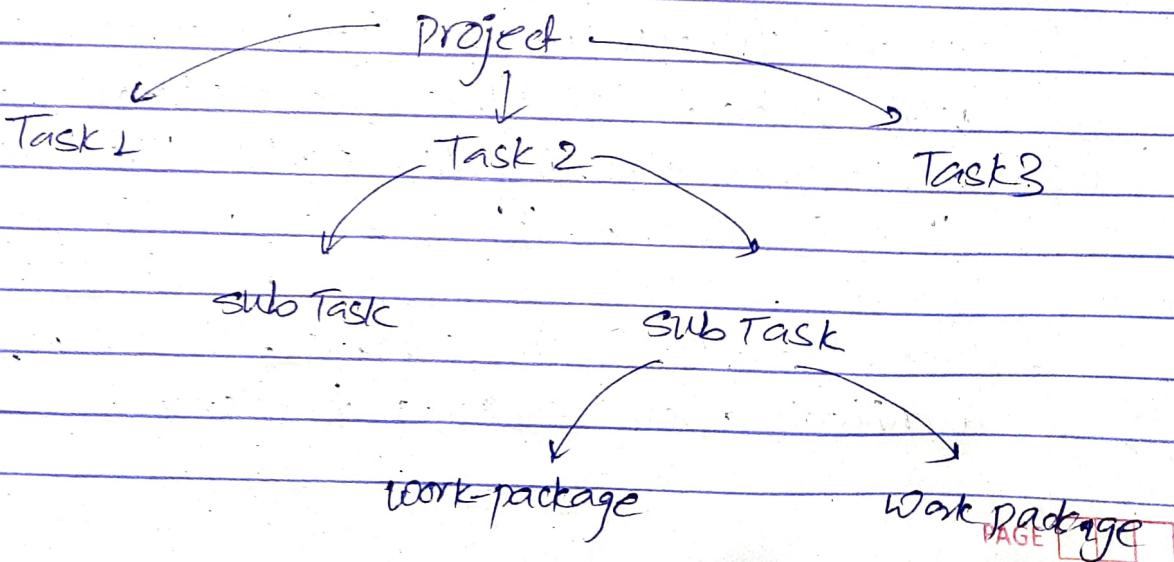


Work Breakdown Structure:

- ↳ A WBS includes the dividing of a large and complex project into smaller, manageable and independent tasks.
- ↳ The development of the WBS depends upon the project management style, organizational culture, customer preference, financial constraints and various other parameters.
- ↳ Here, the root node of the WBS tree is labelled by the project name itself and each node is recursively decomposed into smaller sub activities until leaf node where activities are undivisible and independent.
(Top down approach)
- ↳ Steps:
 - ① Identify the major activities,
 - ② Identify the sub-activities of the major activities,
 - ③ Repeat till undivisible, simple & independent.



↳ Parameters that drive the decomposition:

- organizational unit,
- product subsystem,
- components,
- functions,
- life cycle phases,
- geographics

↳ Types:

① Conventional WBS

② Evolutionary WBS

① Conventional WBS:

→ They are generally prematurely decomposed or structured, planned and budgeted either in little or too much more details description around product design.

→ The flaws in Conventional WBS:

1) Premature structured and decomposition around product design:

→ Once the structure is allocated to responsible managers with budgets, schedule and expected outcome, a concrete planning foundation has been set that is difficult & expensive to change.

→ A loose coupling is desirable if the plan of the architecture are subjected to change.

2) Premature decomposition, planned and budgeted in either too little or too much more detail description:

→ larger SW projects tends to be overplanned whereas smaller projects tends to be underplanned.

→ Elaborating & explaining the WBS at least two or three levels makes sense.

3) Difficult or impossible comparison of project specific and cross-product:

→ Some org- allows to elaborate the product structure as per the project manager or the demand of the customer.

→ Without the WBS, it would be very difficult to compare plans, financial aids data, scheduling data and other organizational data.

