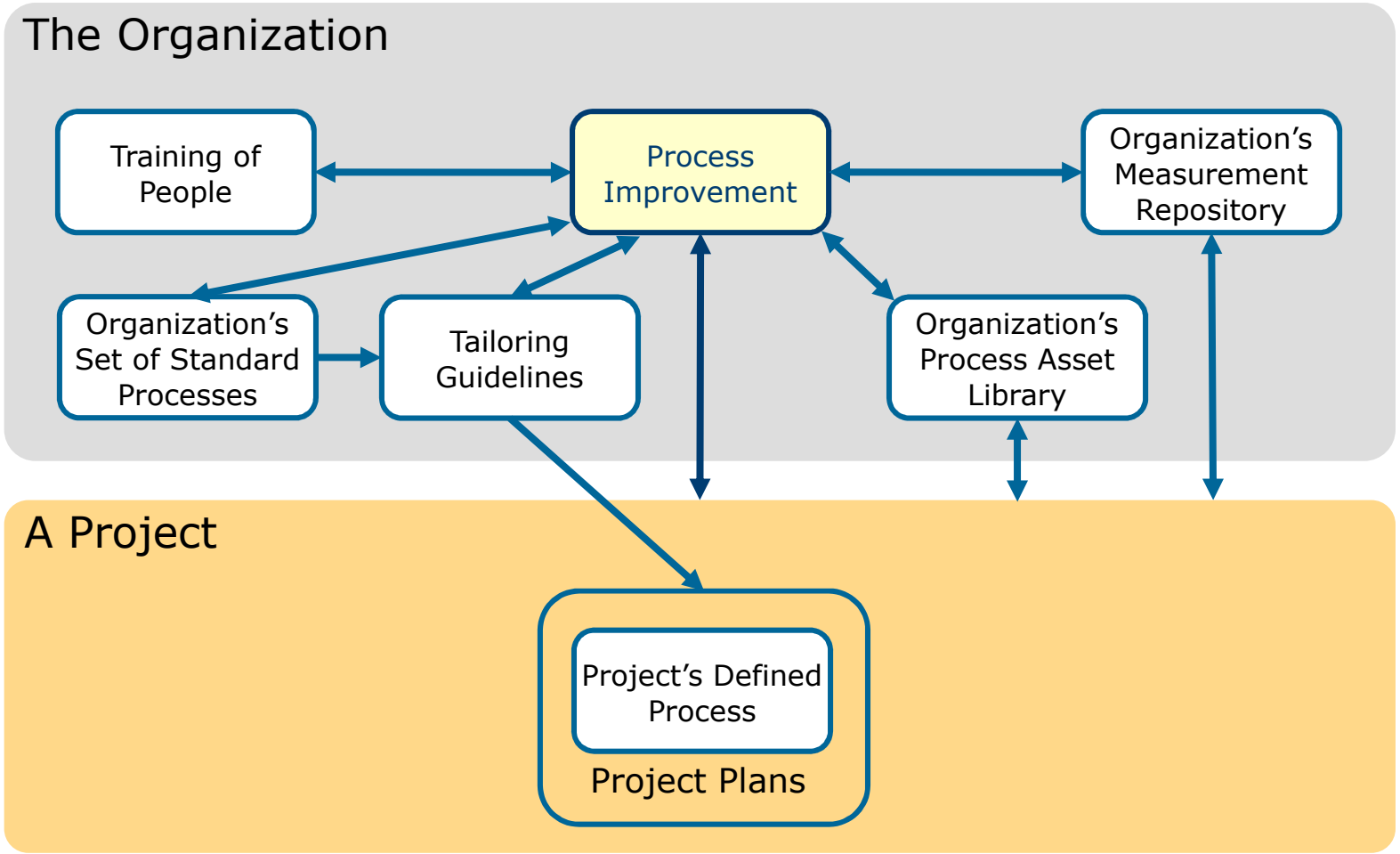
The Improvement Infrastructure



Benefit versus Costs

It is an investment!

To increase the process maturity, 5-9% of R&D budget should be invested per year.

To maintain the process maturity, it is 3-5% per year.

It is not done within 3 months!

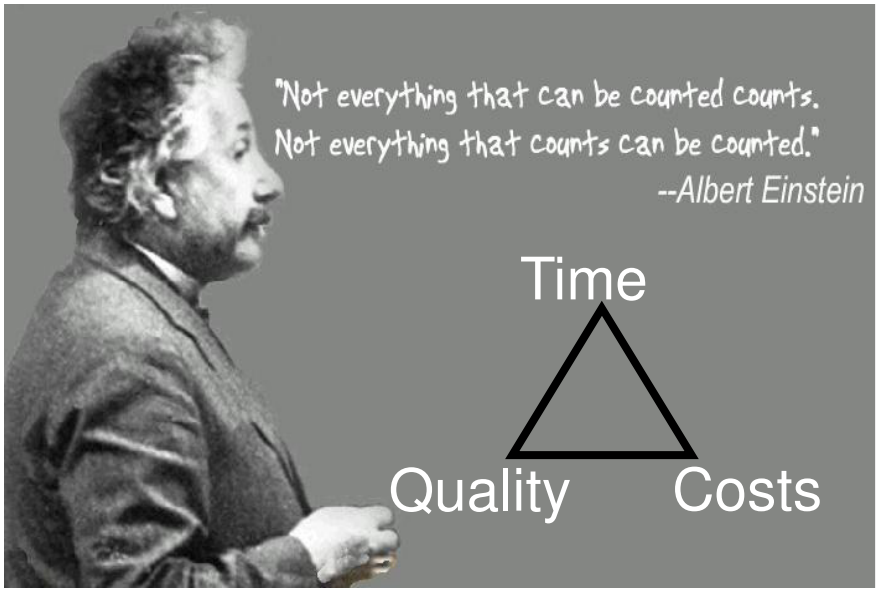
Institutionalisation of processes needs often at least 6-9 months (and sometimes more).

