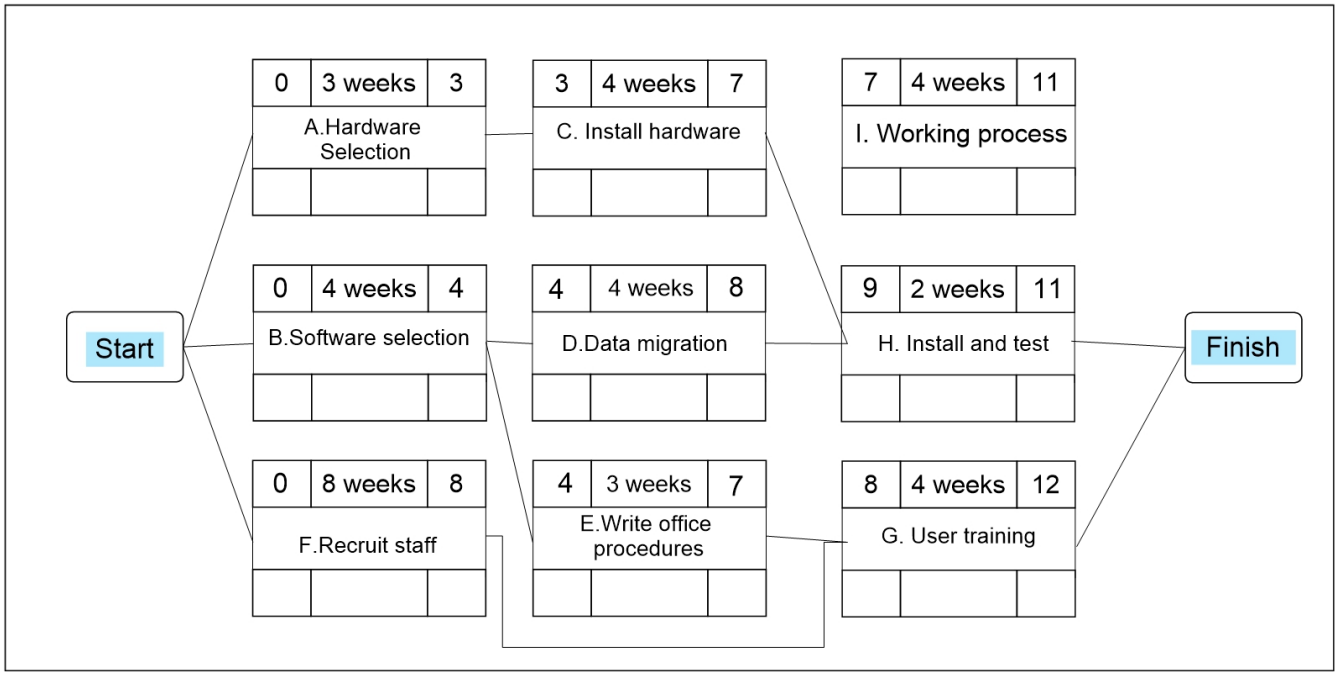
A - Overall design
B - Specify module 1
C - Specify module 2
D - Specify module 3
E - Code module 1
F - Code module 2
G - Code module 3
H - Integration testing
I - System testing

Project specification with activity duration :

FORWARD PASS :

Forward pass is a technique to move forward through network diagram to determining project duration and finding the critical path or Free Float of the project. Whereas backward pass represents moving backward to the end result to calculate late start or to find if there is any slack in the activity.

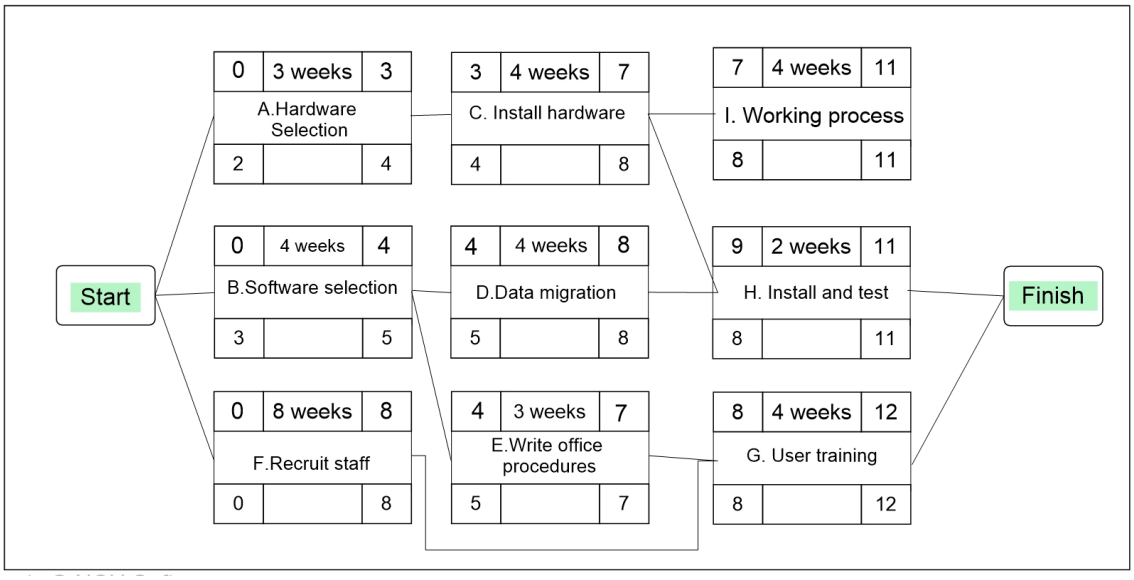
Here is the detailed view of forward pass in car rental system :



Backward pass :

A backward pass in the area of project management refers to the calculation of late finish dates and late start dates for the portions of schedule activities that have not been completed. This is determined by starting at the project's scheduled end date and working backwards through the schedule network logic.

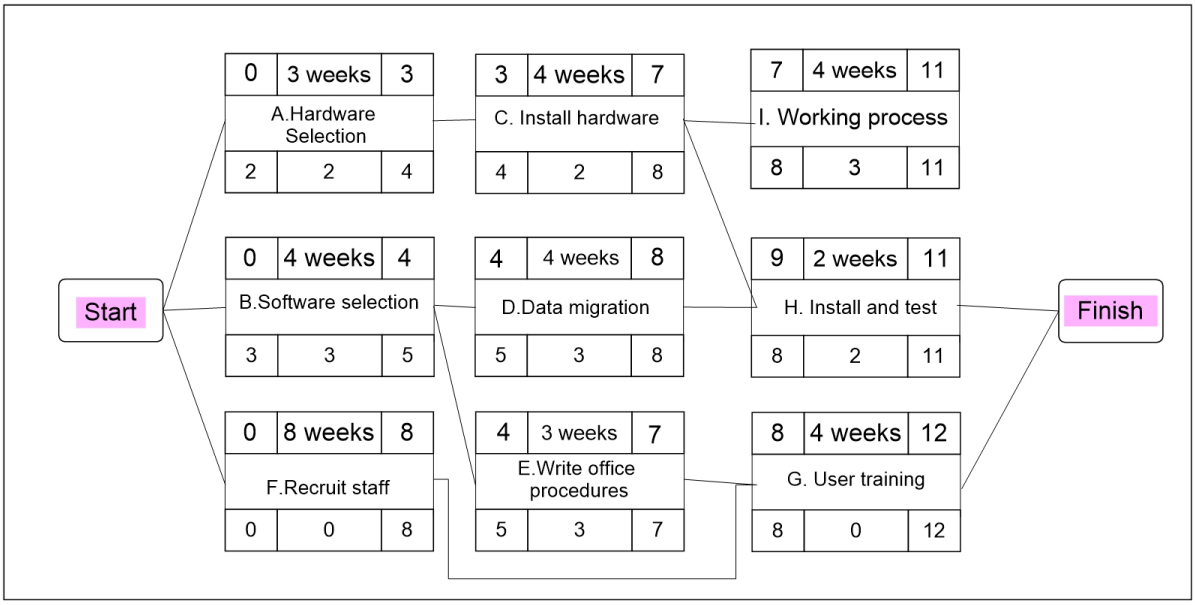
Here is the detailed view of backward pass in car rental system :



Identifying Critical Path :

The one path that defines through the network that defines the duration of the project is called as critical path. Any delay to any activity on this critical path will delay the completion of the project. Critical path is the longest path from the first column through the lines showing prerequisites to the last column. It determines the project completion date because you must complete all tasks on the path within the estimated time or delay the project. Any activity with floating of zero is critical.

Here is the detailed view of critical path in car rental system :



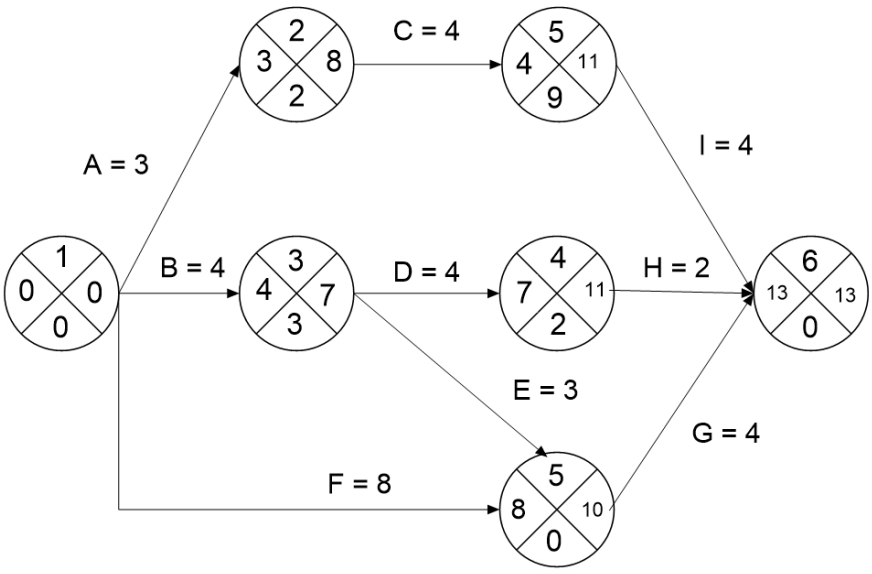
Activity	Duration (Weeks)	Precedents
A	3	
B	4	
C	4	A
D	4	B
E	3	B
F	8	
G	4	E,F
H	2	C,D
I	4	C

NETWORK ANALYSIS :

The network analysis is a method used to analyze, control and monitoring of business processes and workflows. The network analysis enables project managers to take various factors into account when creating a project plan:

- ✧ Dependencies between activities
- ✧ Buffer times between activities
- ✧ Earliest and latest start and end dates
- ✧ Duration of activities
- ✧ Critical Path

The network analysis method is often used in procurement and production in order to control project processes more efficiently and to complete projects on schedule and on budget.



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Activity	Duration (weeks)	Earliest start date	Latest start date	Earliest finish date	Latest finish
A	3	0	2	3	8
B	4	0	3	4	7
C	4	2	8	6	11
D	4	2	7	6	11
E	3	2	7	5	10
F	8	0	0	8	10
G	4	4	10	8	13
H	2	5	11	7	13
I	4	5	11	9	13

RISK MANAGEMENT :

Risk management is the process of minimizing any potential problems that may negatively impact a project's timetable. 'Risk' is any unexpected event that might affect the people, processes, technology, and resources involved in a project. Unlike 'issues', which are certain to happen, risks are events that could occur, and you may not be able to tell when. Because of this uncertainty, project risk requires preparation in order to manage them efficiently.

Common Risks :

- Software never completed or delivered late.
- Project canceled after design stage.
- Development budget exceeded.
- Maintenance costs higher than estimated.
- Response time targets not met.

RISK IDENTIFICATION :

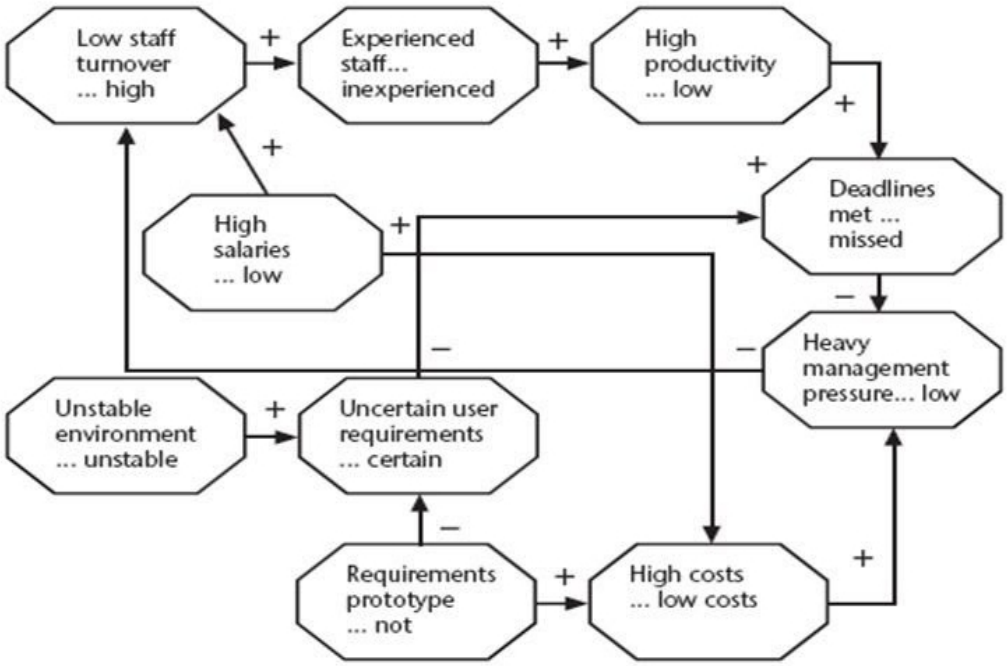
Risks identified by Boehm's top 10 Development risks :

- Personnel shortfalls
- Unrealistic time and cost estimates
- Developing the wrong software functions
- Developing the wrong user interface
- Gold Plating (inclusion of features)
- Late changes to requirements
- Real time performance problems
- Development technically too difficult.

Possible Risks identified by use of checklists (based on past projects) :

- Security
- Non-compliance
- Data loss
- Key personnel risk
- Fraudulent activity

CAUSAL MAPPING - INTERVENTIONS :



RISK ASSESSMENT :

Risk exposure (RE) = (potential damage) X (probability of occurrence)

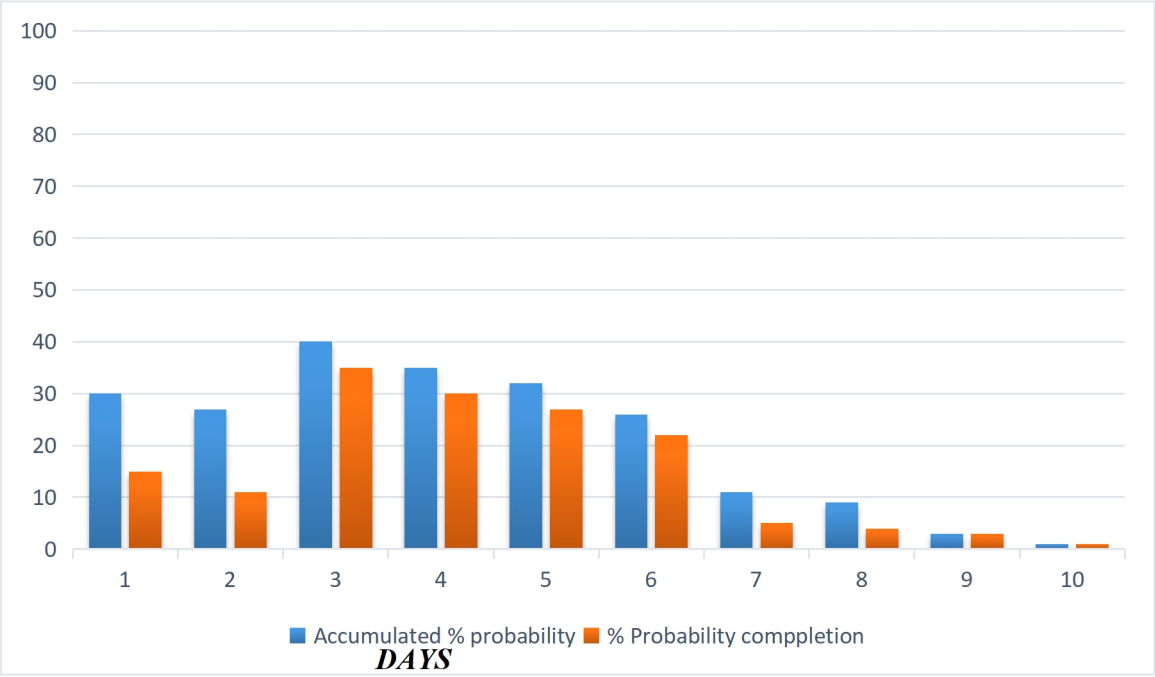
Potential damage : External Hard disks (HDD) failure in systems.

