Synopsis 2017 of PS Project Management Course

Material based on Dr. Giedrius Slivinskas PS Project Management Course

Made by Kęstutis Matuliauskas in January, 2018

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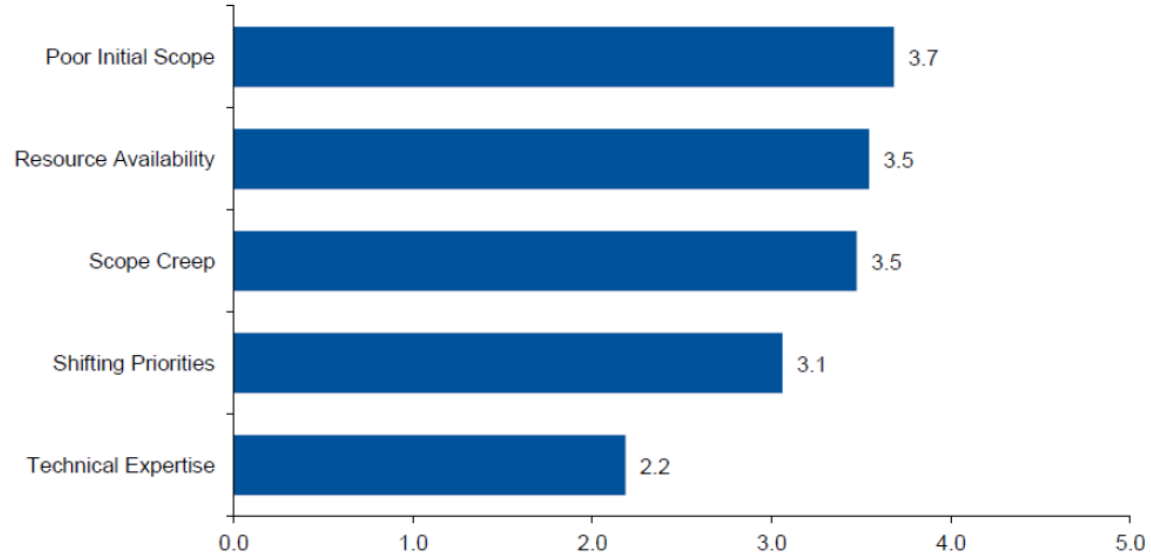
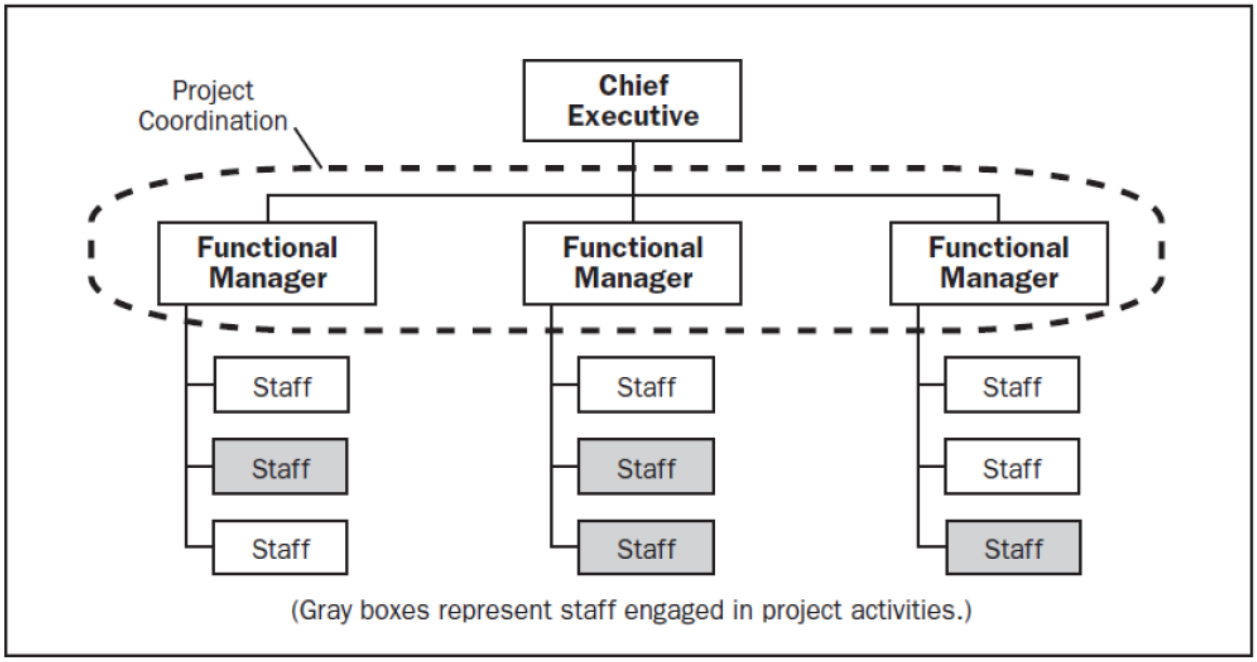
Part #1

Reasons for Late Delivery and Scope Creep



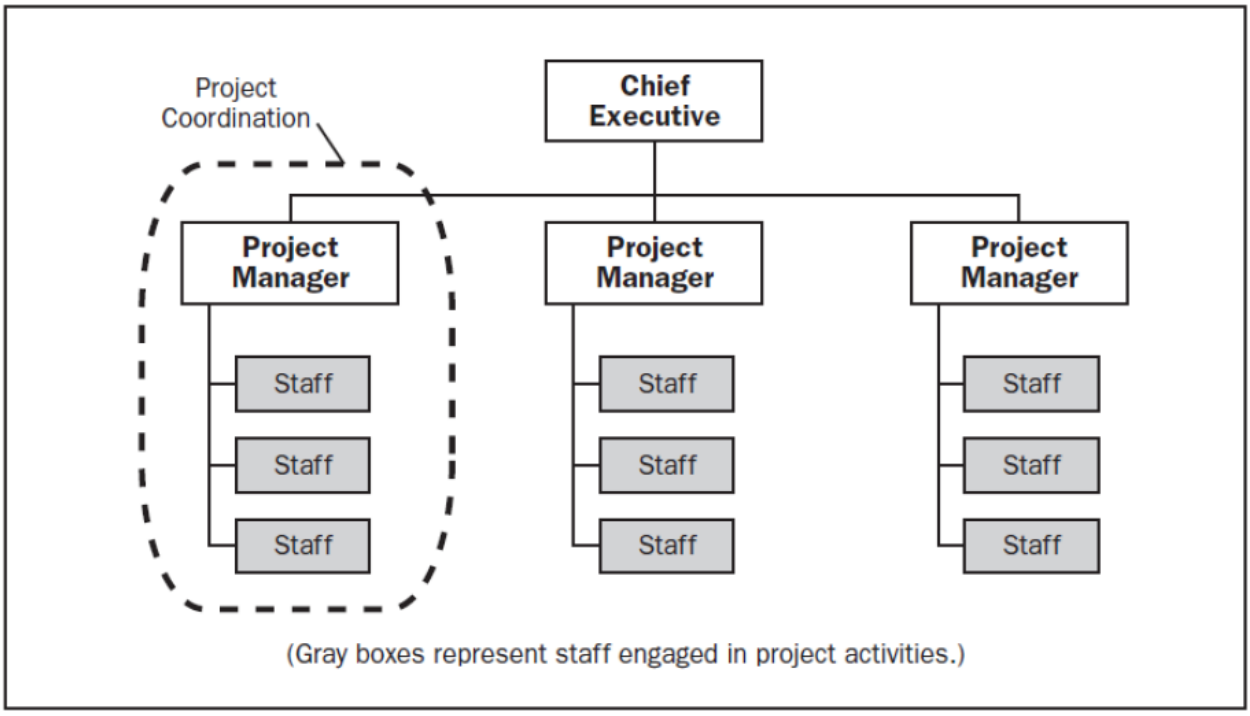
Source: Gartner IT Key Metrics Data (December 2014)