↳ Structure:

Management

System Req & Design

SubSystem 1

Component 1

Component 2

SubSystem 2

Component 1

Integrated Test

Test planning, Test cases, Test Reports

Other Support Area

Config Control

Quality Assurance

[II] Evolutionary Work breakdown Structures

- ↳ In this structure, the planning elements are organized around process framework and not product framework.
- ↳ This approach better accommodates the expected changes in the evolving plan and allows the level of planning, fidelity to evolve in straightforward way.
- ↳ WBS should be organized in following ways.
 - ① Elements like workflows which includes management, environment, requirement, design, implementation, assessment and deployments needs to be described at first level of WBS.
 - ② In 2nd level of WBS, the lifecycle phases like Inception, Elaboration, Construction and Transition must be described.
 - ③ In 3rd level, the elements for activities that develops the artifacts are developed.
- ↳ Here, we must make sure that no overlap in scope definition between elements of WBS.
- ↳ One must decide when to stop dividing,
- ↳ Numbering must be done as:
 - > A → 1st level
 - AA → 2nd level
 - AAA → 3rd level

A. Management

AA. Inception phase

AAA. Business case development.

AB. Elaboration phase

ABA. Release Specification

AC. Construction phase.

ACA. Deployment phase planning

AD. Transition phase

ADA. Status Assessment.

B. Environment.

C. Requirement

importance of WBS:

1) simple & clear task decomposition
for assignment of various responsibilities

D. Design.

E. Implementation

2) An essential supporting structure for
scheduling, budgeting & expenditure
tracking.

F. Assessment.

G. Deployment

3) Description of all essential and significant
work4) Make it easy to design, organize and
manage projects

5) Improve project efficiency.

6) Helps in estimating resources that
are essential like cost, time, staff,
etc.

Project Planning Guidelines:

- ↳ These are the written statements that contains the guidelines to be followed before starting any software development project.
- ↳ These guidelines are generally used for purpose of uniformity, comfort and safe development.
- ↳ These guidelines must be followed by each and every individual involved in the project development process.
- ↳ This builds up a sense of confidence amongst the stakeholders.
- ↳ Initial planning guidelines are built on the basis of the experience of the peoples preparing them.
- ↳ There are two project planning guidelines that should be followed:
 - [I] Give advice for allocation of cost among all the first level elements in WBS.
 - [II] Give advice for allocation of ~~cost~~^{schedule} & effort among all the 2nd level elements in WBS.

(i) Give advice for allocation of cost among all the first level elements in WBS.

→ Here, the budgeted cost of first level elements (i.e. Mgmt, Environment, Requirement, Implementation, Assessment and Deployments) are allocated.

→ The values might change or vary among different projects but allocation generally plays essential role in comparing the deviation of obtained result as per plan.

First level WBS elements	COST
Management	10%
Environment	10%
Requirement	10%
Design	15%
Implementation	25%
Assessment	25%
Deployment	5%
	100%

(ii) Give advice for allocation of ~~cost~~ schedule and efforts among all the 2nd level elements in WBS:

→ Here, the ~~cost~~ schedule and effort of the 2nd level elements (i.e. Inception, Elaboration, Construction, Transition) are allocated.

→ 2nd same

2nd Level WBS Elements

Schedule

Effort

Inception
Elaboration
Construction
Transition

10% 5%
20% 20%
50% 65%
10% 10%

Evolution of planning fidelity in WBS over life cycle.