Probability : 10% - 25% (approximately many chances)

25% = 0.25 (25 in hundred chance)

RE = 50,000 Rs X 0.25 = Rs. 12,500

RISK ASSESSMENT - PROBABILITY CHART :



RISK PROBABILITY : QUALITY DESCRIPTORS

PROBABILTY LEVEL	*RISK*
HIGH	1) Software never completed or delivered
HIGH	2) Project canceled after design stage
SIGNIFICANT	3) Development budget exceeded > 20%
MODERATE	4) Software delivered late
LOW	5) Development budget exceeded <= 20%
LOW	6) Response time targets not met
LOW	7) Real time performance problem

PROBABILTY IMPACT MATRIX :

		Impact				
		Trivial	Minor	Moderate	Major	Extreme
Probability	Rare	Low	Low	Low	Medium	Medium
	Unlikely	Low	Low	Medium	Medium	Medium
	Moderate	Low	Medium	Medium	Medium	High
	Likely	Medium	Medium	Medium	High	High
	Very likely	Medium	Medium	High	High	High

MATRIX FOR CAR RENTAL MANAGEMENT SYSTEM :

5	*10*	*15* R1	*20*	*25*	*5 Extreme*	IMPACT
4	*8*	*12*	*16* R2	*20* R3	*4 Significant*	
3	*6*	*9*	*12* R4	*15*	*3 Moderate*	
2 R6	*4* R5	*6*	*8*	*10*	*2 Low*	
1	*2* R7	*3*	*4*	*5*	*1 Negligible*	
1. Negligible	*2. Low*	*3. Moderate*	*4. Significant*	*5. Extreme*		
PROBAB ILITY						

RISK PLANNING :

- ***Risk Acceptance :***

  Risk acceptance is absolutely not possible, as the cost of avoiding risk may be greater than the actual cost.

- ***Risk Avoidance :***

  Risk avoidance will be carried out since the environment in which the risk occurs will be avoided.

- ***Risk Reduction and Mitigation :***

  Risk reduction is best among these planning. Risk reduction is done by creating prototypes which will greatly reduce the risk of incorrect requirements.

RISK REDUCTION LEVERAGE :

Risk reduction leverage = (RE_{before} - RE_{after}) / (cost of risk reduction)

RE_{before} = Risk exposure before risk reduction

External hard disk failure (HDD) in systems.

RE_{before} = **25%** of chance causes **Rs.12,500** damage.

RE_{after} = Risk exposure after reduction.

External hard disk (HDD) in systems.

RE_{after} = Maintenance of Hard disks costing **Rs.1000** reduces probability of HDD failure to **15%**.

RRL = (25% of Rs.12,500 **) – (** 15% of Rs.12,500 **) /** Rs.1000

= (3125 – 1875) / 1000

= 1250 / 1000

RRL = 1.25

Since **RRL > 0.3** therefore its worth doing.

RESOURCES ALLOCATION :

COST SCHEDULE:

- To produce the detailed cost schedule showing weekly or monthly costs over the life of the project.
- Cost categories: Staff costs, Overheads and Usage charges.

STAFF COST :

Staff Member :	Wages per day (in rupees)
1. Folk	600
2. Due	550
3. Aari	500
4. Sree	470
5. Vino	500

WEEKLY PROJECT COST :

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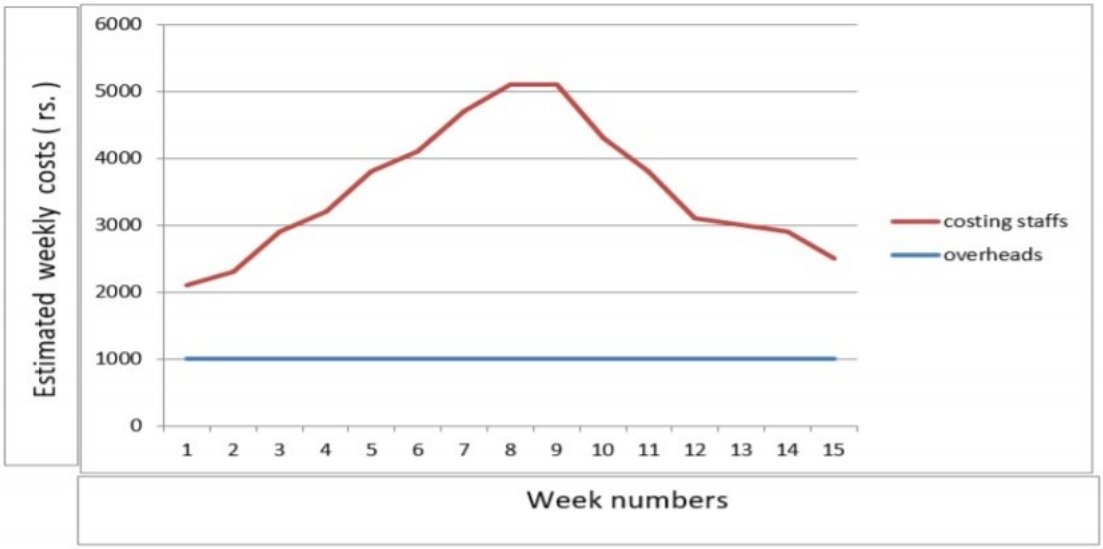
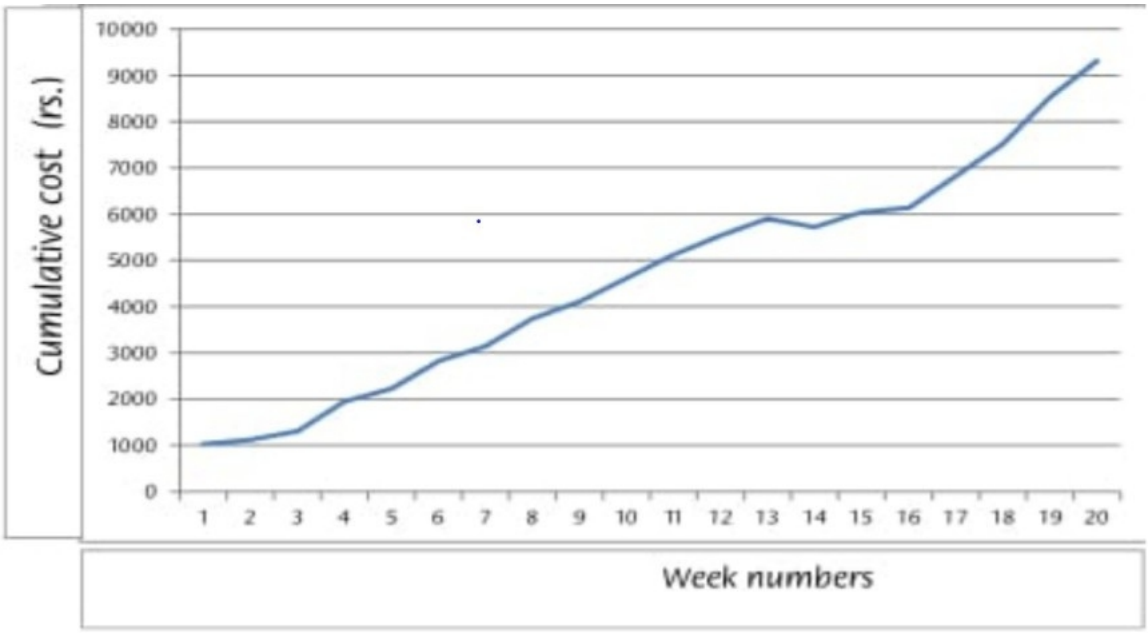


- The qualities of individual members of staff should be taken into account in allocating staff to activities.
- In order to avoid risk we should have alternate staffs for important phases. If one not available them we can go with the other.

CUMMULATIVE PROJECT COST :

Cumulative cost equals cumulative cost for the previous period plus scheduled cost for this period. Best Uses Add the Cumulative Cost field to the timephasedportion of the Task Usage view to display the running total cost for the task, combining actual and remaining costs on an ongoing basis.



MONITORING AND CONTROL

- Monitoring and Controlling are processes needed to track, review, and regulate the progress and performance of the project. It also identifies any areas where changes to the project management method are required and initiates the required changes.
- Once work schedules have been published and the project is started, attention must be focused on progress of the project.
- This requires monitoring.

FRAMEWORK CREATION:

- Exercising control over a project and ensuring that targets are met is a matter of regular monitoring.
- To find out what is happening and compare with targets.
- Re planning might be needed.
- Functionality, and costs going over target. In this chapter we are mainly concerned with the first and last of these.

PROJECT CONTROL CYCLE:

The project control life cycle involves the following sequence of steps:

1. Producing a plan for the project to follow.
2. Monitoring progress against the plan.
3. Comparing actual progress with the planned progress.
4. Identifying variations from the plan.
5. Applying corrective action if necessary.

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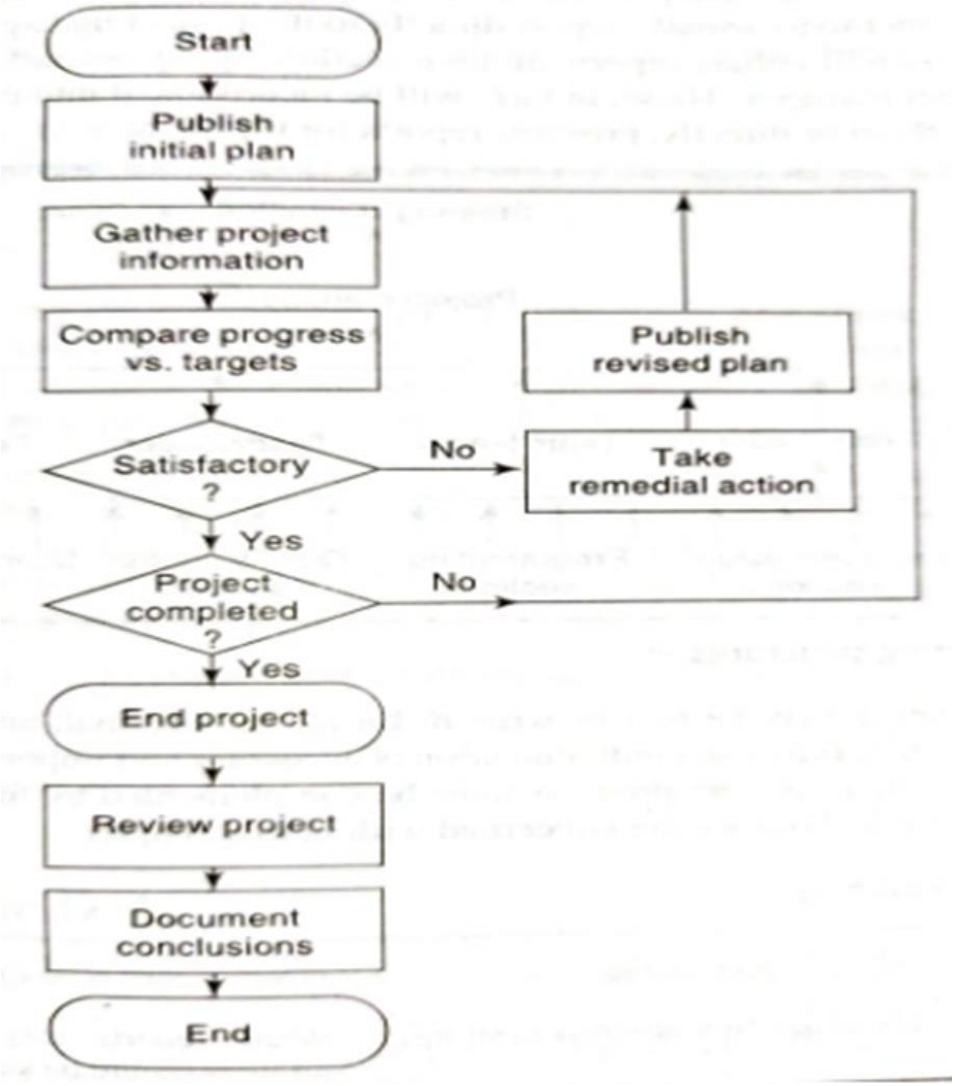
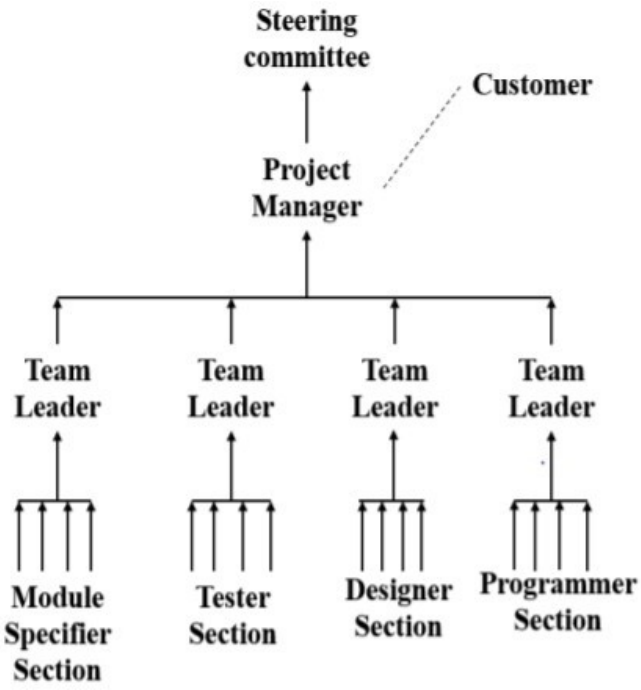


RESPONSIBILITY:

- The overall responsibility of ensuring the progress of the project is therole of Project Steering Committee
- Day to Day responsibility is rest with Project Manager.
- Project steering committee
- Project board
- Reporting formal or informal

PROJECT REPORTING STRUCTURE:



- Reporting may be oral or written, formal or informal, or regular or ad hocand some examples of each. While any effective team leader or project manager will be in touch with team members and available to discuss problems, any such informal reporting of project progress must be complemented by formal reporting procedures.

Assessing Progress:

Information to assess project will be collected routinely, while some otherevents will be triggered by specific events.

Checkpoints : predetermined times when progress is checked

Event driven: check takes place when a particular event has been achieved

Time driven: date of the check is predetermined.

Time sheet :

STAFF: BHUVANESH WEEKENDING:04 /06/2021

RECHARGABLE HOURS:

Project	Activity Code	Description	Hours in this week	% Done	Scheduled completion	Estimated completion
P23	A243	Code made A3	12	30	20-05-21	20-05-21
P43	0771	Document taken on	20	90	6-5-21	8-5-21

Total Rechargeable hours : 32Non

Rechargeable hours :

Code	Description	Hours	Authentification
L12	Hours in leave	2	Authorized by Aravind

Total non - rechargeable hours : 2

Frequency of reporting:

The higher the management level then generally the longer the gaps between checkpoints

COLLECTING DATA :

- As a rule, managers will try to break down long activities into more controllable tasks of one or two weeks duration.
- However, it will still be necessary to gather information about partially completed activities and, in particular, forecasts of how much work is leftto be completed.
- It can be difficult to make such forecasts accurately

RED/AMBER/GREEN (RAG) REPORT:

Traffic-light method

- Identify the key (first level) elements for assessment in a piece of work;
- Break these key elements into constituent elements (second level)
- Assess each of the second-level elements on the scale green for 'on target' amber for 'not on target but recoverable', and red for 'not on target and recoverable only with difficulty';
- Review all the second-level assessments to arrive at first level assessments;
- Review first- and second-level assessments to produce an overall assessment.

ACTIVITY ASSESSMENT SHEET:

STAFF: DEEPAN

REF: IOE/P08 ACTIVITY: CODE AND TEST MODULE C

Week number	8	9	10				
Activity summary	G	A	R				

Components Comments

Screen handling procedure	G	G	A	G			
Complication	G	G	G	R			
Test data runs	G	G	G	R			
Program documentation	G	G	G	R			

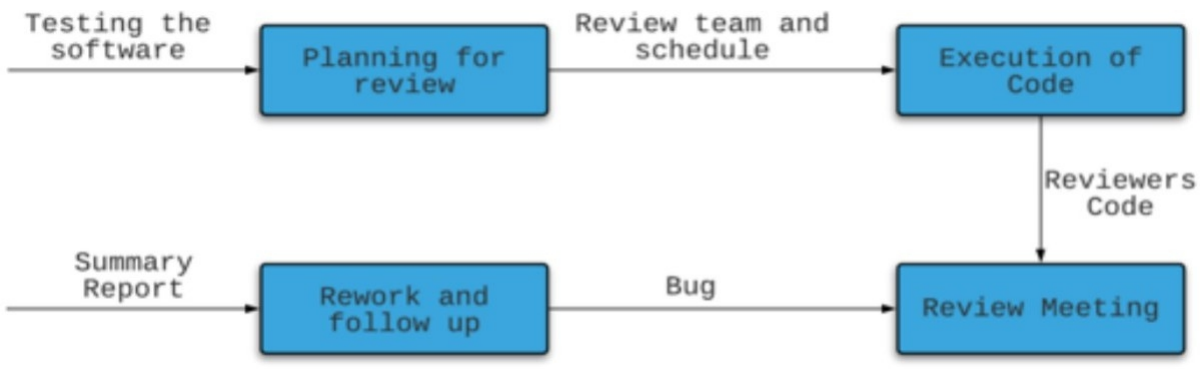
REVIEW:

Review of work products is an important mechanism for monitoring the progress of a project and ensuring the quality of the work products.

