

Turning Visions
into Business.



TECHNISCHE
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Project Management

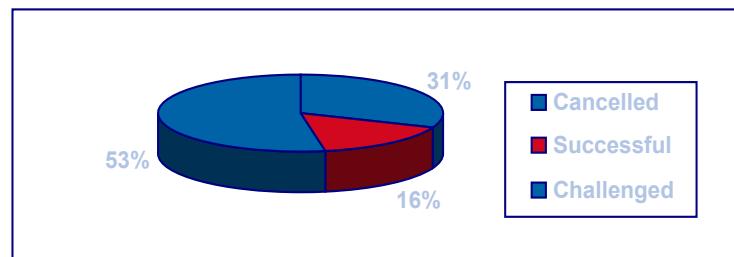
Introduction Lecture – TU Darmstadt



The Ground Hog Day of Software Engineering: Troubled Projects

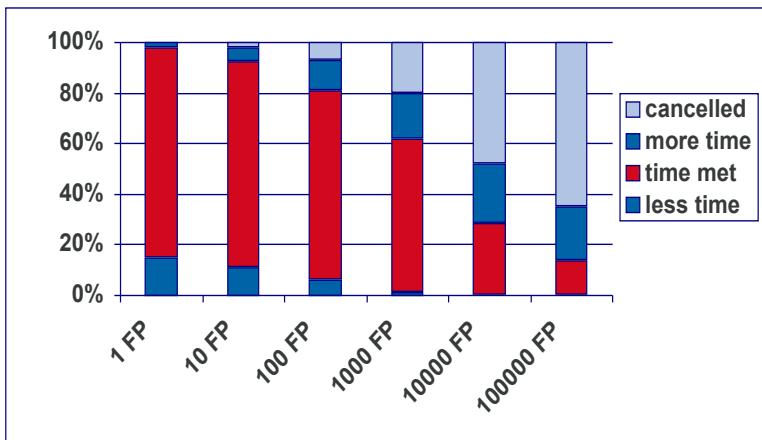
Many IT projects go badly wrong¹:

- 30% of all IT projects fail
- 90% of all IT projects suffer at least one restart
- IT projects overrun their budget in average by 100%



Challenged project: time or budget exceeded or requirements not met

As IT projects grow in size, their chance to succeed on time decreases rapidly²:



1 FP (function point) equals 125 lines of C code.

With an annual worldwide revenue of 600 billion dollar (spent on over 1 million software projects in the year 2000, growing by 25% each year), at least 200 billion dollar are wasted each year.³

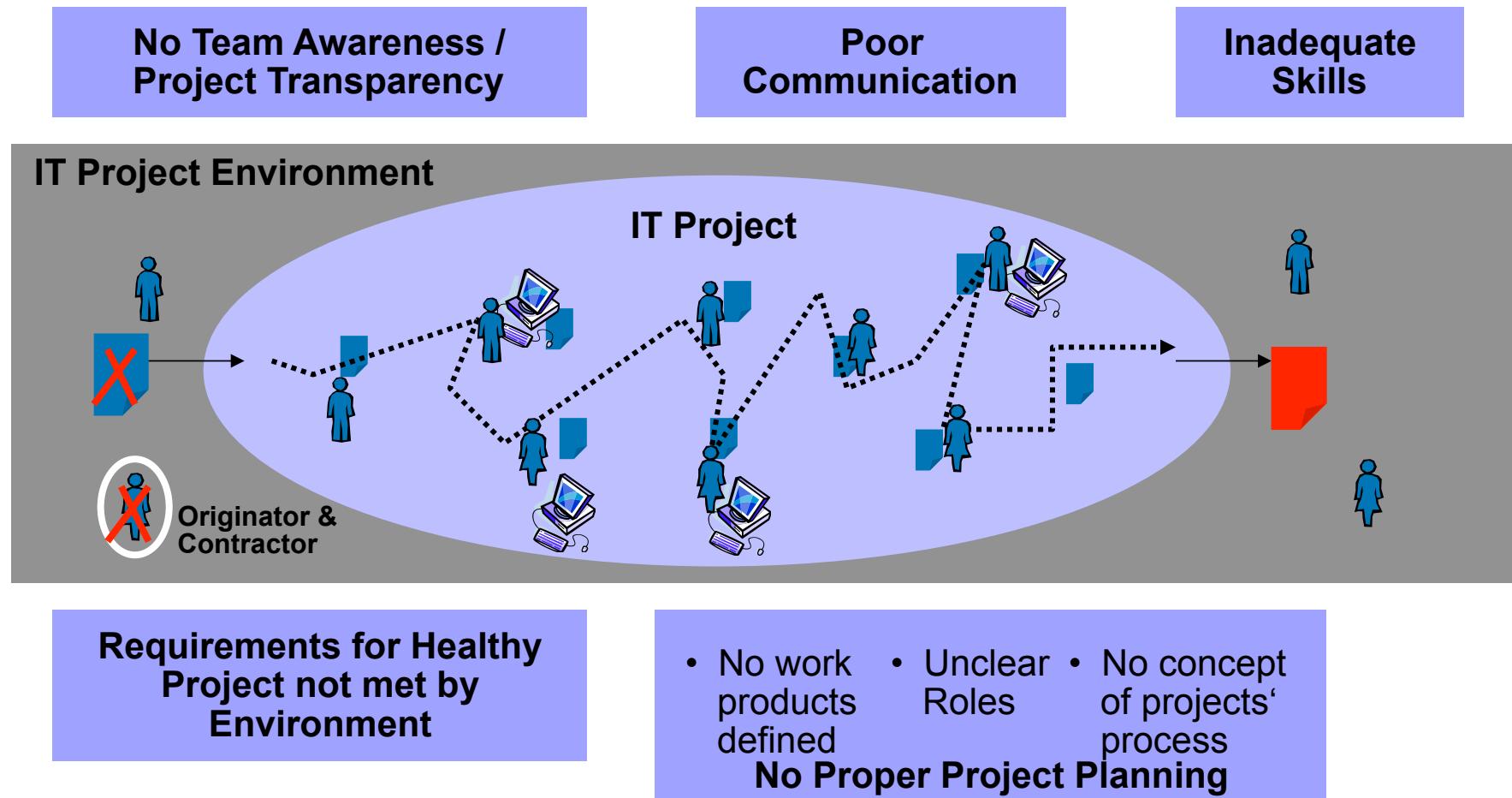
1 Survey of the Standish Group, www.standishgroup.com, Retrieved 2000

2 C. Jones: Patterns of Software Systems Failure and Success, International Thomson Computer Press, London, 1995

3 Figures from P. Jalote: CMM in Practice, Addison-Wesley, Reading, 2000



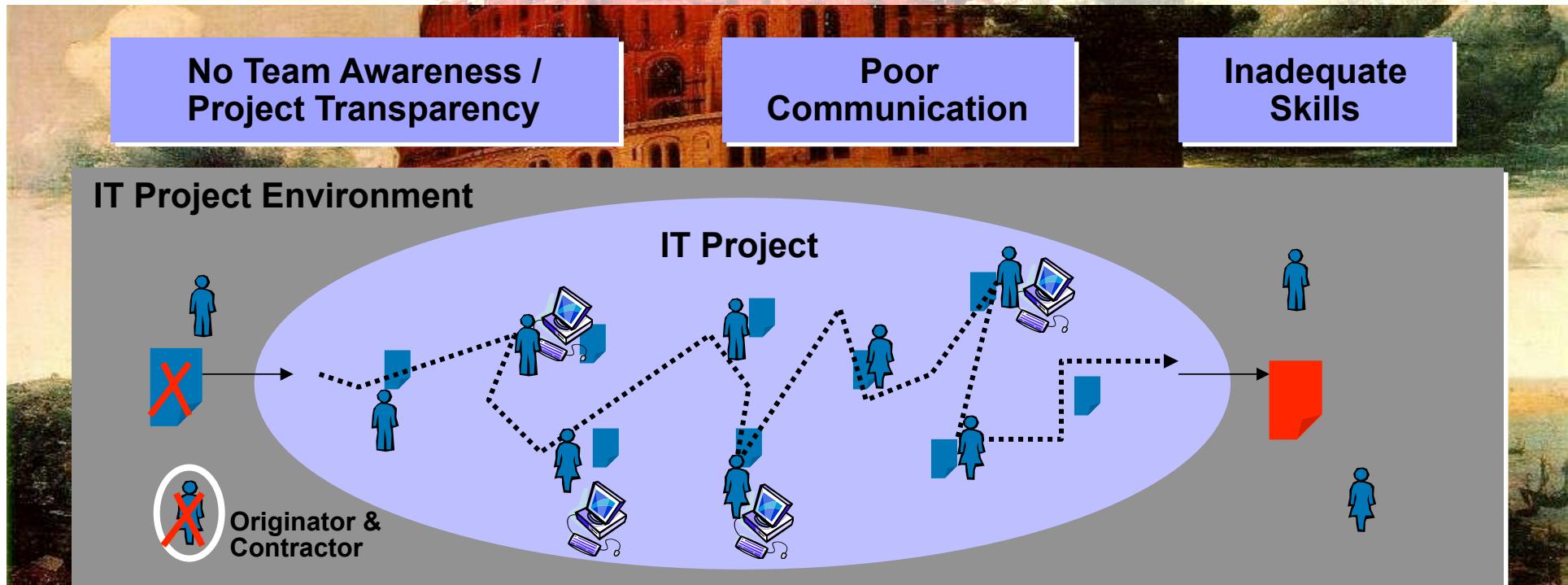
There are many well known reasons for troubled projects.



1. IBM Quality Assurance Headquarters, "Prevention Measures to avoid Troubled Projects", 2000
2. GartnerGroup, "IT Projects Don't Have to Fail", Doc.Nr. DF-05-3821, 1998

Most projects fail because they do not adhere to common standards and best practices.

