

A large, light-colored background collage featuring various industrial and technological images, including a hand gesture, a computer monitor, a factory at night, and a wind turbine.

## 2<sup>nd</sup> AutomationML User Conference

# What is good Engineering?

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## Agenda

Siemens Corporate Technology

Introduction to Engineering

Engineering Layer

Engineering Maturity

Summary

# Siemens Corporate Technology

## Profile Ulrich Löwen

August 12th, 1961 in Hamm (Westfalen)  
married, three children

### Educational Summary

1981 - 1986	Computer Science, University of Dortmund
1986 - 1988	PhD Scholarship, University of Karlsruhe and Duisburg

### Professional Summary

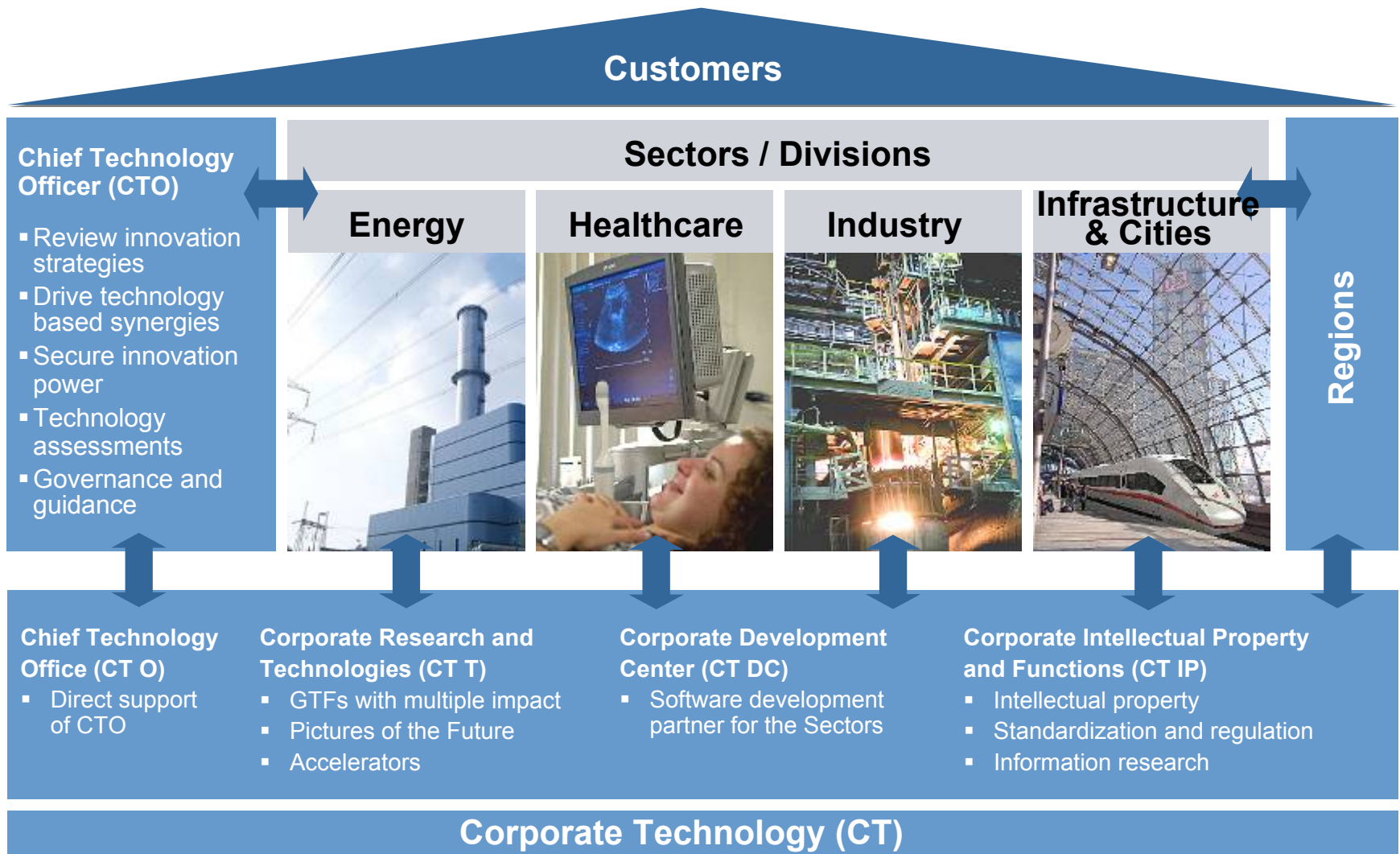
October 1 <sup>st</sup> , 1988	Entering Siemens AG
1988 - 1991	Development in the area of process control systems
1991 - 1993	Project management in the area of transportation systems
1993 - 1998	Management of research- and software-development project "Modeling of Plants"
1999 - 2011	Department Head Systems Engineering
2007	top+ Working Group Engineering
Since 2010	Senior Principal Engineer for Engineering