What does it mean for you to improve?

„To improve " means something different for each company:

- What are your business goals?
- How is improvement measured?

„To improve" means it is a long-term strategic procedure



Generic Process Improvement Procedure

- Gap Analysis of current process definition and implementation
  - Implementation of assessments / audits / gap-analysis
  - „Evaluation" of current development processes
  - How is the project work conducted?
  - Which improvement opportunities are available?
  - Does process documentation exist? How is it structured?
  - Which tools are used? How are they configured?
  - What kind of documents are available and for which purposes are they used?

- Comment:
  - Gap Analysis and formal assessments are used as well to validate improvements
  - See section about „assessments"

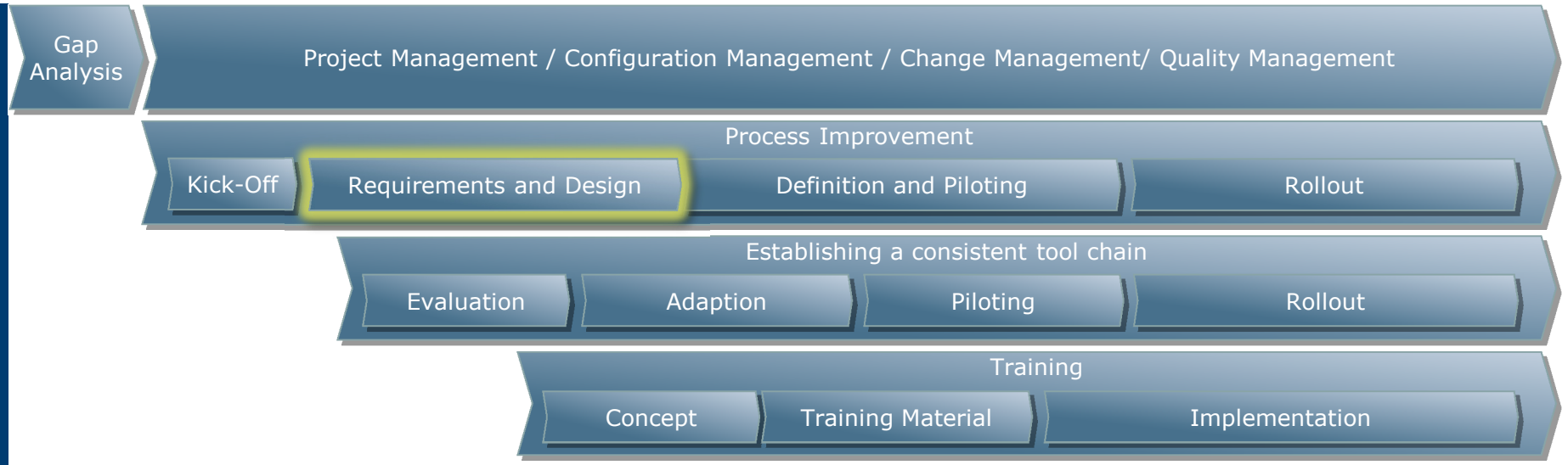
Generic Process Improvement Procedure

- Kick-off
  - Goal definition for the improvement project
  - Alignment with all stakeholders
  - Writing the roadmap
  - Getting the „Management Commitment“

