



Software Engineering in der industriellen Praxis (SEIP)

Dr. Ralf S. Engelschall

Business

? Which two classes of software are primarily developed using the **Custom Software Development** approach?

Development Approaches

Software Prototyping *mocking* **SP**

Develop an early sample or model of a software solution by mocking and cheating in order to just once test a concept, idea or process.



Example: Customer Sales Demo

Software Bricolage *integrating* **SB**

Develop a single instance of a software solution by tinkering, cobbling and integrating partial solutions in order to prove feasibility or just provide a service.



Example: Company-Internal SaaS

Software Craftsmanship *crafting* SC

Develop a production-grade software solution by professional, clean but plain craftsmanship means in order to solve a usually complicated problem.



Example: Open Source Framework

Software Engineering *teaming* **SE**

Develop a production-grade software solution by a professional risk-hedged engineering approach in order to solve a usually complex problem.



Example: Business Information System

Development Approaches: **Characteristics Comparison**

Continuum & Process		Development Approaches									
		Effort: Person-Days	Effort: Persons	Process: Risk-Hedge	Process: Traceability	Solution: Target Technology	Solution: Production-Grade	Solution: Sustainability	Solution: Claim	Solution: Life-Time Months	Solution: Lines of Code (k)
Development approaches do not form a continuum, but can be combined in practice: Engineering and Bricolage can be earlier in the process, Craftsmanship or Engineering . Software Engineering can be part of Bricolage or Engineering . Each approach requires a special skill set (e.g., integrating, crafting, teaming).											
Software Prototyping	1-20	1-2	-	-	-	-	-	5%	0-3	0-3	* All figures are just rough orders of magnitude for indication and illustration purposes.
Software Bricolage	5-100	1-2	-	-	X	(X)	-	60%	3-24	1-10	
Software Craftsmanship	5-100	1-2	-	-	X	X	X	100%	24-48	5-25	
Software Engineering	>150	5-50	X	X	X	X	X	80%	>48	>25	
		Key Message All four approaches are equally essential in practice. Which one(s) to choose.									

Key Message

All four approaches are equally essential in practice. Which one(s) to choose, entirely depends on the particular requirements.

Development Approaches: **Success Patterns**

	Software Prototyping	Software Bricolage	Software Craftsmanship	Software Engineering
Performance Responsibility Model	One-Man-Show Single Mental	One-Man-Show Single Mental	One-Man-Show Single Mental/Documented	Team Play Separated Documented
Decisions Process Optimisation	Implicit Minimized Time	Implicit Partial Efficiency	Implicit/Explicit Partial Effectiveness	Explicit Complete Economics
Risks Stakeholders Mastering	Ignore Ignore Time-Constraint	Ignore Ignore Complexity	Ignore Ignore Complication	Mitigate Manage Complexity
Solutions Standards Efforts	Use Full Use Configuration	Use Partial Use Integration	Use Partial Potentially Create Programming	Use Partial Use Programming
Target Sustainability Traceability	Demo No No	Solution Partial No	Product Full Partial	Product Full Full

One can distinguish four kinds of Software Development approaches.

In **Software Prototyping**, one develops an early sample or model of a software solution by mocking and cheating in order to just once test a concept, idea or process.

In **Software Bricolage**, one develops a single instance of a software solution by tinkering, cobbling, and integrating partial solutions in order to prove feasibility or just provide a service.