IBM International QA, White Paper on Troubled Projects



Requirements for Healthy Project not met by Environment

- No work products defined
- Unclear Roles
- No concept of projects' process

No Proper Project Planning

The goals of this lecture are to know requirements AND solutions for professional project management.

- Requirements: Capability Maturity Model Integration for Development (CMMI) (en/de)
 - » CMMI for Development®: Guidelines for Process Integration and Product Improvement, 3rd Edition,
By Mary Beth Chrissis, Mike Konrad, Sandra Shrum, ISBN-10: 0-321-71150-5
- Solutions: Scrum
 - » Der Ultimative Scrum Guide, Malte Foegen et. al., wibas GmbH, Darmstadt
 - » Scrum Guide (en) or Agile Atlas (en)
 - » Succeeding with Agile: Software Development Using Scrum, [Mike Cohn](#)
- Solutions: Scaled Agile Framework (SAFe) and Large Scaled Scrum (LeSS)
 - » <http://scaledagileframework.com>
 - » Agile Software Requirements: Lean Requirements Practices for Teams, Programs, and the Enterprise, Dean Leffingwell
 - » <http://agileatlas.org/articles/item/large-scale-scrum-more-with-less>
- Solutions: Your research

Project Management

A project is a temporary endeavor undertaken to create a unique product or service

Temporary

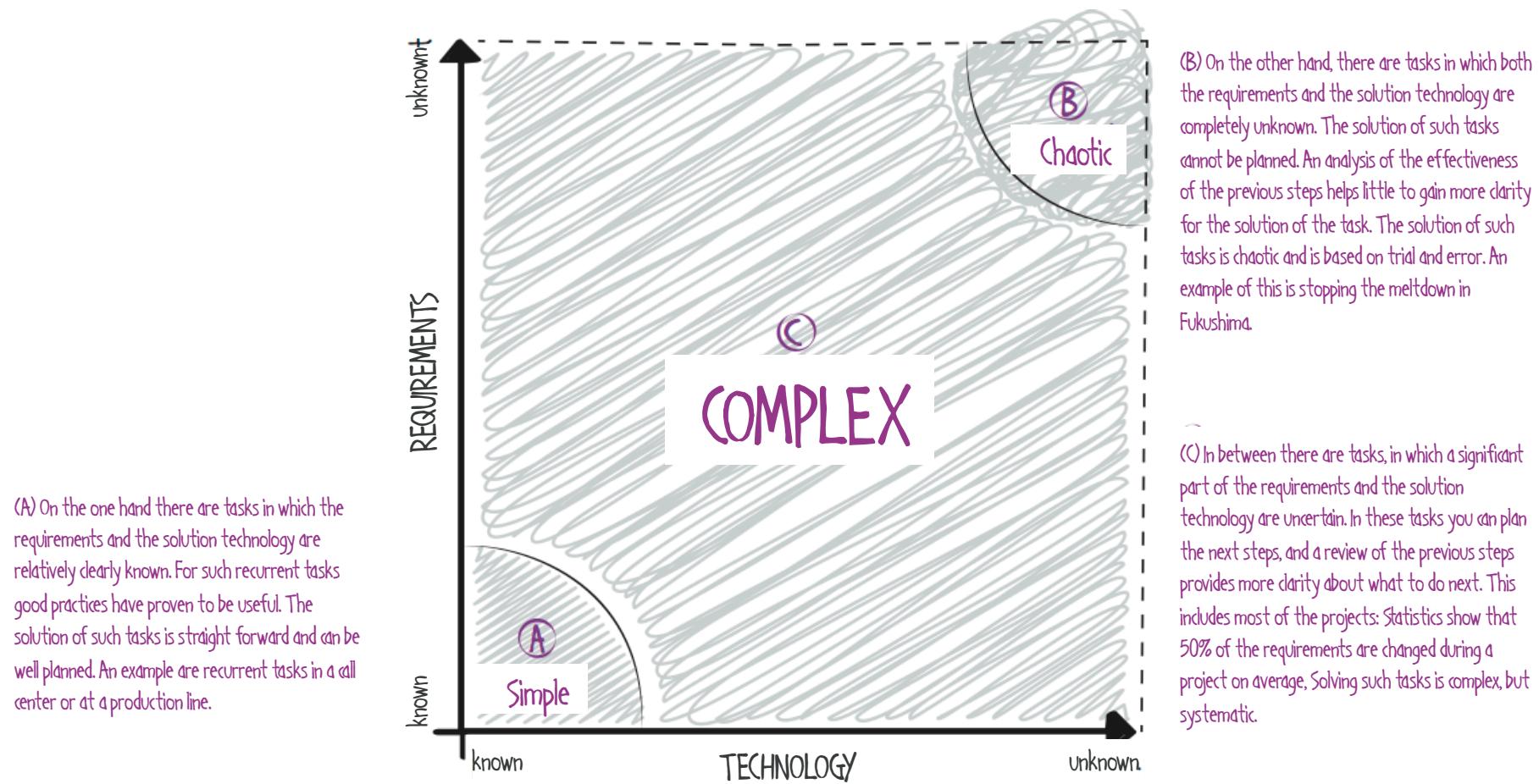
- means that every project has a definite beginning and a definite end

Unique

- means that the product or service is different in some distinguishing way from all other products or services.



Because they are unique, projects have unknown requirements and unknown technology. That makes them complex.



Projects can be very different.

Examples are

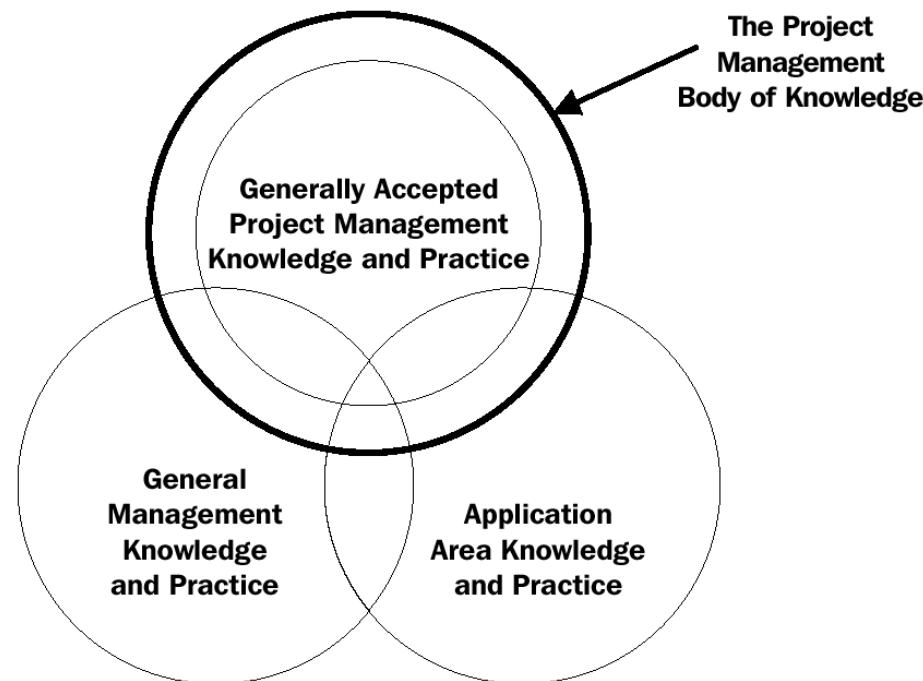
- Developing a new product or service.
- Effecting a change in structure, staffing, or style of an organization.
- Designing a new transportation vehicle.
- Developing or acquiring a new or modified information system.
- Constructing a building or facility.
- Building a water system for a community in a developing country.
- Running a campaign for political office.
- Implementing a new business procedure or process.

Project management requires a broad set of skills.

- Leading
 - » Involves establishing direction, aligning people, motivating and inspiring people
- Communicating
 - » Involves the exchange of information
- Negotiating
 - » involves conferring with others to come to terms with them or reach an agreement
- Problem solving
 - » involves a combination of problem definition and decision-making
- Influencing the organization
 - » involves the ability to "get things done"



Project management skills overlap with general management skills and technical skills.