Generic Process Improvement Procedure

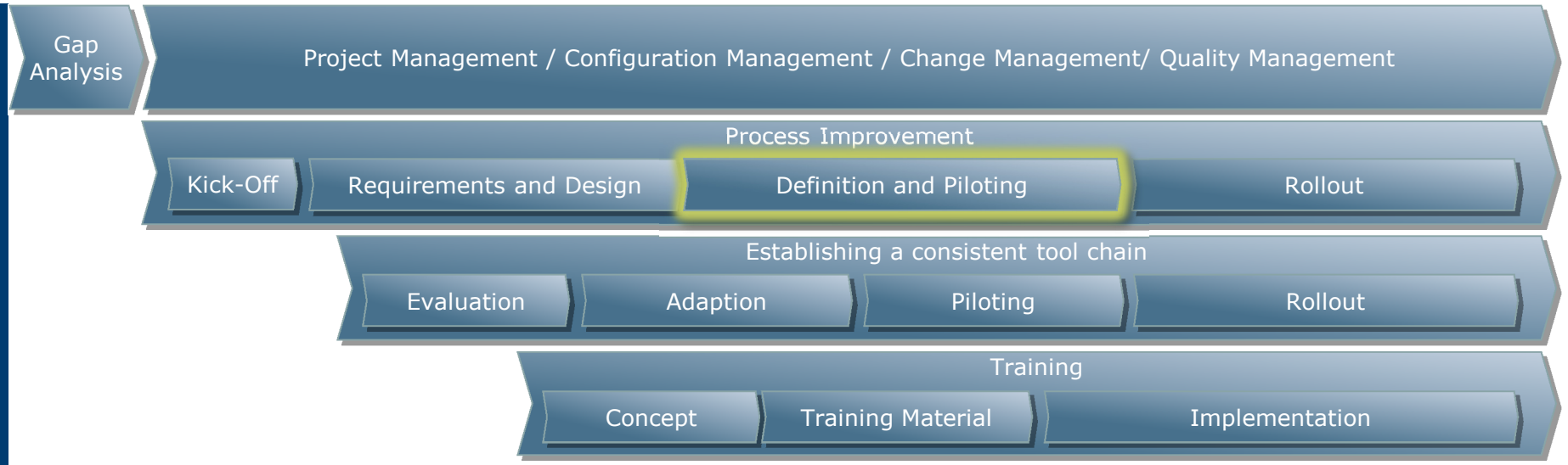
- Project Management:
  - Planning, coordinating, monitoring and reporting of the project
- Configuration Management
  - Strategy and implementation of document control, versioning, release
- Quality Assurance:
  - Assuring quality of artefacts and processes (document reviews, milestone reviews)
- Change Management:
  - Strategy and implementation of changes into the process definitions

Generic Process Improvement Procedure



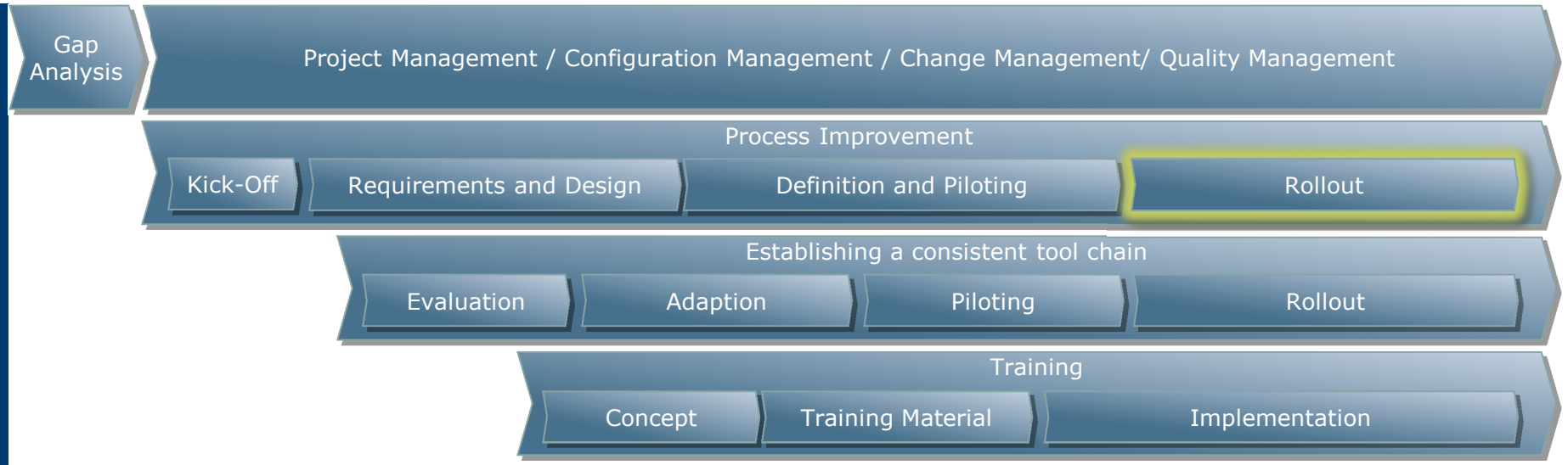
- Requirements:
  - Requirements elicitation for process architecture and process definitions (e.g. standards like Automotive SPICE®, ISO 26262 or CMMI; this includes as well policies given by your organization like embedding the processes into already established ISO compliant QM systems)
- Design:
  - Definition of process element types (e.g. roles, activities, phases, milestones, documents, etc.) and how these process element types must be interconnected.

