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Analysis of Engineering-Workflows as Basis for Optimal Use of Engineering-Tools

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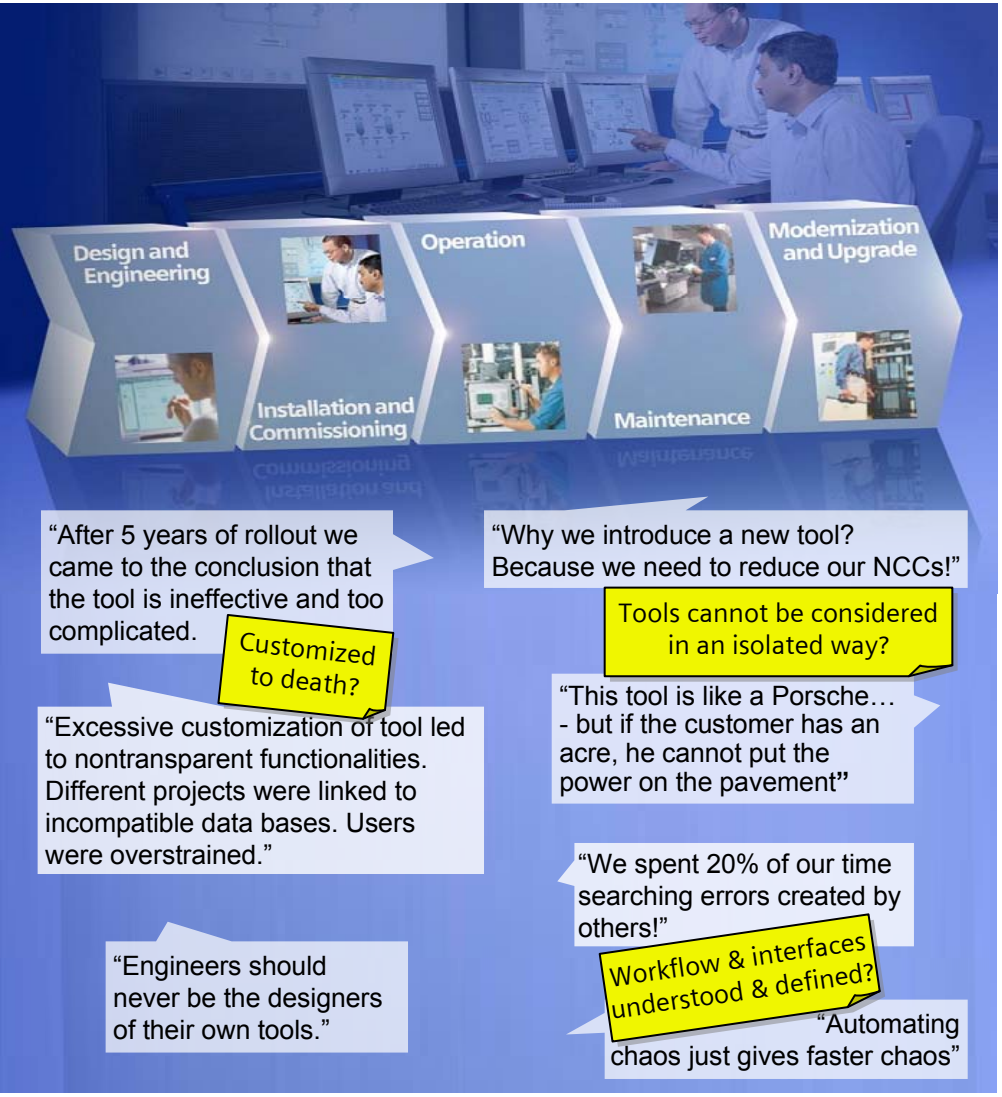
Project Engineering

Siemens Corporate Technology

http://www.siemens.com/innovation/de/ueber_funde/corp_technology/research_technology/index.htm

Sounds familiar?



