

Software Engineering in Industrial Practice (SEIP)

Dr. Ralf S. Engelschall

ENGINEERING FUNDAMENTALS

Project Management Triangle

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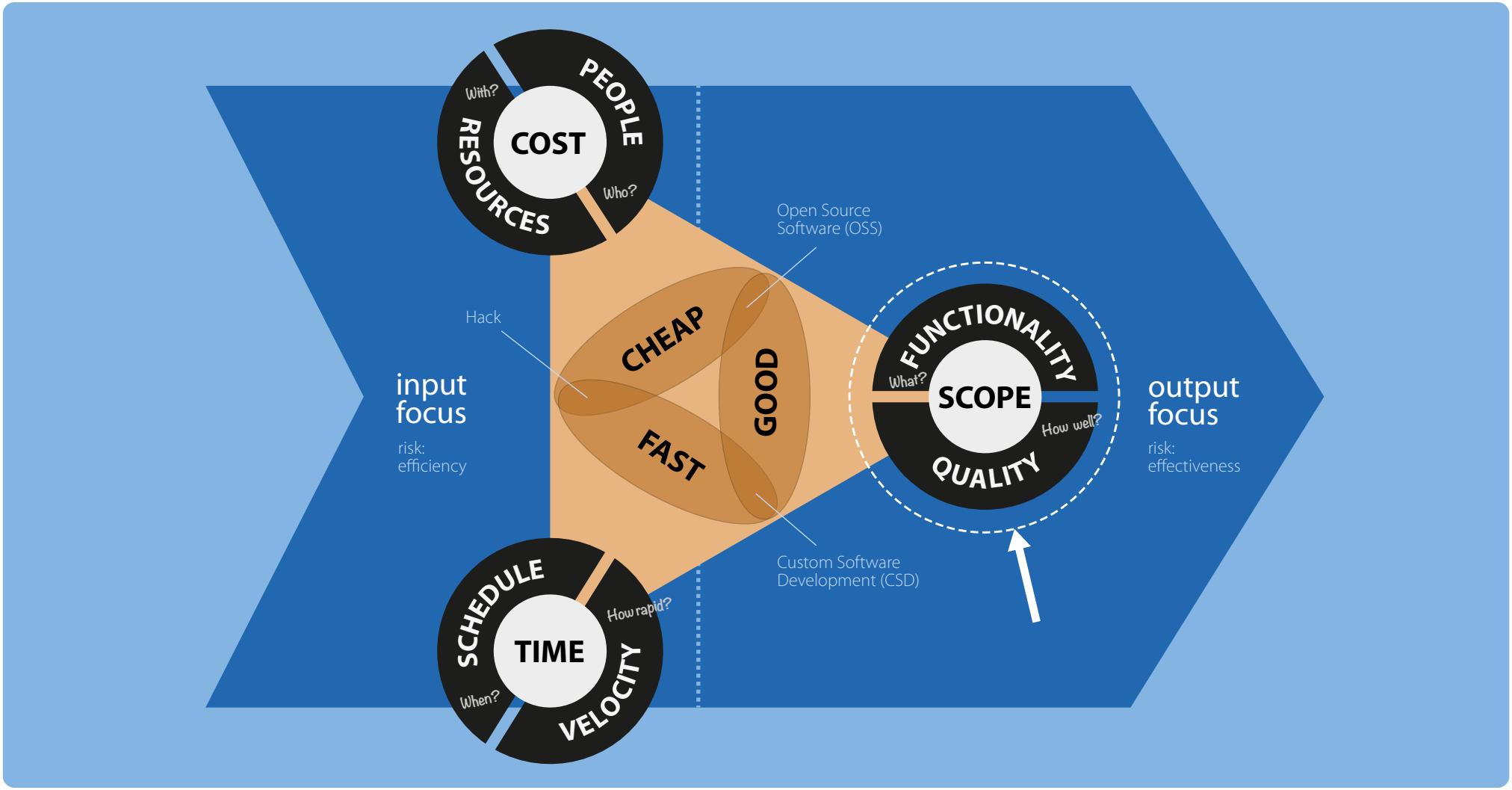

Definition of a *Project*:
"*Temporary endeavor undertaken to create a unique product, service or result.*"
Temporary in that it has a defined beginning and end in time, and a defined scope and cost.
Unique in that it is not a routine operation, but a one-time, single-goal, and risk-containing operation.

