ITPM
UNIT-1

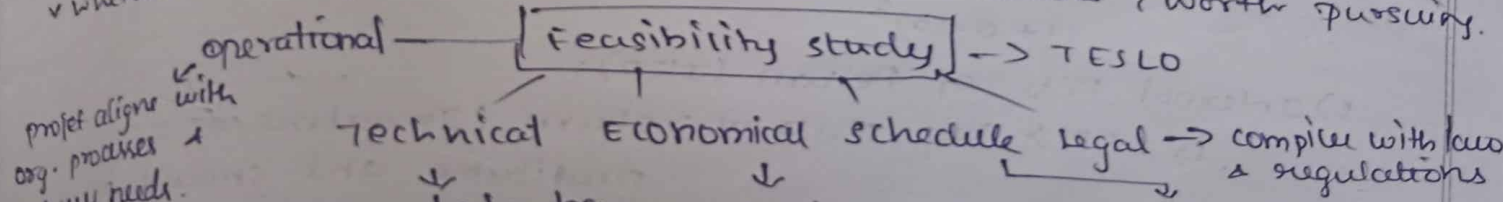
1. Project overview
   * High level summary of an IT project
   * serves foundation for understanding project's purpose, scope, stakeholders.

key components of PO:

a) Project objectives: Defines the purpose of the project outlines goals & delieverables
b) Scope: specifies boundaries, including what is included & not. Avoids scope creep by setting clear limits.
c) stakeholders: Identifies individuals (or) groups impacted by project
d) Resources: required resources. (fin, human, technological)
e) Timeline: Establishes key milestones & deadlines.
f) Budget: Estimate of the fin. resources required.
g) Risks & Assumptions: lists potential challenges & assumptions made during planning.

2. Feasibility study in ITPM:

* whether the project is viable, achievable, worth pursuing.



Teacher's Signature:

Steps to conduct a FS:

(i) Define the project goals & objectives
(ii) Gather & analyze relevant data.
(iii) Evaluate each feasibility aspect
(iv) Doc. findings and provide recommendations.

3. Financial Appraisal.

a) Payback Period:- Initial Investment / Annual cash Inflow

Eg: calculate the payback period for a company investing $50,000, annual revenue $25,000.

$$\Rightarrow \frac{\$50,000}{\$25,000} = 2 \text{ years}$$

b) NPV (Net Present Value): $NPV = \sum \frac{\text{cash inflow}}{(1+r)^t} - \text{Initial investment}$

Eg: calculate NPV for company investing $50,000 where they gain cashflow $10,000 over 3 year at 10% discount rate?

$$\Rightarrow \frac{\$10,000}{(1+0.10)^3} - \$50,000 = \$8264.$$

c) Internal Rate of Return (IRR):

↳ IRR > Req. Rate of return (Investment is profitable and should be considered)

↳ IRR < Req. rate of Return (Inv. is not viable)

↳ IRR = Req. rate of Return (The inv. breaks even)

Eg: IRR = 15%, cost of capital = 10%.

IRR > COC ✓ Project Viable.

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d) Benefit-cost ratio (BCR): $\frac{\text{Total Benefits}}{\text{Total costs.}}$

BCR > 1 indicates viability.

Eg: Total Benefits $75,000 and Total cost $50,000

$\Rightarrow \frac{\$\ 75,000}{\$50,000} = 1.5$ ✓ $1.5 > 1$ Indicates viable.

e) Profitability Index (PI) $\Rightarrow 1 + \frac{\text{NPV}}{\text{Initial Investment}}$

Eg: Initial Investment = $100000

Projected Revenue = $50,000 (Annual cash Inflow)

Discount rate = 8-1. , yr = 5

a) Payback period = $\frac{1,00,000}{50,000} = 2$ yrs

b) NPV = $\sum \frac{50,000}{(1+0.08)^5} = 1,00,000$

$\approx \$\ 108,660$

c) IRR ≈ 12-1.

d) BCR = $\frac{2,50,000}{1,00,000} = 2.5$

4. Identification of Market & Demand Analysis:

* Involves the target market for the sw project and analyzing its demand.

Key components:

a) Market identification: Define the target audience based on demographics, industry, specific needs.

b) Market Research: uses surveys, interviews, competitor analysis to gather insights.
TOOLS: SWOT Analysis, Google Trends, competitor benchmarking
c) Demand analysis: Estimate the potential demand for the project based on market size & growth trends.
d) Competitor analysis: Analyze competitors offerings, pricing, market share.
e) customer feedback: Engage potential users early for feedback on features and pricing.

5. Project cost estimate:

* Involves predicting the fin. resources required to complete a sw project including development, deployment and support
Key components:
a) Direct costs: -> Development costs:
• salaries for developers, designers, QA testers
Eg: $40,000 for a team for 5 over 6 months
-> Tools and SW:
• licenses for development tools & platform
Eg: ~~$2000 for overheads~~
↳ $5000 for AWS and SW licences
b) Indirect costs: overheads such as office space, utilities
Eg: $2000 for overheads.
c) Contigency costs: Allocate funds for unforeseen expense
Eg: $5000 for contigency
d) Total cost Estimate: combine all three costs
Eg: "Total estimated cost $52,000.

Methods of cost Estimation.

a) Expert Judgement -> Experience based on similar projects.
b) Analogous Estimation -> historical data from " " "
c) Parametric Estimation -> Mathematical models based on project parameters.
d) Bottom-up " " -> Breaks the project into smaller tasks and estimates cost for each
e) top-down " " -> uses overall project goals and constraints to estimate costs.

Factors affecting cost Estimation.

-> project size, complexity, tech-stack, timeline etc--,

Tools:
-> COCOMO, FPA, MS project

(x) of cost Estimation:
-> Ensures budget adherance, helps in decision making etc -

Problems.

6. NPV Example.

Assumptions: Initial investment : $2,00,000
Expected cash inflow :
- year 1 : $80,000
- year 2 : $1,00,000
- year 3 : $1,20,000.