Siemens Corporate Technology
Networking the Integrated Technology Company

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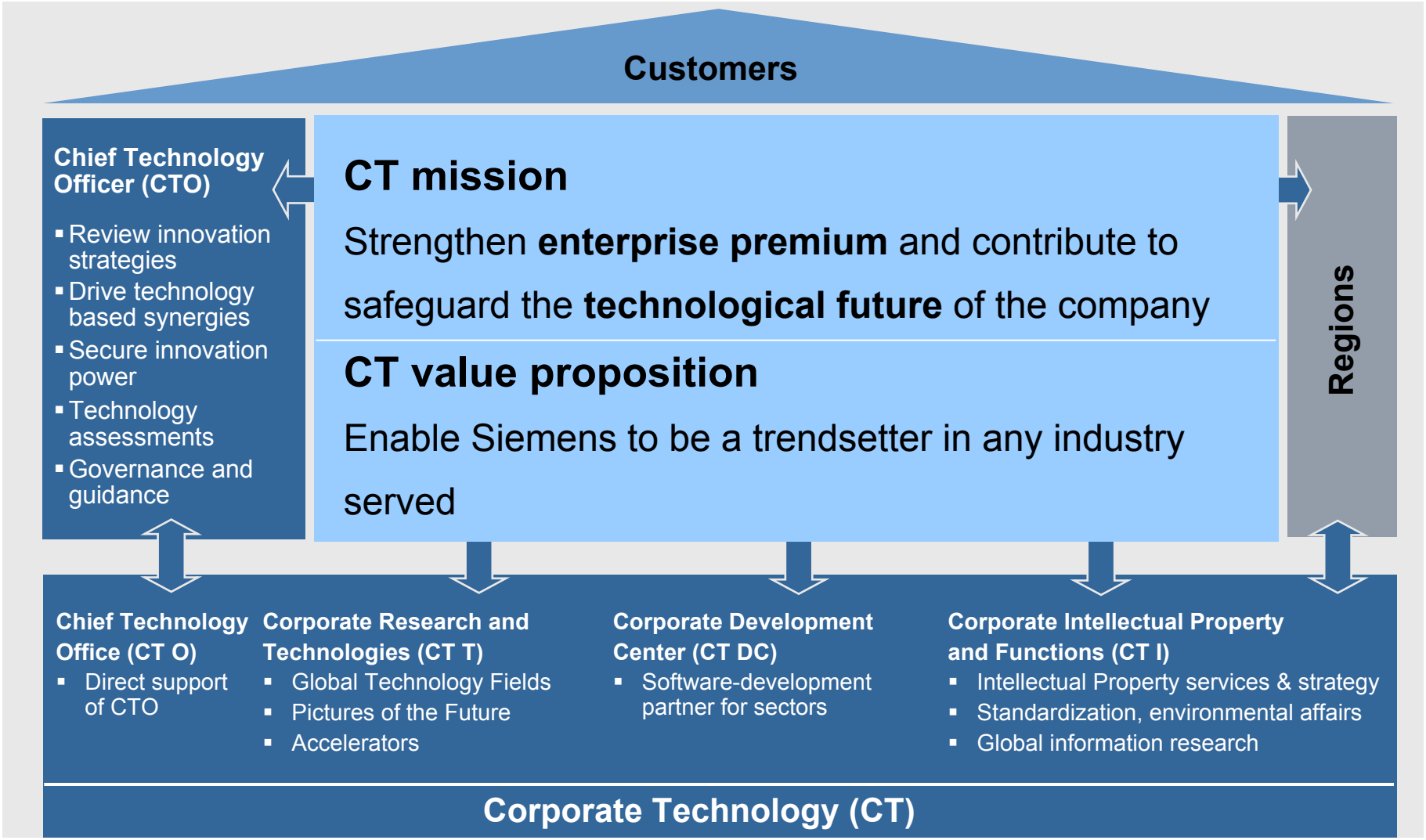

Introduction of Engineering Tools – Phases and Objectives

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Phase	Objectives
Scoping and Focusing	**Know "what"** ▪ Your process and products/data in scope ▪ Affected parties and stakeholders
Trans-parency and Vision	**Understand and evaluate "what"** ▪ Your current workflows for all relevant process and applications ▪ Targets of workflow improvements and boundary conditions ▪ Qualification and quantification of benefits ▪ Consolidated tooling vision and requirements
Viability	**Know "how"** ▪ Evaluation / benchmarking of tools ▪ Business plan
Migration Concept	**Decide "how"** ▪ Implementation concept ▪ Migration roadmap