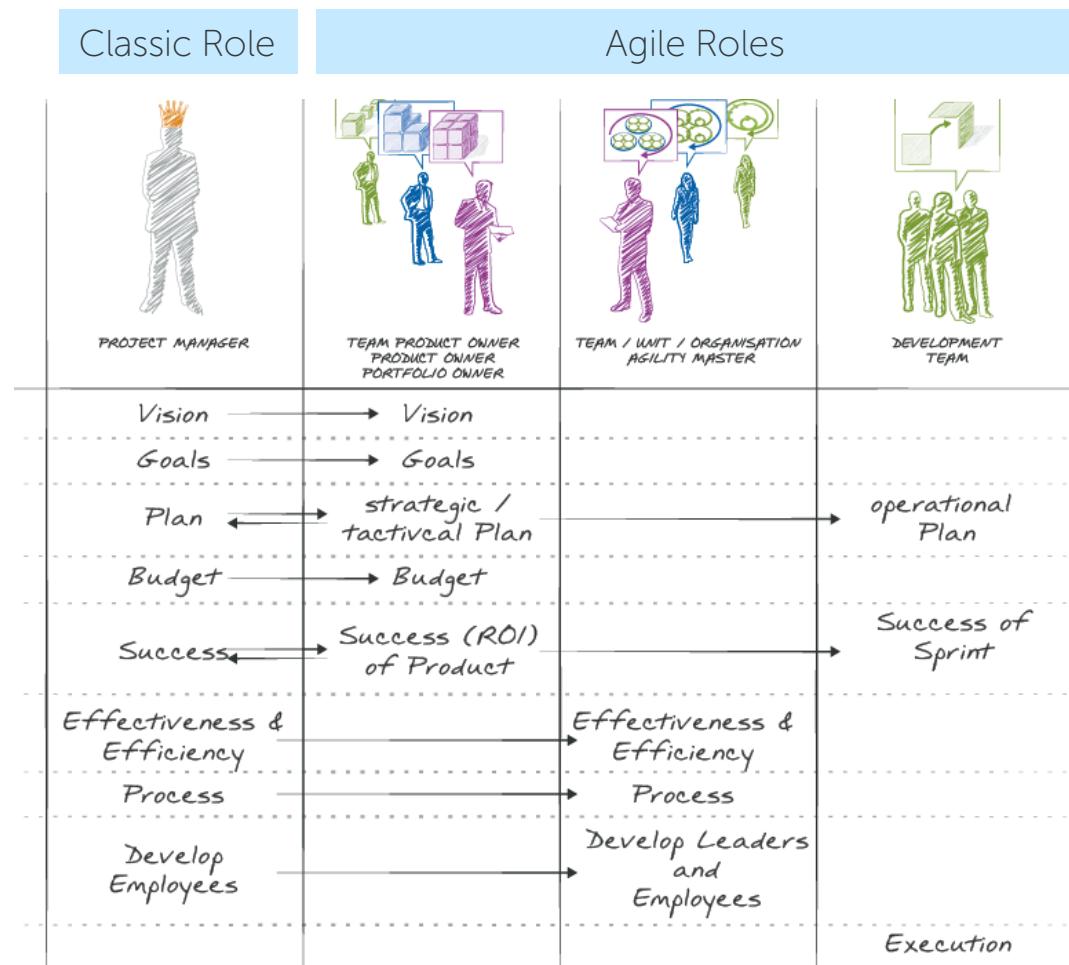


This figure is a conceptual view of these relationships.
The overlaps shown are not proportional.

Figure 1–2. Relationship of Project Management to Other Management Disciplines

Source: PMBok

Ups. Agile frameworks even do not have the role of a project manager.



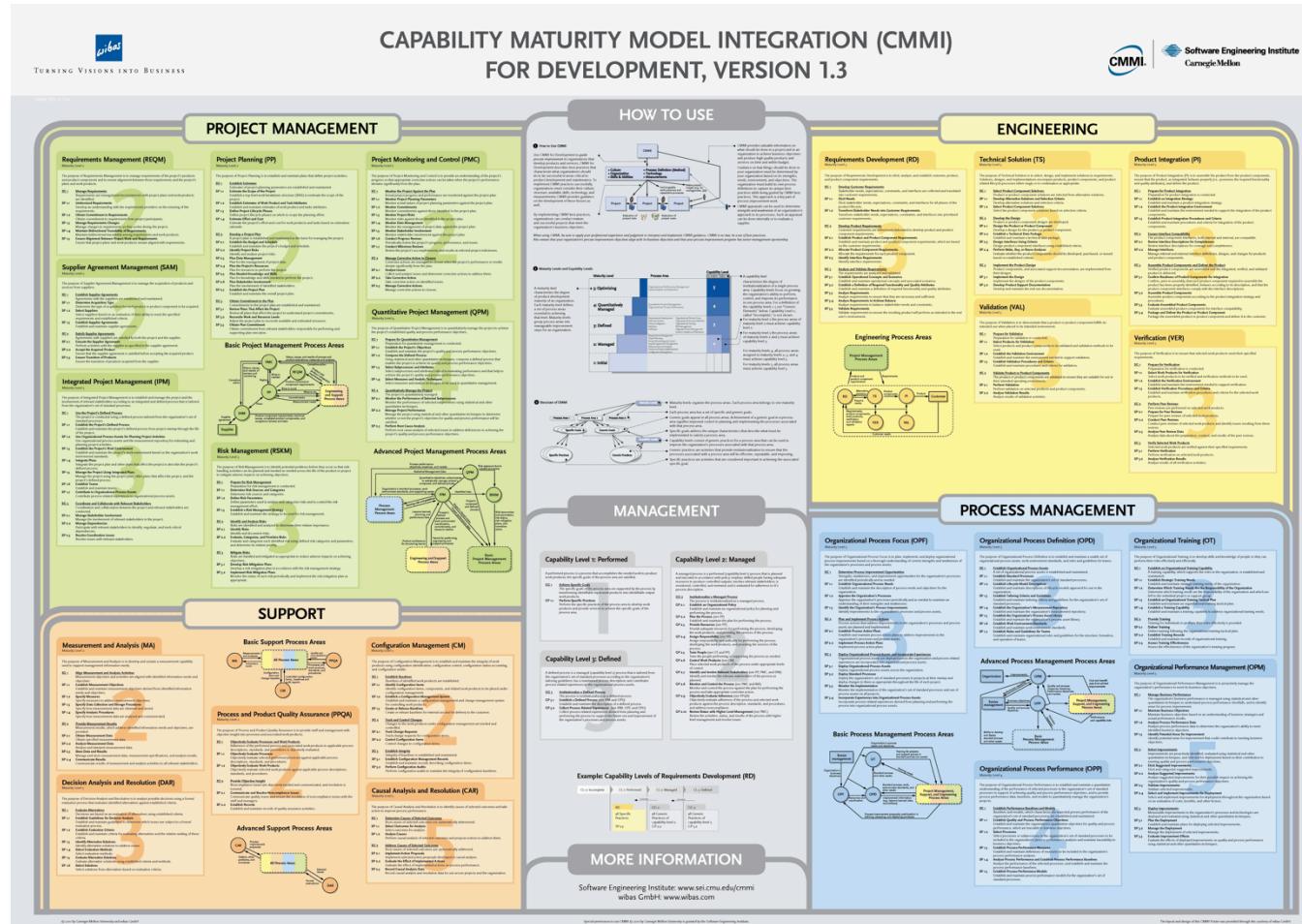
Requirements for healthy projects

CMMI for Development is the world standard for defining good practices for development organizations and projects.

- CMMI was developed by the Software Engineering Institute (SEI) of the Carnegie Mellon University since 1987, and it is maintained by the CMMI Institute
- CMMI supports the improvement of product development organizations by providing
 - » Key characteristics of effective development organizations
 - » Proven good practices that illustrate how to implement those characteristics in an organization
 - » Roadmap for improvement
- CMMI is used worldwide by leading companies
- CMMI addresses any kind of development project



The process areas are sorted into four categories: Project Management, Engineering, Support and Process Management



CMMI has a simple structure.



Let's zoom:

1. Level, 4m Distance: Title
2. Level, 3m Distance: Categories
3. Level, 2m Distance: Process Areas, sorry: Work Areas (incl. prioritization)
4. Level, 1m Distance: Goals
5. Level, 0,7m Distance: Practices

A process area has specific goals and specific practices that provide characteristics of effective and efficient technical work.

A process area has ...

specific goals that describe the basic goals of the technical work

A specific goal has ...

specific practices (= technical best practices) that describe the activities needed to achieve the specific goals

Project Planning (PP)

Maturity Level 2

The purpose of Project Planning is to establish and maintain plans that define project activities.

SG 1 Establish Estimates

Estimates of project planning parameters are established and maintained.

SP 1.1-1 Estimate the Scope of the Project

Establish a top-level work breakdown structure (WBS) to estimate the scope of the project.

SP 1.2-1 Establish Estimates of Work Product and Task Attributes

Establish and maintain estimates of the attributes of the work products and tasks.

SP 1.3-1 Define Project Life Cycle

Define the project life-cycle phases upon which to scope the planning effort.

SP 1.4-1 Determine Estimates of Effort and Cost

Estimate the project effort and cost for the work products and tasks based on estimation rationale.

SG 2 Develop a Project Plan

A project plan is established and maintained as the basis for managing the project.

SP 2.1-1 Establish the Budget and Schedule

Establish and maintain the project's budget and schedule.

SP 2.2-1 Identify Project Risks

Identify and analyze project risks.

SP 2.3-1 Plan for Data Management

Plan for the management of project data.

SP 2.4-1 Plan for Project Resources

Plan for necessary resources to perform the project.

SP 2.5-1 Plan for Needed Knowledge and Skills

Plan for knowledge and skills needed to perform the project.

SP 2.6-1 Plan Stakeholder Involvement

Plan the involvement of identified stakeholders.

SP 2.7-1 Establish the Project Plan

Establish and maintain the overall project plan content.

SG 3 Obtain Commitment to the Plan

Commitments to the project plan are established and maintained.

SP 3.1-1 Review Plans that Affect the Project

Review all plans that affect the project to understand project commitments.

SP 3.2-1 Reconcile Work and Resource Levels

Reconcile the project plan to reflect available and estimated resources.

SP 3.3-1 Obtain Plan Commitment

Obtain commitment from relevant stakeholders responsible for performing and supporting plan execution.

A capability level describes the management practices that provide characteristics of effective management work to sustain the process.

A capability level has ...

generic practices (= governance best practices) that describe the activities needed to establish and maintain a way of work

Capability Level 2: Managed

A capability level 2 process is characterized as a "managed process." A managed process is a performed (capability level 1) process that is also planned and executed in accordance with policy, employs skilled people having adequate resources to produce controlled outputs, involves relevant stakeholders; is monitored, controlled, and reviewed; and is evaluated for adherence to its process description. The process may be instantiated by an individual project, group, or organizational function. Management of the process is concerned with the institutionalization of the process area and the achievement of other specific objectives established for the process, such as cost, schedule, and quality objectives.