WBS Element		Inception	Elaboration
WBS Element	Fidelity	WBS Element	Fidelity
Mgmt	High	Mgmt	High
Env requirement	Low	Env	Hi
Design	High	requirement	Hi
Implement	Low	Design	Hi
Assessment	Low	Imp	Moderate
Deployment	Low	Assess	Moderate
		Deploy	L
WBS Element	Fidelity	WBS Element	Fidelity
Mgmt	H L	Mgmt	High
Env	H	Env	High
req	L	Req	L
Design	L	Design	M
Impl	M	Imp	High
Asses	H	Asses	High
Deployment	H	Deploy	M

Transition

Construction

Cost and Scheduling Estimation:

- ↳ The cost and scheduling estimation process helps in determining the number of resources to complete all the project activities.
- ↳ A good estimation is very much essential for keeping the software development process under budget and within the schedule.
- ↳ The project plan needs to be derived from two different prospective:

(i) Forward-looking / Top-Down Approach:

- This approach generally starts with describing and explaining various project tasks that involves the ~~starting~~ ^{with} starting the project aim or end deliverable and breaking it down into smaller chunks.
- In this approach, the project manager creates a high level budget for organization.
- These project manager or senior management develops and creates a characteristics of overall size, process, environment, people, quality that are essential for the project.
- Here, the duration of the deliverable are also estimated.

→ Pros:

- 1) It takes less time and effort compared to bottom up.
- 2) Estimate overall cost and schedule of the project.
- 3) It uses the holistic data from earliest projects or products along with unmitigated risk and scope creeps.
 - This also helps in reducing risk of overlooked work activities or costs.
- 4) It is ideal for work that needs to be done ASAP.

→ Cons:

- 1) It works only on those projects where similar task has been done on the project.
- 2) This estimates the project based on previous work done on the same /similar project.
- 3) It does not work for unique projects.

(II) Backward-looking / Bottom up:

- Here, the project team breaks down the requirement of the client down, determining the lowest level appropriate to develop the range of estimate.
- Overall elements of lowest level WBS are generally explained into detailed task for which the WBS element manager is responsible for estimating the budget and schedule.
- All these individual estimates are pointed and integrated into high level WBS budgets and milestones.

→ Pros:

1) High accuracy:

→ Since, each details are individually estimated, it gives higher accuracy.

2) Saves time for project manager

→ By making estimation for individual work packages, the manager can make quick and accurate decision.

3) Reduce risks:

— Manager can address issues related to the estimates without making significant change and avoid errors.

4) Improve success:

5) Increase productivity.

→ Cons:

1) Not scalable:

→ Project manager must work from scratch on each project & do not get benefit from previous works which makes the estimation non-scalable.

2) Time-consuming:

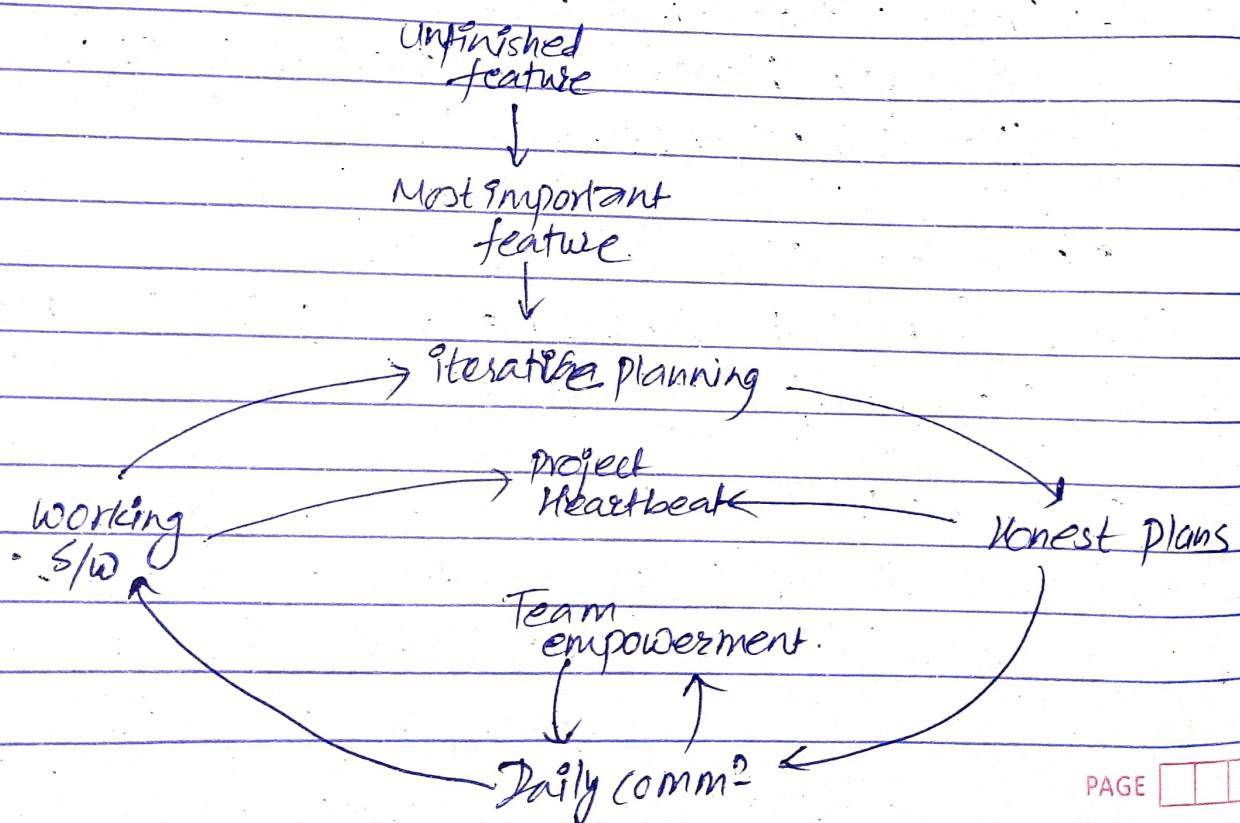
→ For team with high volume of task, it might not be an ideal way for estimation.