Discount rate : 10%.

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Soln: **Step 1:** Formula for NPV:

$$NPV = \sum_{t=0}^{N} \frac{C_t \rightarrow \text{cashflow @ } t}{(1+r)^t \rightarrow (0,1,\ldots n)}$$

$r \rightarrow$ discount rate

Breakdown NPV calculation

* year 0; (Initial Investment)

cashflow: $-\$2,00,000$

$PV = \frac{-2,00,000}{(1+0.10)^0} = -\$2,00,000.$

* year 1:

cashInflow = $\$80,000$

$PV = \frac{80,000}{(1+0.10)^1} = \frac{80,000}{1.10} = \$72727.2727$

* year 2:

cashInflow = $\$1,00,000$

$PV = \frac{1,00,000}{(1+0.10)^2} = \frac{1,00,000}{(1.10)^2} = \frac{1,00,000}{1.21}$

$= \$82,645.$

* year 3:

cashInflow = $\$1,20,000$

$PV = \frac{1,20,000}{(1.20)^3} = \frac{1,20,000}{1.331} = \$90,157$

Step 2: sum the PV

$NPV = -2,00,000 + 72727 + 82645 + 90157$

$NPV = \$45529.$

Step 3: Intrepretation.

NPV = $\$45529$ (+ve)

∴ This project is considered fin. Viable. The projects generates more value than its cost. and it is good investment.

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7. BCR problem. (Benefit cost Ratio)

Assumption: Intial Investment = $2,00,000

Expected Benefits:

* year 1 = $80,000
* year 2 = $1,00,000
* year 3 = $1,20,000

Discount rate : 10 %.

Soln: **Step 1:** calculate / Formula for BCR

$$BCR = \frac{\text{Present value of Benefit}}{\text{Present value of costs.}}$$

Step 2: calculate the PV of Benefits (as we did for NPV)

$$NPV = \sum_{t=0}^{n} \frac{C_t}{(1+r)^t}$$

* year 1: cash Inflow = $80,000

$$PV = \frac{\$80,000}{(1+0.10)^1} = \frac{\$80,000}{1.10} = \$72727$$

* year 2: cash Inflow = $1,00,000

$$PV = \frac{\$1,00,000}{(1.10)^2} = \frac{1,00,000}{1.21} = \$82645$$

* year 3: cash Inflow = $1,20,000

$$PV = \frac{\$1,20,000}{(1.10)^3} = \frac{\$1,20,000}{(.331} = \$90157$$

∴ PV of Benefit = 72727 + 82645 + 90157

= $ 245529.

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Step 3: calculate PV of costs

PV of costs = Initial Investment

∴ PV of costs = $2,00,000 (already provided)

Step 4: calculate BCR

$$BCR = \frac{2,45,529}{2,00,000} = 1.227.$$

Step 5: Interpretation

BCR > 1 indicates viability

1.227 > 1, means benefits are greater than costs, indicating that the SW project is beneficial.

8. PERT	CPM
* Project Evaluation Review Technique	* critical Path Method
* Event oriented technique	* Activity oriented technique
* manages unpredictable activities	* manages predictable act.
* Focus on time control	* Focus on cost optimization
* 1958	* 1957
* three-time estimate	* Single time estimate
* probability model	* deterministic model.
* Non crashing concept	* crashing concept is used.

9. Precedence Relationship.

* FS, FF, SS, SF

→ Sequence activities

→ project schedule n/w diagram

→ identification & visualization of the sequence & dependencies in project

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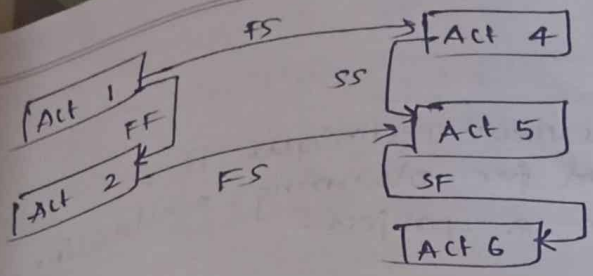
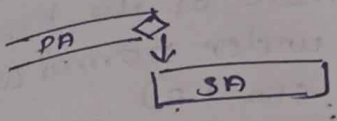


FS → finish - to - start
SS → start - to - start
FF → Finish - to - Finish
SF → start - to - Finish

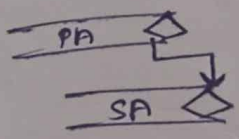
a) Finish - to - start :-

predecessor activity must be completed b4 the successor activity start



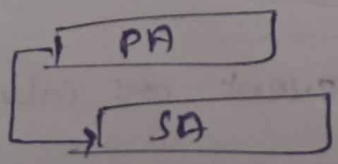
b) Finish-to-Finish:

successor activity requires the predecessor activity to be finished b4 it can be completed.

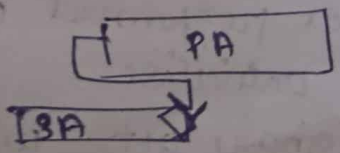


c) start - to - start:

predecessor activity must have started b4 the successor activity can start



d) start - to - finish:



predecessor activity must have started b4 the successor activity can be finished.

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10. PERT:

* Program Evaluation & Review Technique is a project mgmt method used for planning, scheduling, & coordinating tasks within a project.

key components

↳ optimistic time (O): shortest time can be completed under favorable conditions

↳ pessimistic time (P): longest time the activity might take under unfav. condi:

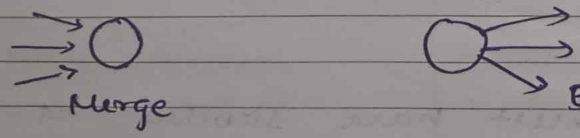
↳ Most likely time (M): Best estimate of the time required under normal conditions.

$$\text{Expected duration (TE)} = \frac{(O + 4m + P)}{6}$$

CPM:

* Critical Path Method is a project management technique used to planning, scheduling and managing complex projects.