# Corporate Technology

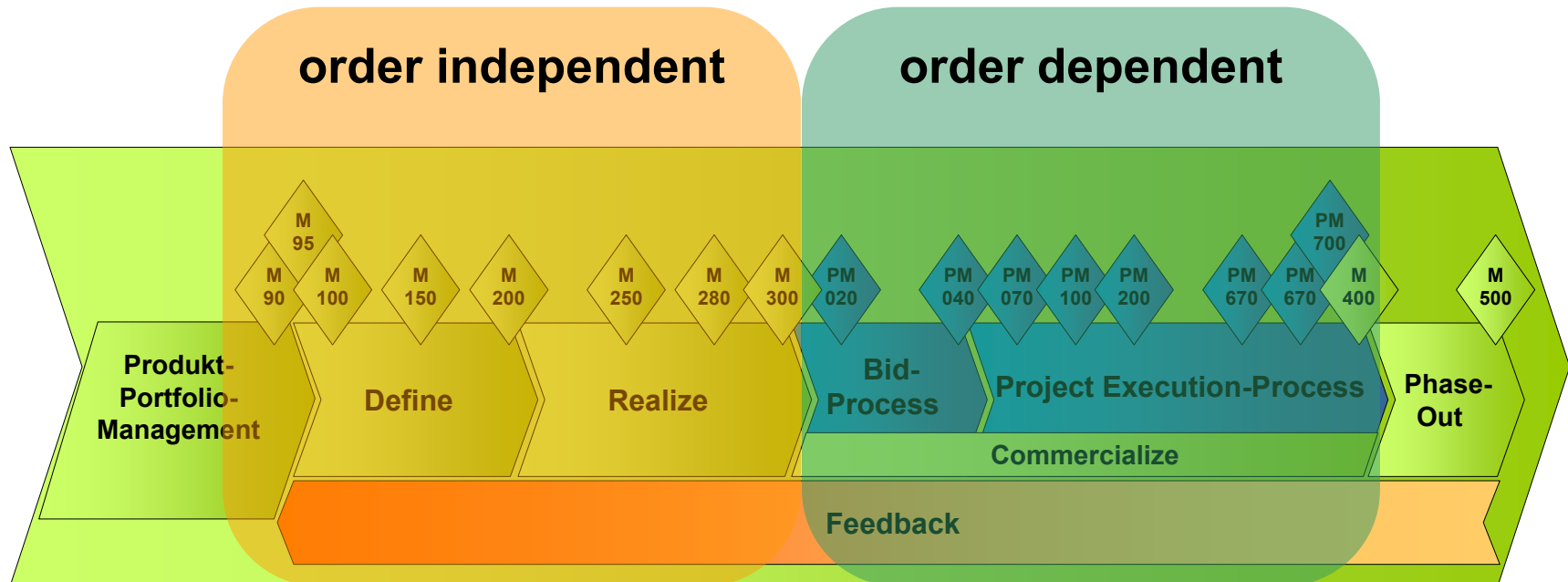
## Networking the Integrated Technology Company

**SIEMENS**



# Introduction to Engineering

**Scope: Engineering comprises all technical activities creating a **customer** solution**



- Design of solutions/systems for bidding
- Sizing, customizing, and integration of products for customer projects
- Technical realization and commissioning within customers' projects
- Design of reusable assets