- CG 2 Institutionalize a Managed Process**
The process is institutionalized as a managed process.
- GP 2.1 Establish an Organizational Policy**
Establish and maintain an organizational policy for planning and performing the process.
- GP 2.2 Plan the Process (see PP)**
Establish and maintain the plan for performing the process.
- GP 2.3 Provide Resources (see PP)**
Provide adequate resources for performing the process, developing the work products, and providing the services of the process.
- GP 2.4 Assign Responsibility (see PP)**
Assign responsibility and authority for performing the process, developing the work products, and providing the services of the process.
- GP 2.5 Train People (see OT)**
Train the people performing or supporting the process as needed.
- GP 2.6 Manage Configurations (see CM)**
Place designated work products of the related process areas under appropriate levels of configuration management.
- GP 2.7 Identify and Involve Relevant Stakeholders (see PP)**
Identify and involve the relevant stakeholders as planned.
- GP 2.8 Monitor and Control the Process (see PMC)**
Monitor and control the process against the plan for performing the process and take appropriate corrective action.
- GP 2.9 Objectively Evaluate Adherence (see PPQA)**
Objectively evaluate adherence of the process against its process description, standards, and procedures, and address noncompliance.
- GP 2.10 Review Status with Higher Level Management**
Review the activities, status, and results of the process with higher level management and resolve issues.

The generic practices (=management practices) are additional to the specific practices (=technical practices)

The Maturity Levels provide a prioritization of the process areas for improvement.

A maturity level has

All process area of a maturity level

A defined set of process areas

Must have a defined level of governance (=capability level)

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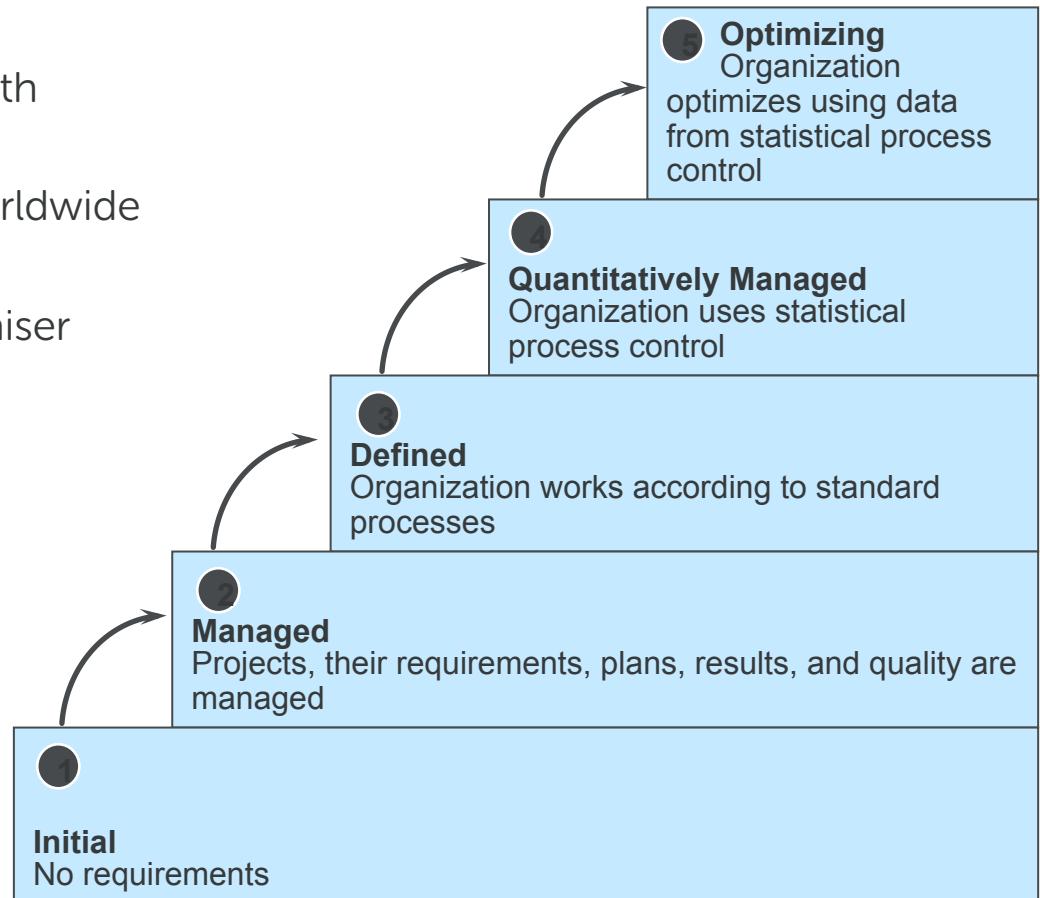
SP 2.7 Establish the Project Plan

Establish and maintain the overall project plan content.

Priority

The five maturity levels define an improvement path. They are also recognized hallmarks.

- CMMI defines **5 Maturity Levels** which provide an improvement path
- An achieved CMMI Maturity Level is a **hallmark** that is recognized worldwide
- Maturity Levels are **objectively evaluated** by an official Lead Appraiser and an appraisal team





Maturity Levels are guidance for the prioritization of improvements.

Removing impediments that you locate within maturity level 2 have probably a higher ROI than impediments that you locate within maturity level 3.

If you would prioritize otherwise, just do so.

It is guidance, nothing more and nothing less ("professional judgment").



CMMI is a Coach

Use CMMI practices as coaching questions.

How do you ...

<CMMI Practice>



Example

Example: Project Planning, specific goal 3

How do you ...

... establish an commitment to the project plan?

Process = Work

Replace – when reading CMMI – the word “process” with the word “work”.

Process

- Is the work performed.

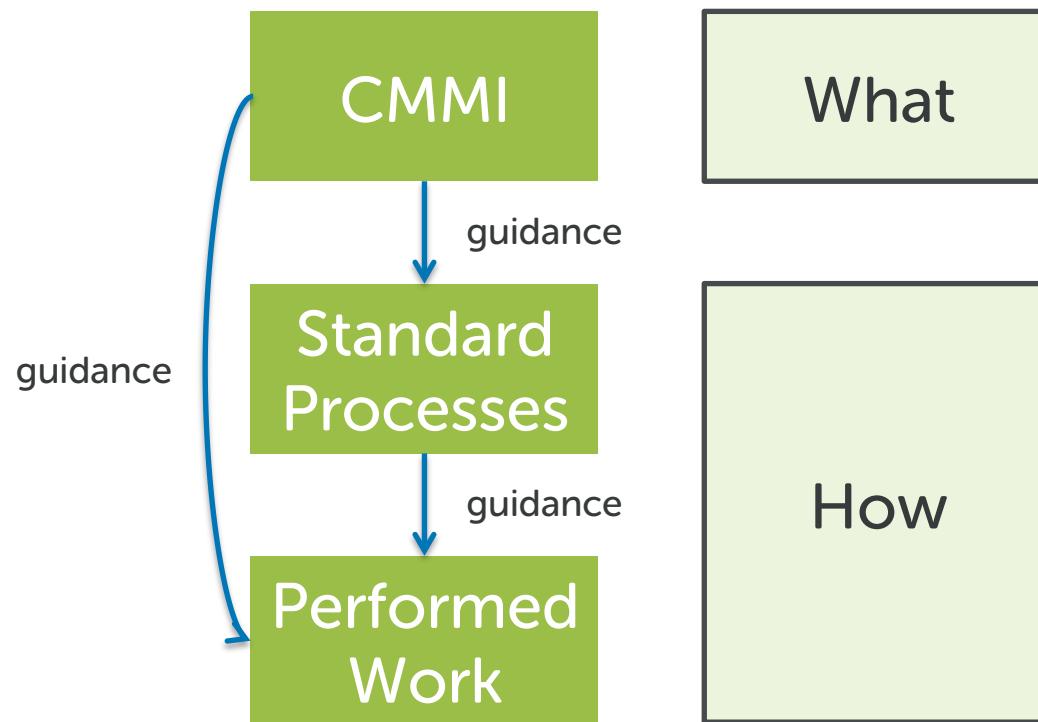
Process Description

- Is some description (paper) of the work performed

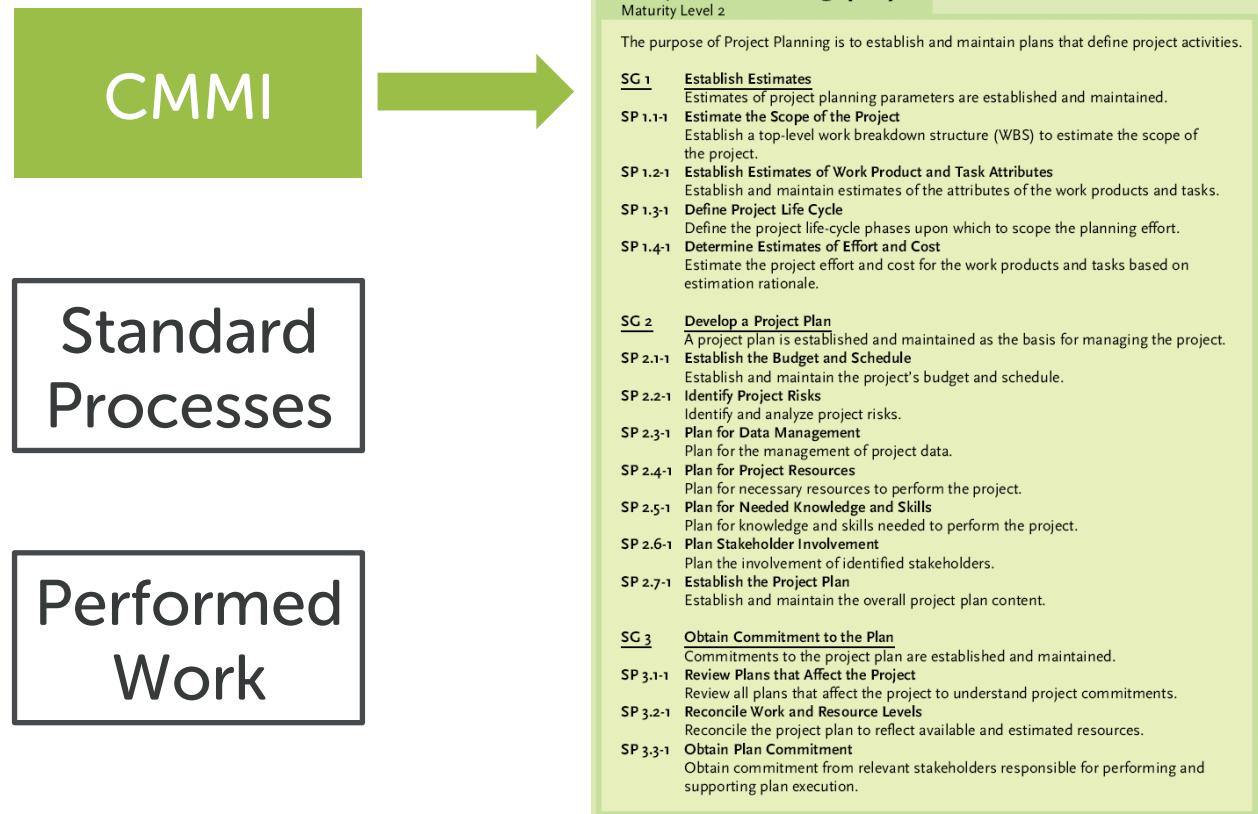
Standard Process

- Is a standard process description, e.g. a method like the Rational Unified Process, V-Modell XT, or PRINCE2