Merge and Burst Events.



* Activities performed by given events are called as preceding activities.

* Activities performed after a given event are called as succeding activities.

* A imaginary act. which doesn't consume any resource and time is called as dummy activity.

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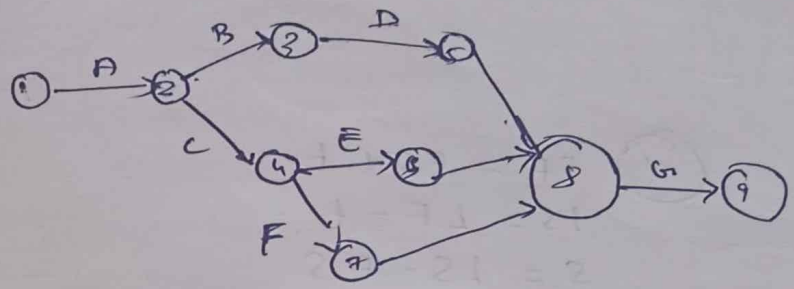
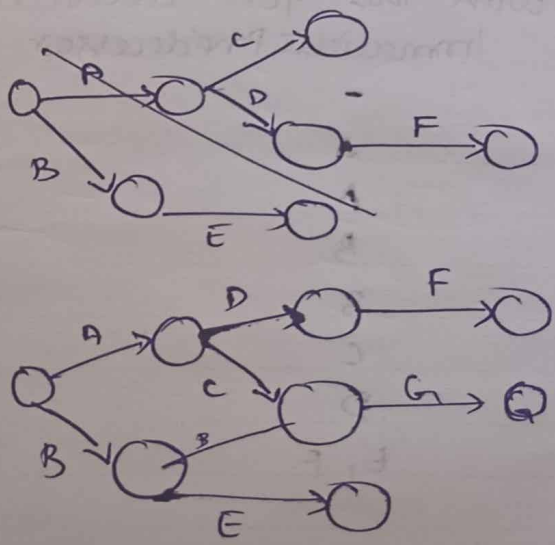
* To disconnect an act - by the completion of all activities in a NW diagram called dangling.

11. How to Draw NW Diagram.

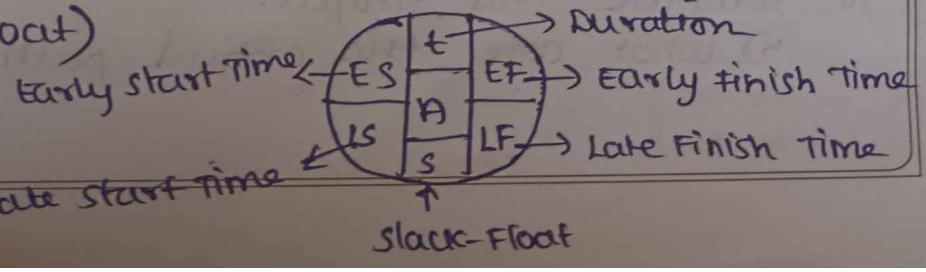
Activity	Predecessor
A	-
B	A
C	A
D	B.
E	C
F	C
G	D, E, F
H	G



Act	predecessor
A	-
B	-
C	A
D	A
E	B
F	D
G	B, C



How to calculate Early start, Late start, Early finish, late Finish and slack (Float)



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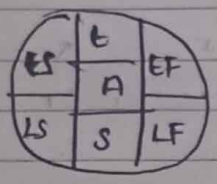

Early Finish = EF = ES + t
Early start = 0
Late Finish = Last duration
Late start = LS = LF - t
Slack - Float(S) = S = LS - ES
~~F = LF - ES~~
F = LF - EF

(X) EF = ES + t
LS = LF - t
S = LS - ES
F = LF - EF

12. Draw the activity-on-node (AON) project network associated with the foll. activities for company project

Activity	Immediate Predecessor	Time
A	-	3
B	A	4
C	A	6
D	B	6
E	B	4
F	C	4
G	D	6
H	E, F	8

a) How long should it take Dave and his team to complete this project?
b) What are the critical path activities?

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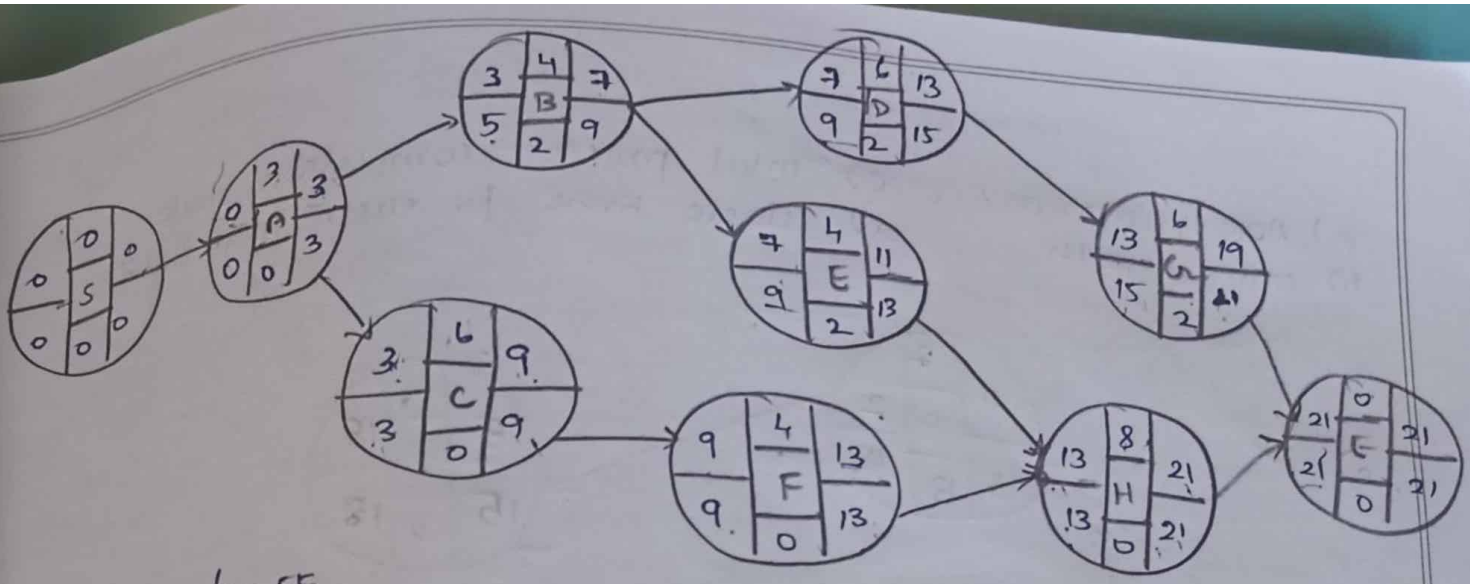