Functional Organization



PMBOK Guide

Project Organization



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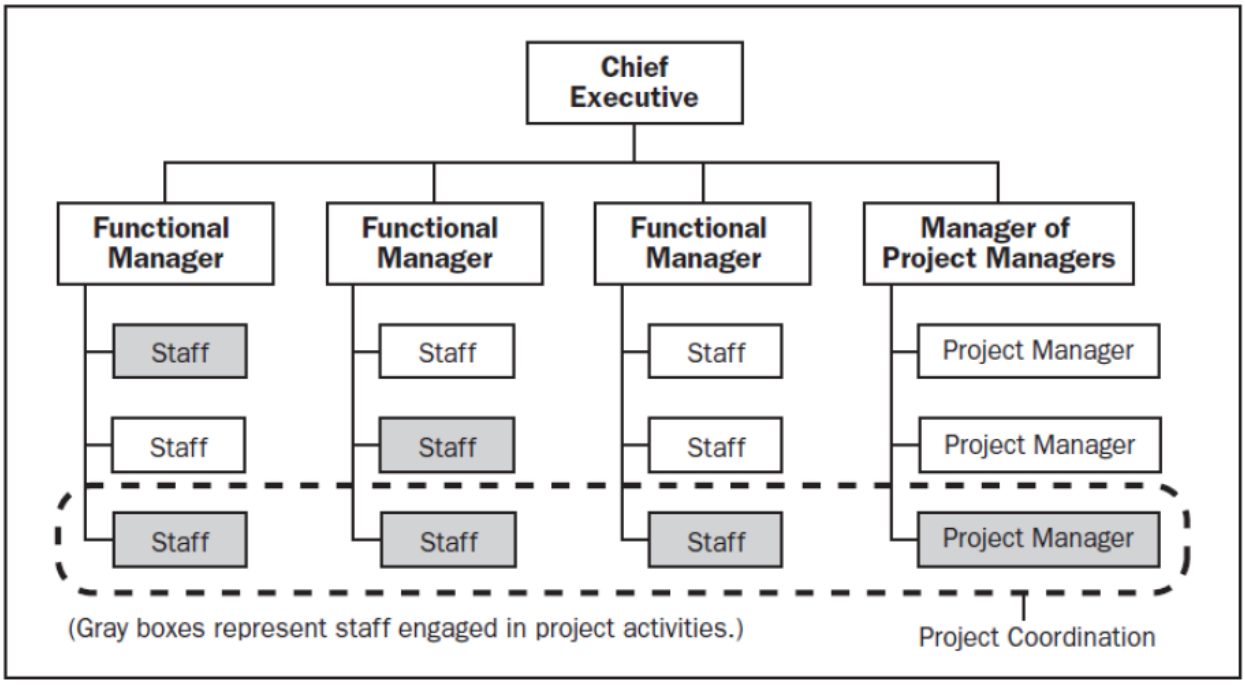
Strong Matrix Organization



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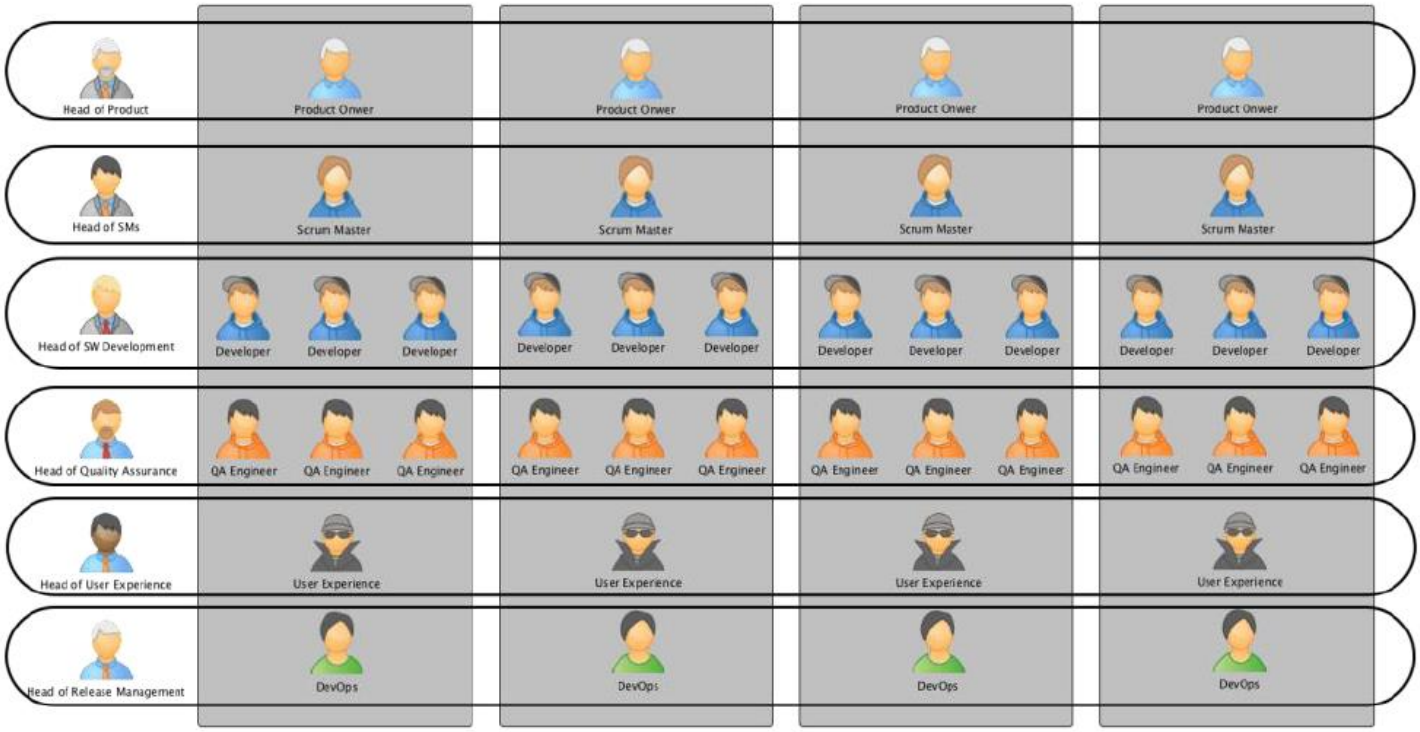
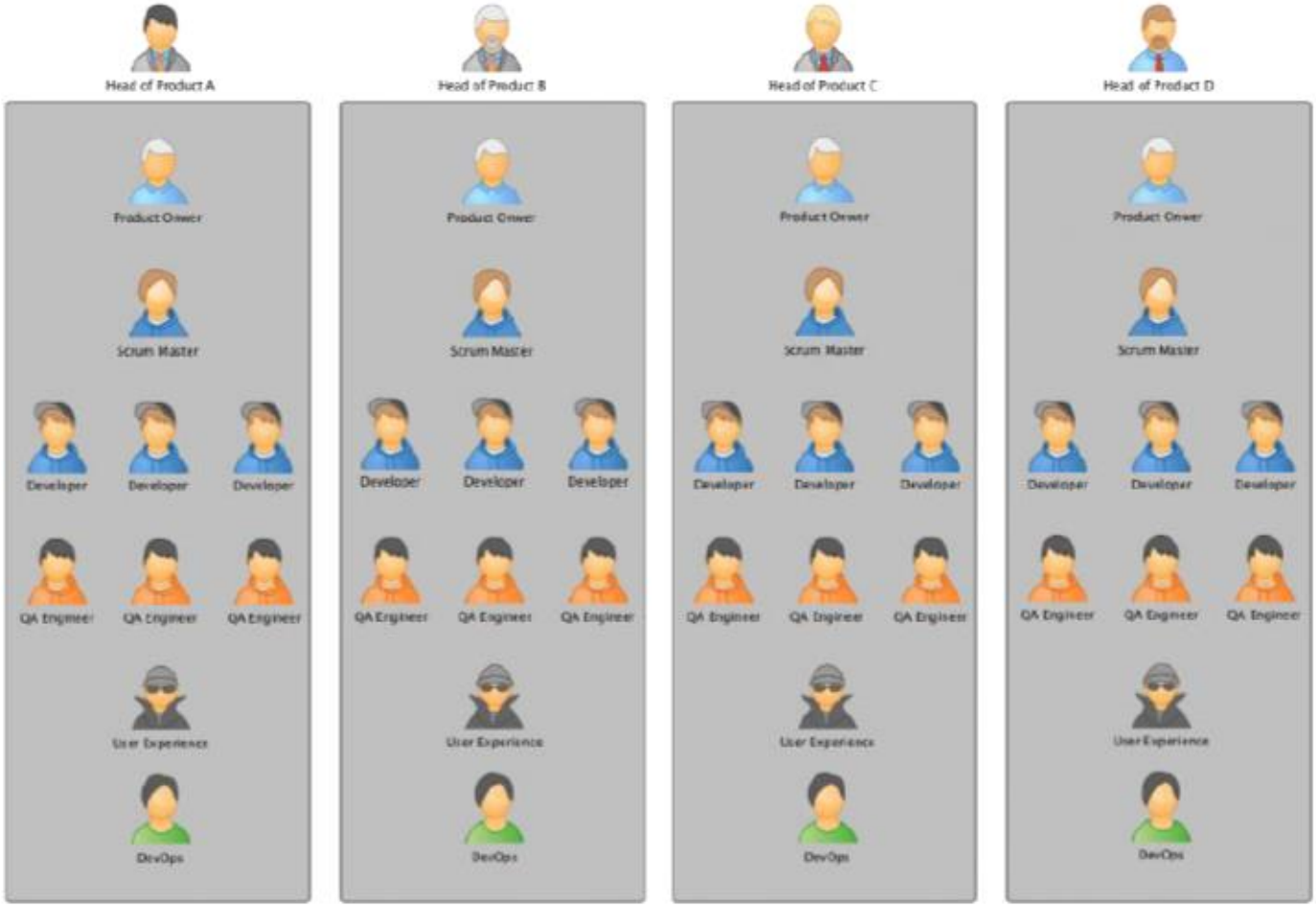
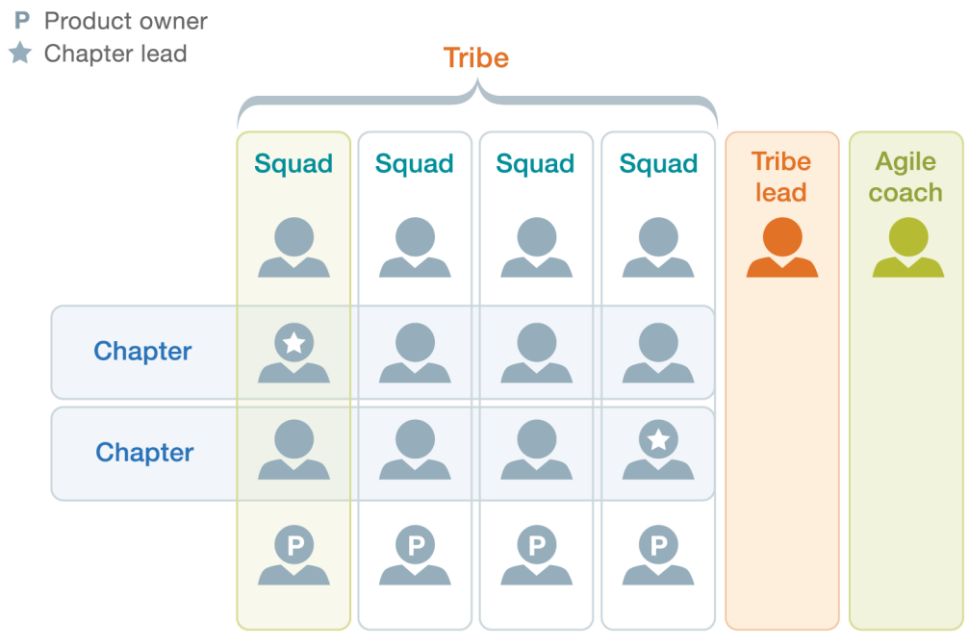
Agile: Matrix