Focus of today's presentation

Standardized Criteria Catalogue for Evaluation of Workflows and Tools

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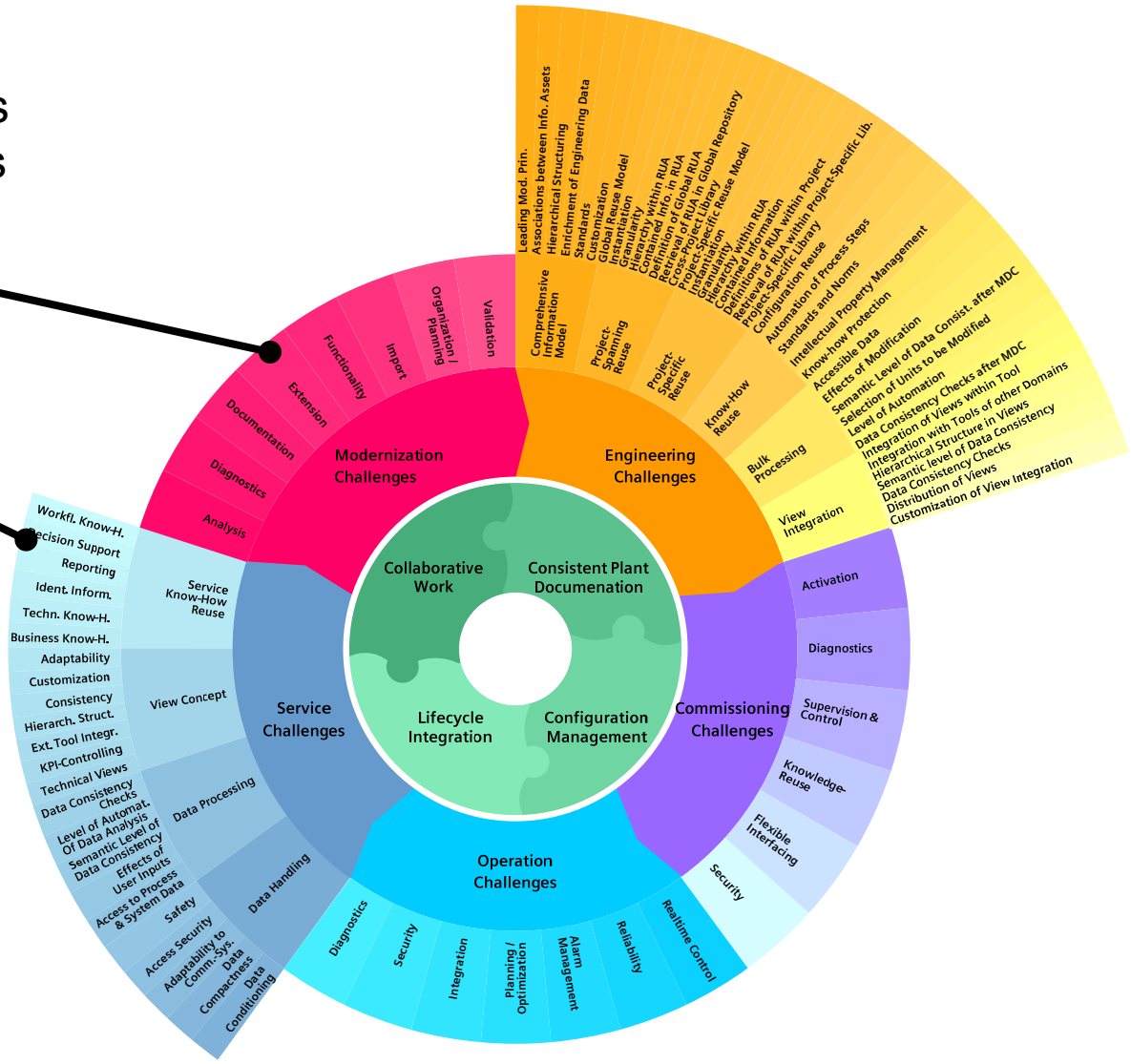
- Over 30 productivity factors for industrial plant business (challenges) covering the whole life-cycle
- Over 240 productivity relevant industrial software aspects
- Over 1000 Best Practices for industrial software



Proven know-how base and criteria matrix for evaluation of workflows and tools

Classified Best Practices as Basis for Objective and Precise Evaluation of Workflows & Tools