3) Slow moving:

→ It is not done in hurry and do not work well for project that needs to be done faster.

Iteration Planning:

- ↳ In a software development process, the initial plan are not always the final plan, plans simply gets changed based upon feedback from monitoring process, some changes on project assumption, risk, and also changes in schedule, cost and scope.
- ↳ Planning is basically concerned with explaining and defining the actual sequence of intermediate result.
- ↳ Iteration planning is generally the process of discussing & planning next cycle, phase or iteration of software application that is in development process.
- ↳ An evolutionary development plan is very essential because there are always adjustment in the developed content as the project grows.



i) Inception Iteration:

- This process can be completed in a single iteration but when project includes new product rollout or creation of new technology, more than one iteration is essential to further explain scope of project, risk and all the benefits.
- It can be used in further improvement of quality of Usecase model, business case and also iteration plans.
- It can be advised when problem domain is new or team members are unexperienced.
- It is generally responsible to establish scope and vision and to explain & define business case.

ii) Elaboration Iteration:

- Initial Elaboration phase is only focused on preparing the environment for analysis, design and implementation.
- The second iteration might focus on preparing the test case environments which includes configuring test processes, writing development cases and also preparing/generating guidelines needed to be followed for test & setting up test tools.
- In each iteration, the environment are refined.
- It also results in architecture with complete framework & infrastructure for execution.

3) Construction Iteration:

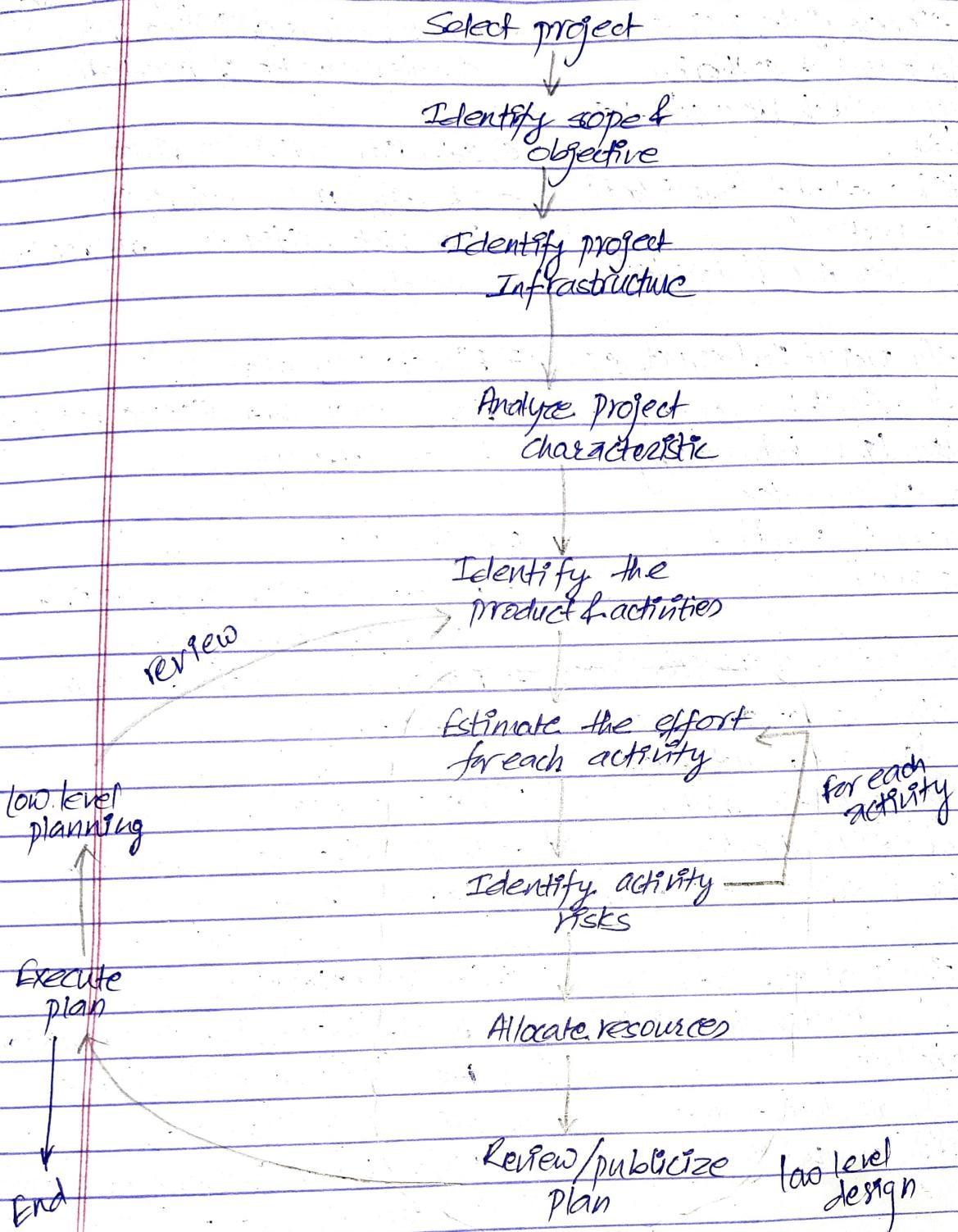
- During construction phase, the use cases are generally realized and the implementation takes place.
- In each iteration, the more functionalities are added to which yields in increasing computer system.
- The first built/outcome is the alpha release which includes the capability for each critical use cases.
- Second is the beta ~~feature~~ release that provides 95% of total product and also achieves the SP2 quality.

4) Transition Iteration:

- It is generally responsible to migrate the developed product into user domain.
- Several process uses only one iteration to translate the beta product into the end product or final product.

Project planning activities.

DATE



PAGE

- 1) Project Scope & objectives:
- Identify the objective and the effectiveness of the project.
 - Assign a project authority.
 - Identify stakeholders and their interest.
 - Establish method of communication between all the parties.
 - Modify objective if needed.

- 5) Estimate effort for each activity.
- Identify ref. bet = effort & time.
 - Break various activities into smaller chunks if needed.

- 2) Identify project Infrastructure:
- Identify project team organization.
 - Establish link between project and strategic plan.
 - Define the standards & procedures.