Utility of Review:

- To identify any deviation from standards
- To suggest ways to improve the work product
- Learning Opportunities
- Good Understanding

REVIEW ROLES AND PROCESS:



PROJECT TERMINATION PROCESS:

Project Termination Review:

Project termination decided by Manager Reasons for Project Termination:

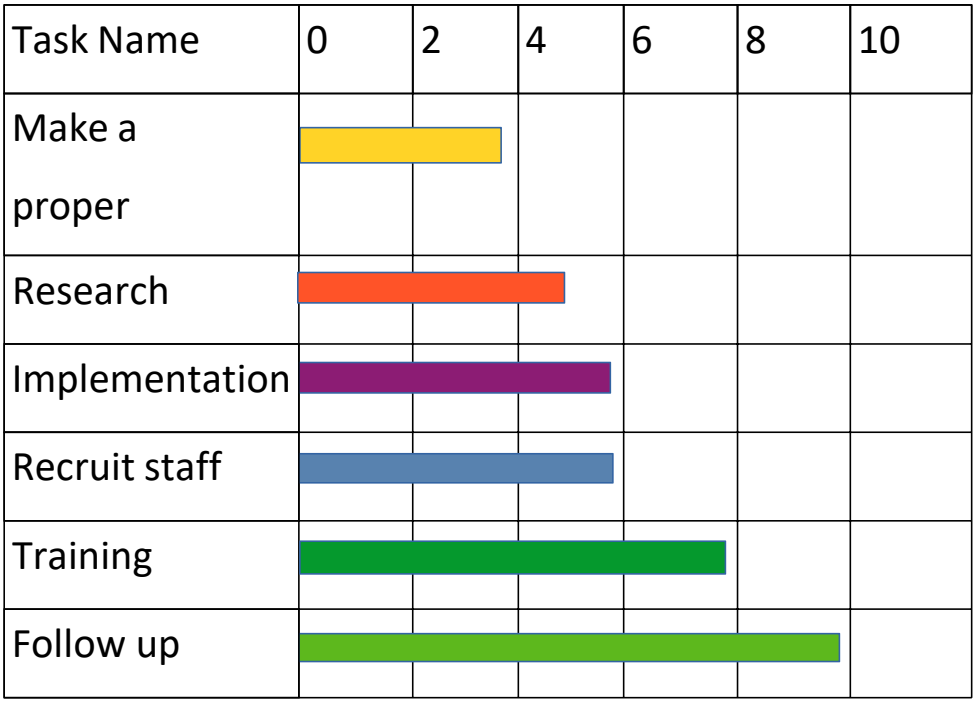
- Project is completed successfully and handed over to the customer
- Incomplete requirements
- Lack of resources
- Key technologies used in the project have become obsolete while execution
- Economies of the project changed

VISUALIZING PROCESS:

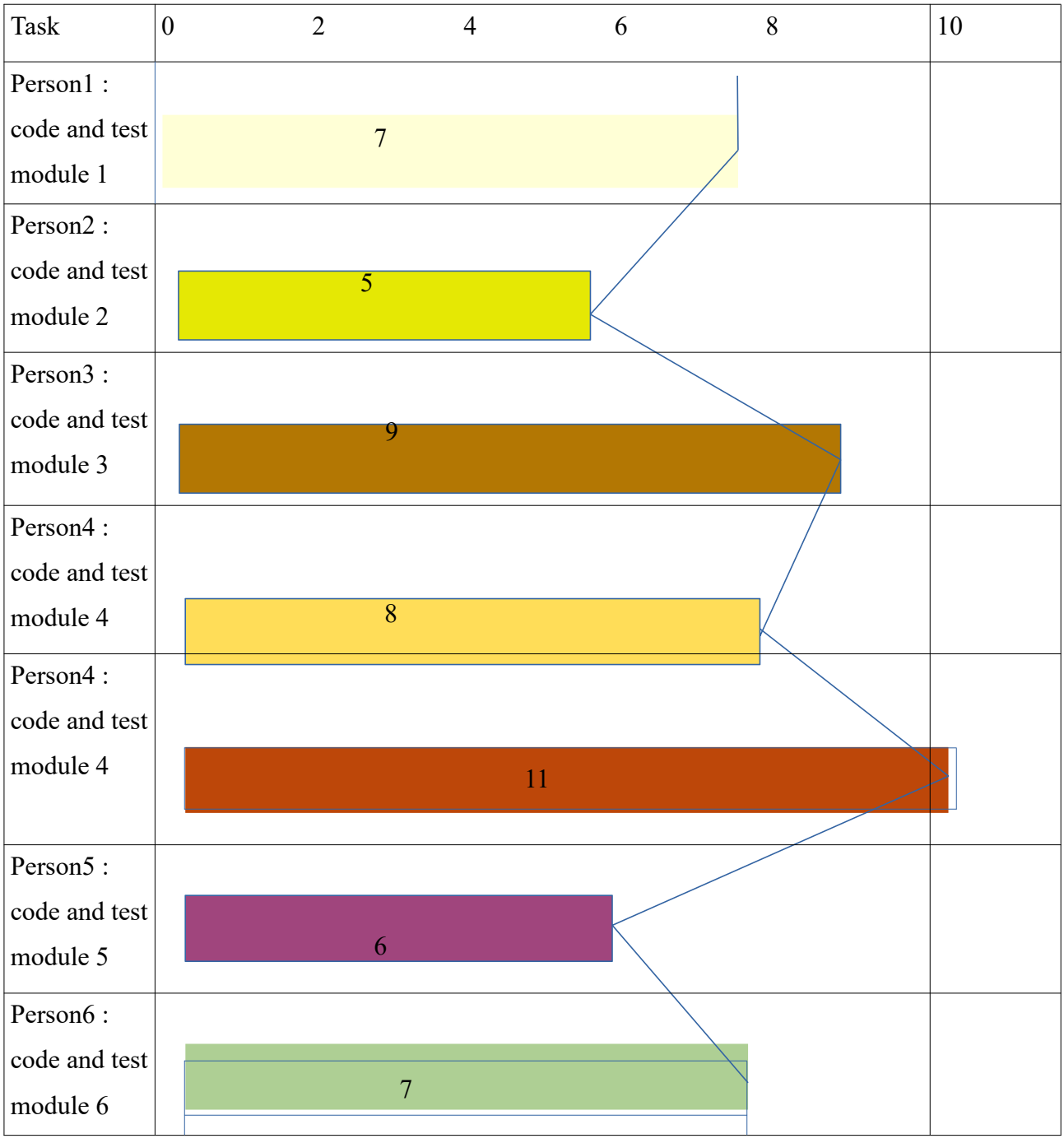
The data about the project progress should be presented in an effective way bythe project manager.

1. The GANTT Chart
2. The Slip Chart
3. The Timeline

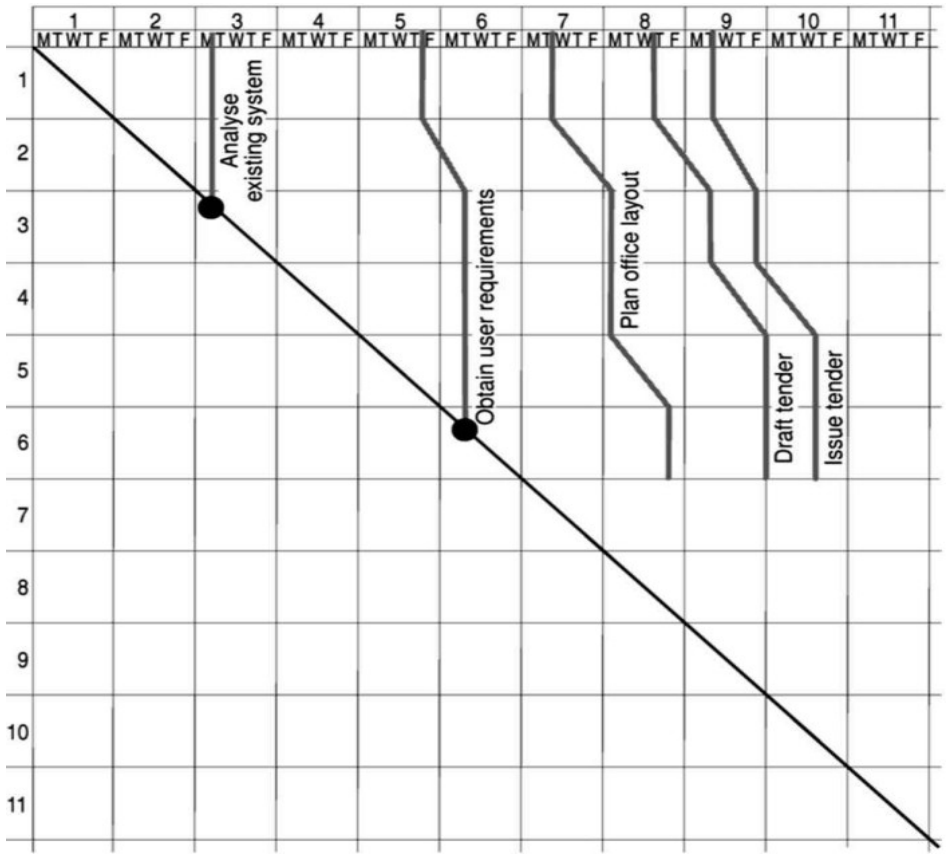
GANTT CHART:



SLIP CHART:


Task
0
2
4
6
8
10
Person1 : code and test module 1
7
Person2 : code and test module 2
5
Person3 : code and test module 3
9
Person4 : code and test module 4
8
Person4 : code and test module 4
11
Person5 : code and test module 5
6
Person6 : code and test module 6
7

TIME LINE :



COST MONITORING:

- Expenditure monitoring is an important component of project control. Not only in itself, but also because it provides an indication of the effort that has gone into (or at least been charged to) a project. A project might be ontime but only because more money has been spent on activities than originally budgeted.

Cost control :

- The budget table defines your baseline
- Actual costs define your current status
- It can be split over years (or reporting periods)

Items	Budgeted	Actual	Status	New budget
Hardware	15000	6000	8000	7000
software	6000	5000	3000	4000
Travel	2000	6000	-2000	1000
Project bfr	2000		4000	1000

Total	25,000	17,000	13,000	13,000

EARNED VALUE ANALYSIS:

- Earned Value Analysis (or EVA) is a calculation method that helps you see if your project is within budget and schedule given where you are right now in your project. It takes into consideration the work that has been accomplished so far and costs incurred until now, and puts that into perspective to the original budget and schedule (also known as baseline).

Now, calculation EVS for (task A) HARDWARE SELECTIONBAC-

₹30,000

AC-₹20,000

EV-₹18,000PV-

₹28,000

1.CV=EV-AC=18000-20000 = -2000

We are over budget by 2000 2.SV=EV-

PV=18000-28000 = -10000

We are behind schedule by 10000 3.CPI=EV/AC =

18000/20,000 = 0.9

For each ₹1 we spend we gain ₹0.9

4.SPI=EV/PV = 18000/28000 = 0.64

We are behind schedule by 36%

5.EAC=AC+((BAC-EV)/(CPI*SPI))

=20,000+((35000-18000)/(0.9*0.64))

=20000+(17000/0.576)

=20000+29513 EAC

=₹49,513

If we continue with the same efficiency rate we might end up with a total cost Of ₹49,513

Performance ratio:

- The Cost Performance Index (CPI) CPI=

EV/AC (Earned Value / Actual Cost)

- The Schedule Performance Index SPI=EV/PV

(Earned Value / Performed Value)

→ The Schedule Variance is measured in cost terms as EV-PV

→ It indicates the degree to which the value of the completed work differs fromthe planned work.

→ A work with a PV of $50,000 should has been completed by now. In fact,some of t work has not been done so that the EV is a 49,513. Calculate SV.

→ SV-EV-PV 49,513-

50000= - 487

A negative SV means the project is behind schedule.

MANAGINING CONTRACT :

A contract is a legally binding document between at least two parties that defines and governs the rights and duties of the parties to an agreement. Acontract is legally enforceable because it meets the requirements and approval of the law.

- There are five major processes :
  - 1. Acquisition
  - 2. Supply
  - 3. Operation
  - 4. Maintenance
  - 5. Development

Types of Contracts:

- Services
- Contract for completed software package
  - Bespoke system
  - Off-the-shelf
  - Customized-off-the-shelf (COTS)

- Fixed price contracts

  Advantages to customer

  - known expenditure
  - supplier motivated to be cost-effective

  Disadvantages

  - supplier will increase price to meet contingencies
  - difficult to modify requirements
  - cost of changes likely to be higher
  - threat to system quality

- Time and Materials contracts

  Advantages to customer

  - easy to change requirements
  - lack of price pressure can assist product quality

Disadvantages

- Customer liability - the customer absorbs all the risk associated with poorly defined or changing requirements
- Lack of incentive for supplier to be cost-effective
- Fixed price per delivered unit contracts

Advantages for customer

- customer understanding of how price is calculated
- comparability between different pricing schedules
- emerging functionality can be accounted for
- supplier incentive to be cost-effective
- Life cycle range

Disadvantages

- difficulties with software size measurement - may need independent FP counter
- changing (as opposed to new) requirements: how do you charge.

Stages in Contract Placement:

- Requirement Analysis
  - Mandatory
  - Desirable
- Evaluation Plan
- Invitation to Tender
- Evaluation of Proposals
  - Scrutiny of the proposal documents
  - Interviewing suppliers representatives
  - Demonstration
  - SITE visits
  - Practical tests

Different aspects to evaluate the proposals:

- The usability of an existing software application
- The usability of a software application which is yet to be designed and constructed.
- The maintenance costs of hardware to be supplied
- The time taken to respond to requests for software support Training.

Typical Terms of Contract:

- Definitions
- Form of agreement
- Goods and services to be supplied
  - ✓ Training
  - ✓ Documentation
  - ✓ Installation
  - ✓ Conversion of existing files
  - ✓ Maintenance agreements
  - ✓ Transitional insurance arrangements
- Ownership of the software
- Environment
- Customer commitments
- Acceptance procedures
- Standards
- Project and quality management
- Time table

MANAGING PEOPLE IN SOFTWARE ENVIRONMENTS

Main concerns with the Staffs

- Staff Selection
- Staff Development
- Staff Motivation
- Staff Well being

STEPWISE PLANNING FOR STAFF :

- ***Project Scope and Objectives (step-1)***
  - The company focuses upon imparting better comfortness to the staff. It helps the company to maintain a good relationship with their workers and enhance the work quality.
  - To establish a convenient communication.
  - Objectives can address the Health and Safety of staff during the project

- ***Project Infrastructure (Step-2)***
  - Establish the link between the staff and their strategic plan.
  - To identify the project staff team.
  - Although project leaders might have little control over organizational structure, they need to be aware of its implications.

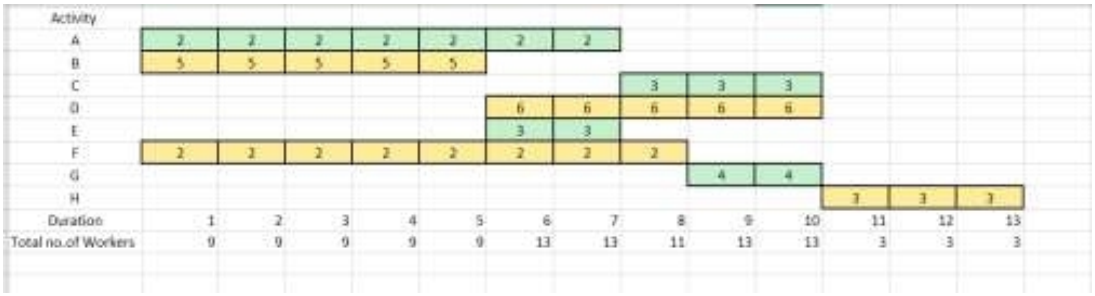
- ***Products and Activities (Step-4)***
  - Identify and describe staff work and activities.
  - Recognize product instances
    - Select members
    - Create team according to the need
    - Explain the activities to be done
    - Make them implement what we want
    - Get done
  - The scope and nature of activities can be set in such a way that it will enhance staff motivation.

- ***Activity Risks (Step-6)***
  - Activity Risks includes problems such as maintenance of staffs, some staffs may leave in middle of project, some may take long leave, which may likely affect the project.
  - In order to avoid such risk we should have alternate staffs for important phases in order to replace the one who is not available.

- In order to reduce such risks proper risk reduction plans should be adopted.
- This usually includes any risks to project success related to staffing.

❖ ***Allocate Resources(Step-7)***

- The qualities of individual members of staff should be taken into account in allocating staff to activities.



ORGANIZATIONAL BEHAVIOUR :

❖ ***Objectives :***

✓ We should select people with practical experience - important aspect of product management.

✓ We should select those with positivist approach and the best candidate for that job.

✓ Instruct them in the best methods.

✓ We will provide incentives in the form of higher wages to the best workers.

- These views emphasize on the financial basis of staff motivation, however, the other issues of motivation should be encouraged not just on such rewards.
- Theory X and Theory Y by Donald McGregor draws attention to the way that expectations influence behaviour.

❖ ***Theory X holds that :***

- The average human has an innate dislike of work.
- There is a need therefore for coercion, direction and control.
- People tend to avoid responsibility.

❖ ***Theory Y holds that :***

- Work is as natural as rest or play.
- External controller and coercion are not the only ways of bringing about effort directed towards an organization's ends.
- Commitment to objectives is a function of the rewards associated with their achievement.
- The average human can learn to accept and future seek responsibility.
- The capacity to exercise imagination and other creative qualities is widely distributed.

SELECTING THE RIGHT PERSON FOR THE JOB:

- It's a significant process to select the right person for the job.
- The best situation is to employ someone who is **suitable** candidates (can do the job)but not e**ligible!** (having the right qualifications) as they are likely to be cheaper and to stay in the job.

- **The Recruitment Process :**

  - ✓ **Create a job specification**
    - This includes the type of tasks to be carried out – Software designer, data analyst, developer, coder, tester , installer , maintenance staff ,etc., required for our project car rental management system.