Generic Process Improvement Procedure



- Definition
  - Workshops with process experts to define tailored processes for your organization
  - Process modeling and reviews
    - Definition of milestones, documents, roles, activities, methods, etc.
    - Definition of responsibilities
    - Alignment of process interfaces
    - Creation of templates and examples
- Piloting
  - Piloting of new processes within a piloting project, support by coaching

Generic Process Improvement Procedure

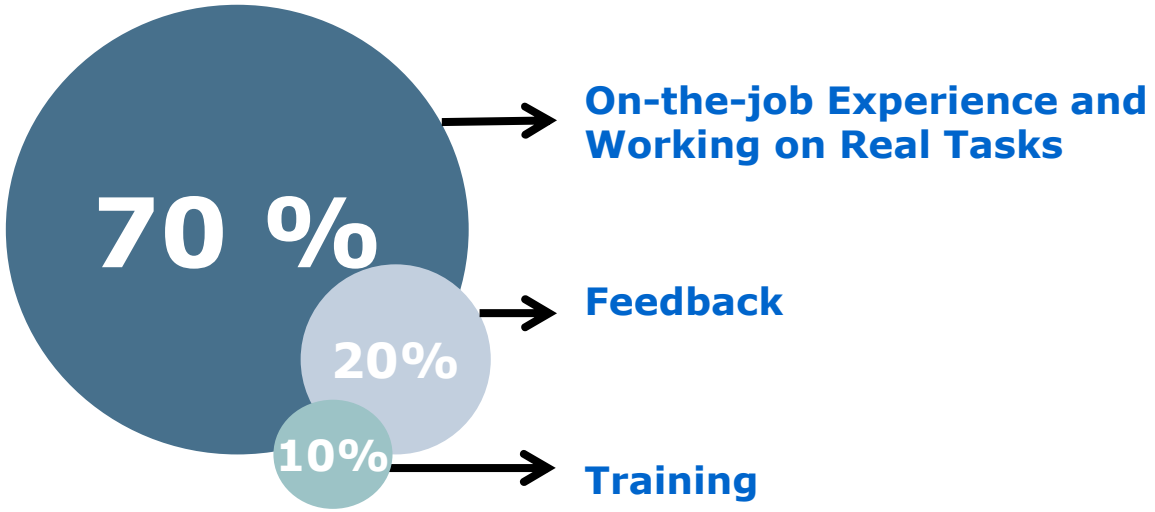


- Rollout
  - Implementation of defined processes in other projects
  - Support by coaching

Rollout/Coaching

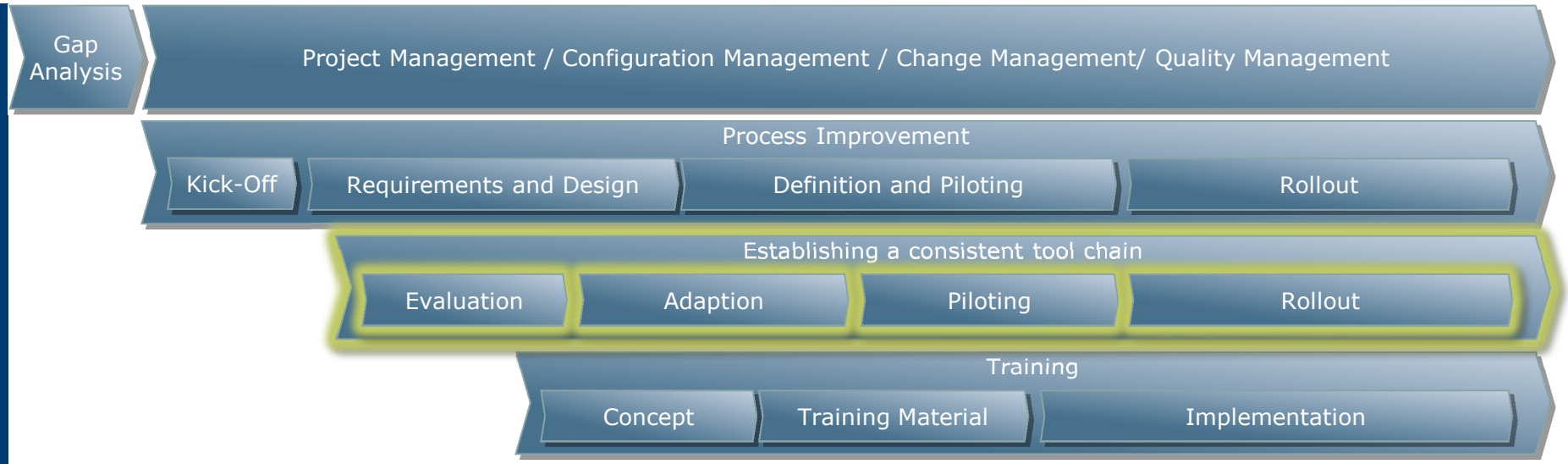
Kung Fu Tzu (Confucius)

What I hear, I forget.
What I see, I remember.
What I do, I understand.



- Coaching is a cooperative process, where the person to be coached is responsible for the results.
- The Coach will help him to define goals, give feedback and create possibilities.