# What is Good Engineering?

## Some Quotes:

*Engineering is good if...  
it doesn't cost anything*

*Only "zero engineering"  
is good engineering*

*Engineering is not important at all, it's  
only 5% of all project costs!*

*Good engineering is our main  
unique selling proposition*

*Engineering is people business ...  
... best people implies best engineering*

*Good engineering helps to...*

- *Prevent errors*
- *Solve problems*
- *Realize solutions*

*We can't survive without  
engineered products!*

*Engineering is critically important!*

## Experiences of Engineering Improvement Projects

Engineering Organizations oftentimes ...

- ... have to get better, cheaper, faster: but how and where to start?
- ... have tried to improve engineering by single areas only
- ... have impression that "something bigger" needs to be changed to achieve real improvement



## Voice of Siemens Engineering Heads

### APPROACH

Statement Cluster "We need a new <b>APPROACH</b> in engineering"		SIEMENS	
<b>Statement</b> "We need a clearly defined engineering strategy"	<b>Statement</b> "We need to implement new engineering methods"	<ul style="list-style-type: none"> <li>Overall business setup</li> <li>Engineering trends</li> <li>Picture of the future for engineering</li> <li>Alignment of engineering and business strategy</li> </ul>	<ul style="list-style-type: none"> <li>Lean engineering</li> <li>Design for engineering</li> <li>Value stream orientation</li> <li>Lifecycle considerations in engineering</li> </ul>
<b>Statement</b> "We need to establish a global product portfolio rather than execute project after project"	<b>Statement</b> "We need a change program to successfully implement new engineering approaches"	<ul style="list-style-type: none"> <li>Requirements engineering for a global product portfolio</li> <li>Analysis and benchmarking of competitors</li> <li>Understanding of market as well as of the customer of our customers</li> </ul>	<ul style="list-style-type: none"> <li>Coordinated implementation plan of all change programs</li> <li>Rollout plan with responsibilities and dates</li> <li>Communication plan</li> <li>Training concept</li> </ul>
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### KNOWLEDGE

Statement Cluster "We need an overall <b>KNOWLEDGE</b> of engineering"		SIEMENS	
<b>Statement</b> "We need a common understanding of engineering inside Siemens"	<b>Statement</b> "We need to understand interdisciplinary interactions in engineering"	<ul style="list-style-type: none"> <li>Common definition of engineering</li> <li>Mission and vision of engineering</li> <li>Engineering handbook and glossary</li> </ul>	<ul style="list-style-type: none"> <li>Seamless integration of technical disciplines</li> <li>Definition of interfaces between lifecycle phases and technical disciplines</li> <li>Knowledge and information management across technical disciplines</li> </ul>
<b>Statement</b> "We need to understand how to design modules and still provide customer specific needs"	<b>Statement</b> "We need to push standardization activities inside Siemens as well as outside Siemens"	<ul style="list-style-type: none"> <li>Different design approaches for modules</li> <li>Structuring and decomposition of technical solutions</li> <li>Configuration, versioning and variant management</li> <li>Handling of customer specific needs/changes</li> </ul>	<ul style="list-style-type: none"> <li>Participation in standardization boards (e.g. GMA, VDI, ISO, ...)</li> <li>Common standardization approach</li> <li>Actively moderated standardization processes</li> <li>Standardized interfaces of our products</li> <li>Standardized or even automated processes</li> </ul>
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### SYNERGIES