$S = LS - ES / LF - EF$

$EF = ES + t$

$LS = LF - t$

Pogumbothu take higher value
varambothu low value take

The activities which have slack / float value zero, they are coneidered as critical path activities

A → C → F → H (CPA)

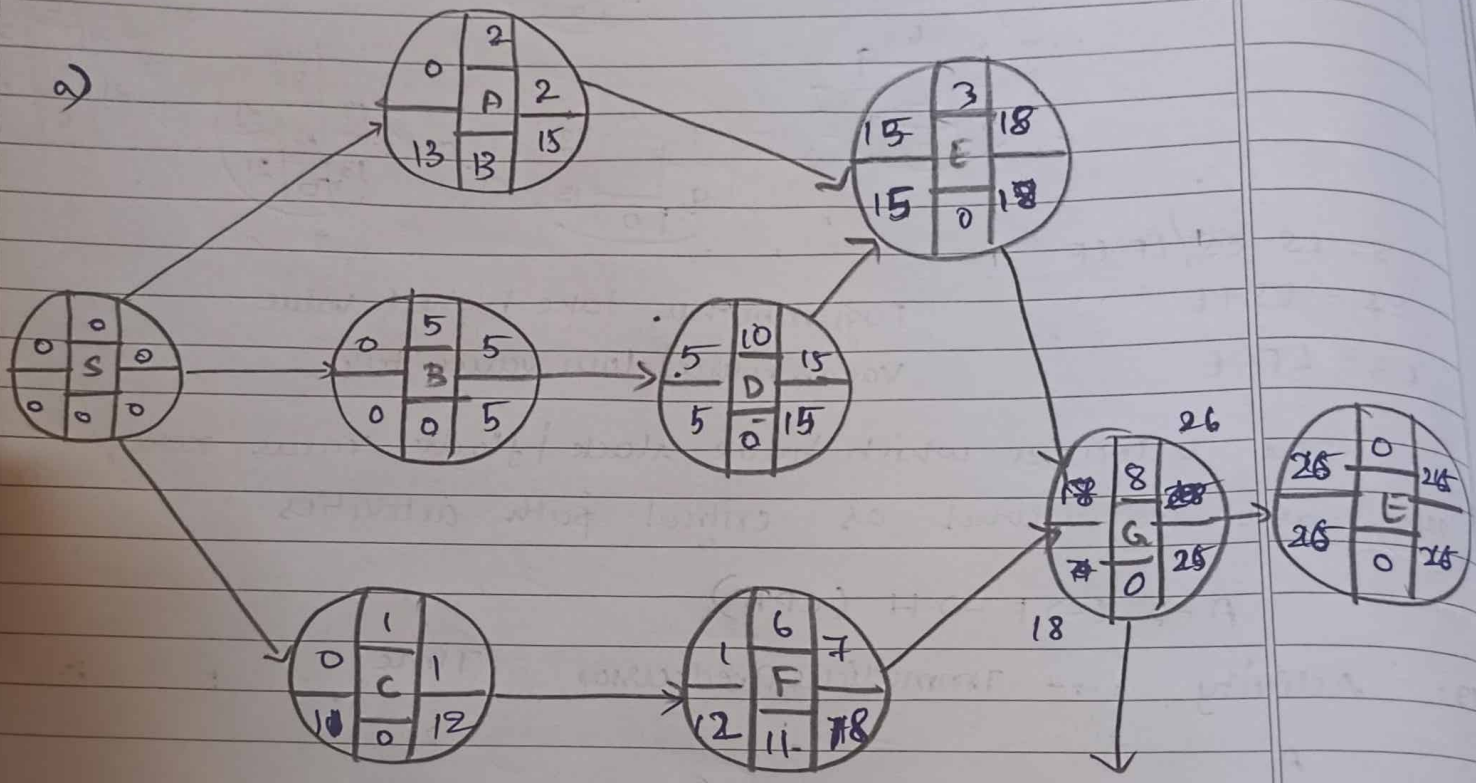
13.

Activity	Immediate Predecessor	Time
A	-	2
B	-	5
C	-	1
D	B	10
E	A, D	3
F	C	6
G	E, F	8

Teacher's Signature:

a) AON diagram
b) critical path
c) total project completion date
d) slack time for each indicent?