Generic Process Improvement Procedure



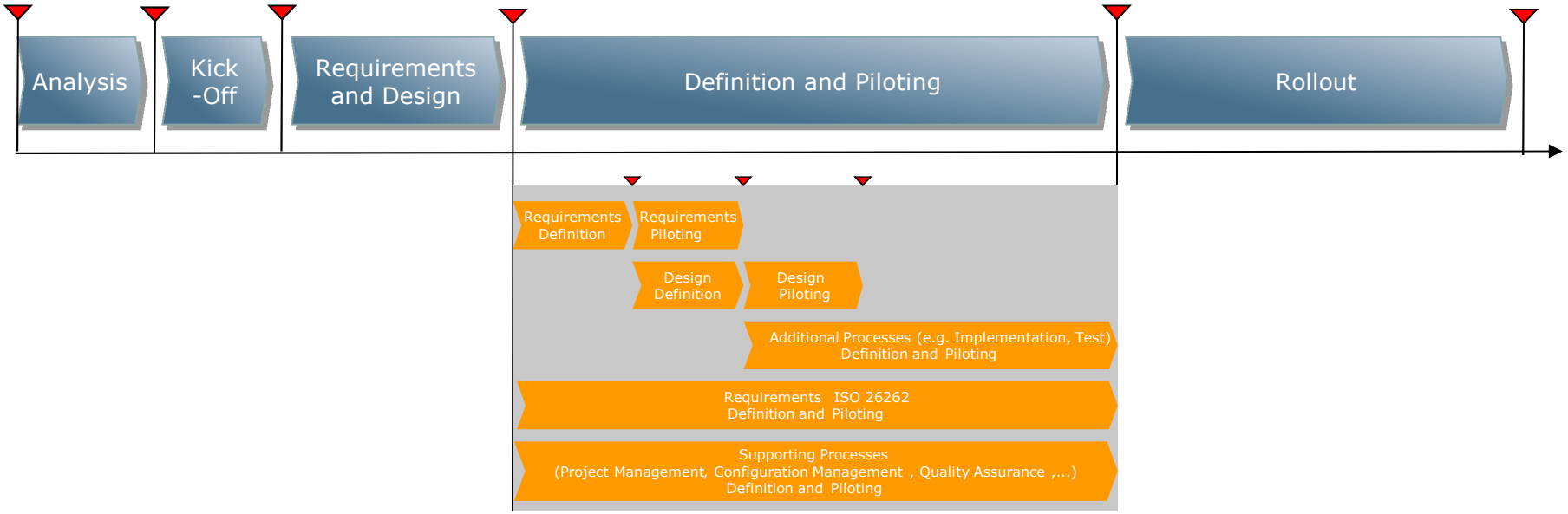
- Tool chain
  - Selection of appropriate tools
  - Design: Definition of necessary interfaces and adaptions to be implemented
  - Adaption of tools
  - Usage of tool in pilot project
  - Rollout support for tools in other projects

Generic Process Improvement Procedure

- Training
  - Development of training concept
  - Development of training material
  - Training of your employees (just bevor they have to implement the new processes)

Process Improvement: Generic Timeline

- Milestones (▼) are defined for single phases of the improvement approach.
- Phases are broken down into work packages, work packages are planned. See the picture for an example (phase „Definition and Piloting").



An Example on Company Level

Does the company's vision and the project's vision conform to each other?

Scenario based business planning (→ Use Cases?)

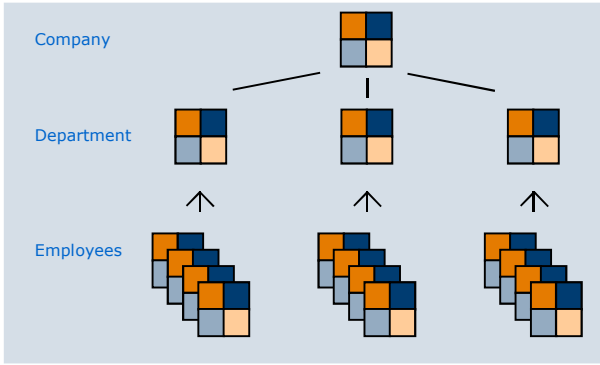
Typical questions (from the management viewpoint):

- Where are we (the organization) in 5 years?
- Who is then our customer? What does he need?
- Which products do we have then?
- Which kind of services will we offer?
- Who will be our competitor?

Derived questions:

- Which processes do we need then?
- Which organizational structure do we need then?
- With whom will we cooperate?
- Which new technologies will we use?
- Which quality goals do we have to fulfill?
- What kind of culture do we need in the organization?
- What kind of skills do we need for this?

Example: Balanced Score Card



Financial Perspective

Increase of ROI
Increase of total revenue

Customer Perspective

Increase Customer Satisfaction and Locality
Extended product and service portfolio