  - ✓ **Create a job holder profile**
    - Characteristics of the person who could do the job – Mainly consists of educational qualification of the employees and pre - requisites (knowledge) For the selected field from job specifications.

- ✓ **Obtain applicants**
  - To identify the media that potential job holders are likely to consult – to make the requirements reach the applying candidates through media, ads and elicit CV's.

- ✓ **Examine CV's**
  - Do not waste everybody's time interviewing people whose CV clearly indicates are unsuitable for our project.

- ✓ **Conducting Interviews**
  - Selection processes could include aptitude tests, interviews ,examination of work portfolios. Make sure selection processes map to the job holder profile.

STAFF DEVELOPMENT :

Instruction in best methods :

✓The induction of new staff should be carefully planned – worst case where new recruit is simply ignored and not given any tasks may affect our project quality .

✓Good induction leads to new recruit becoming productive more quickly leading to the success of our project car rental management system, completing on before assigned time, thus pay a way in reducing the cost of the project.

✓Need to review staff progress frequently and provide feedback in order to create and maintain our project in a right way .

✓Need to identify training that could enhance staff effectiveness, producing an enormous result .

STAFF MOTIVATION:

- Lack of Motivation can often makeup for short falls in innate skills.
- *Taylor's approach* – we can provide financial incentives in order to motivate our employees if they did wonderful job .
- *Maslow's hierarchy of needs*:
  - ✧ Motivations vary from individual to individual
  - ✧ Hierarchy of needs – as lower ones fulfilled, higher ones emerge
  - ✧ Lowest level – food, shelter
  - ✧ Highest level – self-actualization.

Keeping our employees happy and fulfilling their needs, will also fulfil our requirements .

EXPECTANCY THEORY OF MOTIVATION:

According to the expectancy theory, identified 3 influences on motivation :

- *Expectancy* : we provide the belief that working harder leads to the better performance of the employees resulting in success of their work and our project .
- *Instrumentality* : we assure them the belief that better performance will be rewarded, in that case they will work more efficiently.
- *Perceived value* : of the reward.

HEALTHY AND SAFETY:

- ❖ Safety Policy document
- ❖ Responsibility of Safety
  - ✓ Top management must be committed to the safety policy;
  - ✓ The delegation of responsibilities for safety must be clear;
  - ✓ Job description should include definitions of duties related to safety;
  - ✓ Those to whom responsibilities are delegated must understand the responsibilities and agree to them;
  - ✓ Deployment of a safety officer in the support of experts in particular technical areas;
  - ✓ Consultation on safety;
  - ✓ An adequate budgeting for safety costs.

THE OLDHAM-HACKMAN JOB CHARACTERISTICS MODEL :

CHARACTERISTICS WHICH MAKE JOB MORE MEANINGFUL :

Skill variety - employees see jobs that are high end skill variety as challenging and give employees a greater sense of competence. No day is the same. There is variation in the work process and thereby demands for different skills.

Task identify - The task identity is clear.The employee completes a whole piece of work .i.e. if the designer started designing work he performs the job from start to finish with a visible outcome.

Task significance - An employees job is more important to company,and they understand the importance of their work in the our project of payroll management system .

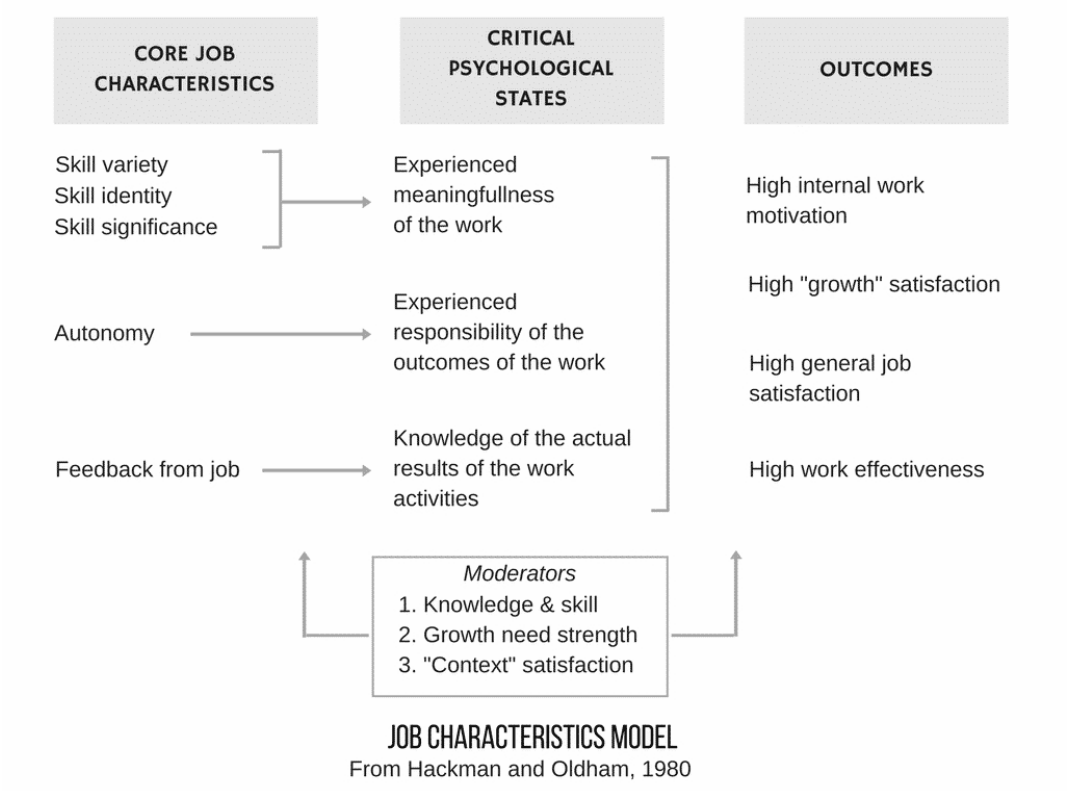
TWO FACTORS THAT CONTRIBUTE TO JOB SATISFACTION

Autonomy - An employee is considered highly autonomous when he/she schedules his own and decides on each requirement most effective approach without supervision for the completion of our project .

Feedback -We must provide the feedback of the employee about his performance effectively in order to motivate him.

METHODS OF IMPROVING MOTIVATION

- ✓ Set specific goals
- ✓ Provide feedback on the progress towards meeting our payroll system project goals
- ✓ Consider job design
- ✓ Measures to enhance
  - ■ Job enlargement
  - ■ Job enrichment



JOB CHARACTERISTICS MODEL
From Hackman and Oldham, 1980

Stress management :

- Project are about overcoming obstacles and achieving objectives, hence the project manager and team members may be under pressure.
- Many of our software developers are expected to work overtime on our projects.
- So we can reduce the reliance on overtime.
- Role ambiguity and role conflict can lead to stress.

WORKING IN TEAMS:

TEAM :

1. A team is created to carry out a joint assignment
2. By team, we mean groups of people who are working together.
3. As software systems are huge in nature, Software development task requires intense human mental activity
4. This human effort has to be shared between individual developers within team or between groups
5. Hence how the efforts of individual developers within team can be coordinated well is a major concern now

BECOMING A TEAM:

- ***Forming:*** The members of the group get to know each other and try to set up some ground rules about behaviour
- ***Storming***: Conflicts arise as various members of the group try to exert leadership and the group's methods of operation are being established
- ***Norming***: Conflicts are largely settled and a feeling of group identity emerges .
- ***Performing***: The emphasis is now on the tasks at hand
- ***Adjourning***: The group disbands .

A team need a balance of different types of people:

- ***The chair*****:** not necessarily brilliant leaders but they must be good at running meeting, being calm, strong but tolerant
- ***The plant*****:** someone who is essentially very good at generating ideas and potential solutions to problems
- ***The monitor-evaluator:*** good at evaluating ideas and potential solutions and helping to selecting the best one
- ***The shaper:*** rather a worrier, who helps to direct the team's attention to the important issues.

- ✧ ***The team worker*****:** skilled at creating a good working environment
- ✧ ***The resource investigator****:* adapt at finding resources in terms of both physical resources and information
- ✧ ***The complete-finisher:*** concerned with completing tasks
- ✧ ***The company worker:*** a good team player who is willing to undertake less attractive tasks if they are needed for team success

To be a good team member one must be able to:

- time your interventions, e.g. not overwhelm the others in the team;
- be flexible;
- be restrained;
- keep the common goals of the team in mind all the time

GROUP PERFORMANCE :

Works yield better results if carried out as a team

Categories of group tasks:

- ➢ **Additive tasks :** Each participant effort are added to get the final result
- ➢ **Compensatory task :** Errors of individuals are compensated by the input from others
- ➢ **Disjunctive tasks :** There is only one correct answer
- ➢ **Conjunctive :** Team members who are ahead help to meet the objective assisting those who are behind.

DECISION MAKING :

Categories :

- ◆ ***Structured***

Simple, routine decisions

- ◆ ***Unstructured***

More complex, requires a degree of creativity

❖ ***Mental obstacles to good decision making***

➢ **Faulty heuristics**

Based only on information, might be misleading

➢ **Escalation of commitment**

Once decided very difficult to alter

➢ **Information over load**

Too much of information may disturb.

Measure to reduce disadvantages of group decision making :

Decision can be categorized as being:

Structured : generally relatively simple, routine decisions where rules can be applied in a fairly straightforward way and

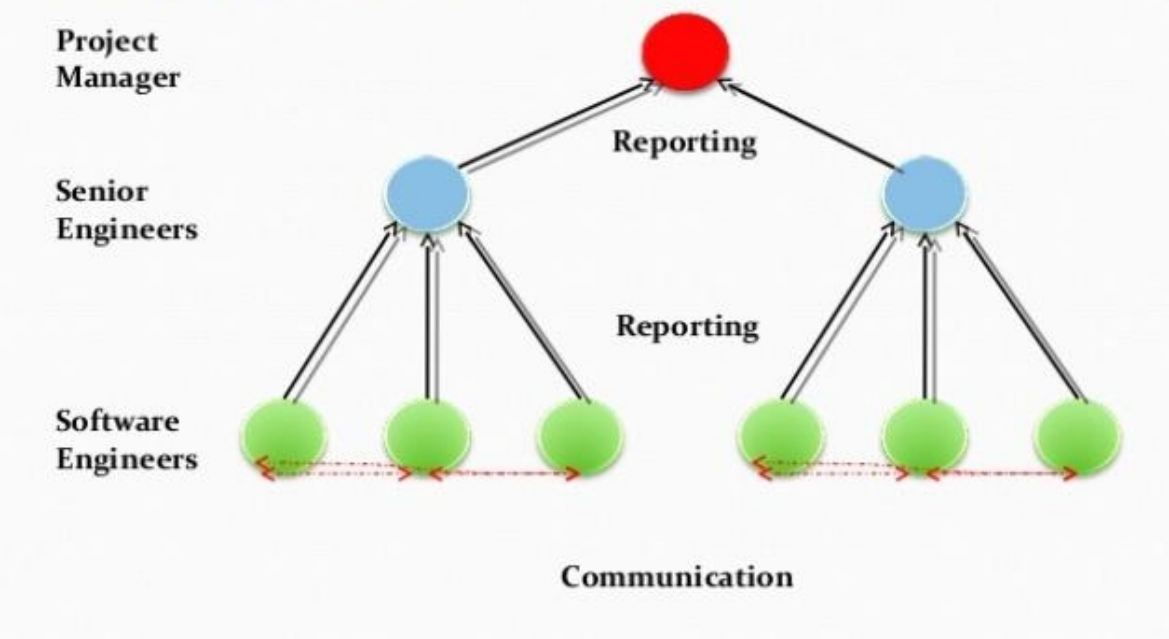
Unstructured : more complex and often requiring a degree of creativity.

Another way to categorize decisions is by the amount if risk and uncertainty that is involved.

To make it more efficient and effective, training members should follow a set procedure

Brainstorming techniques can help groups create more ideas.

TEAM STRUCTURE:



EGOLESS PROGRAMMING :

Programmers become over protective of their coded modules and do not share them. **Gerald Weinberg** introduced the concept of 'peer code reviews' which made the codes as a common property. **(egoless)**

PROJECTIZED STRUCTURE :

- Activities are arranged through portfolio and implement through project
- Project manager control the project
- The authority and power flows side ways

COMMUNICATION PLANS:

✓ Communication between project manager and team members.
✓ To complete the task before the deadline.
✓ To develop a user-friendly application.
✓ Complete the project successfully without any delay

LEADERSHIP :

- ***L-Leading***
- ***E-Efficiently in***
- ***A- All***
- ***D-Departments wit***
- ***E-Effective***
- ***R-Representation***

Employees managing car rental management system must be able to lead effectively. Depending on the seniority of their role, employees may need to coordinate a team of other employees, advise HR staff or be called upon to brief company leaders – and should be ready to do so with confidence.

Leadership involves:

- Establishing a clear vision
- Sharing that vision with others so that they will follow willingly
- Providing the information, knowledge and methods to realize that vision,
- Coordinating and balancing the conflicting interests of all members and stakeholders.

A Lack of Leadership can cause:

- Confusion
- Lack of Innovation High Turnover
- Loss of Talent and Resources
- Unethical Behavior
- Lack of Alignment with Company's vision
- Failed Projects
- Failed Programs

ABSTRACT :

- The aim of the project is to automate the work performed in the car rental management system like generating daily bookings, records of car available for booking, rental charges for cars, store record of the customer.
- This system helps to keep the information of Customer online. It allows the admin to check the customer information any time by using this system.
- If a driver decides to rent a car beforehand, they go to a car rental website or app and find a vehicle that meets their needs. Then, they book it and pay for the chosen rental period.
- An agent makes copies of their IDs, explains the terms of the lease, instructs them on any special features of the car, and finally hands them the keys.

GOALS :

- The system aims at the maintenance and management of the details of car rental agencies and its customers.
- This project makes the overall car service work easily accessible for all and reliable as well.
- This will be able to manage all the information about car, booking, insurance, customer details etc…
- Thus Car rental management system provides a total solution to the field of auto rental industry.

STAKEHOLDERS:

- Project Manager
- Users
- Car rental agencies
- Employees
- Admin
- Developer
- Designer
- Supplier

STEPWISE PROJECT PLANNING

- **STEP 1: Establishing project scope and objectives**

1.1)Identifying the objectives and measures of Effectiveness.

Online car rental management system is a user-friendly web based rental car booking system that is designed to help auto rental agencies to run their business in a more effective and profitable way.

1.2) Establishing a project authority.

1.3) Identify the stakeholders in the project and their interests.

The stake holders like users, agencies, employee, developer, organizer.

1.4) Modify objectives in the light of stakeholder analysis.

1.5) Establish methods of communication with all parties

So we have to maintain a good software and proper communication between the user and the developer.

STEP 2 : Establishing the project infrastructure

2.1) Establish link between project and any strategic plan

The customer needs this application to rent the car that they like. And agency needs this application to rent the cars available.

2.2) Identify installation and procedures

- It can be installed through internet.
- Installation process is quite easier and is highly secure too.

2.3) Identify project team organization

Then we have to divide the work into sub modules and assign the work to the employees where they fit in.

STEP 3: Analysis of project characteristics

- **3.1) Distinguish the project**
  - It is a product based project.

3.2) Analyse other projects characteristics

- User can book the car either online or also on the spot.
- They can also cancel the booking before two days.

3.3) Identify high level project risks

- In this project maintaining the database and booking and canceling functionalities fall under high level risk prone areas.

3.4) Take into account user requirements concerning implementation

The client requirement is that the application should provide all the information of the past orders that the user has made and it should also show the total amount that the user has saved by using this application through the discounts that the app offers.