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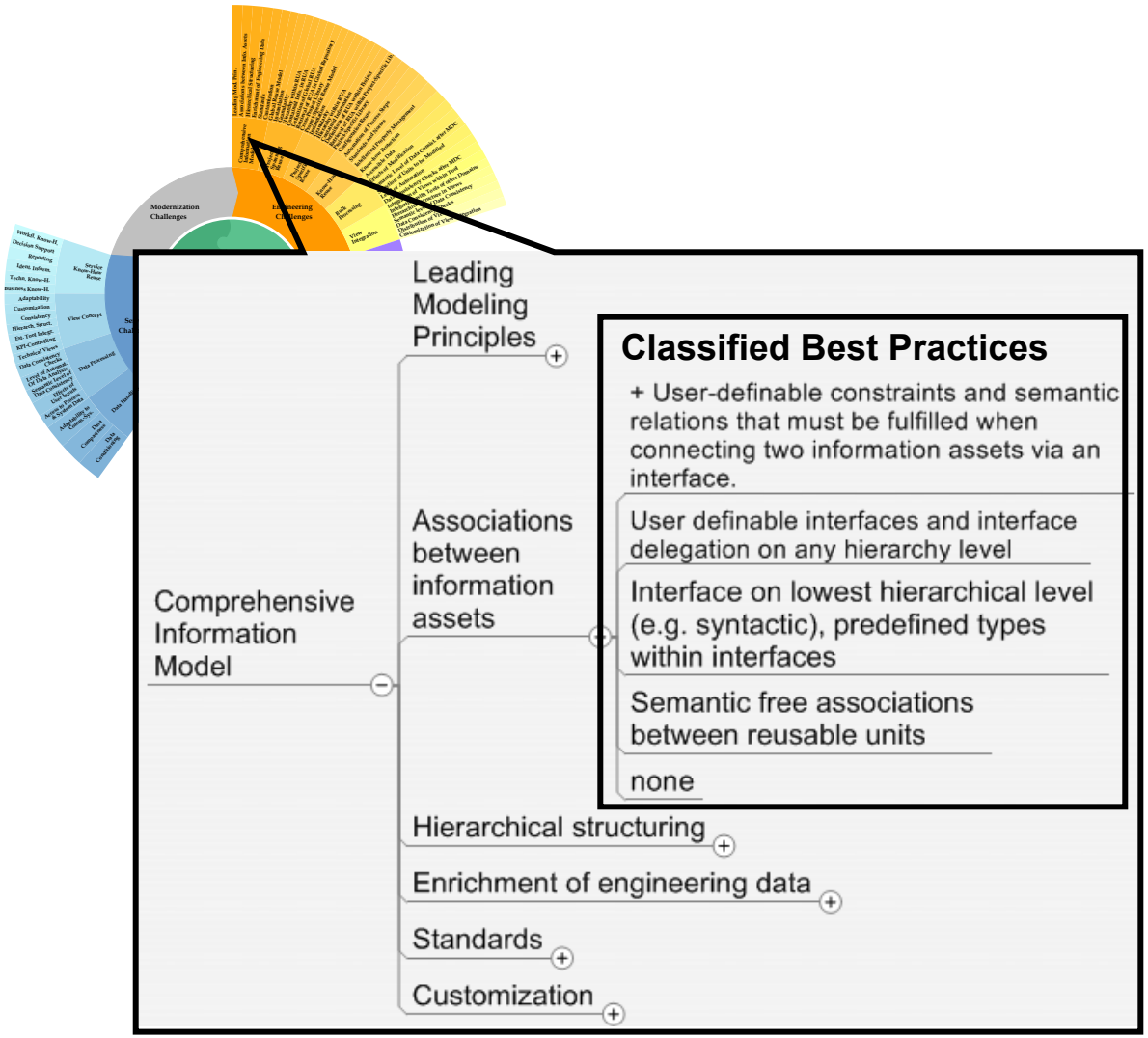
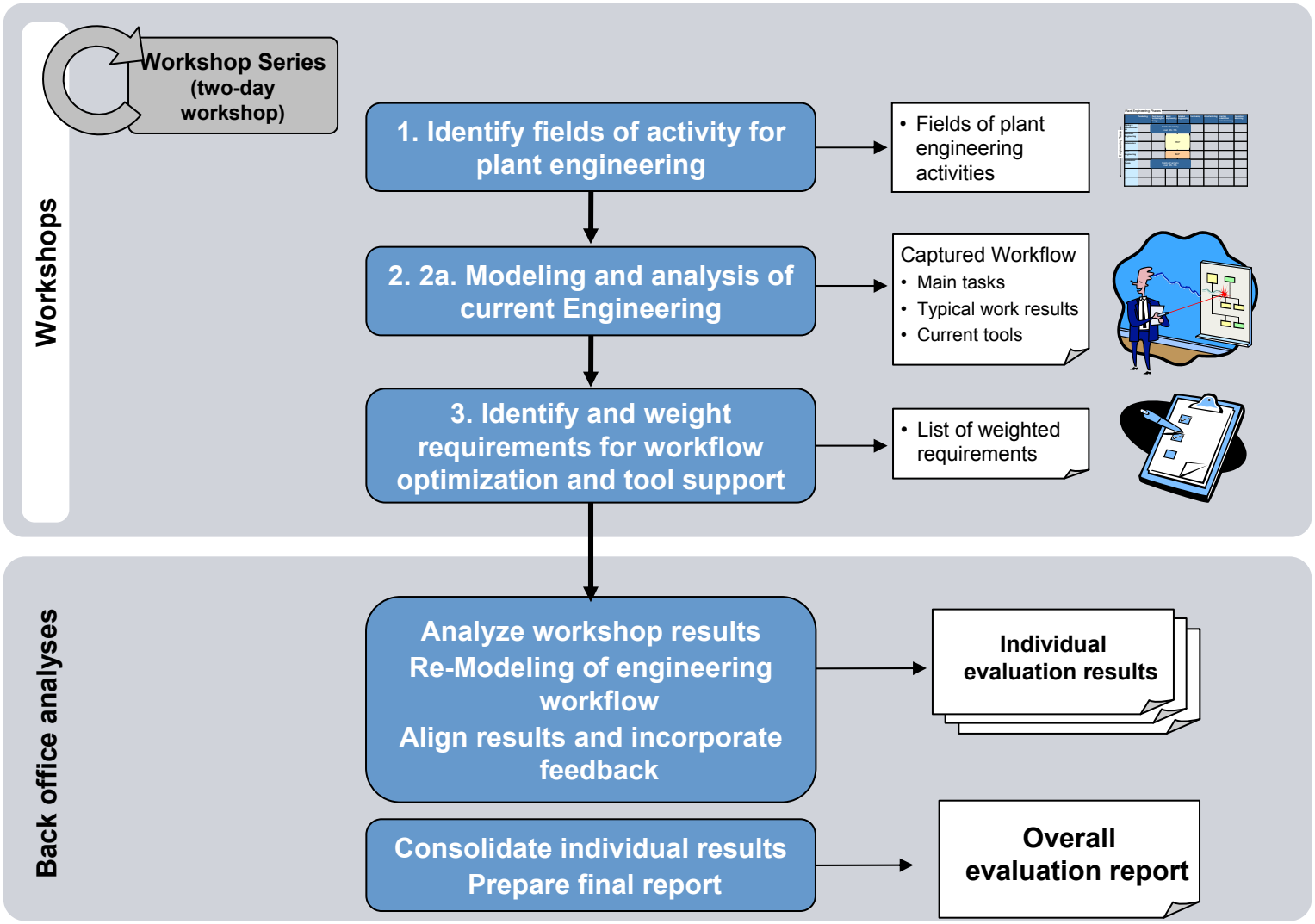