Project Management *Iron Triangle*:
A project is constrained by **time**, **cost** and **scope**. No constraint in this triangle can be changed without affecting the others. Time splits into **schedule** and **velocity**. Cost splits into **people** and **resources**. Scope splits into **functionality** and result **quality**.

Project Management *Trilemma*:
"Fast. Cheap. Good. Pick two!"
Each project optimization effort has the choice among **three** favourable options — only **two** of them are possible at the same time.

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Project Management Building Blocks

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STRUCTURE

Time Periods

Product Stage — STG — 1

Giant step in the development of the product, to deliver a distinct **major** version of the product.



Project Phase — PHS — 2

Major time period in the project process, to split the project into distinct **focus periods,** separated by major milestones.



Project Period — PRD — 3

Minor time period in the project process, to split the project phases into distinct time-, cost-, or scope-based **time units.**



Work Streams

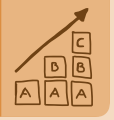
Organisation Scope — SCP — 12

Top-down scopes, Portfolio, Program and Project, to manage initiatives at different granularity levels.



Product Increment — INC — 11

Regular step in the development of the product, to deliver a distinct **minor** version of the product.



Disciplines Iteration — ITR — 9

Work stream consisting of a single sequential or parallel pass over all disciplines.



Disciplines Track — TRK — 8

Work stream consisting of a continuous repeated flow through the domain of related disciplines.



Engineering Discipline — DIS — 6

Distinct knowledge and work area of Software Engineering.



Process Flows

7

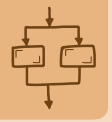
Flow Sequencing — SEQ

Sequential process flow of multiple disciplines, iterations, tracks, slices, increments, phases or stages.



Flow Parallelization — PRL

Parallel process flow of multiple disciplines or tracks.



Flow Interleaving — ILV

Interleaved process flow of multiple disciplines, iterations, tracks, slices, increments, phases or stages.



PROPERTIES

Progress Modes

4

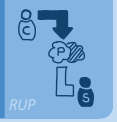
Voluntary (Supplier-Push) — VOL

Supplier pushes requirements and work packages **into** the project and controls the progress.



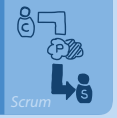
Planned (Customer-Push) — PLN

Customer pushes requirements and work packages **into** the project and controls the progress.



Agile (Supplier-Pull) — AGL

Supplier pulls requirements and work packages **out of** the project and controls the progress.



Lean (Customer-Pull) — LEA

Customer pulls requirements and work packages **out of** the project and controls the progress.



Work Focuses

5

Project Focus — PRJ

Focus on the project itself, to initiate, define, plan and successfully close it.



Technology Focus — TEC

Focus on the IT technology, to use it for implementing the solution.



Domain Focus — DOM

Focus on the domain, to analyse and specify it.



Environment Focus — ENV

Focus on the environment of the solution, to transition the solution into it.



Work Goals

10

Extension Goal — EXT

Following the goal of making a **functional** extension of the product to create a **new** increment.



Revision Goal — REV

Following the goal of making a **quality** revision of the product to improve an **existing** increment.



Reduction Goal — RED

Following the goal of making a **functional** reduction of the product to destroy an **existing** increment.



PROCESS BUILDING BLOCKS:
Every Project Management process in Software Engineering is made of the above building blocks. All building blocks can occur (structure) or be applied (properties) zero, one or more times in a particular process.

PROCESS TAILORING & CREATION:
To tailor an existing process, use the defined building blocks to better understand the given process. To create a process from scratch, decide on the building blocks by following steps 1 to 12 in the given order.

EF 04.2

process & building blocks

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Plan-Driven Project Management

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EF 04.3

Goals & Constraints GNC

Time (Schedule, Velocity), Cost (Human, Resources), Scope (Functionality, Quality)

Context & Environment CNE

Domain / Social & Intern / Extern Context / Environment.

Stakeholders STH

Name, Role, Interest / Expectation, Interest / Fear, Project Stance, Project Impact, Conflict Potential.

Risks & Chances RNC

Risk / Chance, Origin, Impact, Probability, Damage Amount, Risk Level.

Organization ORG

Organization Units, People, Roles, Reporting Lines, Steering Lines.

Phases PHS

Temporal Phases, Major Milestones.

Work Breakdown Structure WBS

WBS Elements, Objects / Functions / Phases, Work Packages.

Schedule SCH

WBS Elements, (Time) Effort, Predecessor Elements, Successor Elements, Milestones.