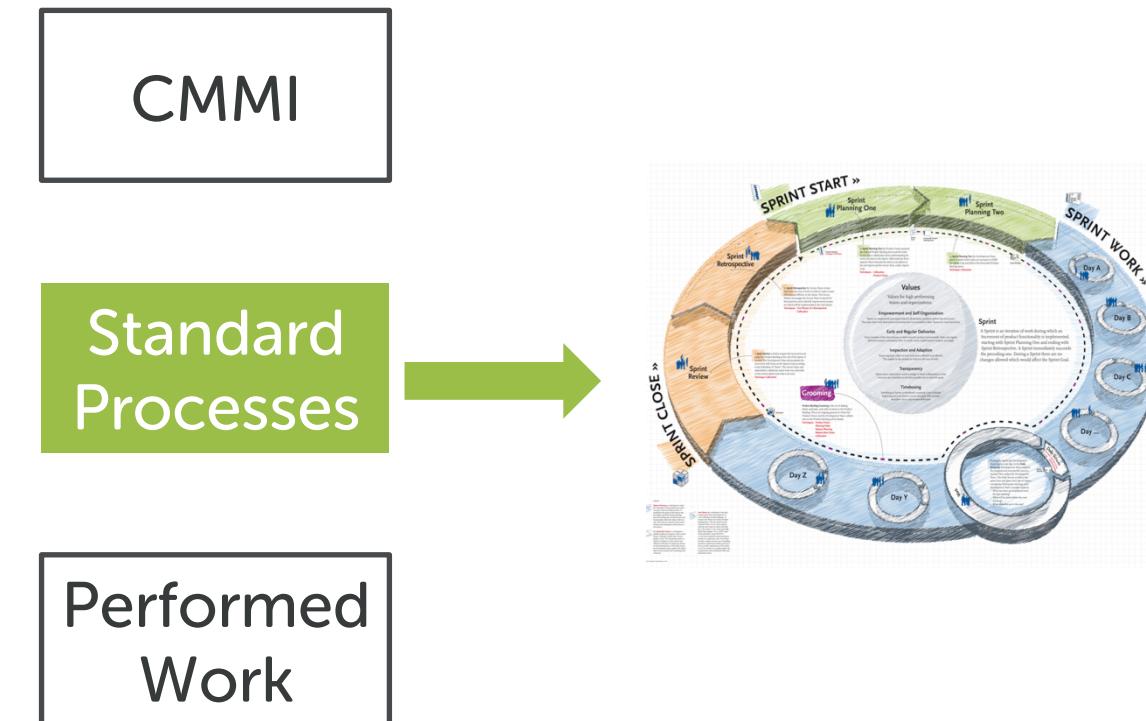
CMMI specifies, WHAT must be done
YOU specify, HOW you do it



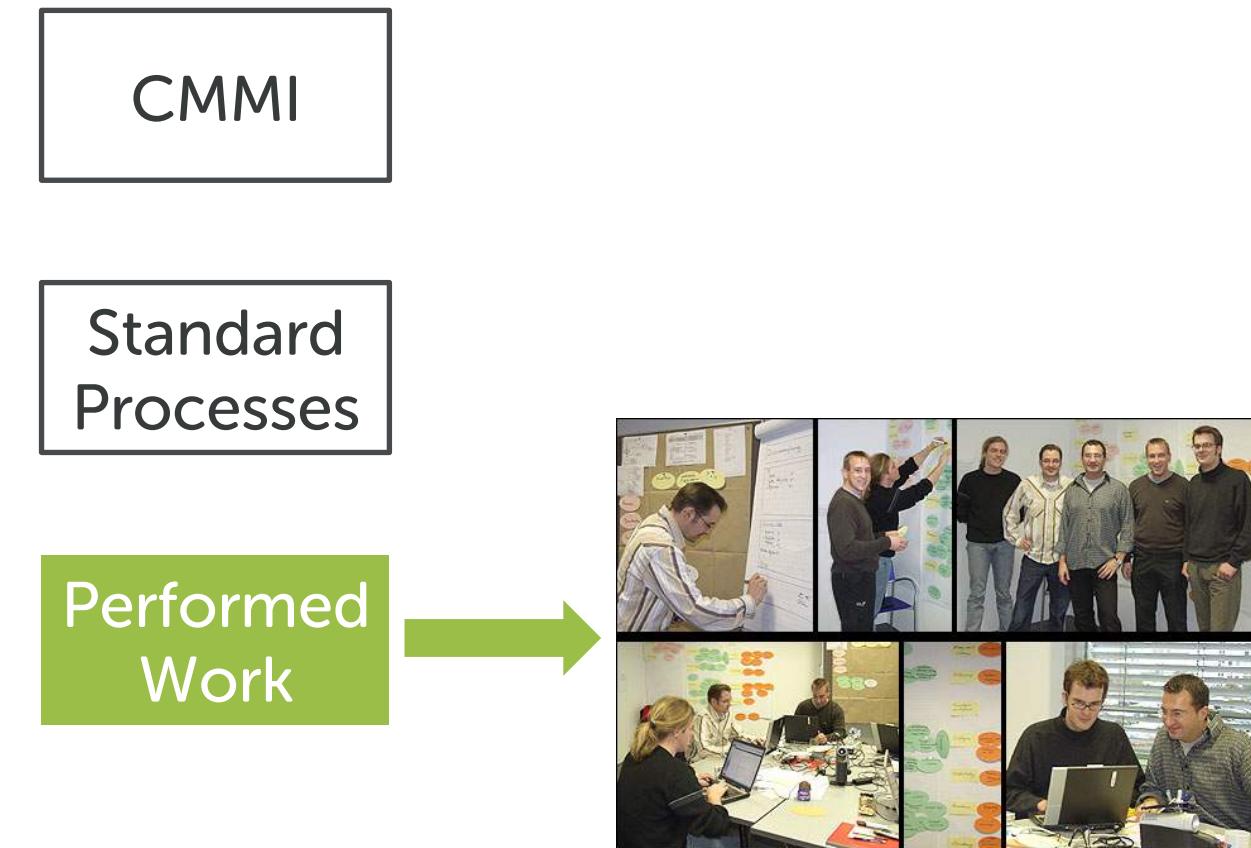
CMMI describes WHAT to do.



Process descriptions describe HOW to do it.

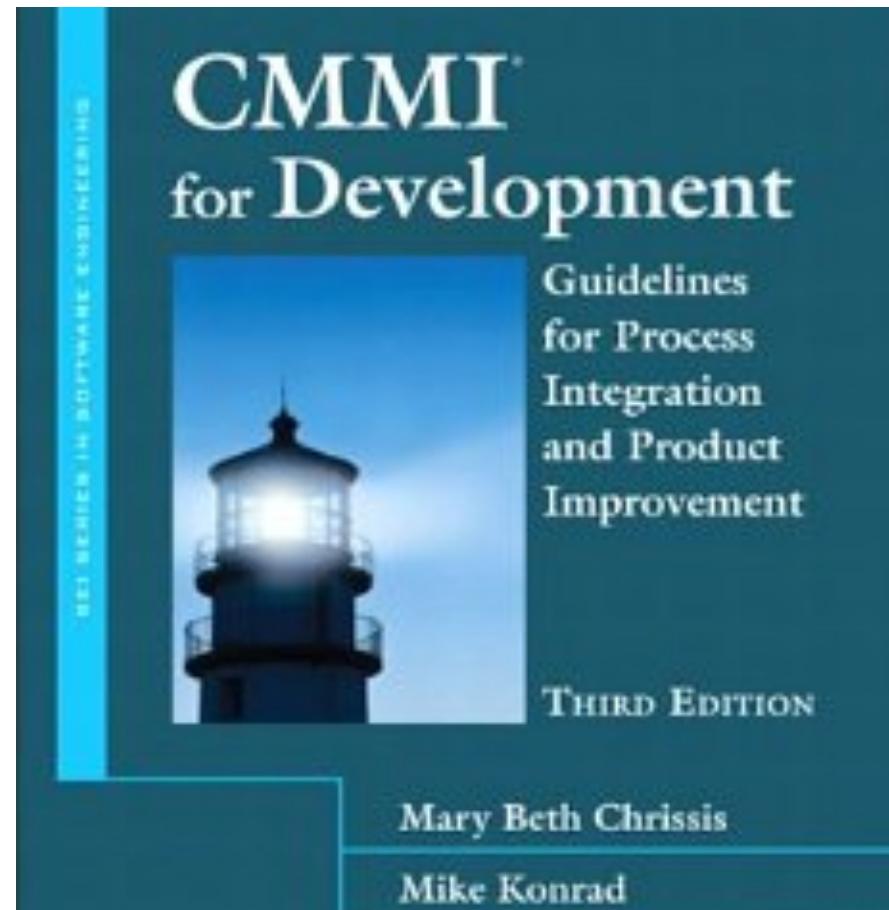


Performed Work ist the actual work in the project.