- 7) Allocate resources:
- Review plan and allocate resources to each activity.

- 3) Identify project characteristics:
- Identify product as either objective or product-based.
 - Identify potential risk.
 - Select SDLC model.
 - Review resource estimation.

- 8) Review plan:
- Review the plan and check if any changes needed.
 - Make sure stakeholders agree on them.

- 4) Identify product & activities:
- Identify and determine what we will produce.
 - Identify product design.
 - Identify product instance.

- 10) Execute plan:
- Perform the ops as per the defined plan.

- 11) Low level planning:
- As per the execution of the plan make ^{check} sure that any changes are not needed (or not).
 - If needed go to Identify product activities state.

~~RAM~~ Responsibility Assignment Matrix (RAM)

~~OR~~ Responsible Accountable Consulted and Informed (RACI) matrix.

- ↳ This matrix contains details of the stakeholders and classifies the responsibilities amongst the teams and their involvement level in a project.
- ↳ A RAM in project management should be referred to by all the parties throughout the project in order to get the idea of their individual roles and responsibilities before the work begins.
- ↳ A RAM ensures that the stakeholder is known who is responsible for doing their respective job & their responsibilities. And, the roles are:
 - i) Responsible (R):
 - The person who is assigned the task to be performed
 - At least one person must be declared as "responsible".
 - ii) Accountable (A):
 - The person who coordinates the actions, making decisions and delegating to those responsible for the task.
 - only one accountable
 - iii) Consulted (C):
 - The people who will be ^{communicated} communicating with regarding decisions & tasks.
 - Their decisions are sorted.
 - There is two way comm?

IV Informed (I):

- These people are kept up-to-date on progress of the development.
- Only one way communication.

↳ Examples:

Project	Project Executive	Project Manager	Business Analyst	Tech Architect	App Dev
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Project 1