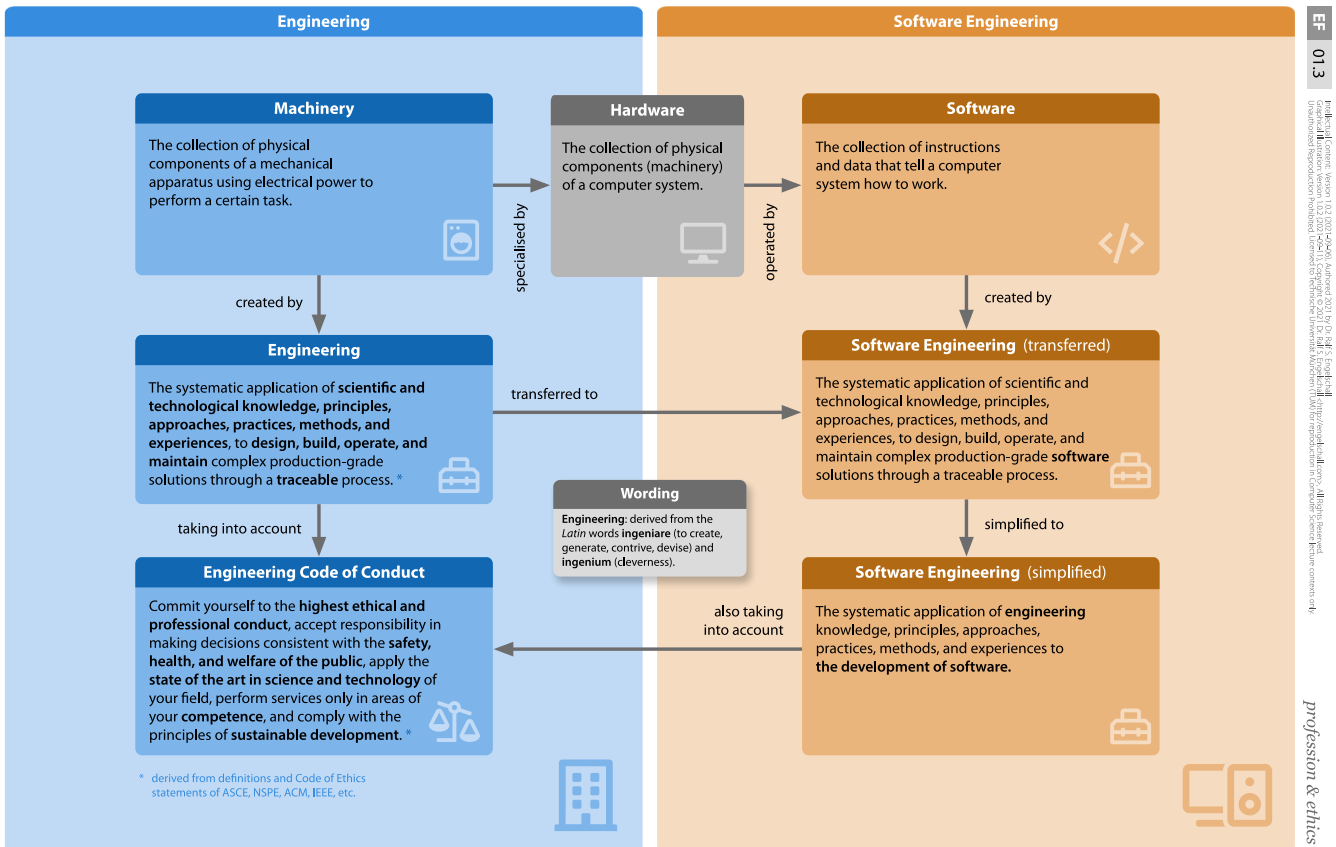
In **Software Craftsmanship**, one develops a production-grade software solution by professional, clean but plain craftsmanship means in order to solve a usually complicated problem.

In **Software Engineering**, one develops a production-grade software solution by a professional, risk-hedged engineering approach in order to solve a usually complex problem.

The four development approaches can be combined in practice: Prototyping and Bricolage can be earlier stages of Craftsmanship or Engineering. Craftsmanship can be part of Engineering. Each approach requires a special skill. All four approaches are equally essential in practice. Which one(s) to choose entirely depends on the particular requirements.

Questions

- ❓ Which Software Development Approach should be chosen to realize a complex Business Information System?
- ❓ Which Software Development Approach should be chosen to realize a complicated reusable library?




Engineering is the systematic application of scientific and technological knowledge, principles, approaches, practices, methods, and experiences, to design, build, operate and maintain complex production-grade solutions through a traceable process.

Software Engineering is the systematic application of engineering knowledge, principles, approaches, practices, methods, and experiences to the development of software.

For both Engineering and Software Engineering, the following **Code of Conduct** holds: Commit yourself to the highest ethical and professional conduct; accept responsibility in making decisions consistent with the safety, health, and welfare of the public, apply the state of the art in science and technology of your field; perform services only in areas of your competence; and comply with the principles of sustainable development

Questions

- ? Is Software Engineering also suitable for the development of a non-complex software in a small team of two people?