More information is in the CMMI book.

- CMMI = Capability Maturity Model Integration
- CMMI is a [collection of best practices](#)
- CMMI provides [guidance](#) which practices a professional project should do
- CMMI supports [objective evaluations](#) of your project and your project management work – What should I do? Do I have gaps in my project management?



Scrum: a framework for small agile projects.

Small: 3-9 team members.



Empowerment and Self-Organization



Early and Regular
Deliveries



Inspect
and
Adapt



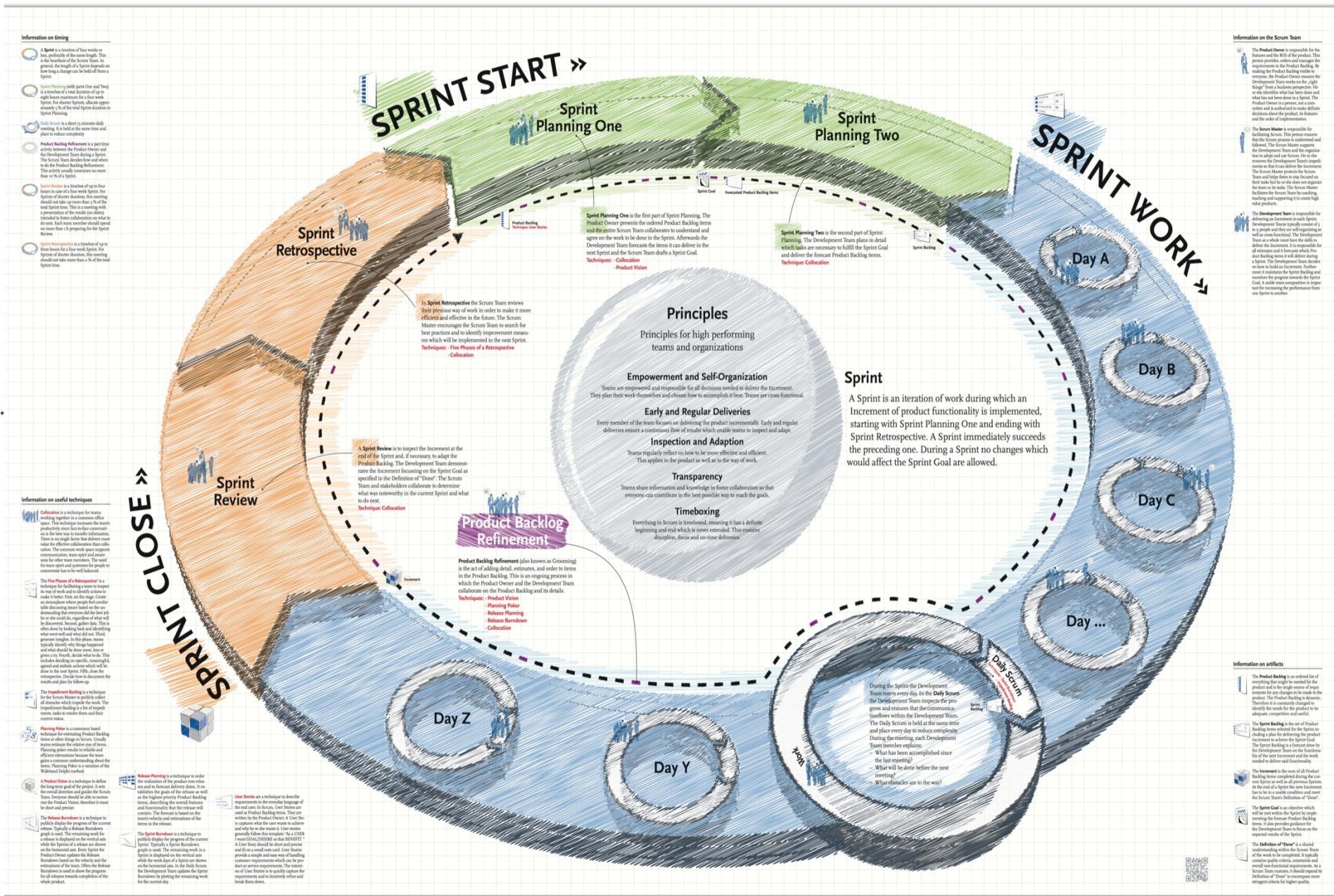
Timeboxing



Transparency

SCRUM

Framework for Developing and Sustaining Complex Products



Roles



The Product Owner creates the product vision and defines the features of the product

- Details the vision into Product Backlog Items and maintains the Product Backlog
- Orders the Product Backlog items and makes scope versus schedule decisions
- Evaluates the delivered increments to make decisions about the future
- Monitors progress of the product using the Release Burndown and make it visible
- Is always one person (not a group) but may be supported by other individuals



The Team is independent, cross functional and self organized and delivers the increment

- Cross functional 3-9 team members that are available to the project full-time
- Forecasts how much they can do in one Sprint
- Makes the Sprint Backlog
- Self-organizes to accomplish the Sprint goal and produce the Increment
- Has the authority to do everything inside the framework and Sprint to reach the goal



The Scrum Master coaches the Scrum Team and ensures the Scrum methodology

- Ensures that Scrum is understood and in place
- Helps the Scrum Team follow their process
- Acts as a coach for the Scrum Team
- Protects the Scrum Team from internal and external distractions.
- Fosters cooperation between roles and stakeholders and tracks impediments till closure

Meetings



During Sprint Planning the Scrum Team selects and plans the work.

- Planning is divided into two parts.
- In Sprint Planning 1 the Scrum Team decides how many items will be completed in the Sprint.
- In Sprint Planning 2 the Development Team determines how the work will be accomplished.



During Daily Scrum the Development Team ensures that they are on track.

- For internal team coordination.
- Daily, 15. min, Standup
- 3 questions:
 - What I accomplished since our last Daily Scrum ...
 - What will I accomplish till our next Daily Scrum ...
 - What is impeding my progress ...
- Not for problem solving



During Sprint Review the Scrum Team and stakeholders review the Increment.

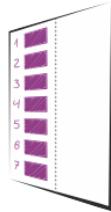
- Look at where we are and collaborate on how to go forward
- Central point of discussion is the Product Increment
- Entire team participates
- Stakeholders and their input is key to this meeting



During Sprint Retrospective the Scrum Team improves its process.

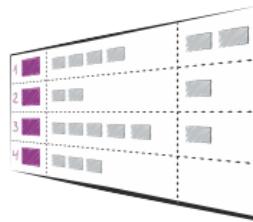
- Review how things went with respect to process, relationships and tools
- Identify what went well and not so well
- Identify potential improvements and actions for improving
- Whole Scrum Team participates

Artifacts



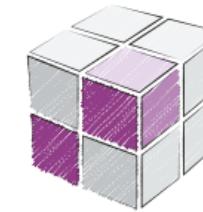
The Product Backlog is an ordered list of requirements, which are desired in the product.

- Single source of requirements
- Often in the form of user stories
- Each item has a description and an estimate
- Ordered
- Kept up to date
- Everybody can participate and suggest
- Product Owner is responsible and accountable for maintaining and ordering



The Sprint Backlog is the list of Product Backlog Items selected for the Sprint together with the Team's plan how to deliver them.

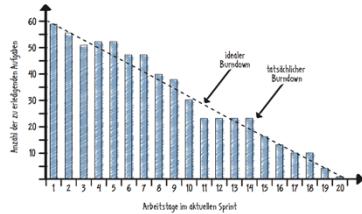
- Tasks are never assigned. Anybody can choose a task of his or her choice
- Product Backlog Items are fixed. Activities are continuously updated based on new information
- If an activity is not clear, it will be discussed and split up into smaller activities in the Sprint Backlog which can be addressed later



Every Sprint produces a Product Increment.

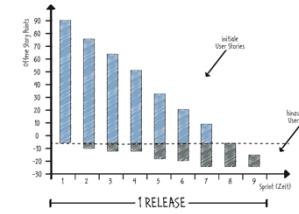
- Most important Scrum artifact
- Product Increment is the sum of all Product backlog Items completed during this Sprint and all previous ones
- Must be of high enough quality to be given to users (potentially shippable)
- Must meet the current Definition of Done

Scrum requires transparency within the team and outside the team. Common additional artifacts include burndown charts.



The Sprint Burndown is a technique to make the progress of a Sprint transparent.

- X-Axis contains days of Sprint
- Y-Axis contains number of tasks still to be completed
- Tasks are ≤ 1 day effort
- Every day (preferably at the daily Scrum) the current number of tasks on the Sprint backlog are noted on the Sprint Burndown chart
- Maintained by Development Team