Agile: Cross-Functional Teams



Agile Structures:



Tribe
(collection of squads with interconnected missions)

- includes on average 150 people
- empowers tribe lead to establish priorities, allocate budgets, and form interface with other tribes to ensure knowledge/insights are shared

Agile coach
- coaches individuals and squads to create high-performing teams

Squad
(basis of new agile organization)

- includes no more than 9 people; is self-steering and autonomous
- comprises representatives of different functions working in single location
- has end-to-end responsibility for achieving client-related objective
- can change functional composition as mission evolves
- is dismantled as soon as mission is executed

Product owner
(squad member, not its leader)
- is responsible for coordinating squad activities
- manages backlog, to-do lists, and priority setting

Chapter
(develops expertise and knowledge across squads)

Chapter lead
- is responsible for one chapter
- represents hierarchy for squad members (re: personal development, coaching, staffing, and performance management)

McKinsey&Company | Source: ING

Project Management Competency Areas

- Integration Management
- Scope Management
- Time Management
- Cost Management
- Quality Management
- Human Resource Management
- Communications Management
- Risk Management
- Procurement Management
- Stakeholder Management

Project Management Process Groups

Initiating Process Group

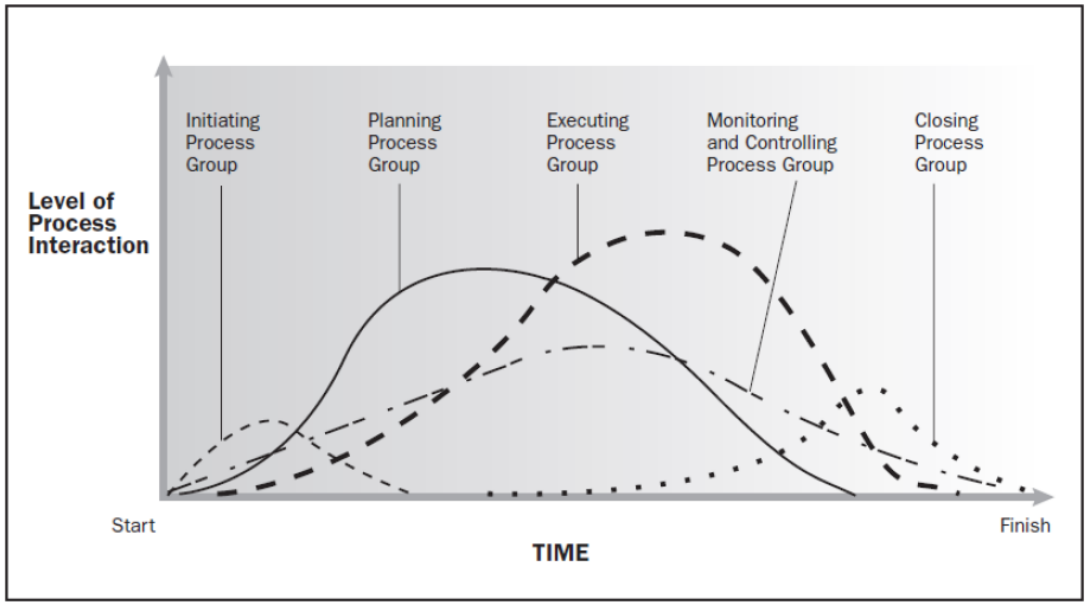
Planning Process Group

Executing Process Group

Monitoring and Controlling Process Group

Closing Process Group

Process Groups in Project Lifecycle



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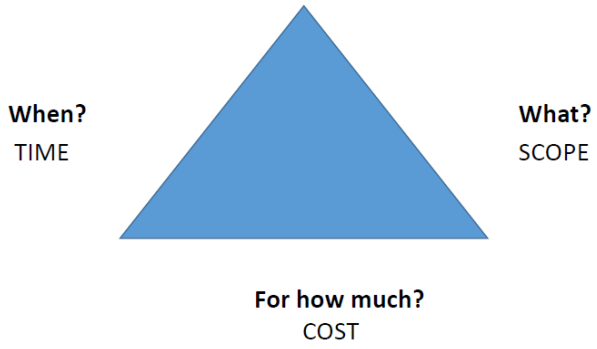
Part #2

Project Goal



Project Planning Goals:

1. Ensure that all project activities are identified and properly sequenced
2. Determine project duration
3. Get commitment
4. Ensure that adequate amount of time is allocated for the project
5. Ensure that resources will be given in time
6. List risk management actions

Scope Management

- Collect requirements
- Define Scope
- Create Work breakdown structure

Time management

- Define activities
- Sequence activities
- Estimate activity resources
- Estimate activity duration
- Develop schedule

Collect Requirements - business objectives, scope and boundaries of the planned solution, acceptance criteria‘s,background for project-activity planning, include cost and time

Project goals must comply with **SMART** criteria:

1. Specific
2. Measurable
3. Agreed Upon
4. Realistic
5. Timely

Characteristics of a Good Requirement:

1. Measurable
2. Verifiable
3. Traceable

4. Complete
5. Consistent
6. Unambiguous
7. Acceptable to stakeholders

Requirements Document Content:

1. Business need and project goals
2. Functional requirements
3. Non-functional requirements (performance, security, compliance with standards, etc.)
4. Requirements for quality
5. Acceptance criteria
6. Influence to customer organization and external third parties
7. Requirements for training and maintenance
8. Assumptions and constraints of requirements

Characteristics of Work Breakdown Structure (WBS):

1. Provides background for further planning
2. Enables activity estimating and control
3. Enables assignment of resources to activities

WBS Work package - Lowest WBS component, may be estimated & it‘s delivery can be controlled

WBS Activity - needed to create a **work package** & can be divided into tasks

WBS Groupings:

a) By groups of project deliverables - e.g., Hardware, Software, Documentation, Testing
b) By project stages - e.g.: Concept definition, Requirements analysis, Development, Deployment

Sequence Activities according to precedence diagramming method (PDM):

1. Finish-to-Start (FS)
2. Finish-to-Finish (FF)
3. Start-to-Start (SS)
4. Start-to-Finish (SF)

Sequence Activities Leads and Lags:

a) Lead: allows acceleration of the success or activity
b) Lag: allows a delay in the success or activity

Estimation Tools and Techniques:

a) **Analogous Estimation** (Quick) – based on expert judgement or stats of previous projects
b) **Bottom-up Estimation** (Time-Consuming) – Work packages are estimated & summed bottom-up
c) **Parametric Estimation** (Less accurate than bottom-up) – based on math models with historical data from past projects

Estimating Software:

1. *“Count if at all possible. Compute when you can‘t count. Use judgment alone only as a last resort.”*

2. Keep and use historical data
3. Use activity checklist

Computable (Countable) Elements of Software:

1. Solution features
2. Use cases
3. User Stories
4. Function Points
5. Use Case Points
6. Web pages
7. Database tables
8. Classes
9. Change requests
10. …

Software Size Estimation:

1. **Lines of Code** – calculable only when solution is developed
2. **Function Points (FP)** – more accurate, but requires a detailed analysis of functional requirements
3. **Story Points (SP)** – quick, but difficult to compare different projects and teams
4. **Use Case Points** – quicker that FP, and allows to compare different projects (differently than in SP)

Constructive Cost Model (COCOMO) is a procedural software cost estimation model developed by Barry W. Boehm. The model uses Lines of code estimate and factors that influence the amount of project resources needed.

"Use Case Points" technique (Gustav Karner, 1993) counts use cases, actors, technical complexity & environmental complexity (based on the team experience level):

1. **Use Case Weight (UUCW)** = (Total No. of Simple Use Cases x 5) + (Total No. Average Use Cases x 10) + (Total No. Complex Use Cases x 15)
2. **Actor Weight (UAW)** = (Total No. of Simple Actors x 1) + (Total No. Average Actors x 2) + (Total No. Complex Actors x 3)
3. **Technical Complexity Factor (TCF)** = 0.6 + (TF/100)
    a. TF = Factor 1 value * Factor 1 weight + … + Factor *n* value * Factor *n* weight
4. **Environmental Complexity Factor (ECF)** = 1.4 + (-0.03 x EF)
    a. EF = Factor 1 value * Factor 1 weight + … + Factor *n* value * Factor n weight
5. **Use Case Points (UCP)** = (UUCW + UAW) x TCF x ECF
6. **Project hours** = UCP x Number of hours for 1 use case point
    a. Hour recommendations for 1 use case point:
        i. 20 hours (Gustav Karner)
        ii. Between 15 and 30 hours (Sparks, 1999)
        iii. Based on historical data of previous projects (if it exists)
    b. UCP does not include time for project management, quality assurance and activities not directly related to development (i.e. deployment, data migration, documentation).

Technical Complexity Factor (TCF)

Factor	Description	Weight
T1	Distributed system	2.0
T2	Response time/performance objectives	1.0
T3	End-user efficiency	1.0
T4	Internal processing complexity	1.0
T5	Code reusability	1.0
T6	Easy to install	0.5
T7	Easy to use	0.5
T8	Portability to other platforms	2.0
T9	System maintenance	1.0
T10	Concurrent/parallel processing	1.0
T11	Security features	1.0
T12	Access for third parties	1.0
T13	End user training	1.0

Enviromental Complexity Factor (ECF)

Factor	Description	Weight
E1	Familiarity with development process used	1.5
E2	Application experience	0.5
E3	Object-oriented experience of team	1.0
E4	Lead analyst capability	0.5
E5	Motivation of the team	1.0
E6	Stability of requirements	2.0
E7	Part-time staff	-1.0
E8	Difficult programming language	-1.0

Project Management Plan & **Project Schedule** are **not the same** things:

1. **Project Plan** – formal document, which defines project scope, time, cost, and project activities.
2. **Project Schedule** (part of project plan) – list of tasks with task sequencing and deadlines.

Develop Schedule – make the project schedule, according to task sequences, effort, resource availability and constraints.

1. **Free float schedule activity –** the amount of time that a activity can be delayed without delaying the early start of next activity
2. **Total float schedule activity –** the total amount of time that a activity may be delayed without delaying the project finish date
3. **Activity Critical path –** the duration of activities that determines the duration of the project (activities whose float is <= 0)

Schedule Compression Techniques:

1. **Scope change or re-estimation –** scope reduction and its agreement with the customer, re-consideration of risks and assumptions
2. **Crashing –** add additional resources

3. **Fast tracking –** activities, that would normally be done in sequence are performed in parallel (can result in rework)

Project plan should answer the following questions:

1. Why is the project needed and what value will it create?
2. What will be done during the project and what are the main project deliverables?
3. Who will participate in the project? What are responsibilities of all parties and people involved in the project?
4. When will the project be finished?
5. What is the project cost?

Project Plan Content:

1. Project Goals and Business Objectives
2. Scope Statement
3. Stages and Schedule
4. Budget
5. Resource Breakdown Structure
6. Communication management
7. Risk Register

Agile projects aim to fix cost and time, but allow to change scope

Earned Value Management (EVM) is used to control project status:

1. **Planned Value (PV)** – the budgeted cost of the work
2. **Actual Cost (AC)** – the total cost incurred in performing the work
3. **Earned Value (EV)** – the budgeted amount for the performed work
4. **Cost Variance (CV)** – shows if project corresponds to Plan Baseline (CV = EV - AC)
    a. If CV > 0, we accomplish more work than planned
5. **Schedule Variance (SV)** – shows if project corresponds to Schedule Baseline (SV = EV - PV)
    a. If SV > 0, we finish work faster than planned
6. **Cost Performance Index (CPI)** = EV / AC
7. **Schedule Performance Index (SPI)** = EV / PV
8. Allows to forecast project cost & time, advises what corrections to make to project, but do not show project deliverable quality (requires separate measurement) & **requires strong plan baseline**

Project activity status using Scrum:

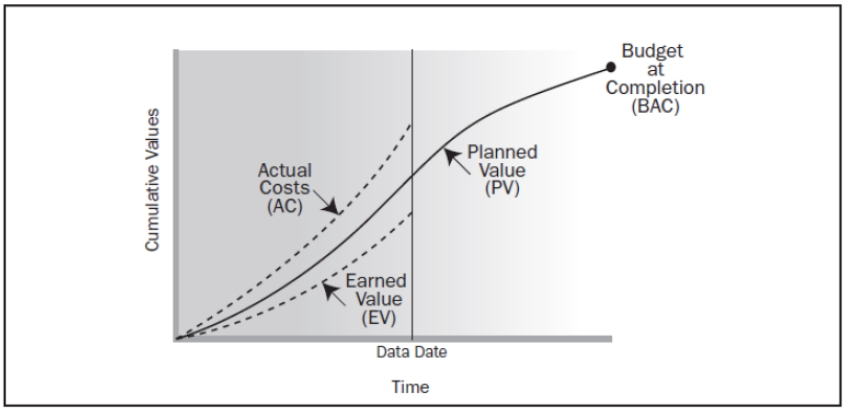
1. Product Backlog Items are divided into smaller tasks, which are included in iterations (sprints), whose length is less than 1 month
2. Product Backlog Item is done when all its tasks are done
3. At the end of each sprint, working result is delivered

Agile and Lean methods focus on tasks (work) in progress (WIP), because:

1. WIP means money spent and no return (yet)
2. WIP may hide efficiency problems
3. WIP increases rework risk, because each task may be needed to be reworked before its acceptance