Vision Strategy Objectives

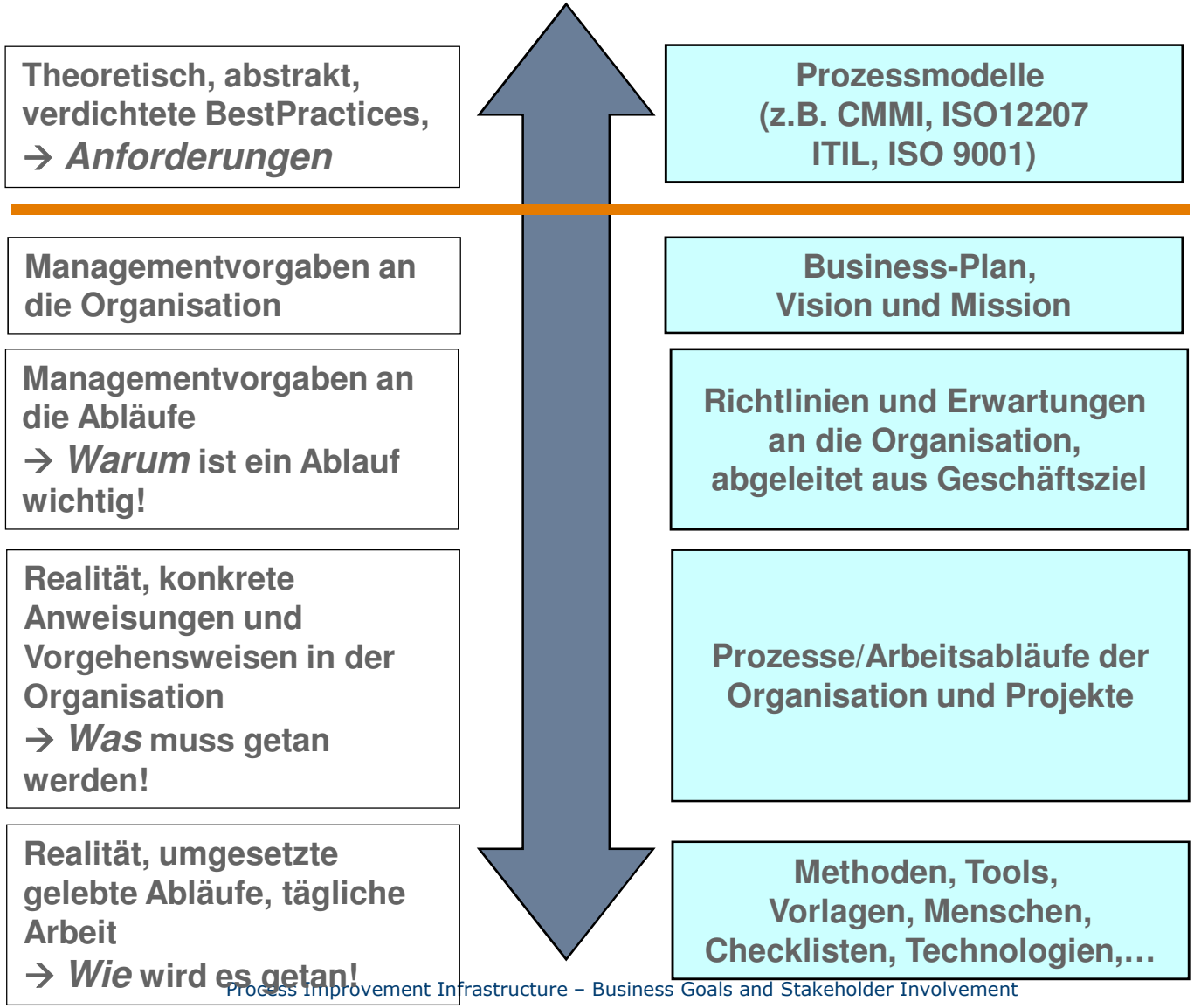
Business Process Perspective

Decrease of error rate
Reduce development effort and timeline

Learning and Growth Perspective

Establish a platform for idea generation
Educational training in innovation management