Statement Cluster "We need to leverage <b>SYNERGIES</b> in engineering"		SIEMENS	
<b>Statement</b> "We need an engineering community in Siemens"	<b>Statement</b> "We need to find synergies despite project and domain diversity"	<ul style="list-style-type: none"> <li>Best practice sharing</li> <li>Knowledge exchange</li> <li>Engineering lobbyism (one voice)</li> <li>Coordination of Siemens-wide activities</li> </ul>	<ul style="list-style-type: none"> <li>Cross domain engineering concept</li> <li>Improved engineering resource exchange in Siemens</li> <li>Products usable across divisions and industries (cross-standardization)</li> </ul>
<b>Statement</b> "We need a common engineering tool landscape in Siemens"	<b>Statement</b> "We need a Siemens-wide engineering approach"	<ul style="list-style-type: none"> <li>Common engineering tool landscape based on the engineering process</li> <li>Coverage of the entire plant lifecycle</li> <li>Coverage and alignment of PLM, SCM and PM requirements</li> </ul>	<ul style="list-style-type: none"> <li>Common philosophy how to do engineering</li> <li>Product development as inherent part of project engineering</li> <li>Common quality mechanisms (e.g. Q-gates, processes, audits, ...)</li> </ul>
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### EMPLOYEES

Statement Cluster "We need to expose the value of our <b>EMPLOYEES</b> "		SIEMENS	
<b>Statement</b> "We need to better show the value of engineering"	<b>Statement</b> "We need to adapt engineering behavior"	<ul style="list-style-type: none"> <li>Engineering is core business of Siemens</li> <li>Engineering as "value center" not "cost center"</li> <li>Engineering influences other lifecycle activities (e.g. service)</li> </ul>	<ul style="list-style-type: none"> <li>Increased willingness to change work approach and methods</li> <li>Extended dissemination of work experience and know-how</li> <li>Increased open mindedness</li> </ul>
<b>Statement</b> "We need better training and education opportunities for engineering"	<b>Statement</b> "We need a global setup of our engineering organization"	<ul style="list-style-type: none"> <li>Defined common corporate/enterprise career path for engineers</li> <li>Advanced training program for engineering inside Siemens</li> <li>University studies and master programs for project engineering</li> </ul>	<ul style="list-style-type: none"> <li>Global organizational structures</li> <li>Common roles and responsibilities</li> <li>Engineering for and in M1-M4 markets</li> </ul>
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- We need to understand how to **design modules** and still provide customer specific needs
- We need an **engineering community** in Siemens
- We need better **training** and **education** opportunities for engineering
- We need to implement **new engineering methods**
- We need to better show the **value of engineering**

## Voice of Business Responsible

### Challenges in Engineering

- Improvement of lessons learnt fed in bid process and development
- Find optimal way of standardization: parameterization versus engineering
- Realize faster time to market without causing non conformance costs
- Early involvement of engineering
- Career path for specialists in technical roles, improve project management skills within engineering
- Find proper KPIs in order to leverage engineering cost effective

### Conclusions

- Integrated consideration of all business functions necessary
- Different business types, scopes, and organizational setups as well as missing common terminology limit experience exchange

# Engineering Layer

## Some General Thoughts and Questions

What is the value of engineering?

- Value rather than cost only considerations
- Where is a good balance of engineering impact and value?
- Who is the business owner after all?

**Engineering  
Strategy**

Which engineering processes should we have?

- Do we need processes at all?
- Who is responsible for what?
- What are our interfaces to other processes?

**Engineering  
Processes**

What are our competences? How do we cooperate?

- How do we manage engineering competences?
- What is good engineering career path?
- Where is our engineering networks? What is a “Center of competences”?

**People and  
Collaboration**

What are the right tools?

- PLM tools?
- Project Management tools?
- How many different tools do we need?

**Engineering  
Tools**

What are good deliverables of an engineering project?

- How should we modularize our solutions?
- Do standardized products help? What can we reuse?
- Which technologies are important in the future?