S Curve

- S Curve can be used to show EVM measures



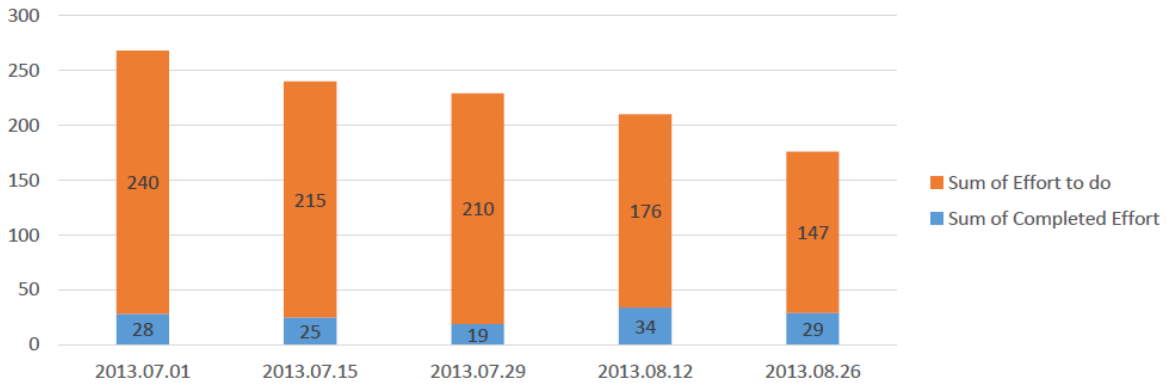
Forecasting (Based on EVM values):

1. **Budget at Completion (BAC)** – the sum of planned values of all project activities
2. **Estimate at Completion (EAC)** – forecased most likely value based on project performance
3. If we plan that the project will run according to Plan Baseline from the current moment:
    a. EAC = AC + BAC - EV
4. If we allocate time and effort to re-estimate remaining activities:
    a. EAC = AC + ETC (Estimate to Complete)
5. If we plan that the project will run according to its past performance:
    a. EAC = BAC / CPI

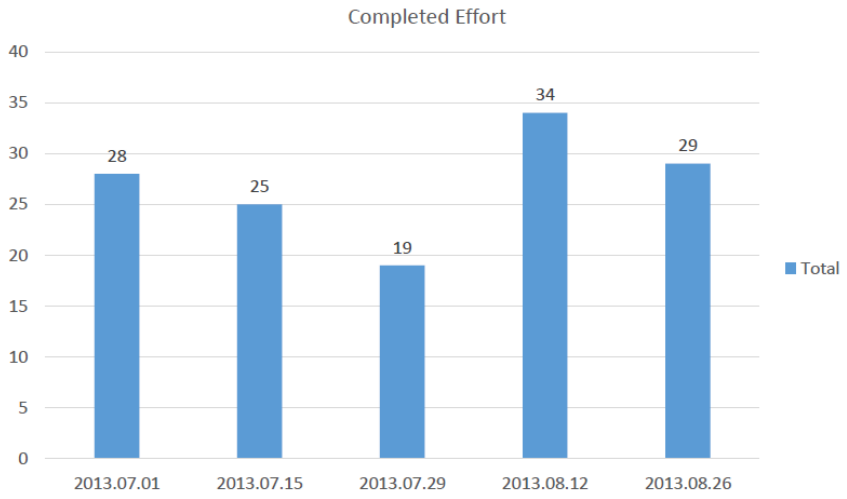
Agile Forecasting:

1. Measures - Remaining tasks (**Effort to Do**) & Work completed per Sprint (**Completed Effort**)
2. Burn Down diagram shows both scope deviation and progess measures
3. Average velocity can be used to forecast

Forecasting, Agile: Burn Down Chart



Forecasting, Agile: Velocity Chart



Actions, if the project is late or exceeds it budget project manager must initiate corrective actions:

1. **Work overtime** – can be effective for short time periods (e.g., one week)
2. **Reduce quality** – that gives short-term effect and will transfer problems to the future & is difficult to evaluate how much should be reduced and where
3. **Add additional team members** – may be effective in project beginning, requires time, increase communication overhead, reduced time of current project members that is spent on project tasks
4. **Replace project team member** - May be effective if the project is not in its final stage
5. **Agree on a new deadline** – easy option for the project team, but may not always be possible because of external factors (e.g., customer deadlines or commitments to third parties)
6. **Change scope** – often the best alternative from all bad ones - customer rarely wants to loose functionality, but the most important functionality delivered before the deadline may be more better than to be late with all functionality

Part #3

Risk Management:

1. Identify risks
2. Perform qualitative risk analysis
3. Plan risk response
4. Monitor and control risk – process executed throughout the whole project course

Risk Identification Tools and techniques:

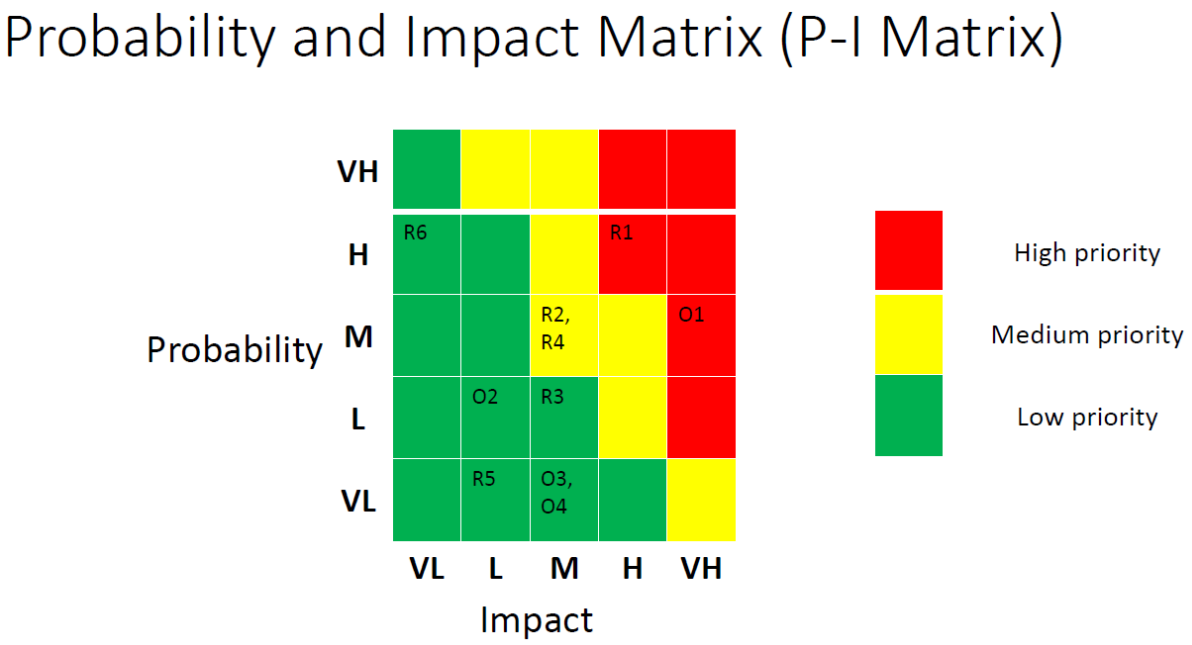
1. Assumptions analysis
2. SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis
3. Brainstorming
4. Document (Project plan, Requirements specification, work breakdown structure) review
5. Checklists
6. Delphi

When identifying risks, it is important to distinguish between **cause**, **risk**, and **effect:**

1. **Causes** – Definite events or sets of circumstances that exist in the project or its environment, and that give rise to uncertainty.
    a. *I.e. Unknown technology, Lack of competent specialists*
2. **Risks** – Uncertainties that, if they occur, would affect the project objectives.
    a. *I.e. Project team will work slower than planned*
3. **Effects** – Unplanned variations from project objectives, either positive or negative, that would arise as a result of risks occurring.
    a. *I.e. Project will be late; Project actual cost will exceed planned cost*

Probability and Impact Matrix (P-I Matrix):

1. P-I Matrix is used to determine risk priorities
2. Project manager's responsibility is to allocate time to manage high-priority risks



Contingency (Extra) Reserve for Risks Management:

1. Contingency reserve is additional cost or time, which is needed to reduce the risk of not achieving project objectives to acceptable level
2. Reserve may be a percentage of planned value or a fixed value
3. Contingency reserve can be computed for identified risks only

Strategies for negative risks:

1. **Avoid Strategy –** eliminate the uncertainty and risk
2. **Transfer Strategy –** transfer risk to a third party
3. **Mitigate Strategy –** reduce risk probability and impact
4. **Accept Strategy –** accept risk and not take any actions

Strategies for positive risks (opportunities):

1. **Exploit Strategy** – eliminate risk uncertainty and make sure that it happens
2. **Share Strategy** – share opportunity with a third party which can make the best use of it
3. **Enhance Strategy** – increase opportunity's probability and (or) impact
4. **Accept Strategy** – accept opportunity and not take any actions

Part #4

Communications plan is described in Project Plan document:

1. Who are project stakeholders?
2. What is project organizational structure?
3. What is communication frequency and what communication methods will be used internally in the project team and with project stakeholders?
4.