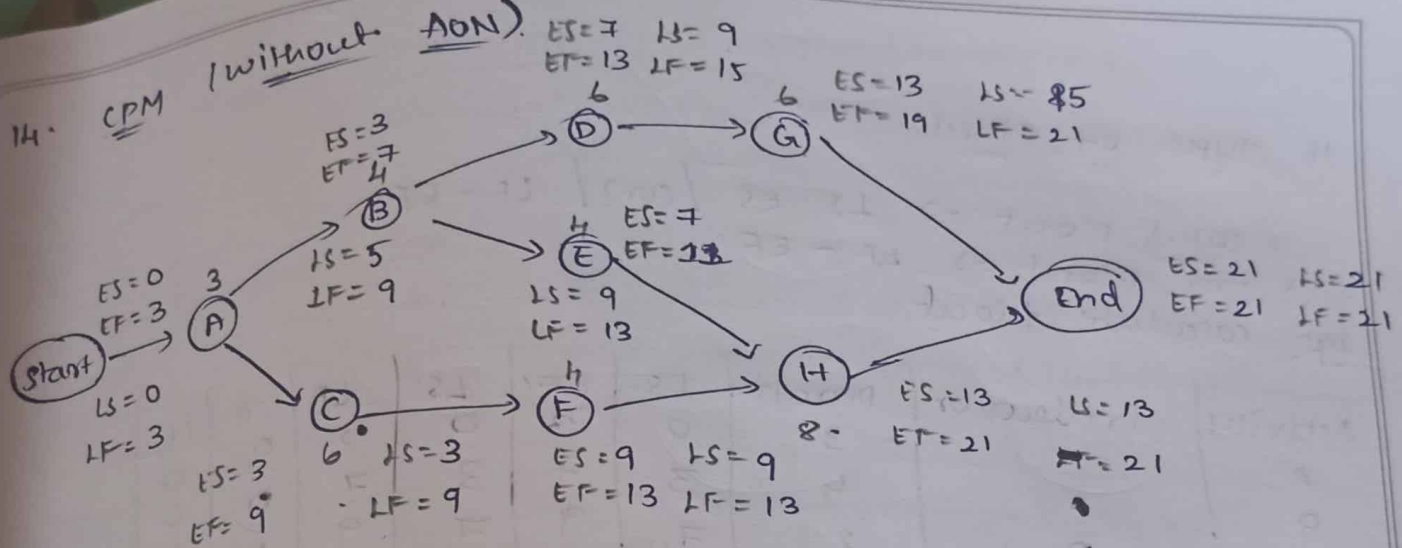
a)



b) critical path → B→D→E→G

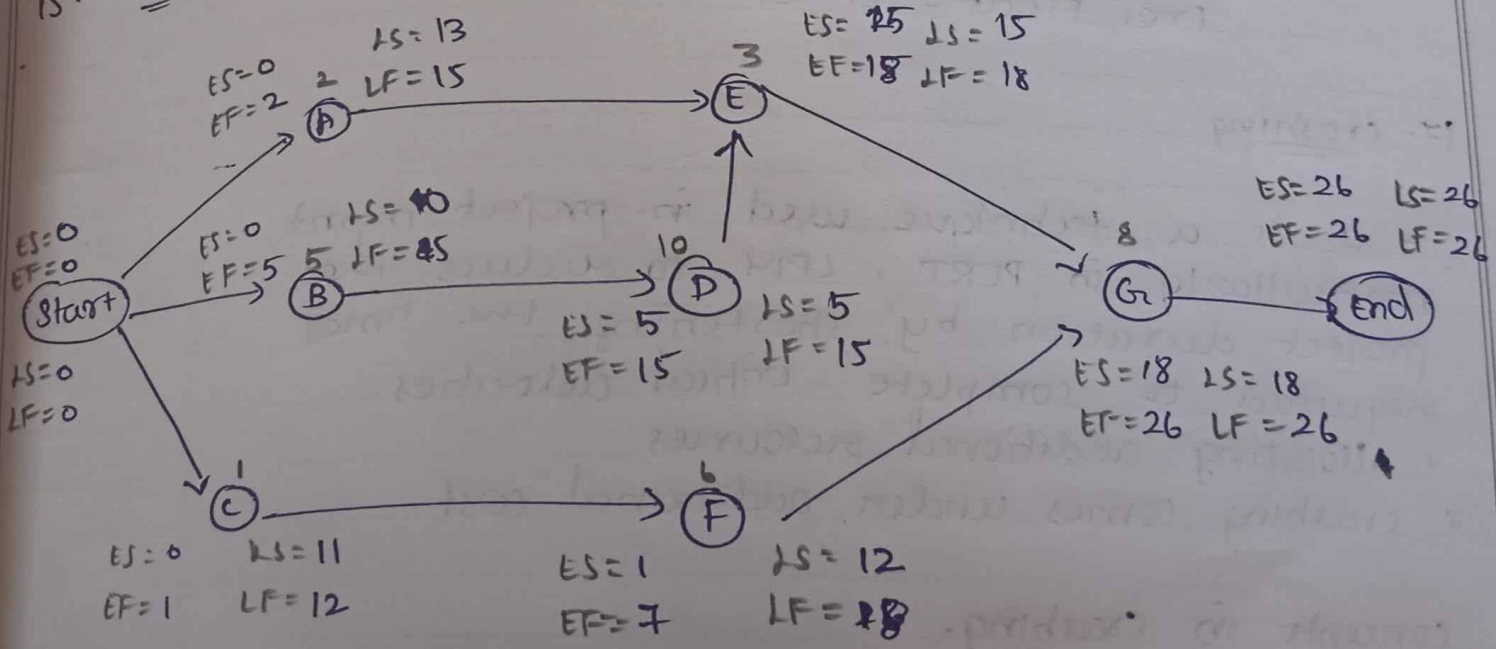
c) total project time ⇒ 26 hours.

14. CPM (without AON).



critical path -> A -> C -> F -> H

15. CPM (without AON Diagram)



B -> D -> E -> G (critical Path).

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16. Types of Float.

* Total Float => LS - ES /(or)/ LF - EF
* Free Float => LF - EF

Eg: calculate float.

Activity	Predecessor	Duration	ES	EF	LS	LF	TF	FF
A	-	3	0	3	0	3	0	0
B	A	4	3	7	3	7	0	0
C	B	2	7	9	7	9	0	0
D	A	5	3	8	4	9	1	1

Total Float = LS - ES

Free Float = LF - EF

17. crashing

* It is a technique used in project mgmt, particullarly in PERT, CPM to reduce the project duration by shortening the time required to complete critical activities.
* Allocating additional resources.
* crashing comes under additional cost.

concepts in crashing.

NT, CT, NC, CC, cost slope.