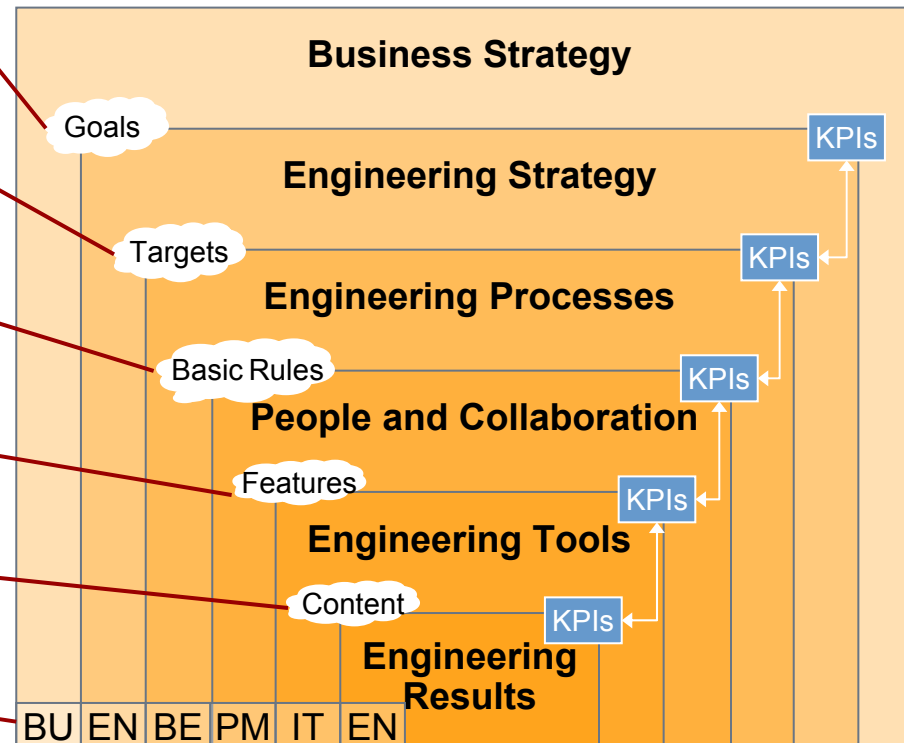
**Engineering  
Results**

## Challenges in Engineering

### Challenges Today

Sometimes...

- Strategies are often too abstract
- KPIs are usually not integrated
- Processes are not being lived
- Tools define workflows
- Projects define tools
- Diversity in ownership

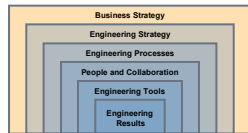


### Systematic Approach

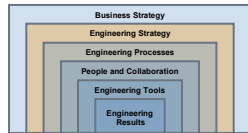
In-depth understanding of main KPIs in engineering

- Staged KPI concept
- Engineering strategy models
- Engineering process best practices
- Productivity factors for workflows and tool support / integration
- Artifact review system

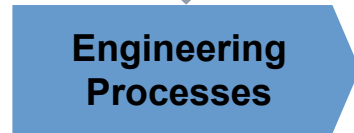
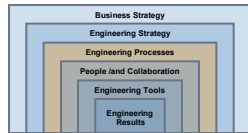
# Example of an Standardization Project: Consideration of All Aspects Leads to Success!



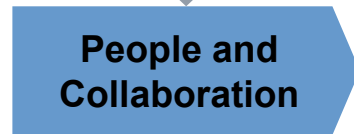
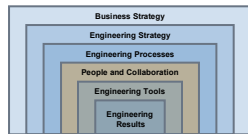
- Overall goal is to improve competitive cost position through standardization



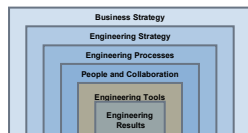
- Move from pure order specific plant solutions to a approach that is on pre-developed standard products
- Integration of all engineering disciplines



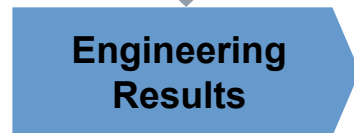
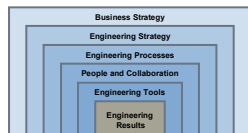
- Definition of common process to develop, use and update products
- Definition of roles



- Assignment of responsibilities
- Analysis of as-is workflows
- Design review systematic