STEP 3: Analysis of project characteristics

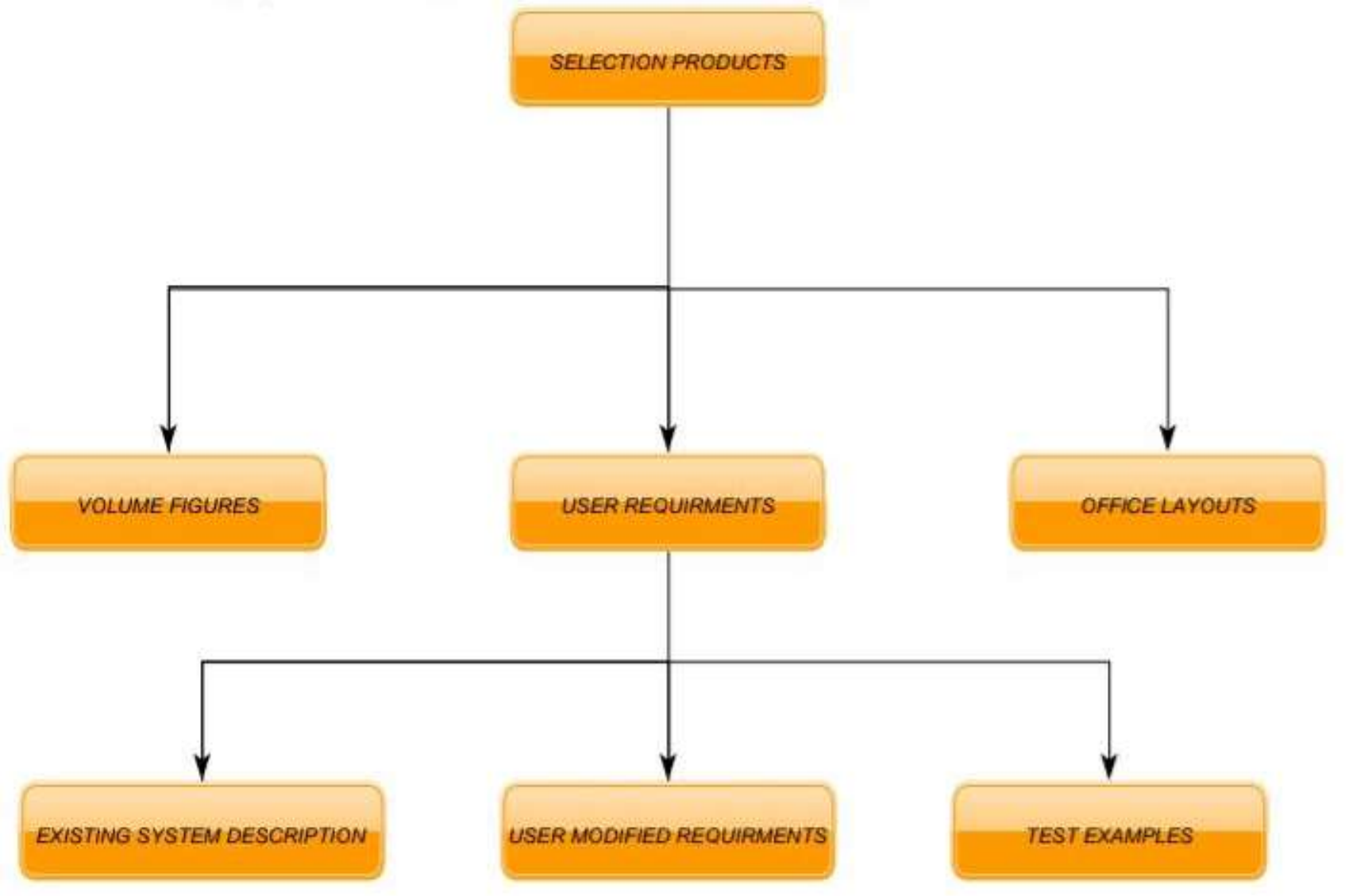
3.5) Select general life cycle approach

- For this type of project Incremental life cycle process model is suitable.
- Because in this we can add extra features like changing the car, for extension of time, quick check out etc.

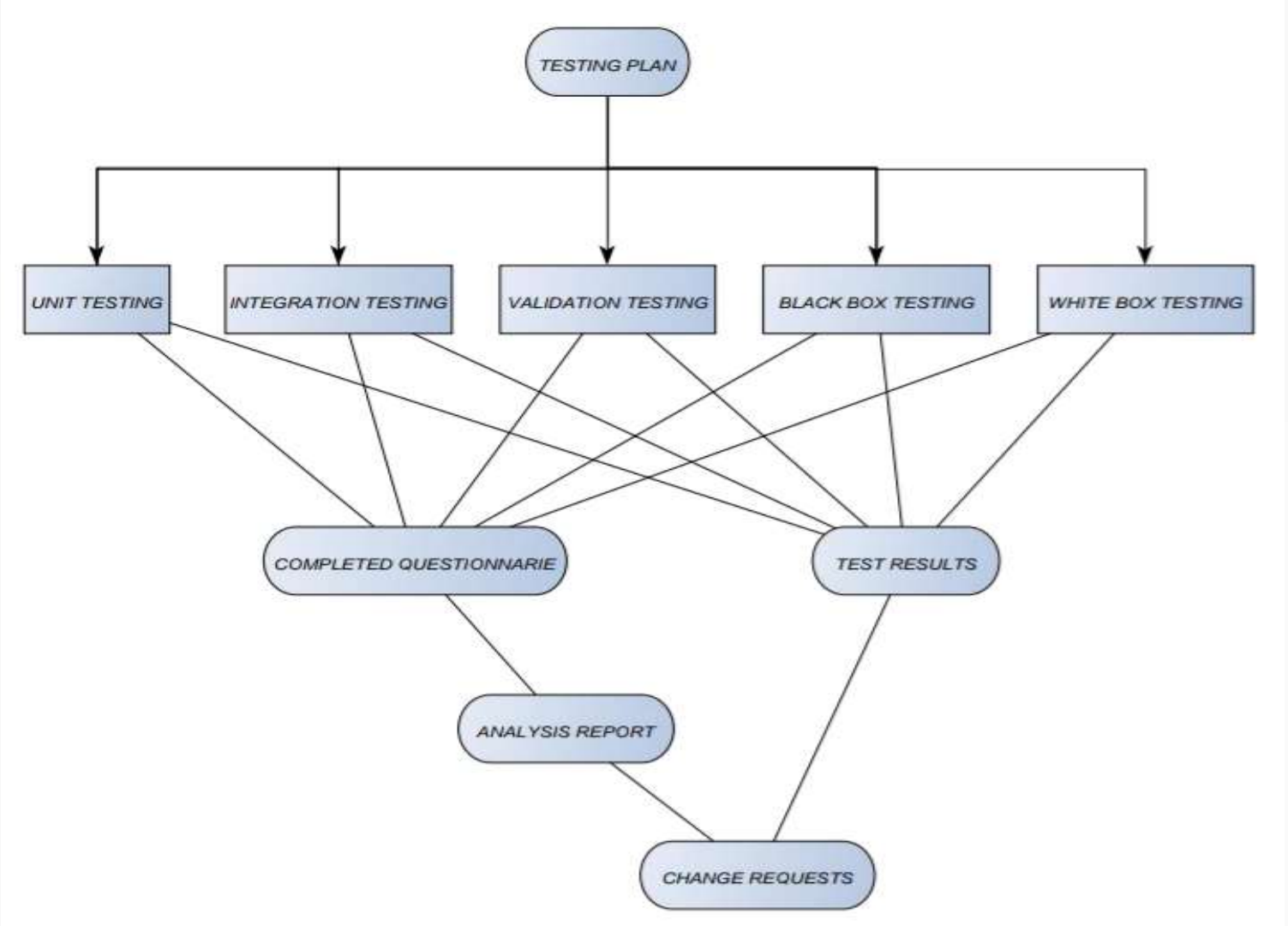
3.6) Review overall resource estimates

It does increase the cost a little bit because of blockchain technology and by using the iterative model but it is worth it.

STEP 4: Identifying project products and activities



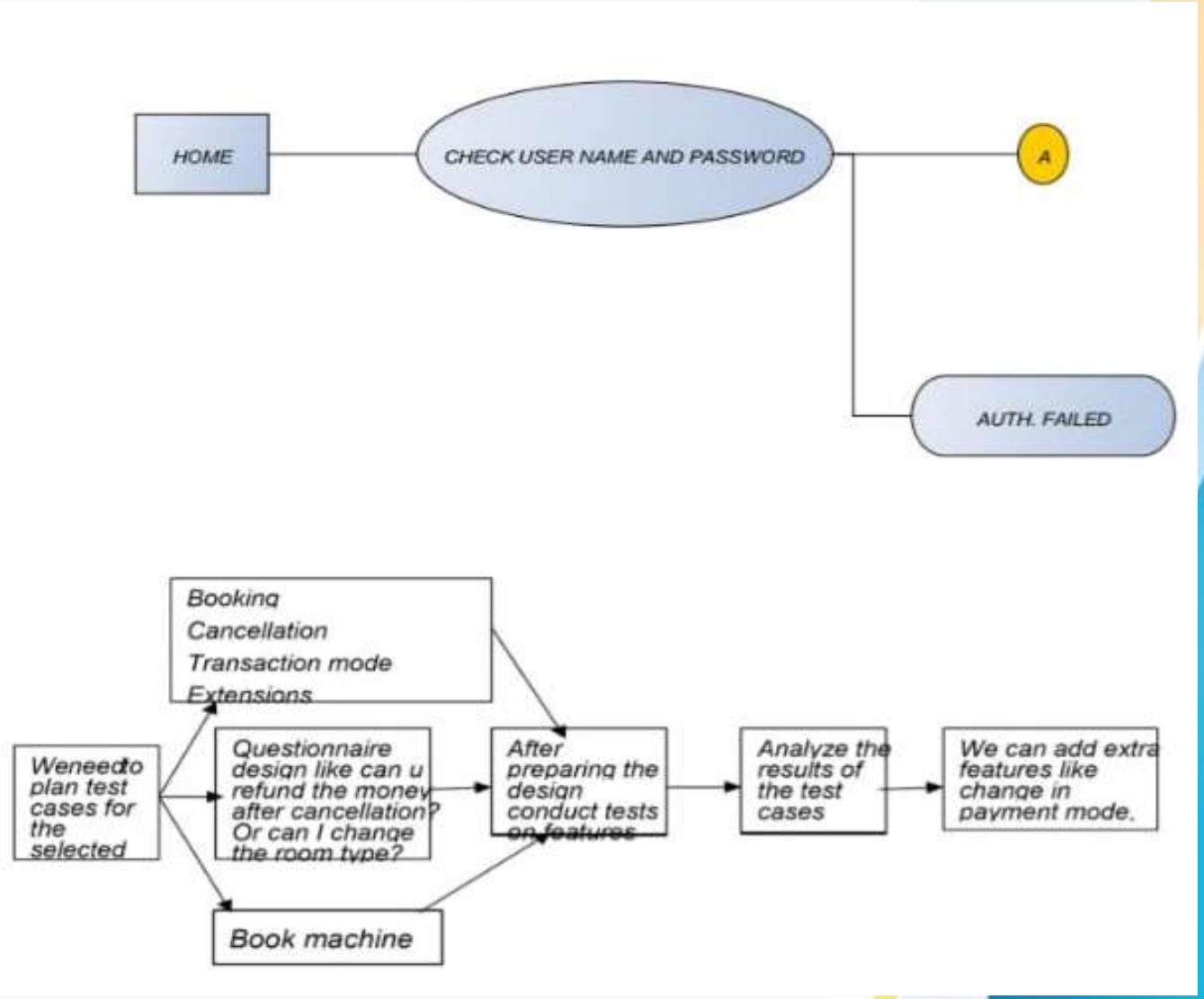
4.2) Document generic product flows :



4.3) Recognize product instances

• Here first of all we want to take care of our customers and their needs and then security for our system.

4.4) Produce ideal activity network



4.5) Modify the ideas to take into account for stages and checkpoints

- The basic product flow will be like after logging in to our website it will be displaying the car model and make year, capacity, check in and check out details, any additional features, payment mode and status of the cars available and payment status.
- So if we want modify any feature according to user’s need, then we have to divide it into stages and checkpoints.

STEP 5: Estimate the effort for each activity

- i. Login credentials: Highest Priority.
- ii. Online security: High Priority.
- iii.Payment verification: High Priority.
- iv. Order cancellation and cashback: High priority
- v. User Interface: Low Priority

STEP 6: Identify activity risks

6.1) Identify and quantity risks for activities :

- In online car rental management, the highly risk prone area is security and database back up .
- In booking and cancellation of cars, there might be a risk of wrong details recorded and the correct details may not get updated.
- There may be a risk in payment mode and transactions too .

6.2) Plan risk reduction and contingency measures :

- We have to maintain a proper backup system and security standards.
- On booking the cars we have to enter all the details correct.

6.3) Adjust overall plan and estimate to take account on risks

- So by planning these activities we can adjust the risk occurring by somewhat better extent.

STEP 7: Allocate the resources

7.1) Identify and allocate resources to activities

- Design - 2 Members, Development - 4 Members and Testing - 2 Members.
- Then we have to revise the plans and estimate the allocated resources activities.
- By using incremental model we can allocate and add the features to our system.

7.2) Revise plans and estimate to take into account resource constraints

- After revising all the plans we can deliver the project to the users.

STEP 8: Review or Publicize plan

- By planning, the proper project planning to product delivery we can deliver a quality product to the end users. Documenting our whole planning and obtaining an agreement from the project management to handle it to the next phase is required. So that we can review all the aspects of our project features and can do a quality project.

- **STEP 9: Execute plan :**

- In this step we have to execute our plan based on the document we have prepared. If any error is found then we have to review the features of our product and then execute the plan again.

- **STEP 10: Lower Level Plans :**

- In this phase we will take the responses and reviews of the lower level people like end users and stakeholders. We will develop the plan according to their needs. Then we will execute those plans and review the aspects of the features.

- STRATEGIC ASSESSMENT:

- **Well defined goals:**
- The online car rental system allows the user of the system access all the details such as location , name, etc..
- It helps the customer to book tickets for there distinction place and help them to reach safely on their requirements
- The system can also be used for both professional and business trips.
- This system maintains centralized repository to make necessary travel from place to place arrangement and to retrieve information easily.

Timing:

- It approximately takes two months

RESOURCING:

- If we want to add any additional resources like refund, spot payment instead of net banking we can allocate those features based on the users point of view
- Then we have to revise the route plans and estimate the allocated resources activities
- By using incremental model we can allocate and add the features to our system

TECHNICAL ASSESSMENT:

The car rental Management System is a web based application. The main purpose of "Car Rental Management System" is to provide a convenient and Easy way for a customer to book rental car at any time for their purpose of needs. To run this System Software and Hardware Requirements are necessary. Requirements which are needed are given below briefly,

Hardware Requirements:

Processor At least 2.0 GHZ
RAM- At least 2GB

Software Requirements:

Operating System - Windows.
Front End - PHP, HTML, CSS, JavaScript.
Back End - PHPmyadmin
Web Browser - Google Chrome, Firefox, Bing and any compatible update browser

COST -BENEFIT ANALYSIS:

Development cost:

Salary for all the workers and expenditures of transport charges are involved in this.

Setup costs:

Includes the cost of implementation of system such as hardware requirements, software requirements and also file conversion, recruitment and employee training.

Operational cost:

cost required to operate system, after it is installed.

Three categories of benefits:

Direct benefits:

- Directly obtained benefit by making use of the online car rental management system.

Accessible indirect benefits:

- These benefits are obtained due to updation or upgrading the performance of current system. It is also referred as “secondary benefits”.

  Example: “use of user – friendly screen”, which promotes reduction in errors, thus increases the benefit.

Intangible benefits:

- These benefits are longer term, difficult to quantify. It is also referred as “indirect benefits”.

  Example: Enhanced job interest leads reduction of staff turnover, inturn leads to the lower recruitment costs.

NET PROFIT :

YEAR	CASH FLOW
0	-6,00,000
1	1,00,000
2	1,00,000
3	2,00,000
4	2,00,000
5	3,00,000
NET PROFIT	**3,00,000**

‘Year 0’ represents all costs before system is operation . ‘Cash-flow ‘

Is value of income less outgoing .Net profit value of all the cash-flows for the lifeline of the application .

COST BENEFIT ANALYSIS-PAYBACK PERIOD :

YEAR	CASH-FLOW	ACCUMULATED
0	-6,00,000	-6,00,000
1	1,00,000	-5,00,000
2	1,00,000	-4,00,000
3	2,00,000	-2,00,000
4	2,00,000	0
5	3,00,000	3,00,000

COST BENEFIT ANALYSIS – DISCOUNT FACTOR AND NET PRESENT VALUE :

- DISCOUNT FACTOR:
- Discount factor = 1 / (1 +r)^t
- r is the interest rate (10% is 0.10)
- t is the number of years.
- In the case of 10% rate,
- 0 year discount factor = 1 / (1 + 0.10)^ 0 = 1.0000
- 1 year discount factor = 1 / (1 + 0.10)^ 1 = 0.9091
- 2 year discount factor = 1 / (1 + 0.10)^ 2 = 0.8264
- 3 year discount factor = 1 / (1 + 0.10)^ 3 = 0.7513
- 4 year discount factor = 1 / (1 + 0.10)^ 4 = 0.6830
- 5 year discount factor = 1 / (1 + 0.10)^ 5 = 0.6209

RISK ANALYSIS:

In online car rental management system, the highly risk prone area is security and database back up.

- In Most booking and cancellation of the car there might be a risk of wrong details recorded and the correct details may not get updated.
- In payment mode and transactions also there may be a risk of data breach.

  So we have to maintain a proper backup system and security standards.
- On booking the car we have to enter our all correct details.
- So by planning these activities we can avoid the occurrence of risk to somewhat better extent.