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$$\text{cost slope} = \frac{\text{crash cost (CC)} - \text{Normal cost (NC)}}{\text{Normal time (NT)} - \text{crash time (CT)}}$$

Eg :

Activity	Predecessor	NT	CT	NC	CC	cost slope → we need to find.
A	-	3	2	$100	$150	$50/day
B	A	4	3	$200	$300	$100/day
C	B	2	1	$50	$100	$50/day
D	A	5	4	$300	$400	$100/day

UNIT-3

1. Agile Principles.

* satisfy customers through early and continous delivery
* welcome changing requirements even late in the project.
* Deliver value Frequently
* Break the silos of your project.
* Build projects around motivated individuals.
* Effective way of communication (Face-to-Face)
* working sw is primary measure of progress
* Maintain a sustainable working pace.
* continous Excellence Enhances Agility.
* simplicity is essential.
* self-organizing teams generate most value
* Regularly reflect and adjust ur way of work to boost effectiveness.

2. Agile sw development.

* Refers to a group of sw development methodologies based on iterative development, where requirements and solutions evolve through collaboration btw self-organizing cross-functional teams.

Agile development refers to any development process that is aligned with the concepts of Agile manifesto

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3. Diff. Agile from traditional sw development models.

Feature	Agile model	Traditional model
a) Development Style	Iterative and Incremental	linear and sequential
b) cutomer involvement	High, continous feedback	low, feedback @ start and end.
c) Flexibility	Highly flexible, adaptable changes	Rigid, difficult to accomodate changes.
d) Testing	continous throughout development	performed after the build phase.
e) Delievery	Frequent small releases	Single final product at the end.

4. various types of Agile methodologies.

* Scrum → uses sprints (2-4 weeks iterations), small
  → Daily stand-up meetings
  → Product owner, scrum master, Deve. team
* Kanban → visualizes work using boards (TO DO, In progress, Done).
  → focuses on continous Delivery.
* Extreme programming → emphasizes technical excellence and practices like pair programming, test-driven development, CI
* Lean SW Development → focuses on eliminating waste, improving efficiency, delivering value quickly
* crystal methodology, DSDM, FDD.

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5. Scrum:

* A definite project mgmt emphasis.

Scrum master:

* A scrum project is managed by a scrum master who can be considered as much a coach as a manager

Sprint:

* scrum has a fundamental 30-day development cycle called sprint (pre-sprint & post-sprint activities)

Daily scrum:

* A short <30 mintues daily scrum meeting allows the team to monitor status and communicate problems.

6. Product Backlog for planning:

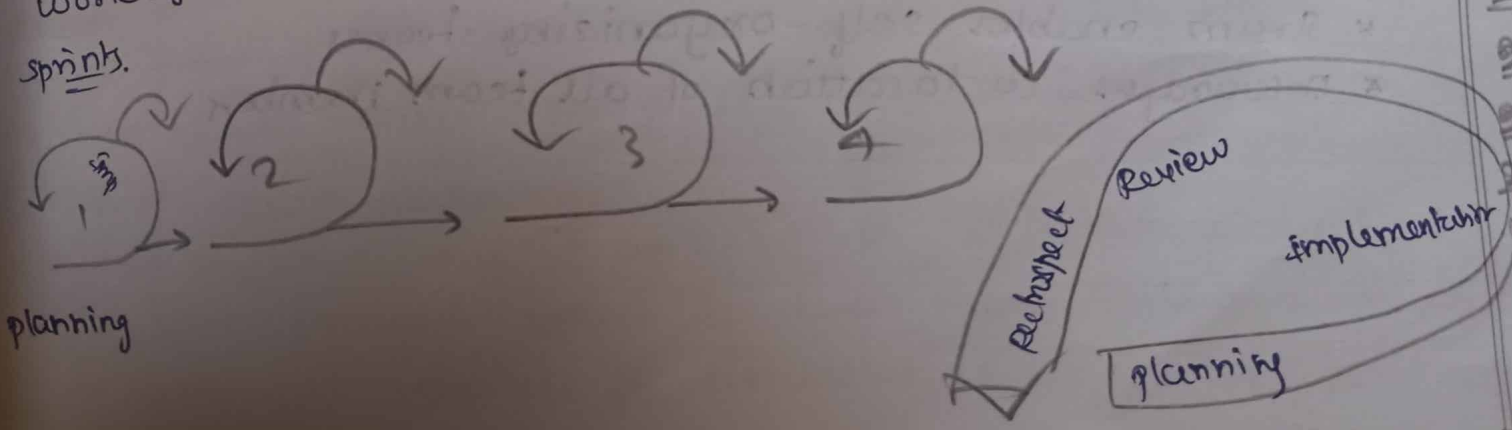
* project planning is based on a Product Backlog, which contains,

->functions and technology enhancements.

Scrum queues:

Product Backlog -> sprint Backlog -> sprint -> working increment of the SW.

sprints.



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Sprint (1 of 4):
↳ Basic unit of development in Scrum.
* sprint duration 1 week to 1 month
* time boxed
* preceded by a planning meeting.

Sprint (2 of 4):
* During sprint, team creates finished portions of a product (an increment)
* Features going into a sprint come from the product backlog.
Sprint goal :--> sets up minimum success criterion for a sprint
-) keeps the team focused on the broader picture rather than narrowly on task.

Sprint (3 of 4):
* Team then determines how many selected items can be completed during the next sprint.
* These then go into the sprint backlog
* Development : time-boxed, sprint must end on-time
* when sprint is done, team demonstrates SW.

Sprint (4 of 4):
* Scrum enables self-organizing teams
* Encourages co-location of all team members.

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6. Sprint Backlog:
* list of work the development team must address during the next sprint.