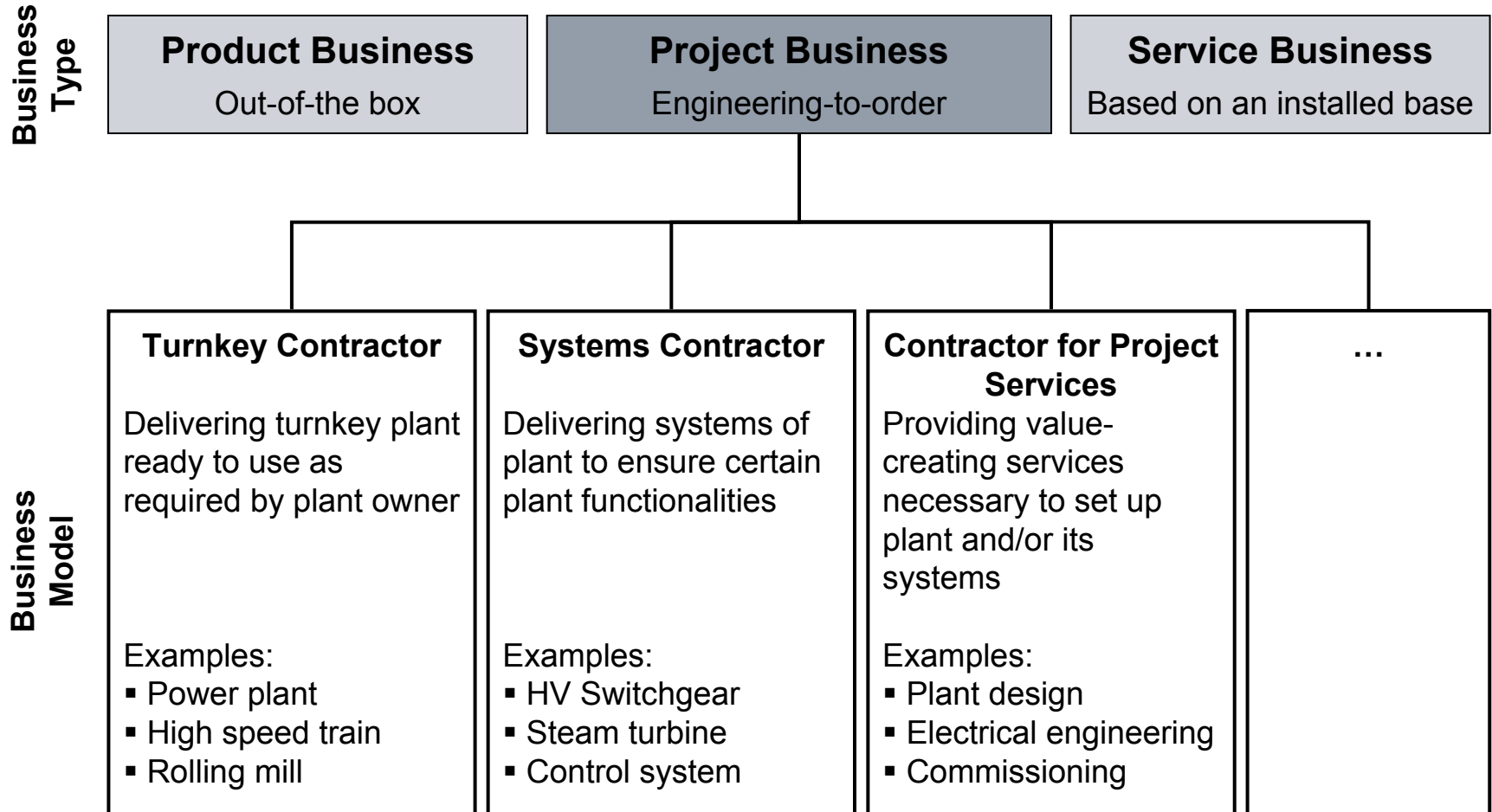
- Definition a globally standardized tool landscape
- Definition of a tool environment for the administration of product data and global Engineering collaboration



- Definition of a common method for structuring plants
- Definition of type & degree of standardization
- Prioritization of plants and products