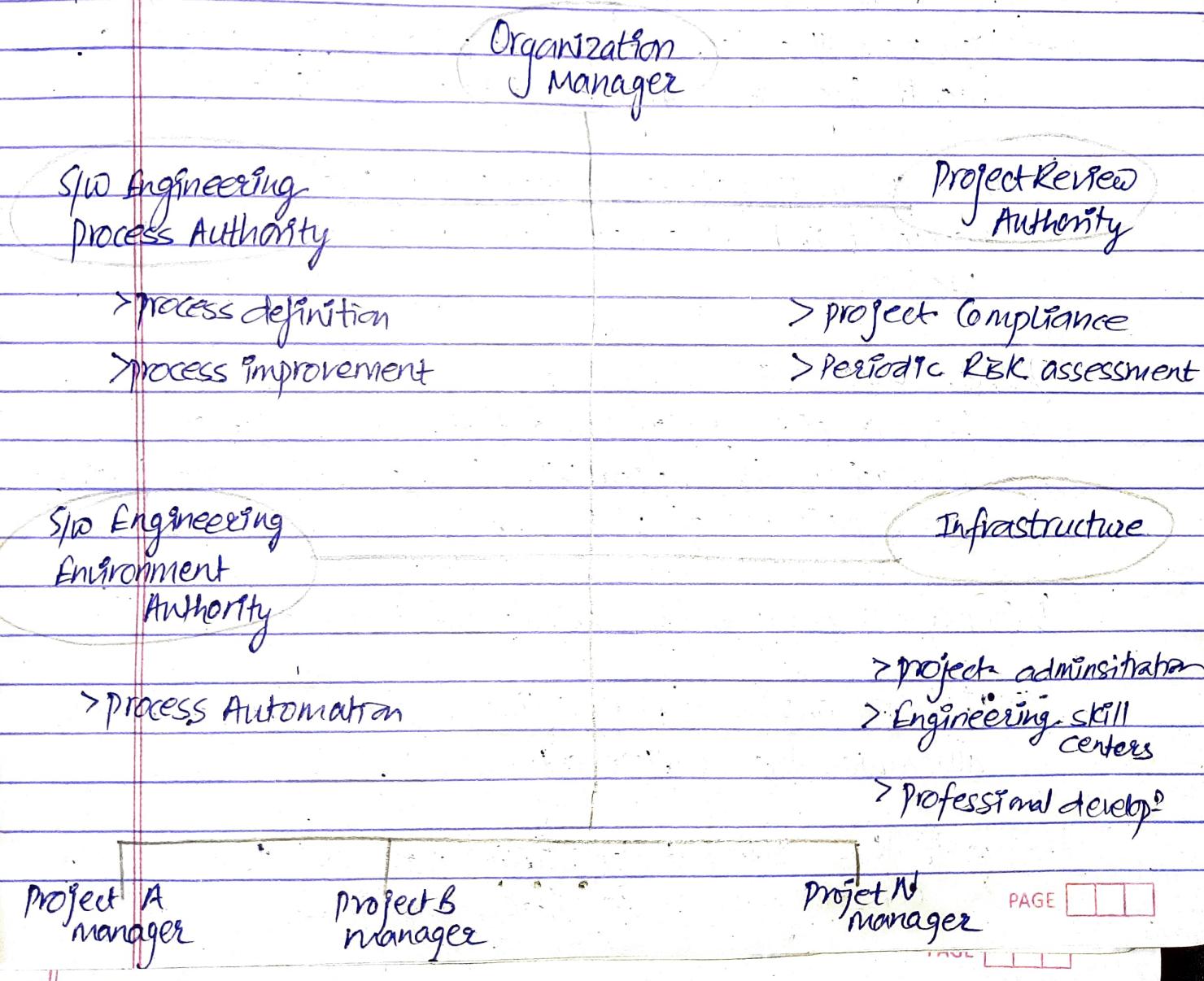
Project 2

Project 3

Activities	Project Manager	Designer	Frontend Developer	Backend Developer
Design UI	A/C	R	I	I
Code Template	A	I	R	C
Create API	A	I	C	R

Project Organizations:

- ↳ It is actually the structure that simply facilitates and motivates the coordination and implementation of activities of the project.
- ↳ Its main purpose is to create an environment that improves the interaction between team members with very less amount of disruption, overlaps and conflicts.
- ↳ Default line of business organization:



↳ Software lines of business are generally motivated and supported by ROI, new business discriminators, market diversification and profitability.

↳ Various Authorities:

1) Software Engineering Process Authority (SEPA):

→ They are the team of peoples responsible for exchanging information between from and to the project teams.

2

2) Project Review Authority:

→ They are the team of people who performs status monitoring at a regular interval of time.

→ They are responsible to determine the project issues, potential risk, progress and other status of the project.

3) Infrastructure:

→ They consists of systems, protocols and various regulations to support the human resources, business (or organizational) vision, missions and goals.

4) Project SW Engineering Environment Authority:

→ It is responsible for providing environment support to automate the development process.

→ Due to this different tools, techniques and trainings can be effectively used in different projects.

↳ Main features of default LOB are:

- 1) Responsibilities for process definition and maintenance depends upon the line of business.
i.e. Process of developing a mobile banking app is different than a portfolio site.
- 2) Responsibility for process automation is an organizational role and is equal importance to the process definition role.
- 3) Organizational roles may be fulfilled by a single individual or several different teams depending on the scale of the organization.
 - A small product development company may require only a single person to fulfill the roles.
 - Whereas, the large product dev company may require hundreds of people to fulfill the roles.

Project Organizations:

- ↳ This is responsible for allocating artifacts and responsibility clearly across project teams to ensure a balance architecture and components.

Software
Management

System Engineering

Administration

Software
Architecture

Software
Development

Software
Assessment

① Software management team:

- ↳ The team focus on the delivery of win-win situation to the stakeholders and maintains balance on activities over the project life cycle.
- ↳ They are responsible for planning the effort, conducting the plans and adapting change in plan as per the requirement.