Resources RES

WBS Elements, Required Efforts (Person Days Intern / Extern), Required Resources (Costs).

Financing FIN

Temporal Phases, Functionalities / Features, Costs, Sources.

Project Profile PRO

Customer, Supplier, Project, Project Type, Context, Goal, Budget, Start Time, End Time.

Steering STR

Status Determination Approaches, Reports, Communications Paths.

In classic/plan-driven Project Management (PM), the objectives (time, costs, scope) are worked out in detail during project planning, on the basis of the business case and the project goals. Before actual implementation, the necessary processes and management plans are created and recorded.

Only after complete planning and approval of these by the customer does the implementation itself begin. For this purpose, the life-cycle of the project is divided into individual phases with defined milestones. Only after the successful completion of a phase there is a transition to the next phase.

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Agile Project Management

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EF 04.4

Agile Manifesto & Scrum Values

"We are uncovering better ways of developing software by doing it and helping others do it. Through this work we have come to value:



Individuals and Interactions over Processes and Tools
Working Software over Comprehensive Documentation
Customer Collaboration over Contract Negotiation
Responding to Change over Following a Plan

That is, while there is value in the items on the right, we value the items on the left more."

— *Manifesto for Agile Software Development*
http://agilemanifesto.org

Scrum Theory:
Empiricism
Lean Thinking

Scrum Values:
Courage
Focus
Commitment
Respect
Openness

Essence of Agility:
Driving On Sight
Deliver Regularly

Sprint

The heartbeat of a Scrum process, where ideas are turned into value. They are fixed length events of 2-4 weeks. A new Sprint starts immediately after the conclusion of the previous Sprint.

Scrum Roles

Product Owner

Captures the needs of customers and stakeholders.

Determines delivery date and delivery content.

Is responsible for product and project success on ROI and TCO basis.

Defines and priorizes the Product Backlog, depending on business value.

Accepts or rejects deliverables.

Developers

Typically a maximum of 8 people.

Is cross-functional, by coping, as a team, all necessary Software Engineering disciplines.

Members are usually assigned full-time, and membership can only change between Sprints.

Scrum Master

Is responsible for adherence of the process to the Scrum Theory and the Scrum Values, and acts as a coach and mediator.

Helps to remove obstacles, and protects Developers from external disturbances.

Is responsible to drive the learning process and self-management of Developers.

Has no authority to give disciplinary instructions to the Developers.

Should *not* be a Developer in parallel.

Scrum Events

Sprint Planning

First meeting (max. 8h) in the Sprint. Developers, with Product Owner, select the highest priority features of Product Backlog. Developers break down features to tasks and estimate efforts. Developers and Product Owner agree on Sprint Goal. Developers also make commitment to Sprint Goal.

Daily Scrum (Stand-Up)

Short (0,25h) daily meeting during the Sprint, always in same place and at same time. Everyone answers 4 questions: *What have I achieved since the last Daily? What would I like to achieve by the next Daily? What are the obstacles for me to do this? Are there any obstacles to reaching our Sprint Goal?* Discussions only afterwards.

Sprint Review

Second to last meeting (max. 4h) of the Sprint, before the Spring Retrospective. The Developers present the Increment they have achieved during the Sprint. Stakeholders give feedback. Only real artifacts or "live demonstrations" are allowed. The whole world is invited to participate!

Sprint Retrospective

Last meeting (max. 3h) in the Sprint. The "Process, Skill and Individual" dimensions are reviewed as well as "Lessons Learned" are discussed. Improvements are addressed immediately. Supports the mantra of Continuous Improvement (KAIZEN).

Scrum Artifacts & Commitments

Product Backlog

Emergent, ordered list of what is needed to improve the product, formulated as User Stories and managed by the Product Owner. User Story granularity is from small to large.

Sprint Backlog

Is managed by the Developers. Contains the User Stories that are planned for implementation in the current Sprint. These are split into tasks by the Developers.

Increment

Usable and thoroughly verified state of the product toward the Product Goal. Additive to all prior Increments.

Product Goal

Long-term goal for the product, formulated as a future state of the product, and provided by the Product Owner. Only one Product Goal is worked towards at any time.

Sprint Goal

Short-term goal for the current Sprint. What is the priority to be achieved in the Sprint? Why should we start the Sprint (Motivation)?

Definition of Done (DoD)

Formal description of the state of the Increment, when it meets the quality measures required for the product. When a Product Backlog item meets the Definition of Done, an Increment is born.

flexibility & change

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