Classification Model

4	Generic Support
3	Explicit, High Level
2	Explicit, Low Level
1	Implicit Support
0	No Support

Analyzing Workflows – Project Concept



Customer Preparation of Workshop

Please provide the following resources, persons and information for a successful workshop and significant results

Participants

Experts for engineering

have to fulfill the following profiles:

- Engineering/Technology heads
- Technical project managers
- Group Managers Engineering/Technology
- Engineers/Technologists (engineering tool users) from all relevant fields of work / disciplines

Infrastructure

- Meeting room with one 5m free wall for graphically workflow modeling (pin board)
- Beamer, flip chart

Information to be prepared

Basic information for workflow

Gathering of engineering-workflow should be referenced to a representative plant project

- Identification of suitable project in advance
- Incorporation of involved project participants / departments / teams in the workshop

Do defined workflows already exist?

- E.g. process instructions, project plans, task descriptions for departments / roles / groups
- Existing documentation for these workflows to be provided in advance to the workshop

1a. Identify Fields of Activity for Plant Engineering

Positioning towards functional tasks and project phases	Concept Design	Basic Engin.	Detail Engin.	Instal-lation	Commis-sioning	Service / Maintenance
Product Design & Engineering						
Process Engineering						
Plant & Assembly Layout						
Manufacturing Engineering						
Automation Control						
Electrical & Instrumentation						
Civil Engineering						
Mechanical Engineering						
…						

Why we need this categorization

- Understanding engineering context
- Preparation of workflow modeling
- Understand the interrelations of different tasks, sub-workflows & tool features
- Basis for identification of customer/use cases specific tool setups
- Basis for positioning of tools in customer's workflows driven by the technical tasks
- Understand the respective area of influence of cross-functional features (project-related)

1b. Scoping of the Workshop Regarding Importance of Requirements and Topics

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	Category	Requirements	Importance
1	Data handling and integration	▪ Single source" principle for data of different engineering disciplines or project phases (roundtrip engineering) ▪ Assurance of data actuality & consistency of modifications ▪ Clear and transparent structuring of project data	Example: 4
2	Standardization / Design of Modules for project-spanning reuse	▪ Global standardization and reuse concept ▪ Consistent specification & supply of reusable modules ▪ Library management and project support	1
3	Reuse in Customer Projects	▪ Usage of libraries of devices / modules / assembly for re-use across different projects ▪ Quality/Efficiency of provided modules in projects ▪ Creation of reusable templates (master copies) in projects	3
4	Collaborative engineering	▪ Simultaneous engineering, multi-site engineering ▪ Access rights and user management ▪ Collaboration with suppliers (equipment and engineering)	2
5	Version and Change Management	▪ Creation of versions and managing of variants ▪ Releasing of project data ▪ Systematic Change Management	4
6	…		

2a. Modeling and Analysis of Current Engineering

Systematic, interactive modeling of tool spanning engineering workflow

- Scope of supply, areas of work
- Tasks, activities and related efforts
- Used engineering tools und data management
- Task sequence, data flow, technical & logical dependencies

Activity

- Responsible
- Int. /external
- Used tool(s)
- Efforts / Repeats

Task sequence / Data flow

Result

- Results type
- Responsible
- Data Format
- State/Maturity
- …

- Strengthens and clarifies common picture, scope and terminology
- Basis for identification / discussion of strengths & weaknesses
- Problems with dependencies and with the use of tools become evident
- Common elaboration / depicting requirements and optimized scenarios

2b. Identification and Weighting of Requirements for Workflow Optimization and Tool Support