Orientierung an Zielen & Bedürfnissen



Actors: Stakeholder Analysis

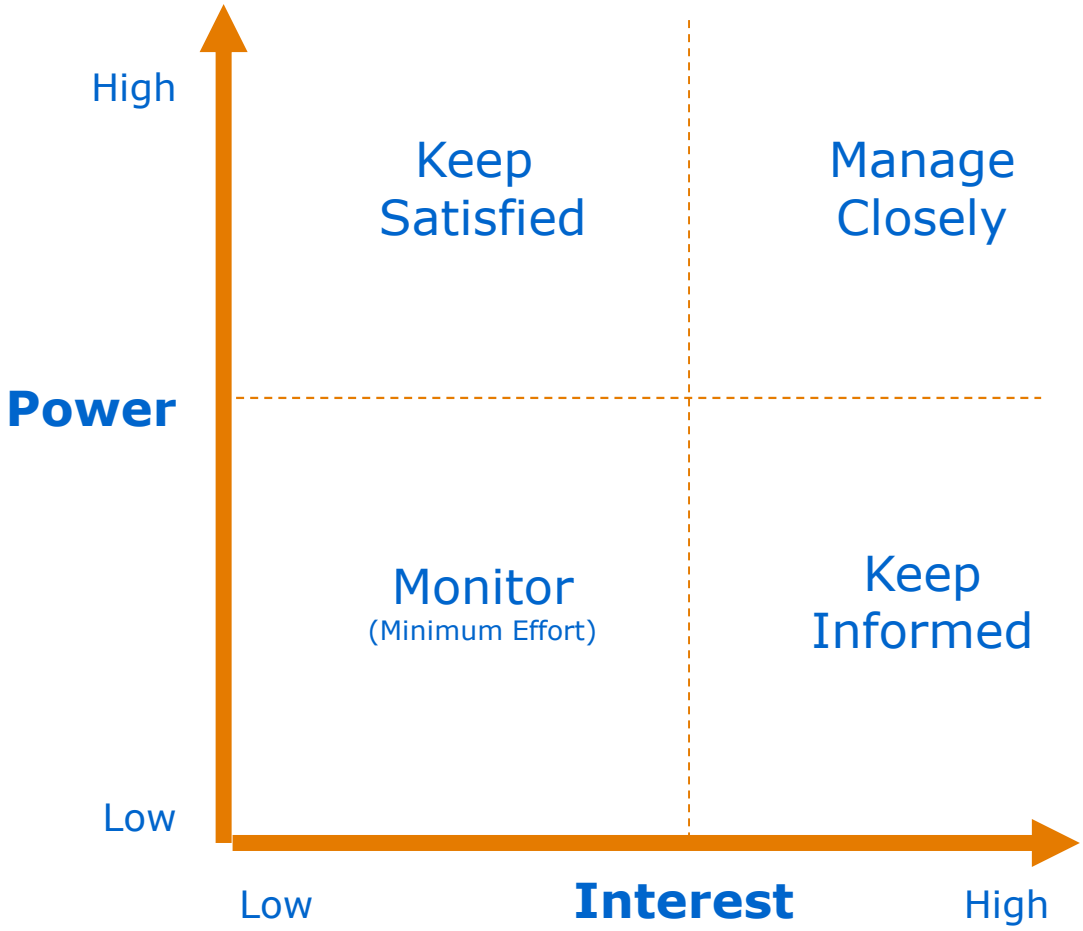
Document the Stakeholders

- For each Stakeholder
  - Name
  - Function (Role)
  - Additional personal data / contact data
  - Availability (time and region) during the project
  - Relevance of the Stakeholder
  - Knowledge area and scope
  - Personal goals / interests regarding the project

Stakeholder Relationship Management

- Convince Stakeholders about the project‘s benefit (Motivation!)
- Prevents conflicts
- Basis for active Stakeholder Involvement during the project

Stakeholder Analysis



More Details about "Use Cases"

- User's point of view
- What is the apparent functionality of the system?
- What are the neighbouring systems and users?
- Where are the system boundaries?
- Use cases describe the operational flow of the system.
- What the system should do, and not how!
- Semi-formal, and can be easily understood.

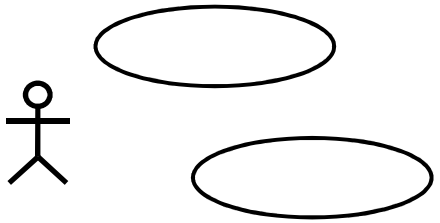
team members

process outcomes

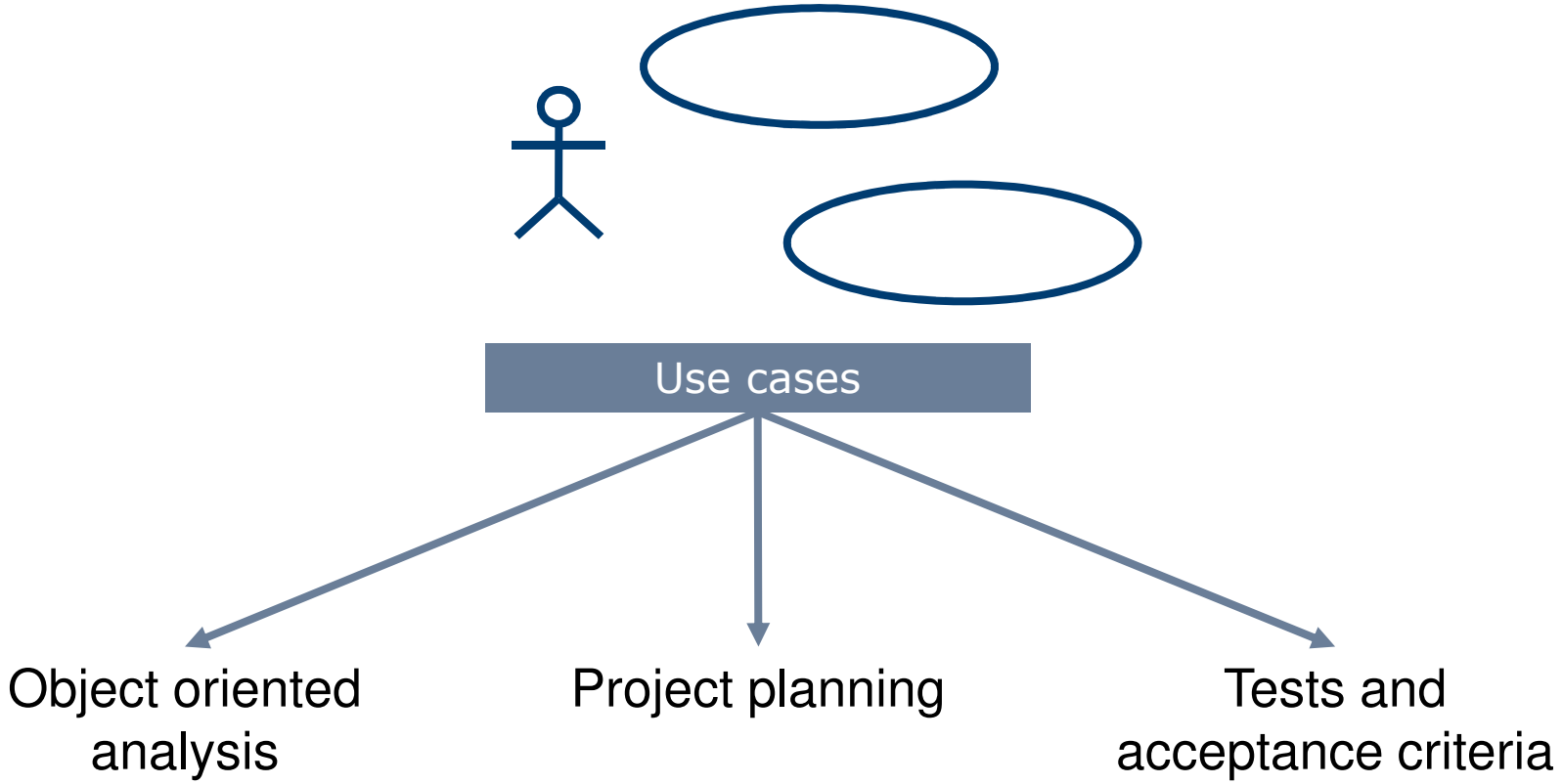
interfaces between processes and tools responsibilities