Communications management is necessary, because the project manager needs to have a clear understanding who are project stakeholders, who is customer project manager, who and how will accept project results, who will sign project form of acceptance

Different Modes for Responding to Conflicts:

a. **Competing –** an individual pursues his own concerns at the other person's expense
b. **Compromising –** both parties try to find some expedient, mutually acceptable solution that partially satisfies them
c. **Accommodating –** the individual neglects his own concerns to satisfy the concerns of the other person
d. **Avoiding –** the person neither pursues his own concerns nor those of the other individual, he does not deal with the conflict
e. **Confronting –** involves an attempt to work with others to find some solution that fully satisfies their concerns

BATNA (Best Alternative to a Negotiated Agreement) are actions of a negotiating party that will be taken if no agreement will be reached during the negotiation.

Project Steering Committee – organizational unit, consisting high-level executives & decision makers.

Project Steering Committee:

1. Monitors and controls project execution
2. Approves decisions if project objectives are changed
3. Initiates actions needed to achieve project objectives that may not be in project scope

Part #5

Enterprise resource planning (ERP) systems integrate internal and external management of information across an entire organization – embracing finance/accounting, manufacturing, sales and service, customer relationship management

Organization, when implementing a new ERP, aims:

1. Measure performance of their supply chain and increase effectiveness
2. Quickly implement new customer requirements
3. Conveniently and efficiently plan and execute customer orders
4. Increase their ability to offer after-sales services to customers

ERP Project Stages:

1. Planning
2. Implementation
3. Support and Maintenance

ERP Implementation Methodologies:

1. **Big bang** – Implementation happens in a single instance. All users move to the new system on a given date.
2. **Phased rollout** – Changeover occurs in phases over an extended period of time. Users move onto new system in a series of steps. *(Phased rollout by module, business unit or geography)*
3. **Parallel adoption** – Both the legacy and new ERP system run at the same time. Users learn the new system while working on the old.

Critical ERP Implementation Mistakes:

1. Not explaining what a new system means to users before startingtheproject
2. Not load testing the system with scripts and end users
3. Not performing a mock Go Live
4. Not taking change management and testing seriously
5. Assigning an internal resource as the only project manager
6. Not communicating changes before they happen
7. Delivering Training 1.0 in a Training 2.0 World
8. Not moving proprietary components to open business standards
9. Not addressing security and archiving before upgrading
10. Assuming your internal tech people can pick up 15 years of experience in a couple of weeks

Part #6

ITIL (Information Technology Infrastructure Library):

1. ITIL is not a standard, but a set of best practices for IT Service Management from experience of well-known worldwide enterprises. ITIL does not tell that you must do it this way, ITIL says that you can do it this way.
2. ITIL isa public framework that describes Best Practice in IT Service Management.
3. ITIL was published by Her Majesty's Stationery Office (HMSO) in the UK on behalf of the Central Communications and Telecommunications Agency (CCTA)
4. ITIL can be used for software maintenance

Service Level Agreement:

1. All quantitative and qualitative requirements and conditions for Service are defined in Service Level Agreement (SLA)
2. SLA is a contract between User and Service Provider
3. SLA inherits many conditions from Project Contract

Maintenance Processes

1. Incident Management
2. Request for Service Management
3. Change Management

Maintenance Functions Units

1. Help Desk - functional unit, consisting from dedicated people responsible for Service providing activities
2. Technical Management - functional unit responsible for IT infrastructure
3. Application Management - functional unit responsible for user applications, integrations, user interface

Part #7

Wasting People's Time when team members are assigned to the project too early (Early Overstaffing)

The biggest drawback of multi-taskingis the cost of switching between tasks

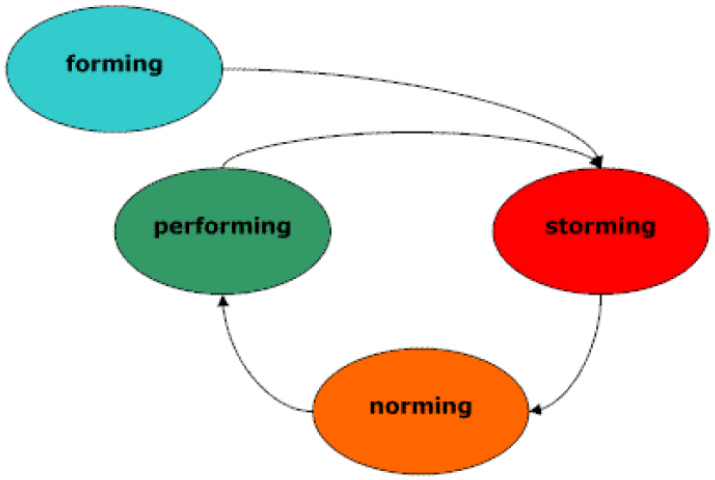
Employee may have more than one task, but one should take into account that, in total, she will accomplish less work than if she had one task

Scrum says that the team should be between 5 and 9 persons („two-pizza teams", Succeeding With Agile, Mike Cohn, 2012)

Team Management

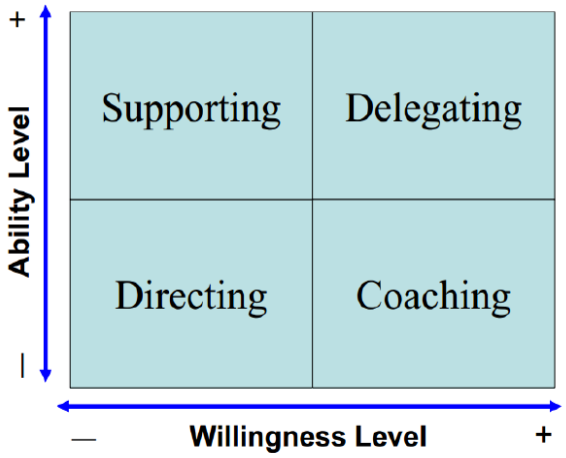
1. **Plan Project Team** - Roles and responsibilities, assignment and release dates, Team member assignment and release schedule, Training needs, Team-building strategy, Recognition and rewards, Plan influence to the organization
2. **Acquire Project Team** - Projectmanager must coordinate assignment of employees to the project with resource managers and other project managers (if several projects use time of one specialist)
3. **Develop Project Team** - The goal of project team development is to improve the competencies and interaction of team members to enhance project performance.
4. **Manage Project Team** – Project team management involves tracking team-member performance, providing feedback, resolving issues, and coordinating changes to enhance project performance.

Stages of Team Development



Bruce Tuckman, 1965.