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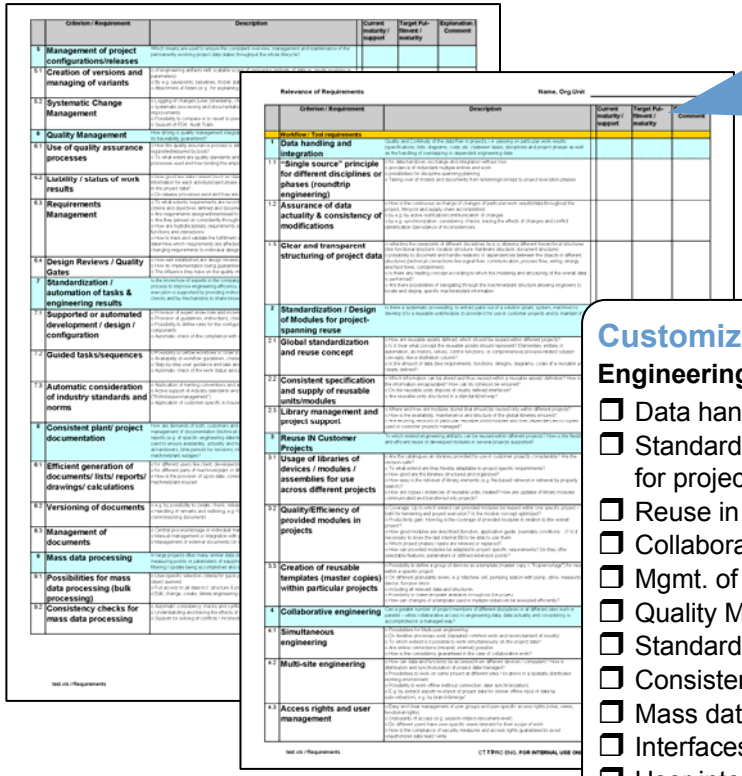

Identification / weighting of requirements/topics regarding workflow optimization and tool support

- Identification of relevant requirement topics[1]
- Assessment of maturity of current tool support and target support

Customizable catalogue of requirements

Engineering[2] workflow/tool requirements categories

- ❒ Data handling and integration
- ❒ Standardization / design of modules for project-spanning reuse
- ❒ Reuse in projects (intra & cross-project)
- ❒ Collaborative engineering
- ❒ Mgmt. of project configurations / releases
- ❒ Quality Management
- ❒ Standardization / automation of tasks & results
- ❒ Consistent plant/ project documentation
- ❒ Mass data processing
- ❒ Interfaces to tools of other domains
- ❒ User interface of tools / systems

Engineering fields of work

- ❒ Requirements Engineering
- ❒ Process Engineering
- ❒ Plant/Factory Layout Design
- ❒ Manufacturing Engineering
- ❒ Planning of Piping & Instrumentation
- ❒ Electrical & Power Supply Engineering
- ❒ Automation Control Engineering
- ❒ Motion Control Engineering
- ❒ Civil Eng. / Steel Structures / Auxiliaries
- ❒ Mechanical Engineering
- ❒ Cost Calculation / Contract
- ❒ Safety & Security Engineering

- Helps to structure and prioritize current issues and requirements
- Based on measurable weights and proven best practices

2b. Identification and Weighting of Requirements: Results to be used for Common Prioritization

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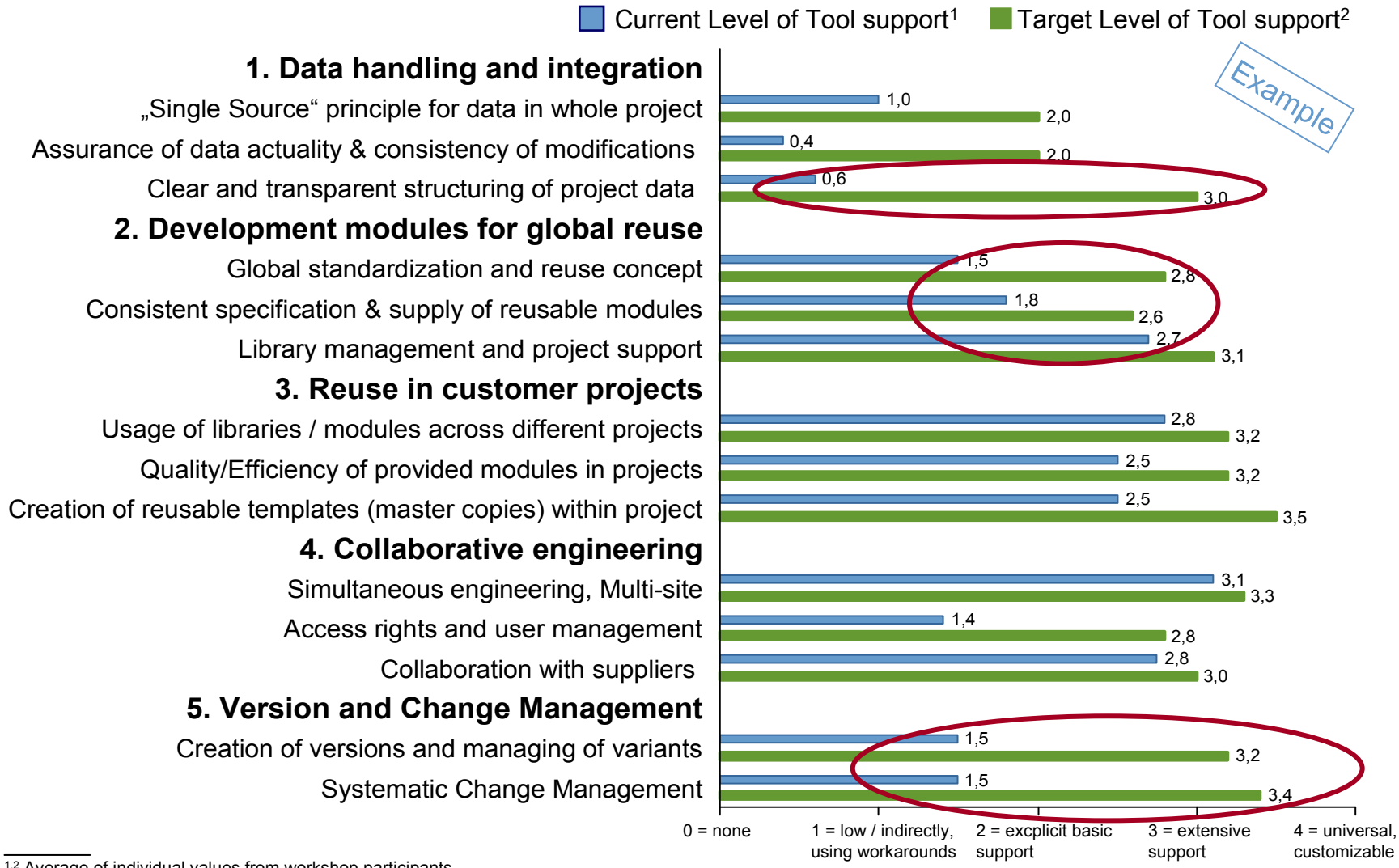