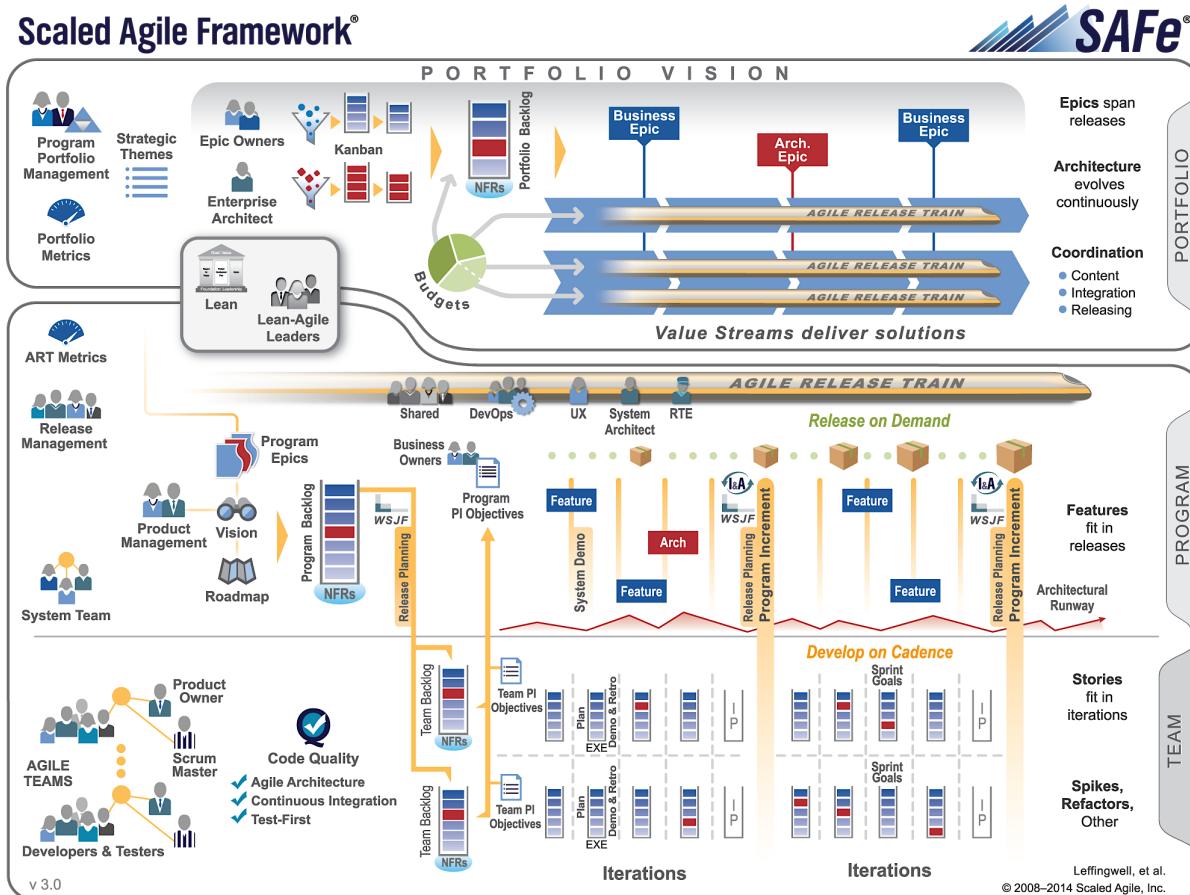
The Release Burndown is a technique to make the progress of a product transparent.

- X-Axis contains number of Sprints in the current release
- Y-Axis contains number of Story Points of Product Backlog Items still to be completed in the current release
- After every Sprint the number of Story Points of the initial Product Backlog Items is counted and marked in the burndown
- Story Points that have been added to / dropped from the release are noted below the x-Axis
- Maintained by Product Owner

Scaled Agile Framework: a framework for large and huge agile projects.

Large: up to 125 team members.
Huge: >125 team members

The Scaled Agile Framework (SAFe®) is a framework for applying Lean and Agile practices at large and huge scales.

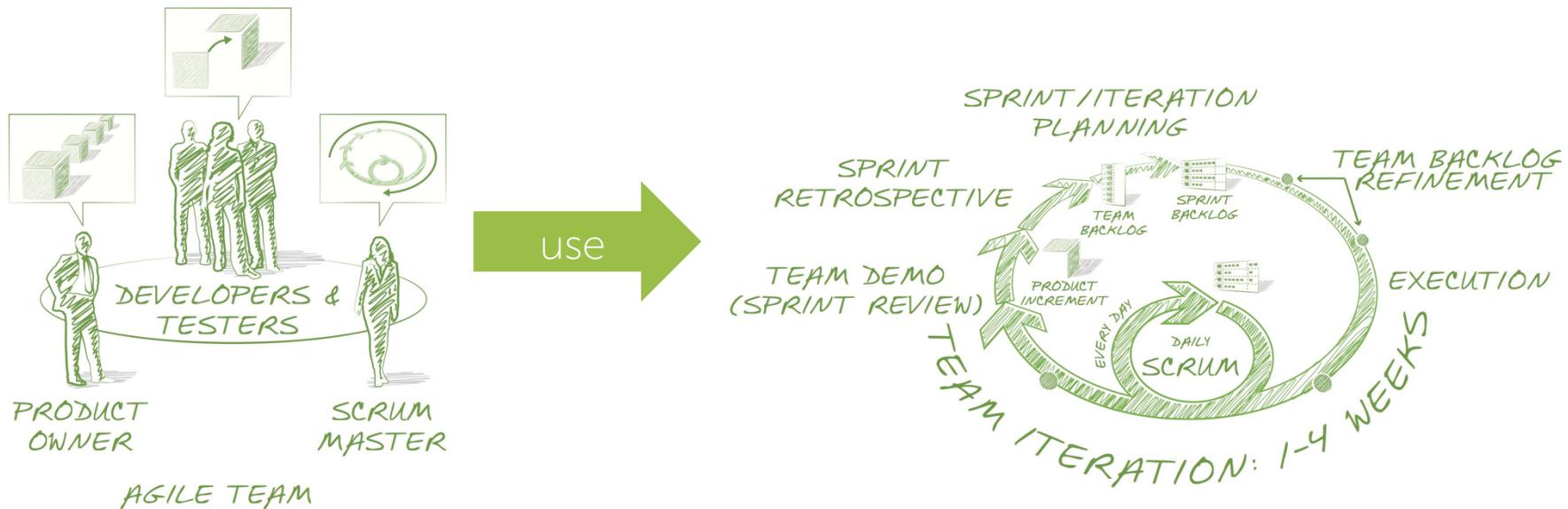


Synchronizes alignment, collaboration, and delivery for large numbers of teams

ScaledAgileFramework.com

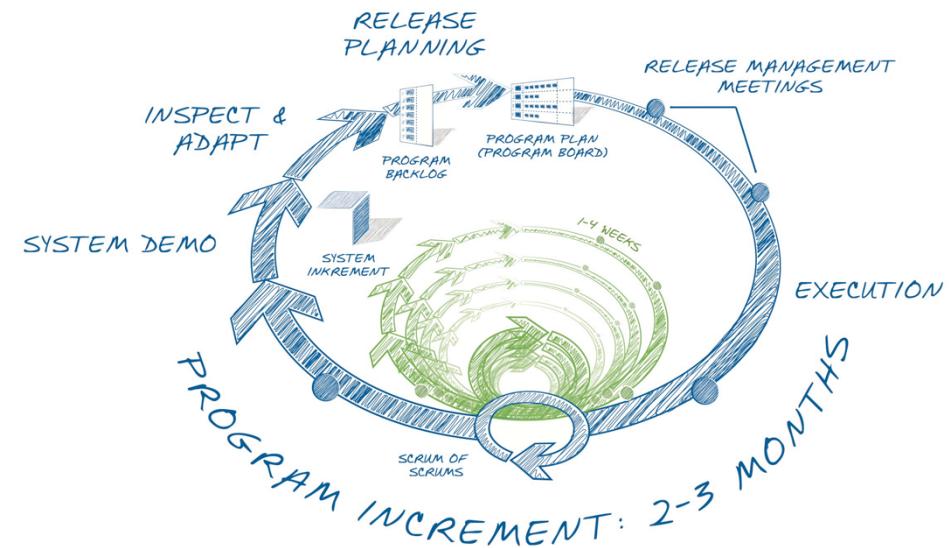
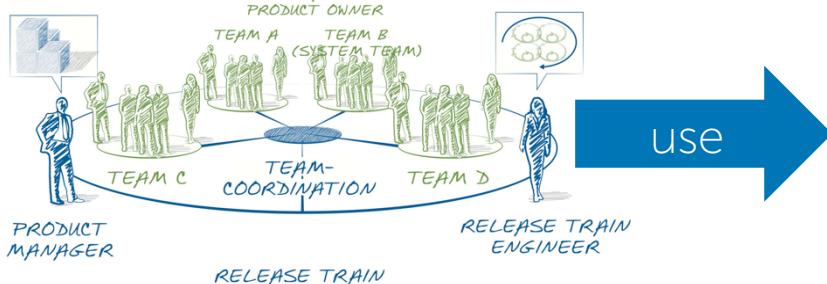
Large and huge agile projects build upon the Scrum framework in the teams.

- Empowered, self-organizing, self-managing, cross-functional teams
- Valuable, fully-tested software increments every two weeks
- Scrum project management practices and XP-inspired technical practices
- Teams operate under program vision, system, architecture and user experience guidance



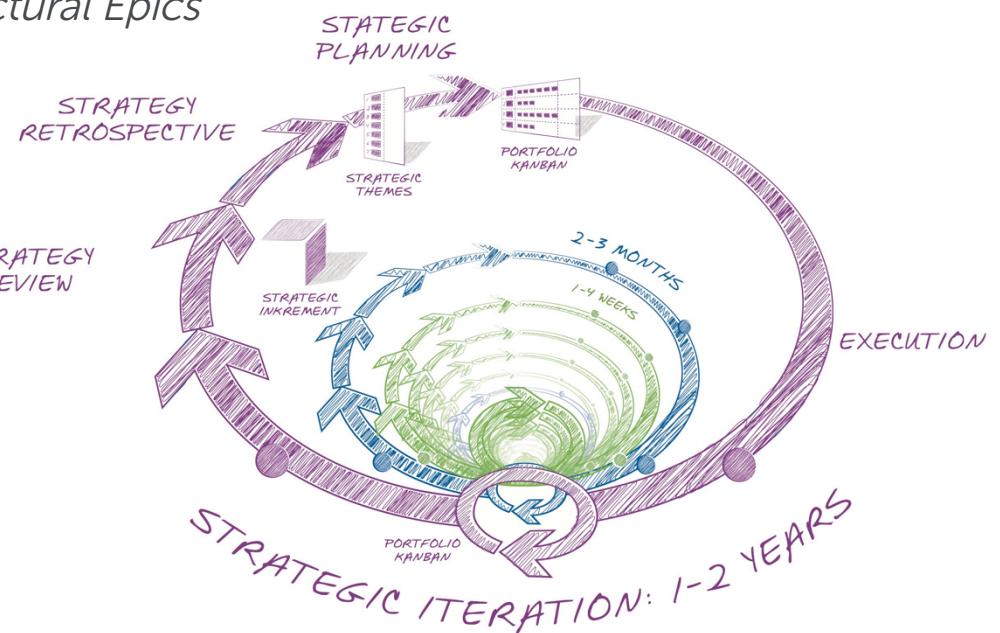
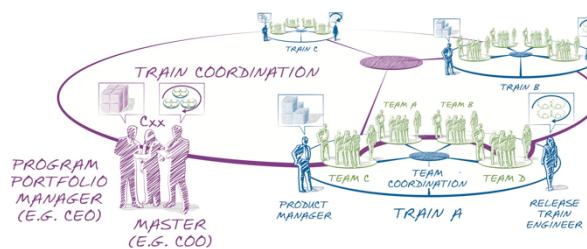
Large large projects use additional events and roles to coordinate.