Management Styles



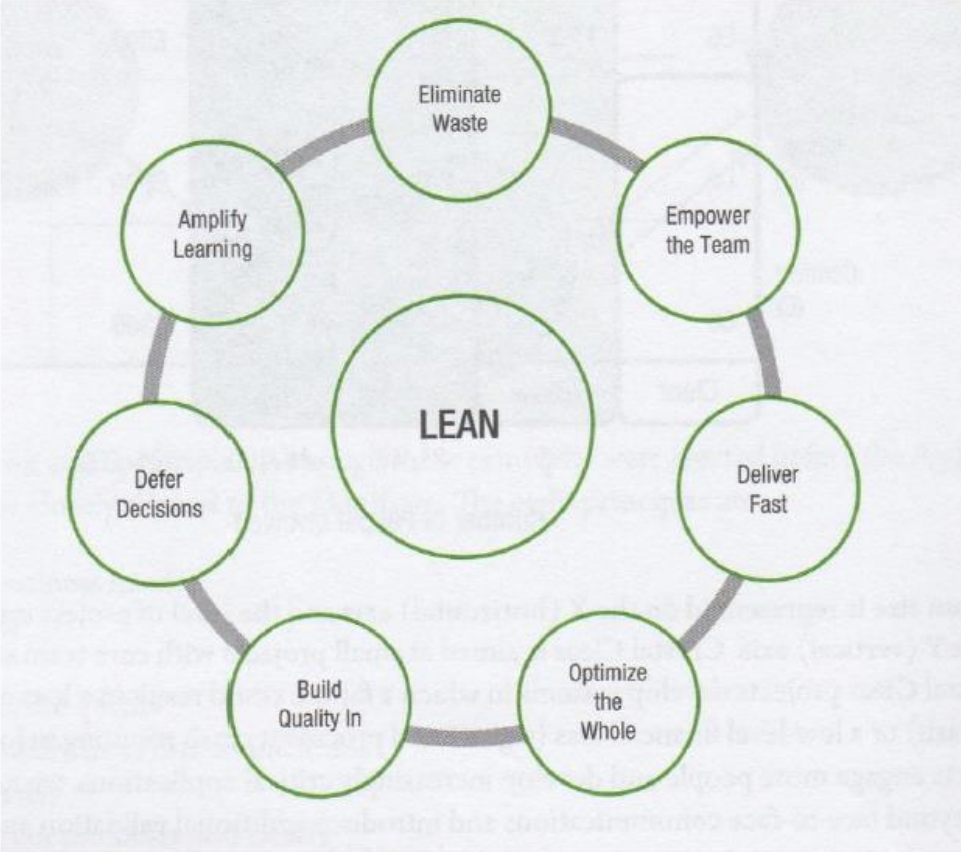
The Situational Leadership Model. Ken Blanchard and Paul Hersey. Management of Organizational Behavior.

Phase	Management Style
Forming	Directing
Storming	Coaching
Norming	Supporting
Performing	Delegating

Part #8

Just in Time (JIT) is a manufacturing strategy, which aims to reduce the amount of inventory and parts in a warehouse and associated costs. JIT increases the effectiveness of an organization.

Lean Principles



Value Stream Map helps to determine activities valuable to customer

Value Stream Map distinguishes between two time categories:

1. Time that creates value (Value-add)
2. Time that does not create value (Nonvalue-add)

Project Cycle Efficiency

$$Total\ cycle\ time = Value\ add\ time\ + Nonvalue\ add\ time$$

$$Process\ cycle\ efficiency = \frac{Total\ value{-}add\ time}{Total\ cycle\ time}$$

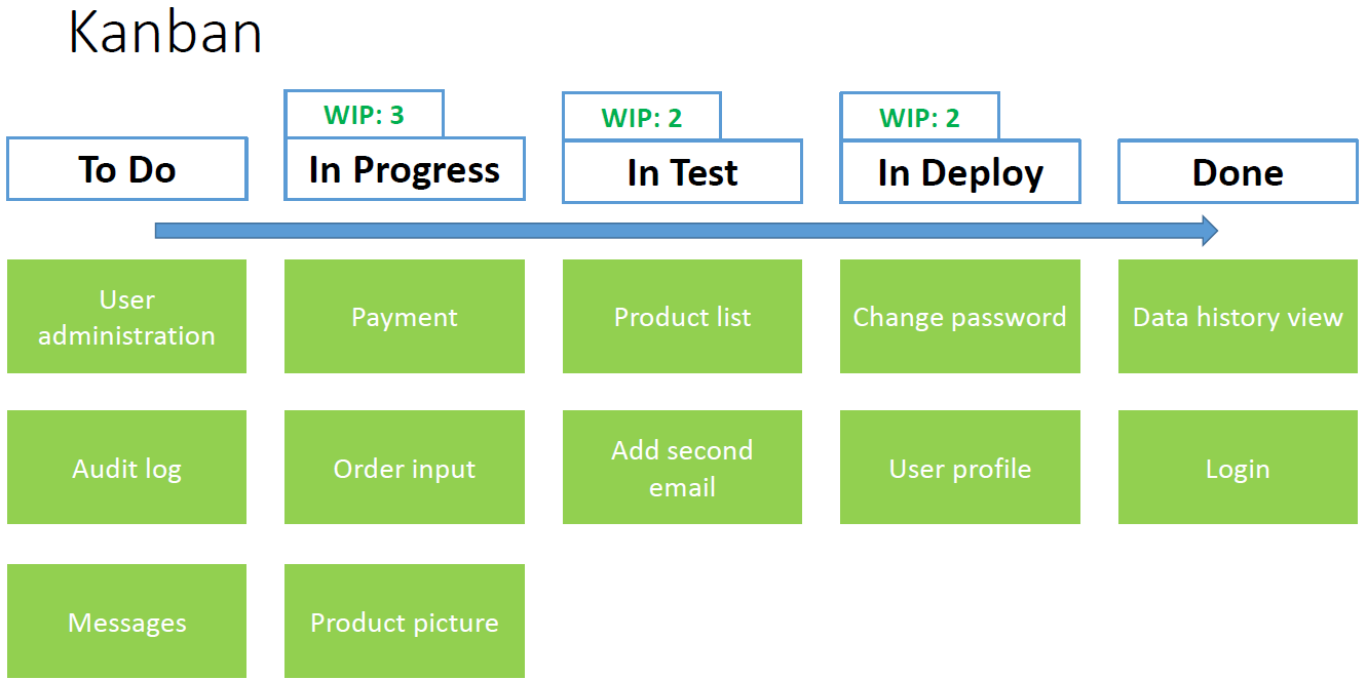
Lean Principles in Software Development

1. Low-dependencyArchitecture

2. Test-Driven Development
3. Test Automation
4. Continuous Integration
5. Code Standards and Reviews
6. Refactoring
7. The Ten-Year Rule

Kanban

1. Split work into states (define workflow columns)
2. Visualize the workflow (put it on the wall)
3. Write each work item on a card and put it on a column on the wall
4. Define "Work in progress" limits for each column



Scrum:

1. Scrum is a framework for developing and sustaining complex products
2. Scrum (n): A framework within which people can address complex adaptive problems, while productively and creatively delivering products of the highest possible value.
3. Scrum is an iterative method aiming to increase predictability and manage risk
4. Product Backlog contains all software development, enhancement and correction tasks
5. Product Backlog is dynamic and changes over time
6. Each product backlog item has a description, priority and estimate
7. The Scrum Team is self-organizing.
8. All Scrum events have fixed duration
9. Sprint is a 1-month or shorter period, during which the Scrum Team creates a potentially releasable product increment
10. A new sprint starts immediately after the conclusion of the previous sprint
11. Sprints consist of:
    a. Sprint planning
    b. Daily Scrum - 15-minute time-boxed event for the Development Team to synchronize activities and create a plan for the next 24 hours
    c. The development work
    d. Sprint Review - held at the end of each sprint and is time-boxed to 4 hours for one-month sprint

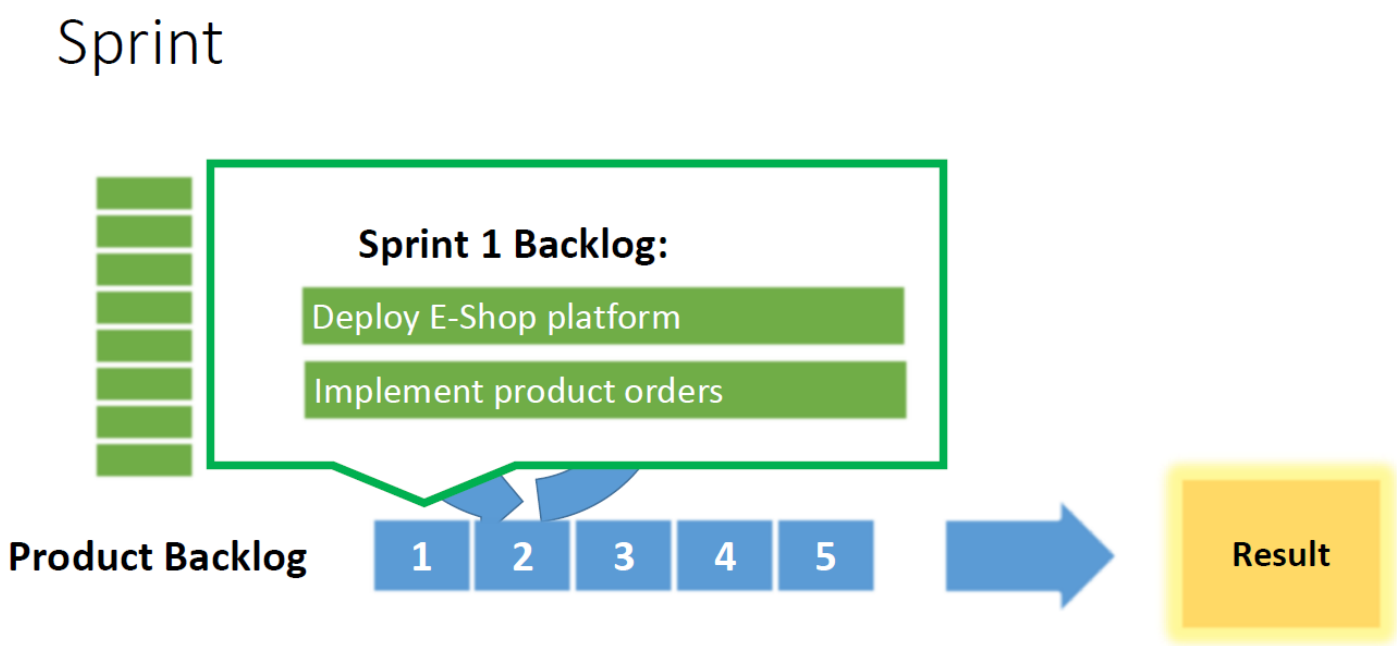
e. Sprint Retrospective - occurs after the Sprint Review and prior to the next Sprint Planning, and is time-boxed to 3 hours for one-month sprint