[1,2] Average of individual values from workshop participants

Example: Suitability Analysis for Comos in Engineering in Metals & Mining

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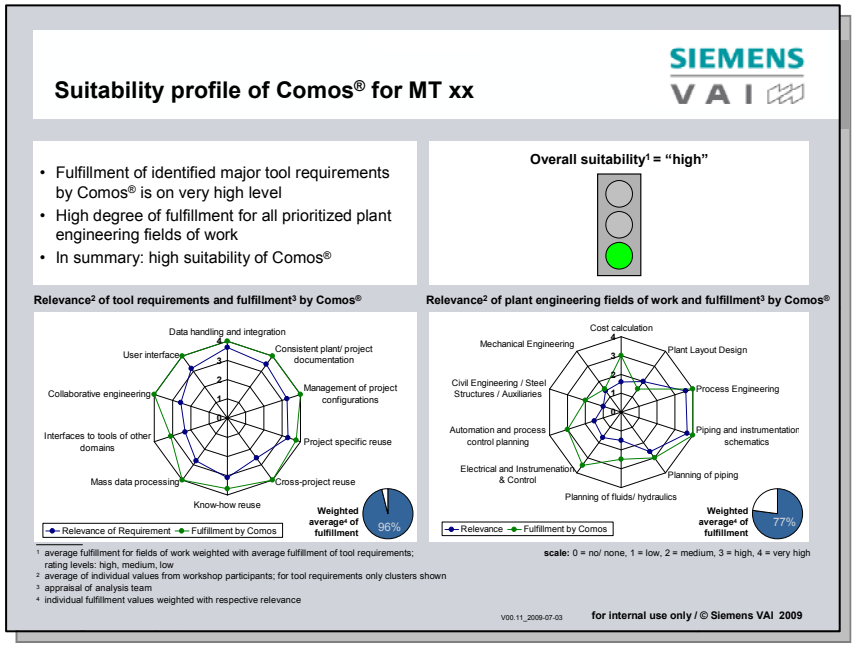
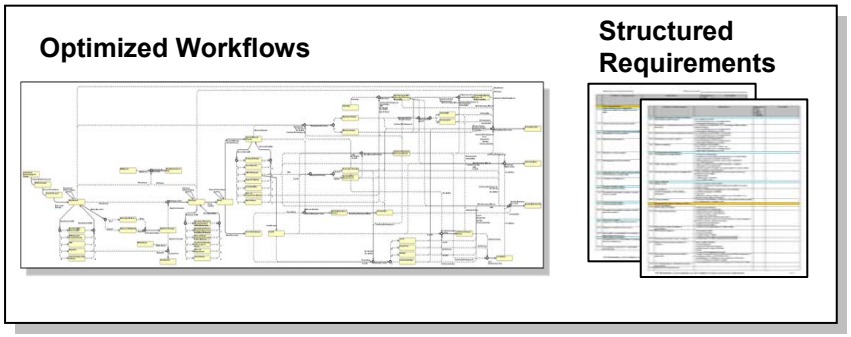




Customer

- Siemens Metals & Mining business unit
- Global business, multi-site set-up
- Projects from acquisition to handover incl. process-, mechanical-, electrical,- automation engineering