Sprint Backlog

Sprint Review:
* 2nd to last event of sprint
* time boxed to a max of 4 hrs for 1 month sprint. For shorter sprint, the event is usually shorter
The foll. sprint review elements:
* Attendees include scrum team and key stakeholders invited by product owner.
* Members of scrum team explain what product backlog items have been "Done" and "not Done".
* The developers discuss what went well during the sprint, what problems it ran into, how those problems were solved.
* The developers demonstrate the work that "done" and answer question about the increment.
* The product owner discuss the product backlog as it stands.
* The entire group collaborates on what to do next, so, the sprint review provides valuable input to subsequent sprint planning.
* Review of how the marketplace of the product might have changed what is the most valuable thing to do next. and review of timeline, budget, potential capabilities.

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7. Three scrum roles:

scrum master (1) | product owner (1) | development team (2)

* scrum teams are small

Scrum master: * It is the person responsible for making sure a scrum team is operating as effectively as possible with scrum values.
* they keep the team on track, plan and lead meetings, and work out any obstacles the team might face.
* scrum masters might also work in a larger role within an org.
* scrum can look different from org. to org. and team to team
* daily standups
* lead sprint planning meetings.
* conduct retrospective reviews to see what went well and what can be improved for the foll. sprint.

Product owner: * Makes sure the scrum team is aligned with the goals of the overall product that the team is contributing to,

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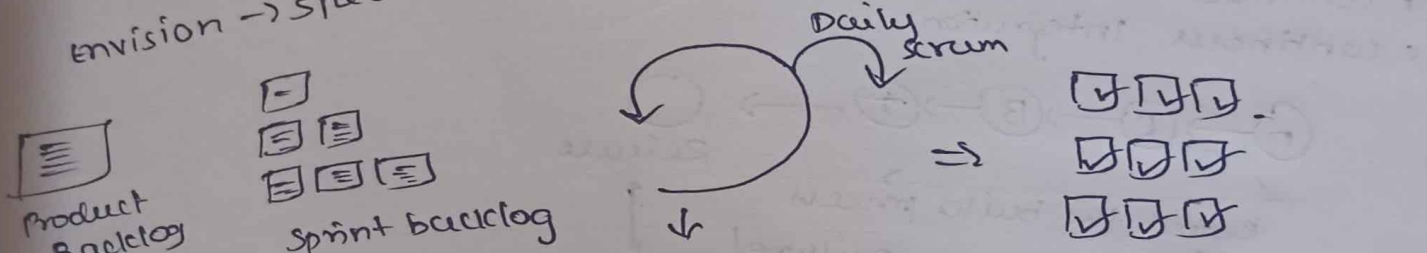
-> They understand the business needs of the product, like customer expectations, and market trends.
Because they have to understand how the scrum team fits into bigger picture goals, product owner usually stay in touch with product managers and other stakeholders outside the team.
Development team: -> Hands-on-work of completing the tasks in a scrum sprint.
-> They can be computer engineers, designers, writers, data analysts etc.

8. Agile phases:

Envision -> speculate -> Explore -> Adapt -> close



planning, Implementation, Review, Retrospective

12 principles of agile:

(i) satisfy the customer (ii) welcome changing requirements
(iii) Deliver working SW frequently (iv) work together
(v) Build projects around motivated individuals.
(vi) Face-to-Face conversations (xii) Reflect and adjustments.
(vii) Focus on working SW (viii) Promote sustainable development
(ix) Ensure technical excellence (x) simplicity (xi) self organizing teams

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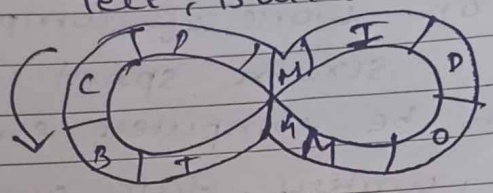
9.

UNIT-4

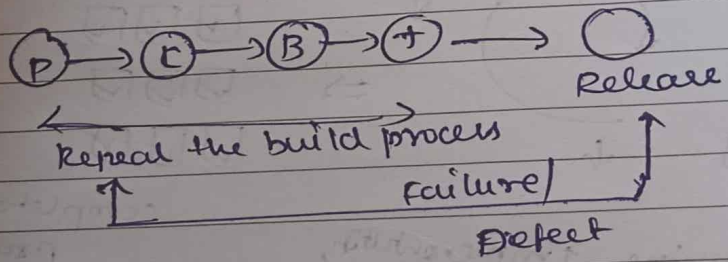
1. DevOps phases (CPMODITB)

Code, Plan, Monitor, Operate, Deploy, Integrate, test, Build.

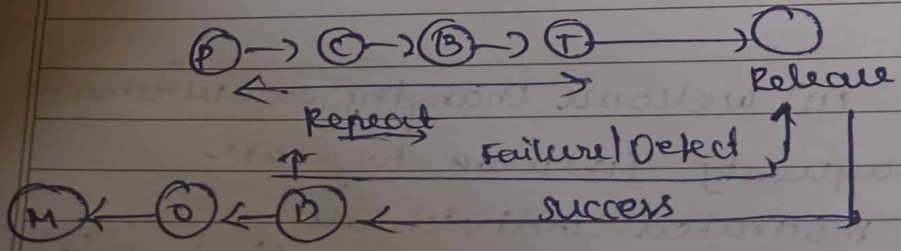


Devops process

* continous Delivery (P, C, B, T)
* continous Integration



* continous Deployment



2. DevOps principles.

a) collaboration
b) Automation
c) continous Integration (CI)
d) continous Delivery (CD)
e) IaC

3. DevOps practises and considerations.

* Fregcuent commits
* Automated testing
* versioning
* secure practises
* Monitoring and logging.

* Agile project mgmt
* shift left with CI/CD
* Build the right tools
* Implement automation
* Monitor the DevOps pipeline & application
* observability
* Gather continous feedback
* change the culture

scrum teminology.

* product owner
* scrum master
* Development team
* product backlog
* Sprint " "
* Sprint

more.

* Independent
* valuable
* Small
* estimatable

Teacher's Signature:

UNIT-2

1. Resource scheduling.

* Strategic allocation and mgmt of human, technological, & other resources throughout various stages of SW Develop. project.
* planning and organizing resources.
* Allocate resources effectively to meet project goals.

key components:

a) Human Resource Allocation
b) Equipment & Technology Allocation
c) Time mgmt, Risk assessment
d) communication
e) colloboration
f) Monitoring
g) Adjustments.

