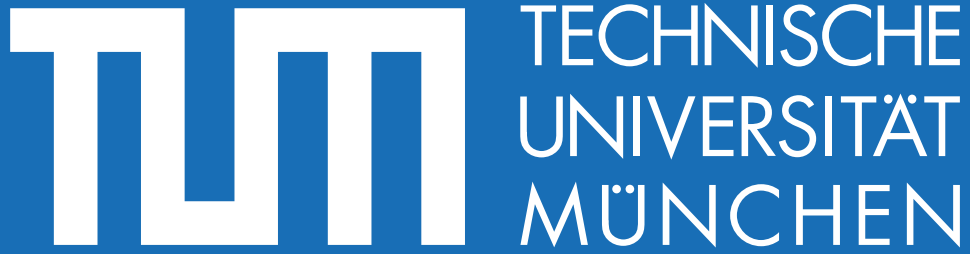

Software Engineering in Industrial Practice (SEIP)

Dr. Ralf S. Engelschall

ENGINEERING FUNDAMENTALS

Sustainability

TECHNISCHE UNIVERSITÄT MÜNCHEN

EF 01.7

HI Minimize HARDWARE Idleness

Minimize the idleness and maximize the utilization of existing hardware resources.

Rationale: Unused or under-utilized hardware are an unnecessary waste of already available resources.

Keywords: Virtualization, Utilization.

DE Minimize DESIGN Excessiveness

Minimize the excessiveness and maximize the adequacy of solution designs.

Rationale: Non-adequate designs cause unnecessary complexity and waste resources.

Keywords: Reduced Libraries, Immutability.

HE Minimize HUMAN Effort

Minimize the efforts of humans and maximize the efforts of machines in all production and operation processes.

Rationale: Delegating tasks to machines gives humans the possibility to concentrate on more important tasks.

Keywords: Computer, Robot, Automation.

SI Minimize SOFTWARE Inefficiency

Minimize the inefficiency and maximize the efficiency of software applications and their development processes.

Rationale: Efficient software and development processes consume less resources.

Keywords: Caching, Monolith.

SE Minimize SOLUTION Ephemerality

Minimize the ephemerality and maximize the life-span of any type of solutions.

Rationale: Short life-spans of solutions cause unnecessary short renewals and this way wastes resources.

Keywords: High Quality, Best Practice.

EC Minimize ENERGY Consumption

Minimize the consumption and maximize the saving of energy in all production and operation processes.

Rationale: Electric energy still has to be partially generated from non-renewable resources.

Keywords: Eco Mode, Reduced CI/CD.

IA Minimize INFORMATION Amount

Minimize the total amount of gathered, transmitted, stored and spreaded information.

Rationale: Reduced amount of information means less data transmission, less data storage, less GDPR issues, etc.

Keywords: Compression, No Big Data.

EE Minimize ECOSYSTEM Exploitation

Minimize the exploitation and maximize the back-contribution in any type of ecosystems.

Rationale: The consumer and provider behaviour have to be in balance for every long-lasting ecosystem.

Keywords: Open Source Software.

CE Minimize CARBON Emission

Minimize the carbon emission and hence the footprint during any type of production and operation processes.

Rationale: Climate change and global warming is partially caused or at least accelerated by carbon emissions.

Keywords: Reduced CO2 Footprint.

ENGINEERING FUNDAMENTALS

Project Management Triangle

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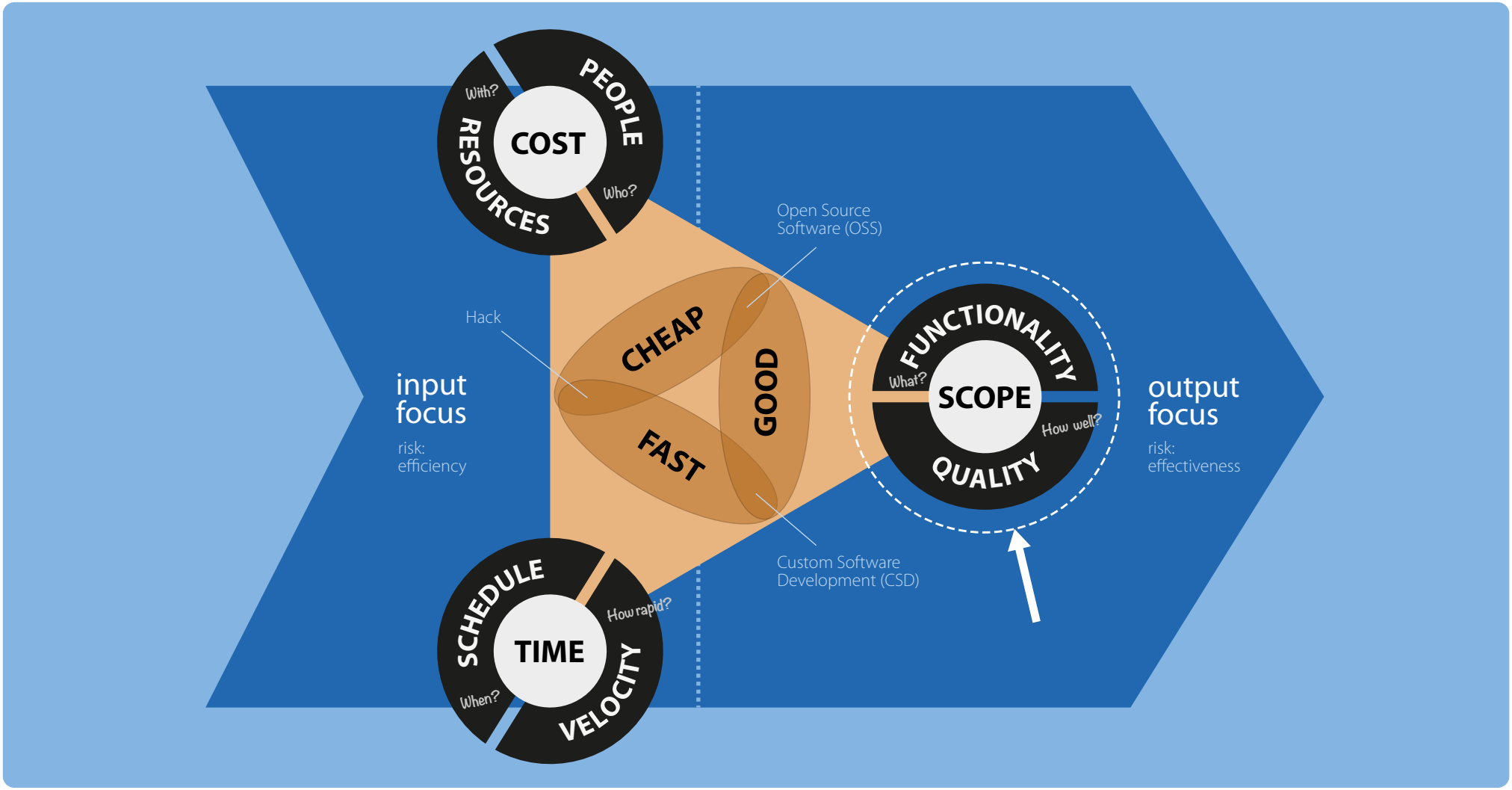

Definition of a *Project*:
"*Temporary endeavor undertaken to create a unique product, service or result.*"
Temporary in that it has a defined beginning and end in time, and a defined scope and cost.
Unique in that it is not a routine operation, but a one-time, single-goal, and risk-containing operation.

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.