Task

- Analyze principle, technical suitability of Comos for engineering activities & workflows
- Identify requirements and develop approach for potential Comos implementation project

Result

- Analysis and modeling of engineering workflows in relevant Business Segments
- Key-findings & recommendations for productivity improvement
- Identification of basic requirements for future tool support
- Suitability profile for Comos
- Concept and roadmap for Comos Implementation

Selected References

Analysis & optimization of engineering tool landscape Siemens Energy - Power Distribution - Energy Automation (E D EA)

Validation & optimization of Comos – PCS 7 integration strategy based on engineering workflows of external key customers

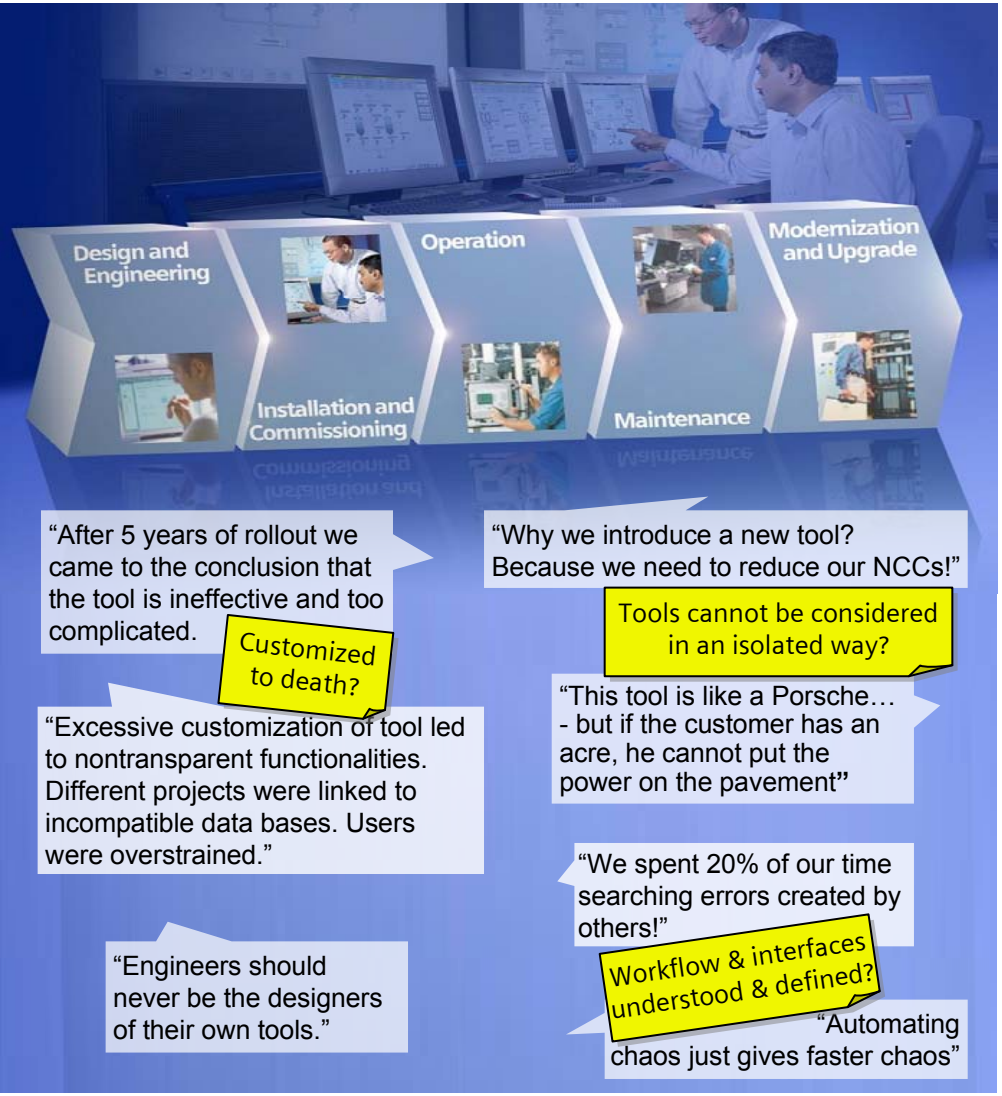
Comos suitability analysis at Siemens VAI Metals Technologies (I IS MT)

Analysis of engineering tool landscape Siemens Energy - Fossil Power Generation - Module & Project Engineering (E F ES)

Evaluation of engineering workflows and interface management for Siemens Energy - Conventional Island (E F NP)

Analysis for engineering tooling integration in Siemens Industry – Rail Automation (I MO RA)

Sounds familiar?



Lessons learned

- Think "lifecycle" and not "IT"
  - Users of a single system will always preach why it does not fit … Benefit is in the whole lifecycle!
- Transparency: First know „what", then decide „how"
  - Changes can influence different process chains in and outside the company
  - Understand relevant processes from different point of views
- Data structures should be guided by work process and not vice versa
- Most important … be patient!

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Thank you for your attention!

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