- Self-organizing, self-managing team-of-agile-teams
- Continuous value delivery
- Aligned to a common mission via a single backlog
- Common sprint lengths and estimating
- Face-to-face planning cadence for collaboration, alignment, synchronization, and assessment



Several large projects are coordinated by a portfolio.

- Lean approaches to Strategy and Investment Funding, Program Management, and Governance
- Portfolio Vision gives the system an aim
- Centralized strategy, decentralized execution
- Kanban systems provide portfolio visibility and WIP limits
- Value delivery via *Business and Architectural Epics*



Homework

This class will have a workshop style; presentations by the students, presentations by the lecturer and exercises will make up the schedule.

You, the students, will be active most of the time

- We will have about 30% student's presentations
- We will have about 30% exercises
- We will have about 40% lecture

Note: Full attendance is required on all days.

Therefore, you will need to prepare so we can have a group learning experience

- We will have several preparation groups
- Each group prepares as “specialist” for one topic
 - » Reads and explains the CMMI “WHAT”
 - » Researches Scrum solutions for the “HOW” and presents them
 - » Collects and presents real-life examples
- Each group presents the material during the lecture
AND
acts as coach on their topic for others

preparation

Exercise: Preparation Groups

- The task:

Research a process area and present it.

You have 45 min to do an interactive session.

- Research

1. Read the CMMI "WHAT"
2. Research solutions for the "HOW" with Scrum
3. Collect real-life examples (ask colleagues, friends, parents what they do)

- Present

1. Explain the CMMI "WHAT"
2. Explain solutions for the "HOW" with Scrum
3. Exhibit real-life examples & relate them to CMMI

preparation

Exercise: Preparation Groups – Further Hints and Explanations

1. CMMI WHAT

- Explain the Process Areas and Practices

2. Scrum solutions for the HOW

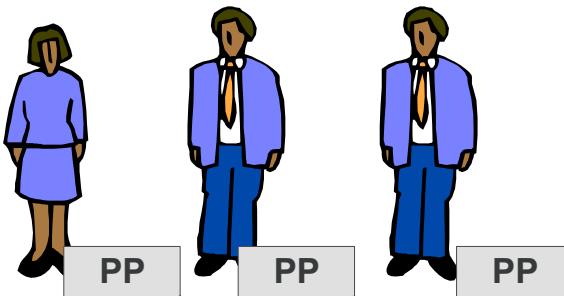
- Explain e.g. how a budget is calculated in Scrum
- Explain e.g. how a Schedule is done in Scrum
- Note: relate this to CMMI – either integrate it into the explanation of CMMI, or reference CMMI practices when explaining the Scrum solutions

3. Real-life work product examples (not necessarily Scrum or Agile)

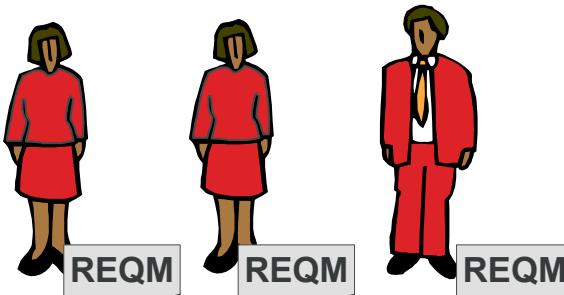
- Find someone who works in a project
- Go get their project plan, have it explained to you, bring it to the class

preparation

Before the lecture you will be formed into preparation groups of 3-5 people for each PA



Preparation group
develops teaching session
for Process Area „Project
Planning (PP)“



Preparation group
develops teaching session
for Process Area
„Requirements
Management (REQM)“

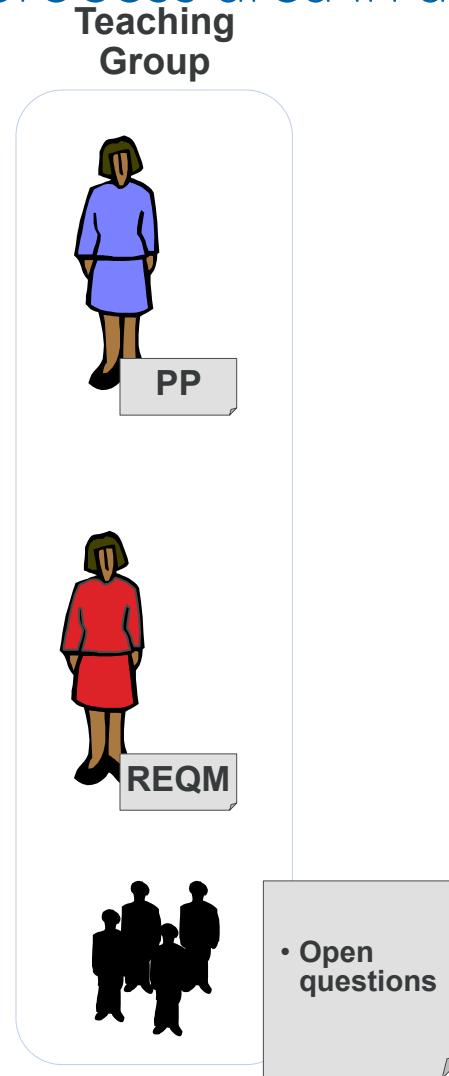


... More teams for other
process areas

pre
pa

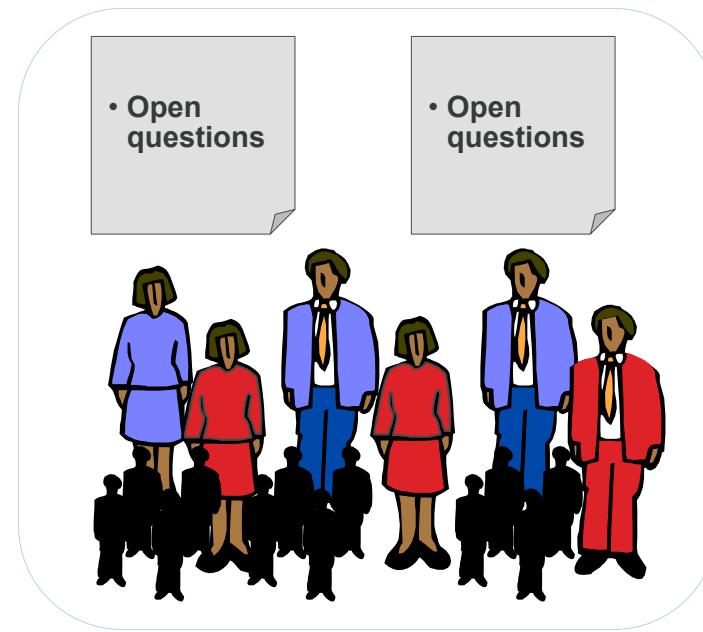
During the class you will present your process area in a teaching group of 6 people

- You will be formed into Teaching Groups of 6 people
- The Teaching Group works in 6 sessions together:
 - » Each member presents his process area – the whole presentation created by the preparation group
 - » Teaching Group discusses
 - » Each team shall return with a flip chart with open questions



After your presentations in the teaching groups we will have a lecture in the whole class and an exercise.

- Whole class comes together
- Open questions will be addressed
- Teacher will add topics to the presentations if necessary
- We will work on a hands-on exercise



Work thoroughly – your success in the final exam depends on how well you and your classmates will present the material

- Your presentation is graded. 1/3 of your grade depends on the quality of your presentation and research.
- Presentations can be any format (Powerpoint, OpenOffice, Prezi, hand-drawn flipcharts), but please submit a PDF.
- Excluding rules: Teams or students will be excluded if
 - » Presentations is not submitted on time (see slide 11)
 - » Presentation does not meet criteria of slide 4 and 5, especially if presentation only covers CMMI practices but does not have “How-to” explanations or no real-life-example
 - » Student cannot present the material fluently.
- Hint: Do plan enough time for reading, researching and preparing.

The preparation teams are:

1. Project Planning
2. Project Monitoring and Control
3. Supplier Agreement Management
4. Requirements Management
5. Risk Management
6. Measurement and Analysis

Datenschutzhinweis: damit die Teams sich untereinander koordinieren und kontaktieren können bekommen alle Teilnehmer der Vorlesung eine Liste mit den Namen, e-mails und der Gruppeneinteilung. Mit der Eintragung in die Liste stimmen Sie der Verteilung dieser Daten zu.

Preparation

Due date for your presentations/workshops:

1.02.2016, 11:59 pm

- No later hand-ins will be accepted
- Presentation must indicate who of the team has done what
- Presentation will be graded
- Upload your slides in moodle

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Revision History

Rev. #	Status	Date	Description	Responsible
3.0	Finished	14.11.2014	Updated version of introduction lecture, with SAFe slides	Malte Foegen
3.1	Finished	28.12.2014	Updated slide layout	Malte Foegen
3.2	Finished	23.11.2015	Update for 2015	Malte Foegen