# Engineering Maturity

# Business Models in Project Business



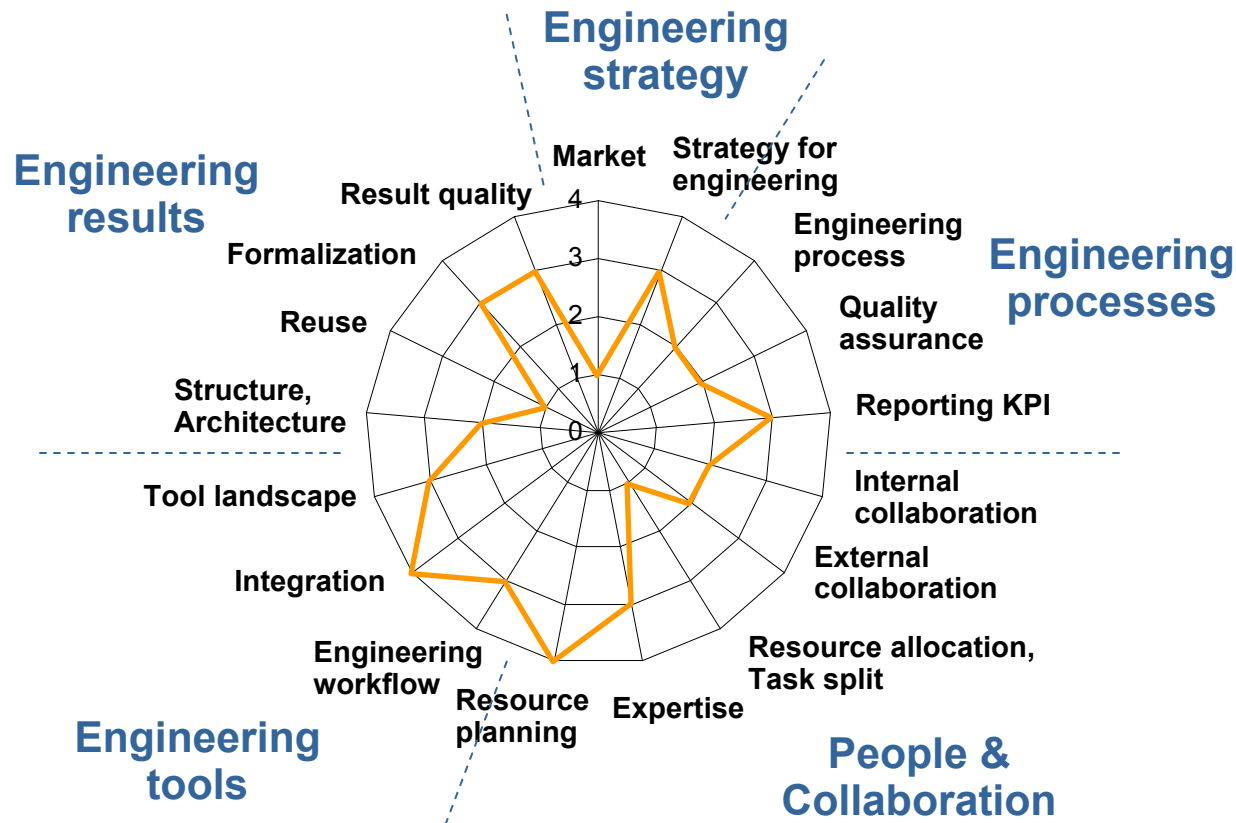


# Overall Structure of Engineering Framework

		Business Models			
		Turnkey Contractor	Systems Contractor	Contractor for Project Services	...
Engineering Layers	Engineering Strategy				
	Engineering Processes				
	People and Collaboration				
	Engineering Tools				
	Engineering Results				