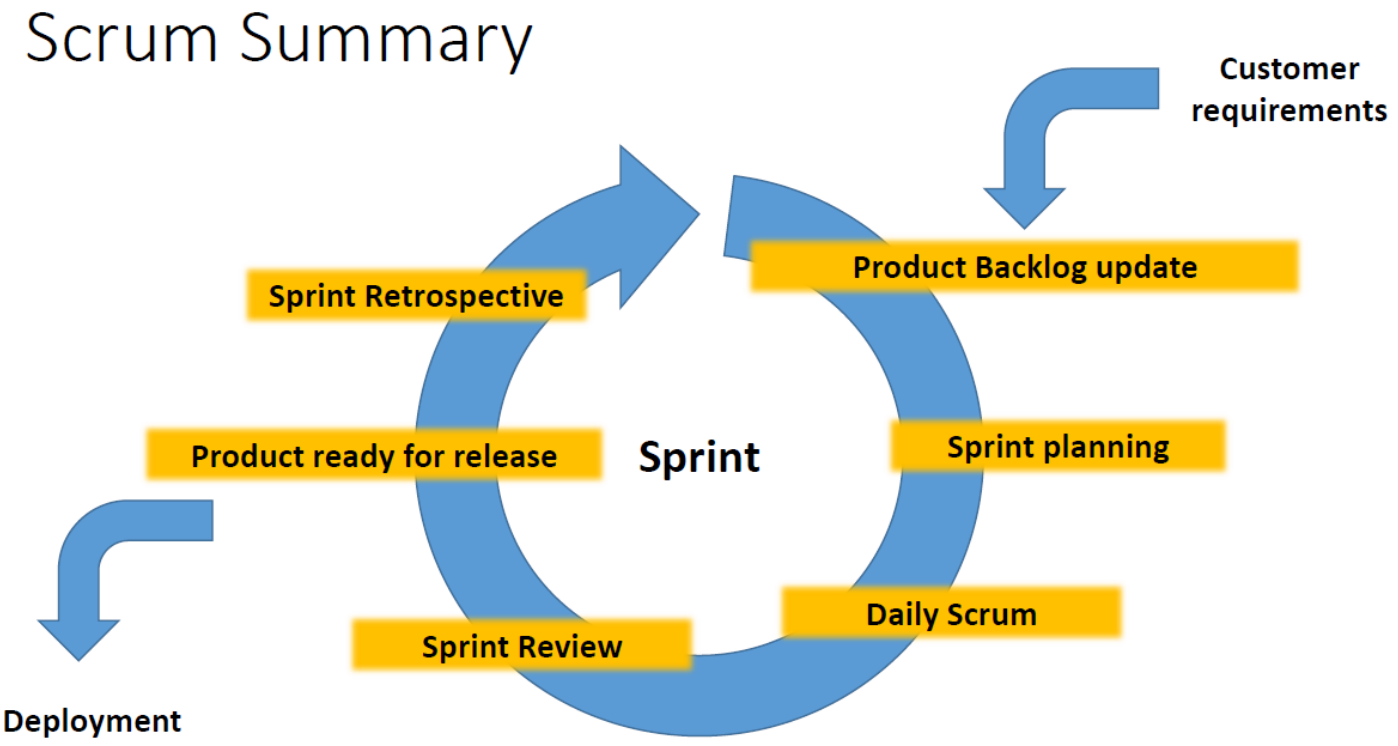
Scrum is founded on empirical process control theory:

1. knowledge comes from experience and
2. making decisions is based on what is known

Roles in a scrum team:

1. Product Owner
2. Development Team
3. Scrum Master - responsible for ensuring that the Scrum Team understands and adheres to Scrum theory, practices, and rules





Part #9

If we use IRR in an NPV formula, we will get NPV = 0

IRR and NPV are used to decide in which projects money should be invested

Project is worth investing, if:

1. IRR is higher than minimal acceptable rate of return
2. NPV is positive

Return on Investment (ROI)

- Return on Investment (ROI) is the ratio of net profit with the investment amount
- ROI = (Net Profit / Investment) * 100%

Present Value

- Present value (PV) is the value of future income determined as of today

$$PV = \frac{FV}{(1+r)^n}$$

FV = Future Value
r = Interest
n = Number of time periods

Net Present Value (NPV)

- Net Present Value (NPV) is the sum of income and expenses over time, according to present value

$$NPV = I_0 + \frac{I_1}{(1+r)^1} + \frac{I_2}{(1+r)^2} + \cdots + \frac{I_n}{(1+r)^n}$$

I = income and expenses balance over time period
r = interest
n = number of time periods

Internal Rate of Return (IRR)

- Internal Rate of Return (IRR) is a rate of return that makes the net present value of all cash flows (both positive and negative) from a particular investment equal to zero.

$$0 = I_0 + \frac{I_1}{(1+r)^1} + \frac{I_2}{(1+r)^2} + \cdots + \frac{I_n}{(1+r)^n}$$

I = income and expenses balance over time period
r = internal rate of return (IRR)
n = number of time periods

Part #10

Key Metrics for Sales

Metric	Description
Revenue, Eur	Sum of all projects sold
Orders, Eur	Sum of all projects sold that are not yet completed
Planned margin, %	$\frac{\text{Project planned revenue} - \text{project planned cost}}{\text{Project planned cost}}$
Actual margin, %	$\frac{\text{Project actual revenue} - \text{project actual cost}}{\text{Project actual cost}}$
Bids won, %	$\frac{\text{Bids won}}{\text{Bids made}}$

Key Metrics for Project Delivery 1/2

Metric	Description
Project completion in time, %	$\frac{\text{Number of projects completed in time}}{\text{Number of all projects}}$
Project cost deviation, %	$\frac{\lvert\text{Project planned cost} - \text{project } \textit{actual cost}\rvert}{\text{Project planned cost}}$
Amount of billed hours, %	$\frac{\text{Amount of billed } \textit{hours}}{\text{Amount of } \textit{available hours}}$
Actual margin, %	$\frac{\text{Project actual revenue} - \text{project actual cost}}{\text{Project actual cost}}$

Key Metrics for Project Delivery 2/2

Metric	Description
Employee turnover, %	$\frac{\text{Number of emloyees who quit}}{\text{Number of all employees}}$
Training days, %	$\frac{\text{Training days}}{\text{All working days}}$

Metrics for Marketing Department

Metric	Description
Sales, Eur	Amount of all sales revenue
Planned margin, %	$\frac{\text{Project planned margin} - \text{project planned cost}}{\text{Project } planned\ cost}$
Marketing costs, %	$\frac{\text{Marketing costs}}{\text{All costs}}$

Main resp. of sales department – to forecast & manage demand for services, and sell services

Main resp. of project delivery department – to manage projects, help to sell projects, transfer project to maintenance, and identify new leads at existing clients

a. **Billable Utilization Rate -** defines what percentage of all available hours of Project Delivery Department staff is sold

Main resp. of productizing – to collect experience of provided services & increase repeatability of services

Main resp. of marketing department – to tell market information about provided services & solutions, and help sales department to execute sales

PS Company Structure