ACTIVITY PLANING :

- An activity is typically one stage of a project management plan.
- Each activity has a defined start and end, as well as a deadline or time period within which it must be completed.
- Each activity consists of one or more actions that, upon completion, will lead to the next project stage

THE ACTIVITY PLANNING ARE

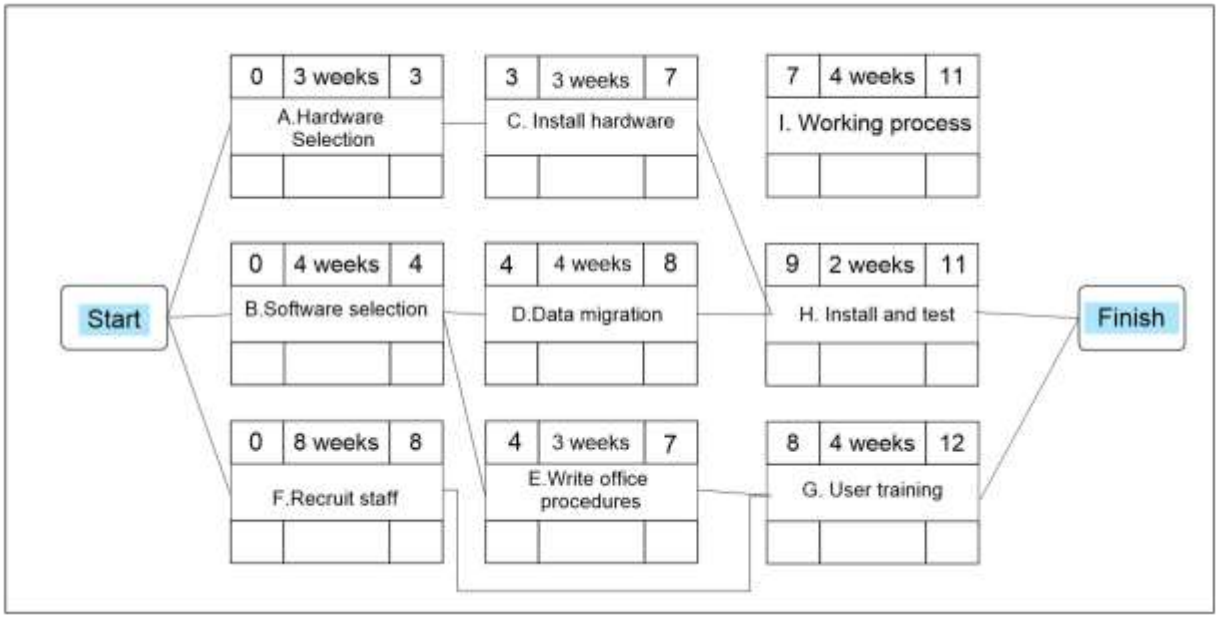
- Feasibility Assessment
- Resource Allocation
- Detailed costing
- Motivation
- Coordination

The final outcome of the planning process of the car rental system is :

A - Overall design
B - Specify module 1
C - Specify module 2
D - Specify module 3
E - Code module 1
F - Code module 2
G - Code module 3
H - Integration testing
I - System testing

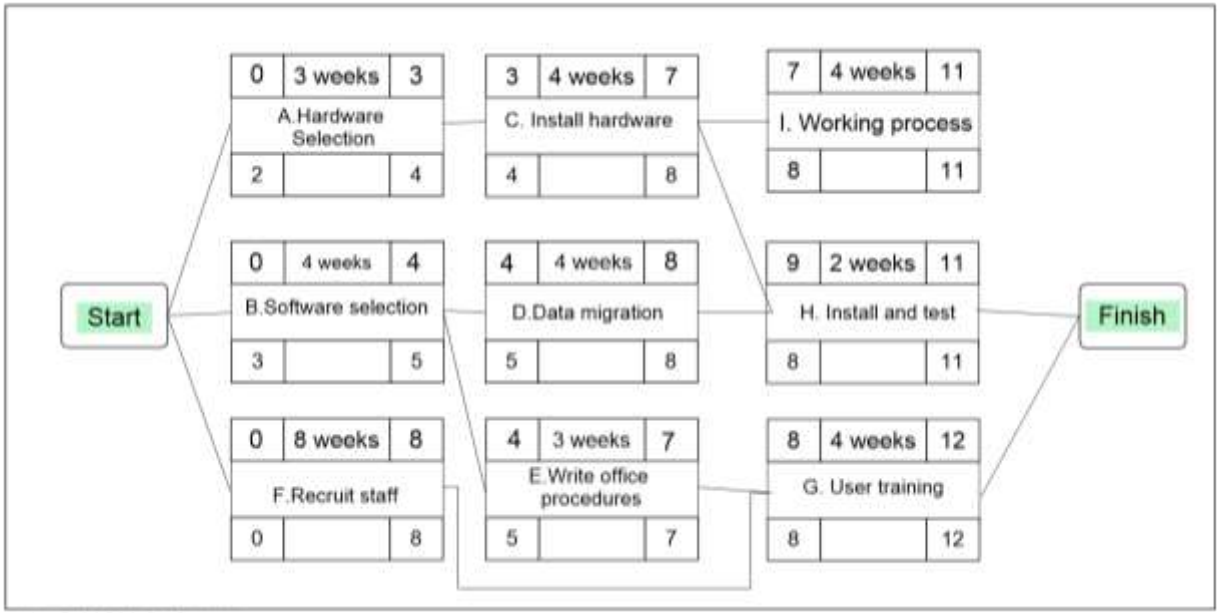
Project specification with activity duration :

Forward pass :



Project specification with activity duration :

Backward pass :

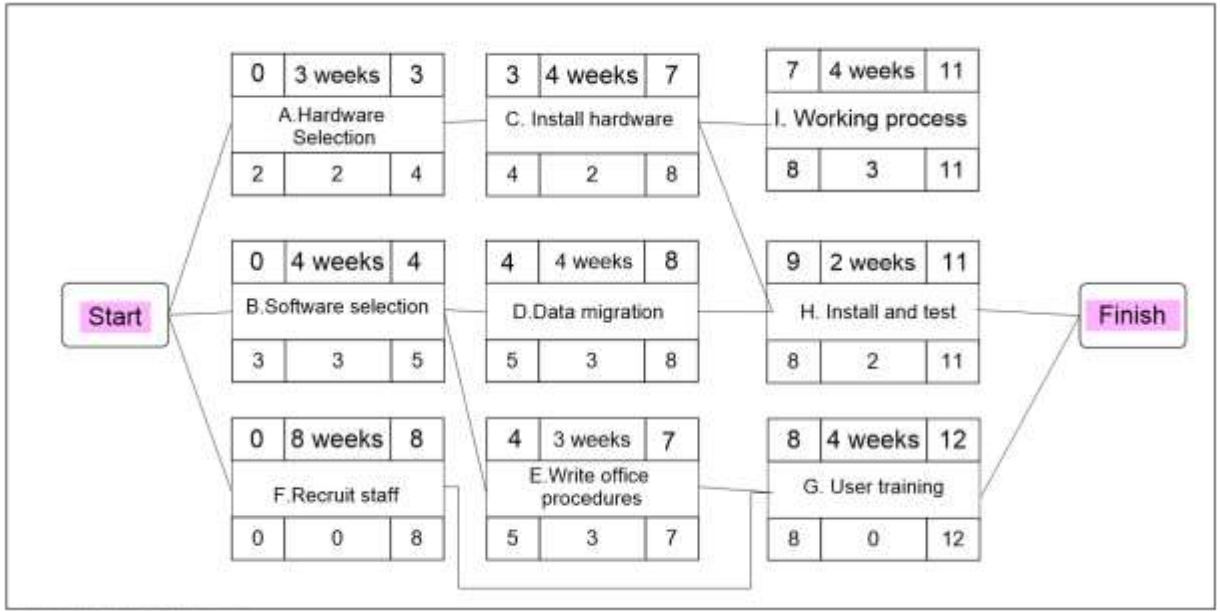


Identifying Critical Path :

- The one path that defines through the network that defines the duration of the project
- Any delay to any activity on this critical path will delay the completion of the project.
- It determines the project completion date and the path within the estimated time.

Critical path

- Here is the detailed view of critical path in car rental system :



Estimated activity durations and precedence requirements:

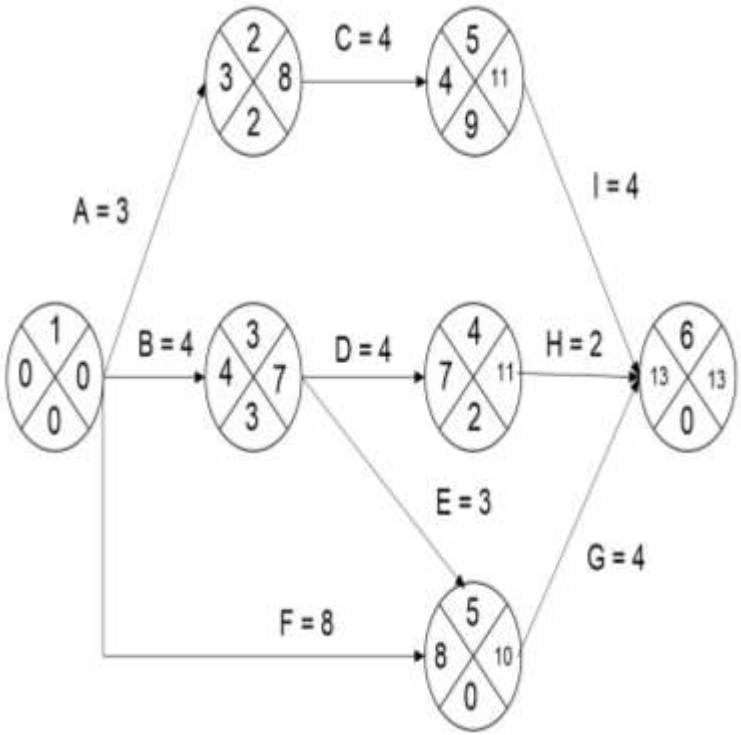
Activity	Duration (Weeks)	Precedents
A	3	
B	4	
C	4	A
D	4	B
E	3	B
F	8	
G	4	E,F
H	2	C,D
I	4	C

Network Analysis :

- The network analysis is a method used to analyze, control and monitoring of business processes and workflows.
- The network analysis enables project managers to take various factors into account when creating a project plan:

1. Dependencies between activities
2. Buffer times between activities
3. Earliest and latest start and end dates
4. Duration of activities
5. Critical Path

Network model diagram :



Activity	Duration (weeks)	Earliest start date	Latest start date	Earliest finish date	Latest finish
A	3	0	2	3	8
B	4	0	3	4	7
C	4	2	8	6	11
D	4	2	7	6	11
E	3	2	7	5	10
F	8	0	0	8	10
G	4	4	10	8	13
H	2	5	11	7	13
I	4	5	11	9	13

RISK MANAGEMENT :

- Process of minimizing any potential problems that may negatively impact a project's timetable.
- Risks are events that could occur, and we may not be able to tell when.
- Because of this uncertainty, project risk requires preparation in order to manage them efficiently.

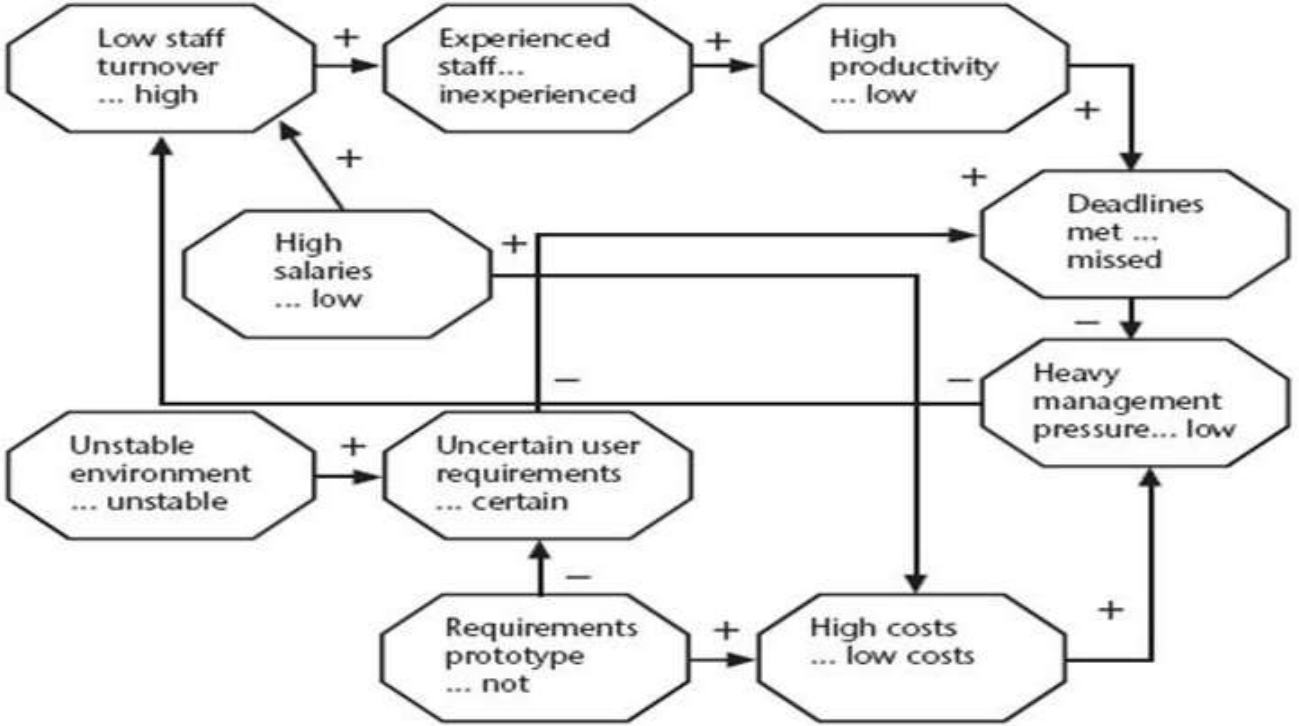
Common Risks :

- Software never completed or delivered late.
- Project canceled after design stage.
- Development budget exceeded.
- Maintenance costs higher than estimated.
- Response time targets not met.

RISK IDENTIFICATION :

- Personnel shortfalls
- Unrealistic time and cost estimates
- Developing the wrong software functions
- Developing the wrong user interface
- Gold Plating (inclusion of features)
- Late changes to requirements
- Real time performance problems
- Development technically too difficult.

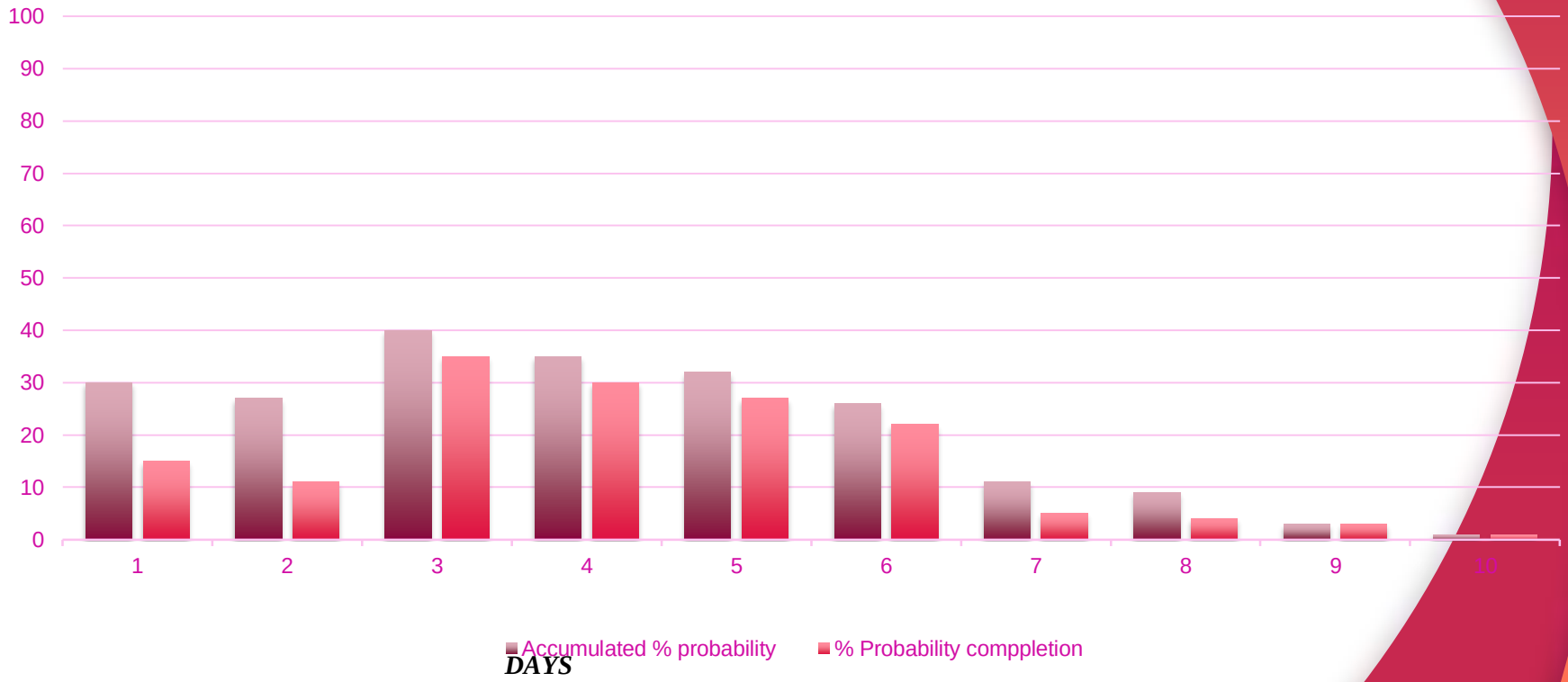
CAUSAL MAPPING - INTERVENTIONS :



RISK ASSESSMENT :

- Risk exposure (RE) = (potential damage) X (probability of occurrence)
- Potential damage : External Hard disks (HDD) failure in systems.
- Probability : 10% - 25% (approximately many chances)
- 25% = 0.25 (25 in hundred chance)
- RE = 50,000 Rs X 0.25 = Rs. 12,500

RISK ASSESSMENT - PROBABILITY CHART :



RISK PROBABILITY : QUALITY DESCRIPTORS

PROBABILTY LEVEL	*RISK*
HIGH	**Software never completed or delivered**
HIGH	**Project canceled after design stage**
SIGNIFICANT	**Development budget exceeded > 20%**
MODERATE	**Software delivered late**
LOW	**Development budget exceeded <= 20%**
LOW	**Response time targets not met**
LOW	**Real time performance problem**

PROBABILTY IMPACT MATRIX :

5	*10*	*15R1*	*20*	*25*	*5 Extreme*	IMPACT
4	*8*	*12*	*16R2*	*20R3*	*4 Significant*	
3	*6*	*9*	*12R4*	*15*	*3 Moderate*	
2R6	*4R5*	*6*	*8*	*10*	*2 Low*	
1	*2R7*	*3*	*4*	*5*	*1 Negligible*	
Negligible	*Low*	*Moderate*	*Significant*	*Extreme*		
PROBABILITY						

RISK PLANNING :

Risk Acceptance :

Risk acceptance is absolutely not possible, as the cost of avoiding risk may be greater than the actual cost.