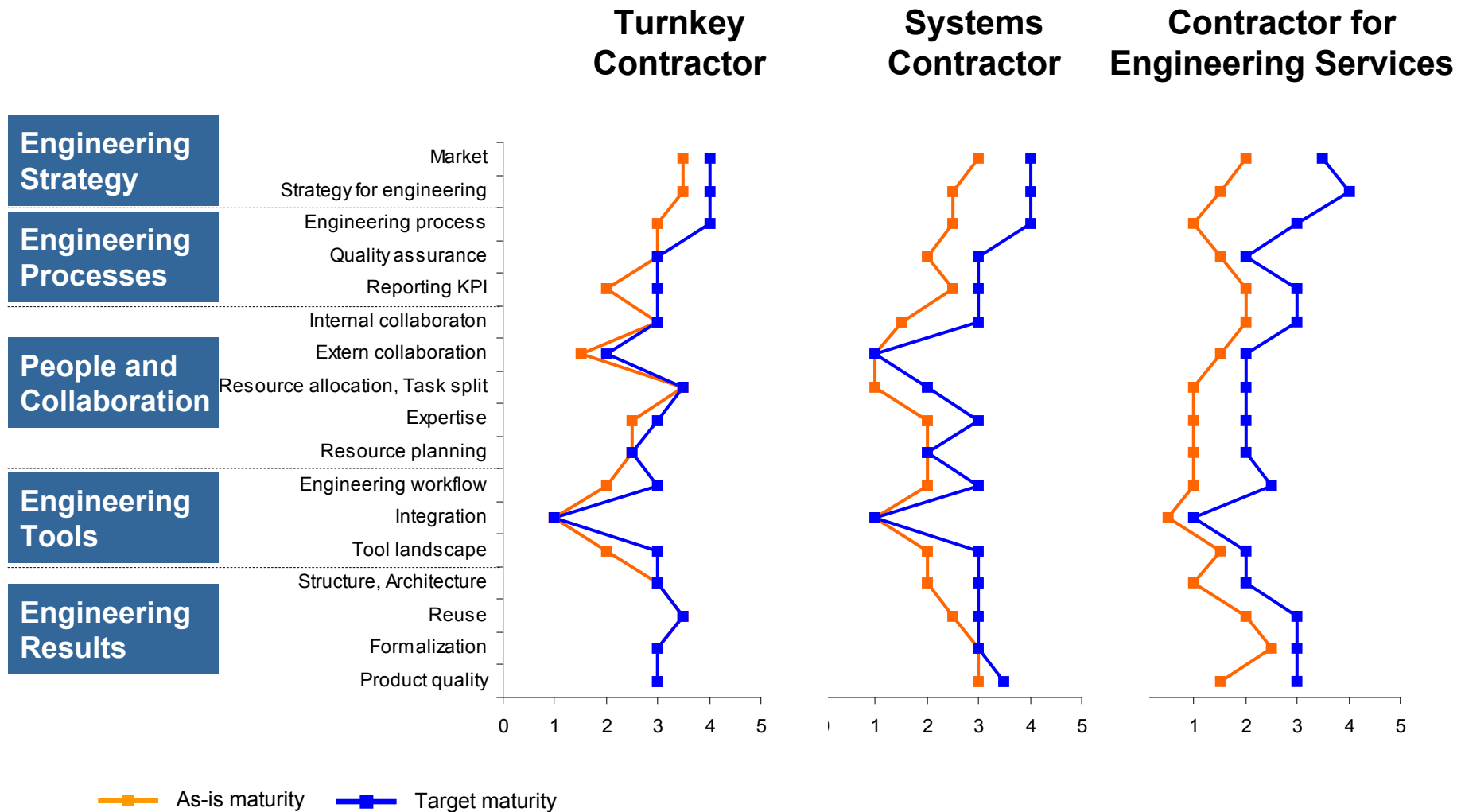
Engineering Framework provides a systematic approach to identify engineering related synergies and best practices in project business

# Evaluation of Engineering Layers



- Aspiration level is depending on individual characteristics of business, an optimal value is not necessarily 4

# Aspired Target Maturity Levels are Different for Each Engineering Model (Samples)



# Summary

## Engineering is Good if ...

### ... it taps the full potential of engineering

- Holistic view on engineering from strategy to engineering results
- Alignment with business-, supply chain-, human resources strategy
- Definition of appropriate engineering maturity (business needs)
- Coverage and involvement of all engineering disciplines
- Consideration of whole value chain and life cycle phases

### ... to maximize business impact

- Lever on reduction of total cost of ownership for customers
- Improved competitive position of plant provider
- Creation of unique selling proposition for plant provider



**Thank you for your  
attention!**

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