Importance of Resource schd.

a) Budget mgmt
b) Risk mitigation
c) client satisfaction
d) continous improvement
e) satisfaction

Eg:-

Project: Develop a mobile app.
Tasks: Design UI, Develop Backend, QA Testing
Resources: Developers, Testers.
Duration: 4 weeks of design, 6 weeks develop, 2 week of test.

challenges:

limited resources, competing priorities, unexpected changes

Step 1:- Break down tasks within project
2: look at ur resource capabilities
3: schedule tasks to team members on avail
4: Manage and monitor resources as the project progresses
5: Track the actual time spent on tasks and activities.

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Resource levelling.

* Used to resolve the overloading (or) underutilization of team members and equipment.
* completes the project with avail resources.
→ It may adjust the project deadline.
* optimize resource allocation to balance workloads

key aspect:- * Balancing workloads, Minimizing risks, continous monitoring and adjustment..

How it works:

* Identify resource conflicts and overallocations
* Adjust project schedule to balance resource workload
* ensure a steady and manageable flow of work.

Benefits:-

*smoother project execution
* reduce stress
* project flexibility.

② Risk analysis in SPM:

* complex and to various uncertainties and risks.
* Identifying, assessing, and mitigating potential risks to ensure project success.

a) Understanding Risk: Definition of risk in sw projects,
Types: technical, operation, organizational and external.

b) Risk Identification: Tech: brainstorming, checklists, historical data analysis.
common risk in sw project: - techn. constraints, resource constraints

c) Risk assessment:- qualitative vs Quantitative, probability and impact

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d) Risk mitigation strategies: Risk avoidance, transfer, mitigation, acceptance.

e) Risk monitoring and control:

f) Tools and techniques for Risk analysis

g) ~~Ris~~ case study e.g.

h) Best practises in Risk analysis: continous risk assesment, involvement of stakeholders, flexibility and adaptability

③ Project control in SPM:

* Involves monitoring, measuring, regulating project activities to ensure they align with the project plan and objectives.
* various process, tools, techniques aimed at managing project scope, schedule, cost, quality and risks.

key elements of project control. (SSCQR)

* scope control: Monitoring and managing changes to the project scope to prevent scope creep and ensure deliverables meet stakeholders requirement.
* schedule control: Tracking project progress against the planned schedule, identifying deviations, implementing corrective actions to minimize delays and meet deadlines
* cost control: Monitoring project expenditures, comparing actual costs against the budget.
* Quality control: Ensuring that project deliverable meet the specified quality standards and confirm to customer expectations.

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* Risk control:- Identifying, assessing, and mitigating project risks to minimize their impact on project objectives and outcomes.

Tools and techniques for project control: (EGCVCQ)

* Earned value management
* Gantt charts
* CPM
* Variance analysis.
* change control process
* Quality assurance tools.

Project control activities (MRRCR)

* Risk management
* Change "
* Resource "
* Monitoring progress
* Reporting & communication

Benefits of effective project control:-

* Improved project performance
* Enhanced stakeholder satisfication.
* Greater visibility.
* Optimized resource utilization
* Mitigation of project Risks.

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1. Project Audit:

* Involves systematic review and evaluation of project processes, performance, and outcomes
* whether the project is on track, identify areas for improvement and ensure alignment with project goals.

Types: Procss, performance, Financial audit

Process: Pre-audit planning
Field work
Analysis and reporting
Follow up

Benefits:

Project termination.

* It is the formulate conclusion of a project.
* Involves the closure of project activities/documentation of lesons learned.

Reasons: succesful completion
Project cancellation
" " failure
Legal Req.

Termination approaches: Normal ter
Premature ter
changed obj.

Termination activities: Documentation and closure
Knowledge Tranefer
celebration and recognition

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Post - Implementation Review:

* Assess project outcomes
* Lessons learned
* Feedback and Improvement.

5. Cost control

* involves monitoring, managing and regulating project expenditures to ensure that the project remains within its approved budget while achieving its objectives.

Key components: (CBMCR)

a) Cost Estimation:-
* Techniques → Analogous Estimating
→ Parametric Estimating
→ Bottom-Up Estimating.

b) Budgeting:
* Allocation.
* Baseline Establishment

c) Monitoring and Reporting
* Earned value mgmt
  - planned value (PV)
  - Earned value (EV)
  - Actual cost (AC).
* variance analysis.

d) change management.
* scope creep
* process.

e) Risk management and contigency planning.
* Risk Identification
* Contigency Reserves

f) Benefits:-
* Fin. discipline
* Transparency
* Proactive Management

6. PERT per cost:. planning, schedu
controlling complex project.
a) Accurate Timeline estimation
b) Linking time to cost
c) Risk Identification and miti
d) CP Analysis

Teacher's Signature:

Best practises scrum.

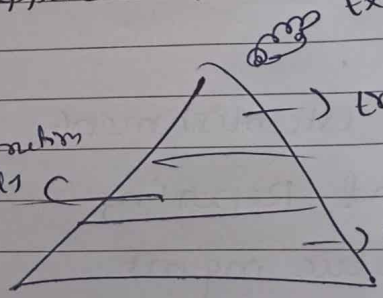
a) Adhere to agile scrum ceremonies
   Daily scrum
   Sprint planning
   " " review
   " " Retrospective
b) Get scrum roles identified quickly
c) Make sure to prioritize user stories b4 ur projects gets started
d) Focus the daily standup for a more efficient workflow
e) Run effective sprint retrospective meetings

devops monitoring (oma)

Test automation : Build, test, ship faster and more reliably
practice of automatically reviewing and validating a sw product such as web application.

Testing practises

* unit testing
* Integration
* end-to-end testing
* Exploratory testing



Benefits :- Reliability, scale, security, and customer happiness

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