 <p>targeted</p> <p>adequate suitable focused</p>	<p>Statement: We focus on adequate and suitable solutions and approaches.</p> <p>Rationale: Both solutions and approaches have to be in a reasonable proportion to the problem.</p> <p>Implications: We avoid both over-engineered and cobbled-together solutions. We avoid "one-size-fits-all" approaches. We suitably adapt solutions, tools and methods.</p>	 <p>reasoned</p> <p>considered assessed deliberate</p>	<p>Statement: We think carefully and holistically in advance about our solutions and approaches.</p> <p>Rationale: We always think large, even if we have to act small, because thinking in advance is more efficient and effective than correcting afterwards.</p> <p>Implications: We always develop the "big picture" first and add ancillary details as late as possible. We are opinionated and steadfast regarding our decisions and solutions. We know that conceptual modeling is key to understanding both problems and solutions.</p>
 <p>up-to-date</p> <p>educated experienced insistent</p>	<p>Statement: We develop high-quality solutions on the basis of up-to-date methods and technologies.</p> <p>Rationale: We have to cope with the fact that the IT world is recurrently revolutionizing itself.</p> <p>Implications: We continuously educate ourselves. We continuously and critically challenge and assess emerging approaches and products. We are not satisfied with mediocre solutions.</p>	 <p>evolutionary</p> <p>sustainable harmonic contextual</p>	<p>Statement: We develop sustainable solutions that optimally fit into their context.</p> <p>Rationale: Nature teaches us that only evolutionary approaches and solutions have a good chance to survive in the long run.</p> <p>Implications: We actively learn from experiences of the past in order to improve the future. We avoid "quick hacks", as they are not long-term solutions, but just short-term means to get rid of problems. We assure that our solutions can be reasonably maintained in the long-term.</p>

The TRUE Manifesto states the foundational attitude for good Software Engineering as a central manifesto, similar to the approach – but intentionally in partial contrast with regards content – of the popular Agile Manifesto. The TRUE Manifesto expressed four main aspects.

(T)argeted (adequate, suitable, focused): We focus on adequate and suitable solutions and approaches because: Both solutions and approaches have to be in a reasonable proportion to the problem.

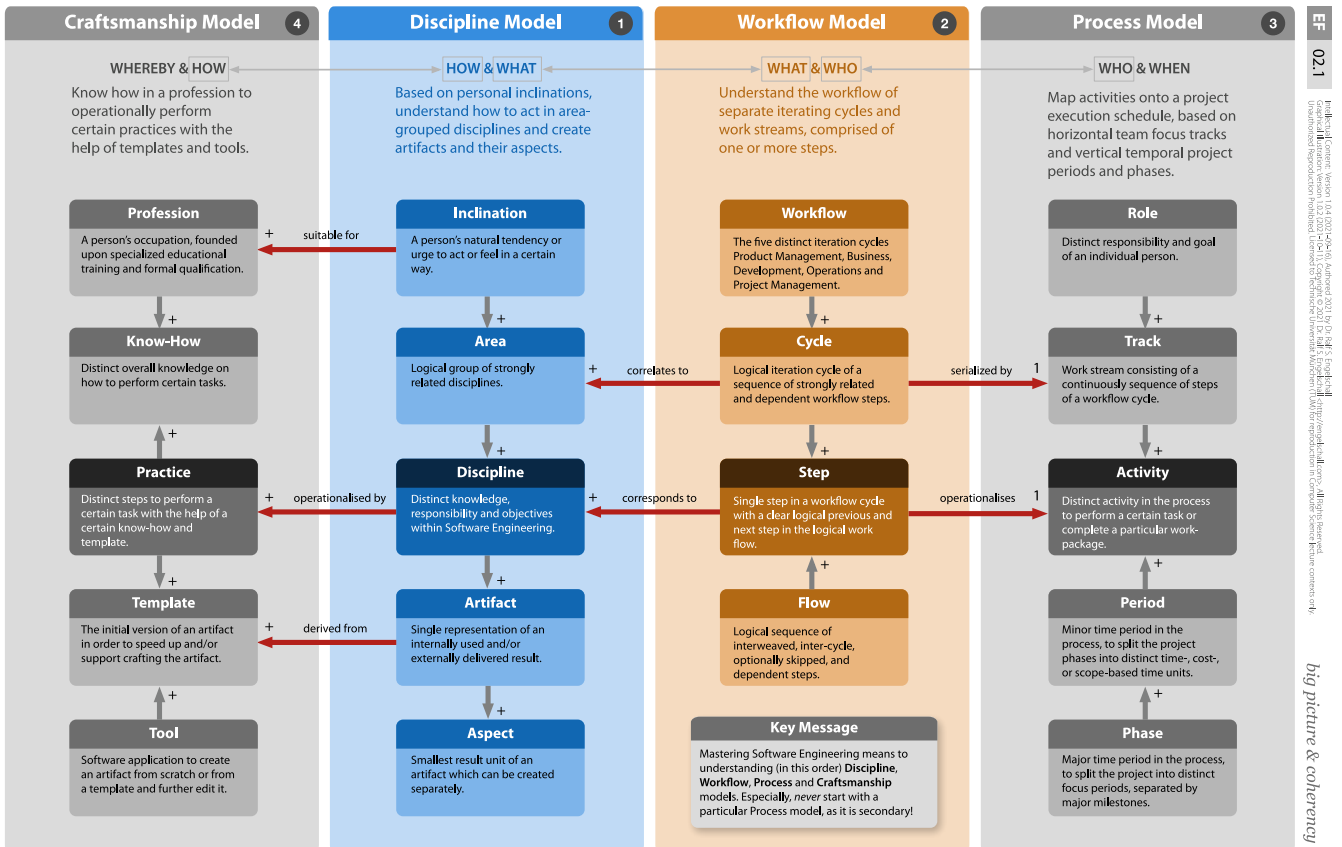
(R)easoned (considered, assessed, deliberate): We think carefully in advance about our planned solutions and approaches because: Thinking is cheaper than correcting.