Risk Avoidance :

Risk avoidance will be carried out since the environment in which the risk occurs will be avoided.

Risk Reduction and Mitigation :

Risk reduction is best among these planning. Risk reduction is done by creating prototypes which will greatly reduce the risk of incorrect requirements.

RISK REDUCTION LEVERAGE :

Risk reduction leverage = (RE_{before} - RE_{after}) / (cost of risk reduction)

RE_{before} = Risk exposure before risk reduction
External hard disk failure (HDD) in systems.
RE_{before} = 25% of chance causes Rs.12,500 damage.

RE_{after} = Risk exposure after reduction.
External hard disk (HDD) in systems.
RE_{after} = Maintenance of Hard disks costing Rs.1000 reduces probability of HDD failure to 15%.

RRL = (25% of Rs.12,500) – (15% of Rs.12,500) / Rs.1000
= (3125 – 1875) / 1000
= 1250 / 1000

RRL = 1.25

Since **RRL > 0.3 therefore its worth doing.**

RESOURCES ALLOCATION

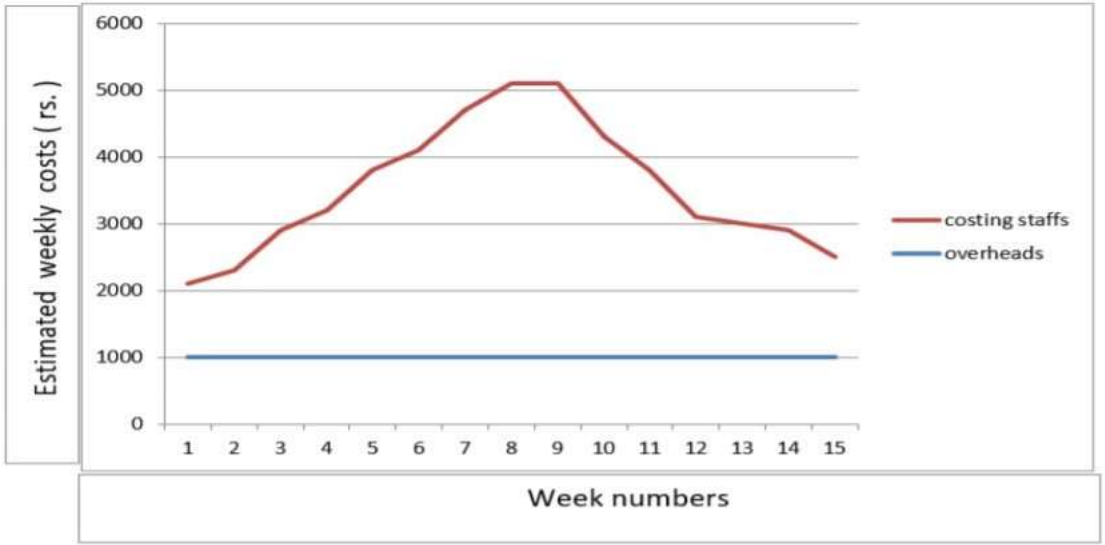
COST SCHEDULE:

- To produce the detailed cost schedule showing weekly or monthly costs over the life of the project.
- Cost categories: Staff costs, Overheads and Usage charges.

STAFF COST :

Staff Member :	Wages per day (in rupees)
1. Folk	600
2. Due	550
3. Aari	500
4. Sree	470
5. Vino	500

WEEKLY PROJECT COST :

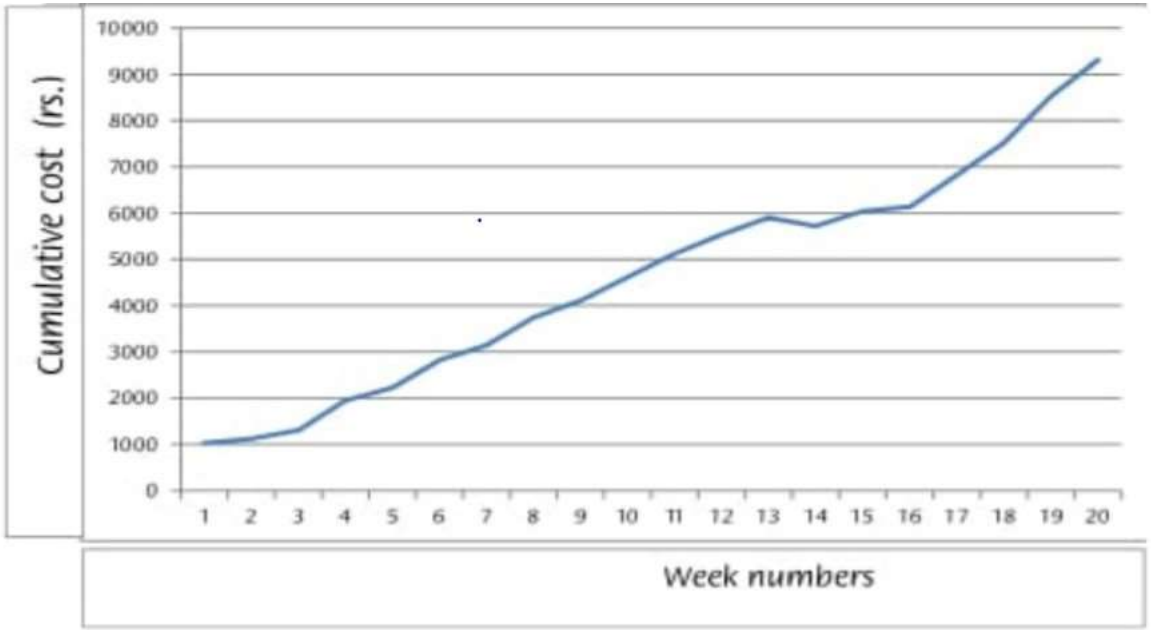


•The qualities of individual members of staff should be taken into account in allocating staff to activities.

•In order to avoid risk we should have alternate staffs for important phases. If one not available them we can go with the other.

CUMMULATIVE PROJECT COST :

Cumulative cost equals cumulative cost for the previous period plus scheduled cost for this period. Best Uses Add the Cumulative Cost field to the timephased portion of the Task Usage view to display the running total cost for the task, combining actual and remaining costs on an ongoing basis.



MONITORING AND CONTROL

FRAMEWORK CREATION:

•Exercising control over a project and ensuring that targets are met is a matter of regular monitoring.

•To find out what is happening and compare with targets.

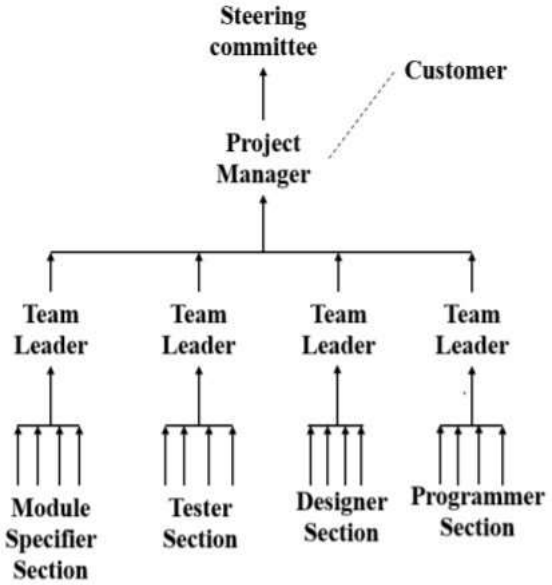
PROJECT CONTROL CYCLE:

RESPONSIBILITY:

- Project steering committee
- Project board

Reporting formal or informal

PROJECT REPORTING STRUCTURE:



Time sheet :

Project	Activity Code	Description	Hours in this week	% Done	Scheduled completion	Estimated completion
P23	A243	Code made A3	12	30	20-05-21	20-05-21
P43	0771	Document taken on	20	90	6-5-21	8-5-21

Total Rechargeable hours : 32

Non – Rechargeable hours :

Code	Description	Hours	Authentification
L12	Hours in leave	2	Authorized by Aravind

Total non - rechargeable hours : 2

Frequency of reporting:

The higher the management level then generally the longer the gaps between checkpoints.

COLLECTING DATA :

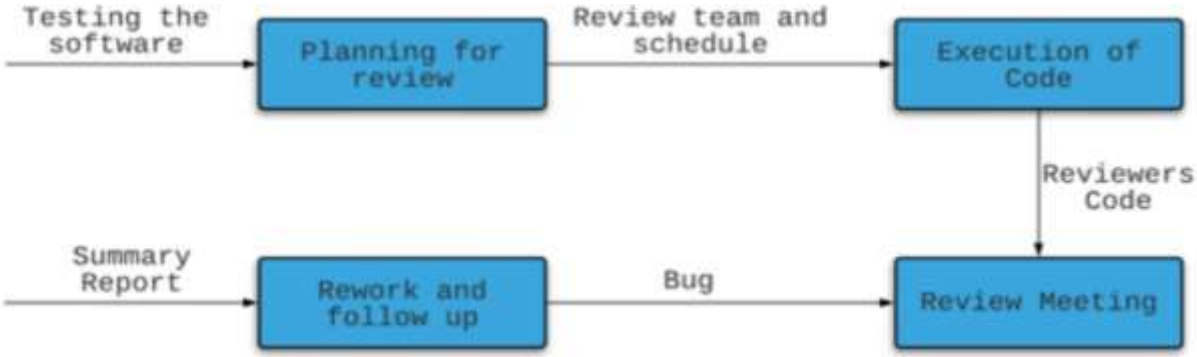
•As a rule, managers will try to break down long activities into more controllable tasks of one or two weeks duration.
•However, it will still be necessary to gather information about partially completed activities and, in particular, forecasts of how much work is left to be completed.
•It can be difficult to make such forecasts accurately

RED/AMBER/GREEN (RAG) REPORT:

Week number	8	9	10				
Activity summary	G	A	R				

Screen handling procedure	G	G	A	G			
Complication	G	G	G	R			
Test data runs	G	G	G	R			
Program documentation	G	G	G	R			

REVIEW ROLES AND PROCESS :



PROJECT TERMINATION PROCESS:

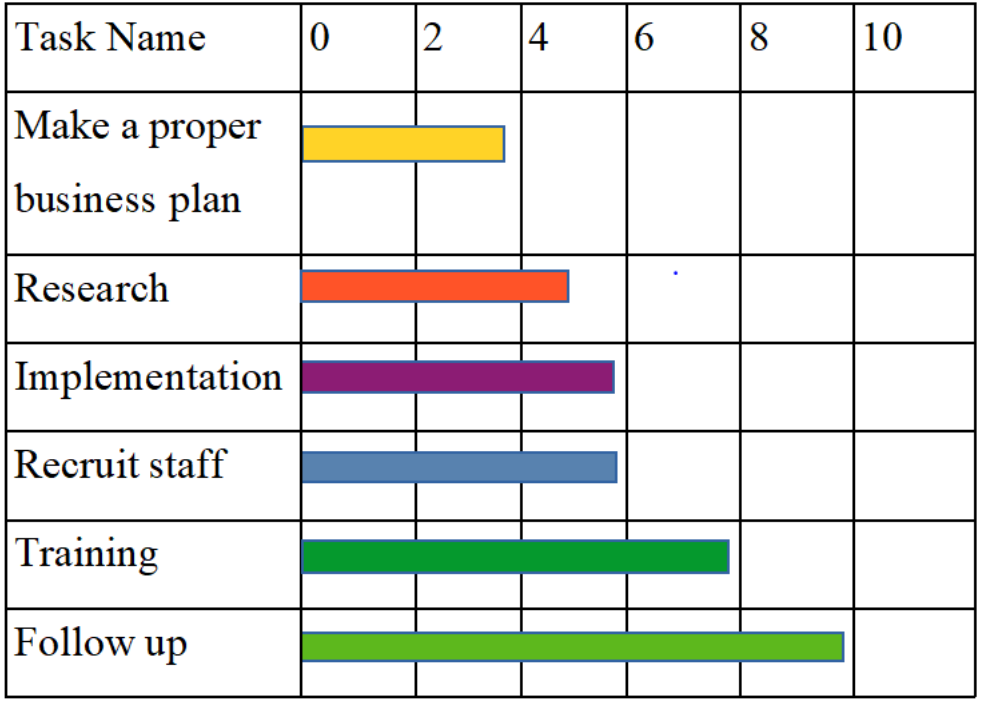
Project Termination Review:

Project termination decided by Manager Reasons for Project Termination:

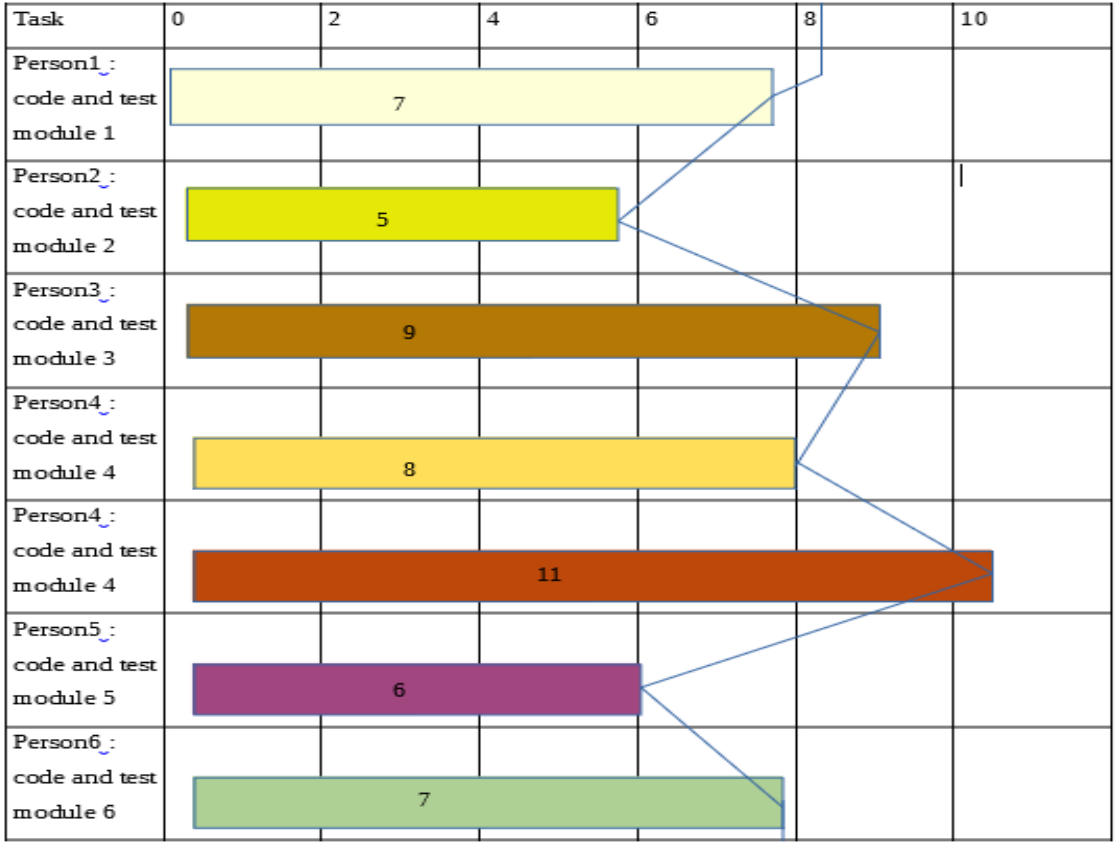
- Project is completed successfully and handed over to the customer
- Incomplete requirements

VISUALIZING PROCESS :

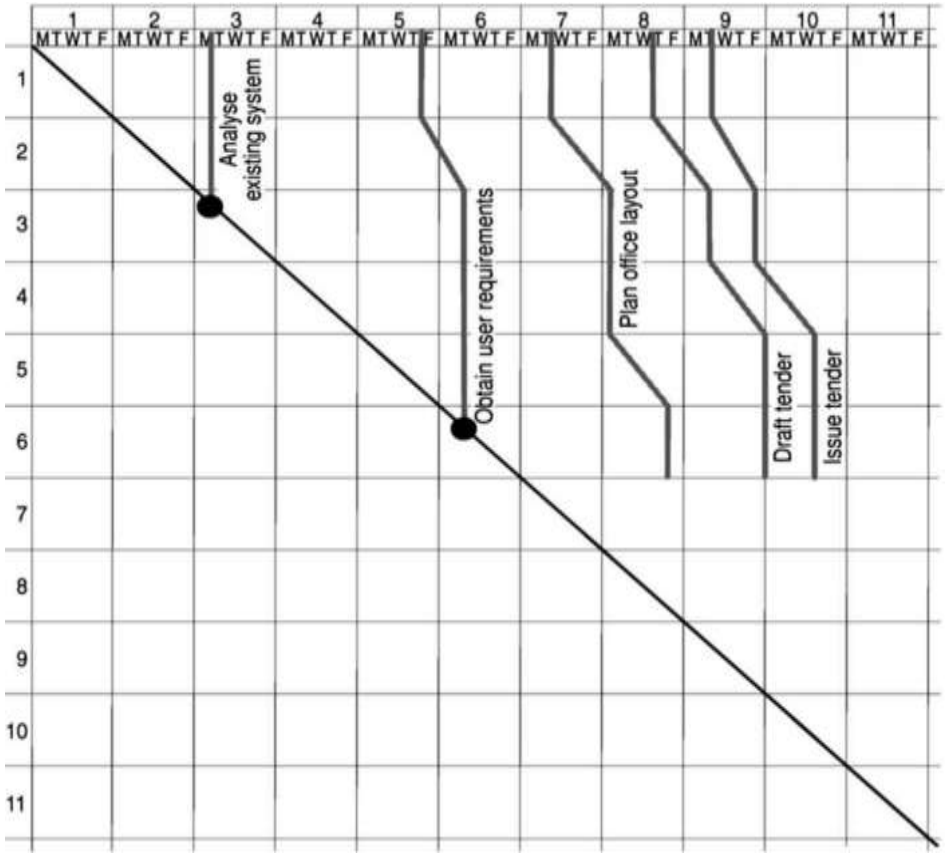
GANTT CHART:



SLIP CHART:


Task
0
2
4
6
8
10
Person1 : code and test module 1
7
Person2 : code and test module 2
5
Person3 : code and test module 3
9
Person4 : code and test module 4
8
Person4 : code and test module 4
11
Person5 : code and test module 5
6
Person6 : code and test module 6
7

TIME LINE :


1 2 3 4 5 6 7 8 9 10 11
M T W T F
1
2
3
4
5
6
7
8
9
10
11
Analyse existing system
Obtain user requirements
Plan office layout
Draft tender
Issue tender

Cost control :

- The budget table defines your baseline
- Actual costs define your current status
- It can be split over years (or reporting periods)

Items	Budgeted	Actual	Status	New budget
Hardware	15000	6000	8000	7000
software	6000	5000	3000	4000
Travel	2000	6000	-2000	1000
Project bfr	2000		4000	1000
Total	25,000	17,000	13,000	13,000

EARNED VALUE ANALYSIS:

EAC=AC+((BAC-EV)/(CPI*SPI))

=20,000+((35000-18000)/(0.9*0.64))

=20000+(17000/0.576)

=20000+29513 EAC

=₹49,513

If we continue with the same efficiency rate we might end up with a total cost Of ₹49,513.