(U)p-to-date (educated, experienced, insistent): We develop high-quality solutions on the basis of up-to-date methods and technologies because: We have to cope with the fact that the IT world is recurrently revolutionizing itself.

(E)voluntary (sustainable, harmonic, contextual): We develop sustainable solutions that optimally fit into their context because: Nature teaches us that only evolutionary approaches and solutions have a good chance to survive in the long run.

Questions

- ❓ Is an extrem agile process with continuous Refactoring in the sense of the TRUE Manifesto for Software Engineering?



Software Engineering can be understood through a meta-model based on four distinct but interlinked models.

The **Craftmanship Model** is the base and targets the WHEREBY & HOW. It spans from the **Professions** of individual persons, their corresponding **Know-Hows** and **Practices** to the underlying **Templates** and **Tools**.

The **Discipline Model** targets the HOW & WHAT. It segregates Software Engineering into **Disciplines**, which are grouped into **Areas** and which are motivated by the usual **Inclinations** of individual persons. Each Discipline is then described through input and output **Artifacts** and their **Aspects**.

The **Workflow Model** targets the WHAT & WHO. It describes a **Workflow** of **Cycles** which contain **Steps**. A **Flow** are the runs through those Steps over time.

The **Process Model** finally targets the WHO & WHEN. It maps **Activities** onto a project execution schedule, based on horizontal **Tracks** of **Roles** and vertical **Periods** of **Phases**.

Questions

- How many Cycles are known in the Workflow Model of Software Engineering, in which persons with similar Inclinations act?



Software Engineering can be understood through 20 distinct **Disciplines** (operationalized through input and output artifacts and their aspects), which are logically grouped into 10 distinct **Areas**, and which in turn are logically grouped into 5 distinct **Inclinations** of individual persons.

Persons with a strong **domain-specific** and **business-oriented** Inclination act in the Areas **Analysis** and **Experience** and the corresponding Disciplines **Software Requirements**, **Domain Modeling**, **User Experience** and **User Interface**.

Persons with a strong **constructive** and **technological** Inclination act in the Areas **Architecture** and **Development** and the corresponding Disciplines **Software Architecture**, **System Architecture**, **Software Development** and **Software Refactoring**.

Persons with a strong **infrastructural** and **technological** Inclination act in the Areas **Configuration** and **Delivery** and the corresponding Disciplines **Software Versioning**, **Software Assembly**, **Software Deployment** and **Software Operations**.

Persons with a strong **analytical** and **domain-specific** Inclination act in the Areas **Analytics** and **Comprehension** and the corresponding Disciplines **Software Reviewing**, **Software Testing**, **Usage Documentation** and **User Training**.

Persons with a strong **people-oriented** and **process-oriented** Inclination act in the Areas **Management** and **Adjustment** and the corresponding Disciplines **Project Management**, **Project Auditing**, **Project Coaching** and **Change Management**.

Questions

- Which Disciplines of Software Engineering are considered the **King Disciplines**?