Performance ratio:

SPI=EV/PV (Earned Value / Performed Value)

SV-EV-PV 49,513-50000= - 487

A negative SV means the project is behind schedule

MANAGING CONTRACTS :

- A contract is a legally binding document between at least two parties that defines and governs the rights and duties of the parties to an agreement. A contract is legally enforceable because it meets the requirements and approval of the law.
- There are five major processes :
  - 1. Acquisition
  - 2. Supply
  - 3. Operation
  - 4. Maintenance

Types of Contracts:

➢Services

➢Contract for completed software package

Fixed price contracts

Time and Materials contracts

Stages in Contract Placement

Different aspects to evaluate the proposals:

➢The usability of an existing software application

The usability of a software application which is yet to be designed and constructed.

Typical Terms of Contract:

- Ownership of the software
- Environment
- Customer commitments
- Acceptance procedures
- Standards
- Project and quality management
- Time table
- Price and payment method
- Miscellaneous legal requirements
- Definitions
- Form of agreement
- Goods and services to be supplied

MANAGING PEOPLE IN SOFTWARE ENVIRONMENTS

Main concerns with the Staffs

- Staff Selection
- Staff Development
- Staff Motivation
- Staff Well being

STEPWISE PLANNING FOR STAFF :

STEP-1 : Project Scope and Objectives

- The company focuses upon imparting better comfortness to the staff. It helps the company to maintain a good relationship with their workers and enhance the work quality.
- To establish a convenient communication.
- Objectives can address the Health and Safety of staff during the project

STEPWISE PLANNING FOR STAFF :

STEP 2 - Project Infrastructure

- Establish the link between the staff and their strategic plan.
- To identify the project staff team.
- Although project leaders might have little control over organizational structure, they need to be aware of its implications.

STEPWISE PLANNING FOR STAFF :

STEP 4 : Products and Activities

- Identify and describe staff work and activities.
- Recognize product instances
- Select members
- Create team according to the need
- Explain the activities to be done
- Make them implement what we want
- Get done

- The scope and nature of activities can be set in such a way that it will enhance staff motivation.

STEP 6 : Activity Risks

- Activity Risks includes problems such as maintenance of staffs, some staffs may leave in middle of project, some may take long leave, which may likely affect the project.
- In order to avoid such risk we should have alternate staffs for important phases in order to replace the one who is not available.
- In order to reduce such risks proper risk

- Allocate Resources(Step-7)
- The qualities of individual members of staff should be taken into account in allocating

ORGANIZATIONAL BEHAVIOUR :

Objectives:

- We should select people with practical experience - important aspect of product management.
- We should select those with positivist approach and the best candidate for that job.
- Instruct them in the best methods.
- We will provide incentives in the form of higher wages to the best workers.
- These views emphasize on the financial basis of staff motivation, however, the other issues of motivation should be encouraged not just on such rewards.
- Theory X and Theory Y by Donald McGregor draws attention to the way that expectations influence behaviour.

Theory X holds that :

- The average human has an innate dislike of work.
- There is a need therefore for coercion, direction and control.
- People tend to avoid responsibility.

Theory Y holds that :

- Work is as natural as rest or play.
- External controller and coercion are not the only ways of bringing about effort directed towards an organization’s ends.
- Commitment to objectives is a function of the rewards associated with their achievement.
- The average human can learn to accept and future seek responsibility.

SELECTING THE RIGHT PERSON FOR THE JOB:

- It’s a significant process to select the right person for the job.
- The best situation is to employ someone who is suitable candidates (can do the job)but not eligible! (having the right qualifications) as they are likely to be cheaper and to stay in the job.

The Recruitment Process :

Create a job specification

- This includes the type of tasks to be carried out – Software designer, data
- analyst, developer, coder, tester , installer , maintenance staff ,etc., required for
- our project car rental management system.

Create a job holder profile

- Characteristics of the person who could do the job – Mainly consists of
- educational qualification of the employees and pre - requisites (knowledge)
- For the selected field from job specifications.

Obtain applicants

- To identify the media that potential job holders are likely to consult – to
- make the requirements reach the applying candidates through media, ads and elicit CV's.

Examine CV's

- Do not waste everybody's time interviewing people whose CV clearly indicates
- are unsuitable for our project.

Conducting Interviews

- Selection processes could include aptitude tests, interviews ,examination of work portfolios. Make sure selection processes map to the job holder profile.

STAFF DEVELOPMENT :

- *Instruction in best methods*:
- The induction of new staff should be carefully planned – worst case where new recruit is simply ignored and not given any tasks may affect our project quality .
- Good induction leads to new recruit becoming productive more quickly leading to the success of our project car rental management system, completing on before assigned time, thus pay a way in reducing the cost of the project.
- Need to review staff progress frequently and provide feedback in order to create and maintain our project in a right way .
- Need to identify training that could enhance staff effectiveness, producing an enormous result .

STAFF MOTIVATION:

- Lack of Motivation can often makeup for short falls in innate skills.
- Taylor’s approach – we can provide financial incentives in order to motivate our employees if they did wonderful job .
- Maslow’s hierarchy of needs:
- Motivations vary from individual to individual
- Hierarchy of needs – as lower ones fulfilled, higher ones emerge
- Lowest level – food, shelter
- Highest level – self-actualization.
- Keeping our employees happy and fulfilling their needs, will also fulfil our requirements .

EXPECTANCY THEORY OF MOTIVATION:

- According to the expectancy theory, identified 3 influences on motivation :
- ▯ Expectancy : we provide the belief that working harder leads to the better performance of the employees resulting in success of their work and our project .
- ▯ Instrumentality : we assure them the belief that better performance will be rewarded, in that case they will work more efficiently.
- ▯ Perceived value : of the reward.

THE OLDHAM-HACKMAN JOB CHARACTERISTICS MODEL :

- *CHARACTERISTICS WHICH MAKE JOB MORE MEANINGFUL :*

- **Skill variety** - employees see jobs that are high end skill variety as challenging and give employees a greater sense of competence. No day is the same. There is variation in the work process and thereby demands for different skills.
- **Task identify** - The task identity is clear.The employee completes a whole piece of work .i.e. if the designer started designing work he performs the job from start to finish with a visible outcome.
- **Task significance** - An employees job is more important to company,and they understand the importance of their work in the our project of payroll management system .

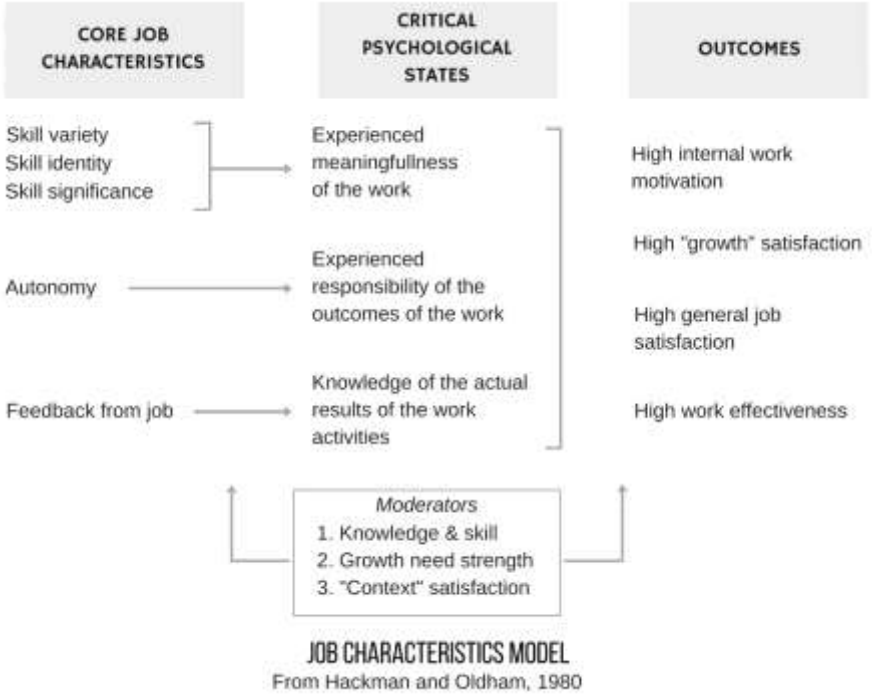
TWO FACTORS THAT CONTRIBUTE TO JOB SATISFACTION

- ⁉ Autonomy - An employee is considered highly autonomous when he/she schedules his own and decides on each requirement most effective approach without supervision for the completion of our project .
- ⁉ Feedback -We must provide the feedback of the employee about his performance effectively in order to motivate him.

METHODS OF IMPROVING MOTIVATION

- Set specific goals
- Provide feedback on the progress towards meeting our payroll system project goals
- Consider job design
- Measures to enhance
- Job enlargement
- Job enrichment

THE OLDHAM-HACKMAN JOB CHARACTERISTICS MODEL :



JOB CHARACTERISTICS MODEL
From Hackman and Oldham, 1980

HEALTHY AND SAFETY:

- ❖ Safety Policy document
- ❖ Responsibility of Safety
- ✓ Top management must be committed to the safety policy;
- ✓ The delegation of responsibilities for safety must be clear;
- ✓ Job description should include definitions of duties related to safety;
- ✓ Those to whom responsibilities are delegated must understand the responsibilities and agree to them;
- ✓ Deployment of a safety officer in the support of experts in particular technical areas;
- ✓ Consultation on safety;
- ✓ An adequate budgeting for safety costs.

Stress management :

- Project are about overcoming obstacles and achieving objectives, hence
- the project manager and team members may be under pressure.
- Many of our software developers are expected to work overtime on our projects.
- So we can reduce the reliance on overtime.
- Role ambiguity and role conflict can lead to stress.

WORKING IN TEAMS:

TEAM :

- 1. A team is created to carry out a joint assignment
- 2. By team, we mean groups of people who are working together.
- 3. As software systems are huge in nature, Software development task requires intense human mental activity
- 4. This human effort has to be shared between individual developers within team or between groups
- 5. Hence how the efforts of individual developers within

BECOMING A TEAM:

- Forming: The members of the group get to know each other and try to set up some ground rules about behaviour
- Storming: Conflicts arise as various members of the group try to exert leadership and the group's methods of operation are being established
- Norming: Conflicts are largely settled and a feeling of group identity emerges .
- Performing: The emphasis is now on the tasks at hand
- Adjourning: The group disbands .

A team need a balance of different types of people:

- The chair: not necessarily brilliant leaders but they must be good at running meeting, being calm, strong but tolerant
- The plant: someone who is essentially very good at generating ideas and potential solutions to problems
- The monitor-evaluator: good at evaluating ideas and potential solutions and helping to selecting the best one
- The shaper: rather a worrier, who helps to direct the team’s attention to the important issues.

- **The team worker**: skilled at creating a good working environment
- **The resource investigator**: adapt at finding resources in terms of both physical resources and information
- **The complete-finisher**: concerned with completing tasks
- **The company worker**: a good team player who is willing to undertake less attractive

To be a good team member one must be able to:

- - time your interventions, e.g. not overwhelm the others in the team;
- - be flexible;
- - be restrained;
- - keep the common goals of the team in mind all the time

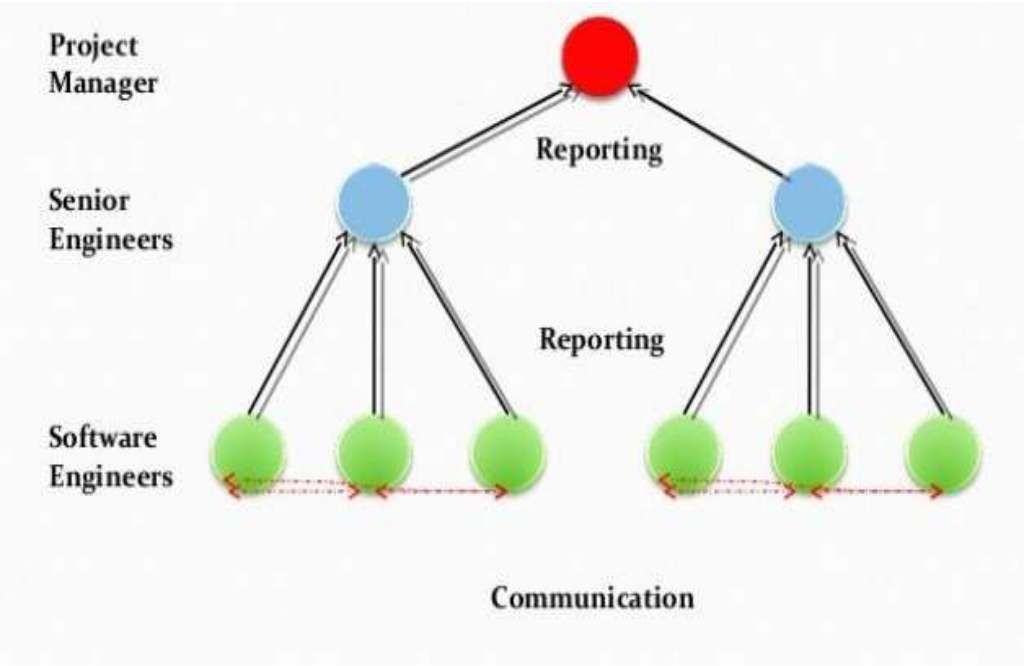
GROUP PERFORMANCE :

- ***Categories of group tasks:***
- Additive tasks : Each participant effort are added to get the final result
- Compensatory task : Errors of individuals are compensated by the input from others
- Disjunctive tasks : There is only one correct answer
- Conjunctive : Team members who are ahead help to meet the objective assisting those who are behind.

DECISION MAKING :

- **Categories :**
- **Structured** : Simple, routine decisions
- **Unstructured :** More complex, requires a degree of creativity
- Mental obstacles to good decision making
- Faulty heuristics Based only on information, might be misleading
- Escalation of commitment - Once decided very difficult to alter
- Information over load - Too much of information may

TEAM STRUCTURE:



EGOLESS PROGRAMMING :

- Programmers become over protective of their coded modules and do not share them. Gerald Weinberg introduced the concept of 'peer code reviews' which made the codes as a common property. (egoless)

- **PROJECTIZED STRUCTURE :**
- Activities are arranged through portfolio and implement through project .
- Project manager control the project
- The authority and power flows side ways

COMMUNICATION PLANS:

- ✓ Communication between project manager and team members.
- ✓ To complete the task before the deadline.
- ✓ To develop a user-friendly application.
- ✓ Complete the project successfully without any delay

LEADERSHIP :

- L-Leading
- E-Efficiently in
- A- All
- D-Departments wit
- E-Effective
- R-Representation

LEADERSHIP :

- Employees managing car rental management system must be able to lead effectively. Depending on the seniority of their role, employees may need to coordinate a team of other
- employees, advise HR staff or be called upon to brief company leaders – and
- should be ready to do so with confidence.

Leadership involves:

- ▯ Establishing a clear vision
- ▯ Sharing that vision with others so that they will follow willingly
- ▯ Providing the information, knowledge and methods to realize that vision,
- ▯ Coordinating and balancing the conflicting interests of all members and stakeholders.

A Lack of Leadership can cause:

- Confusion
- Lack of Innovation High Turnover
- Loss of Talent and Resources
- Unethical Behavior
- Lack of Alignment with Company's vision
- Failed Projects
- Failed Programs