activities

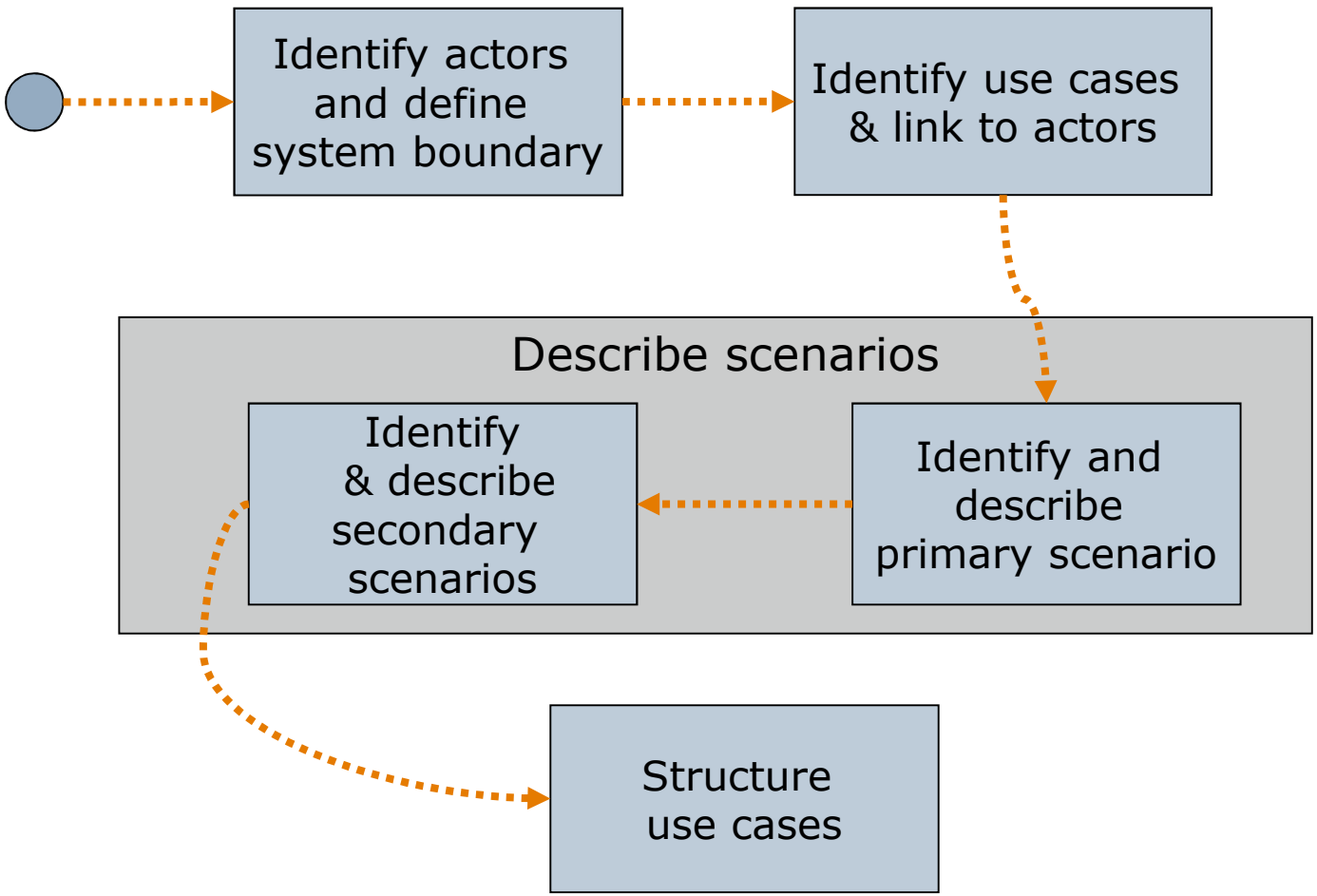
Mmmhhh….. processes and methods



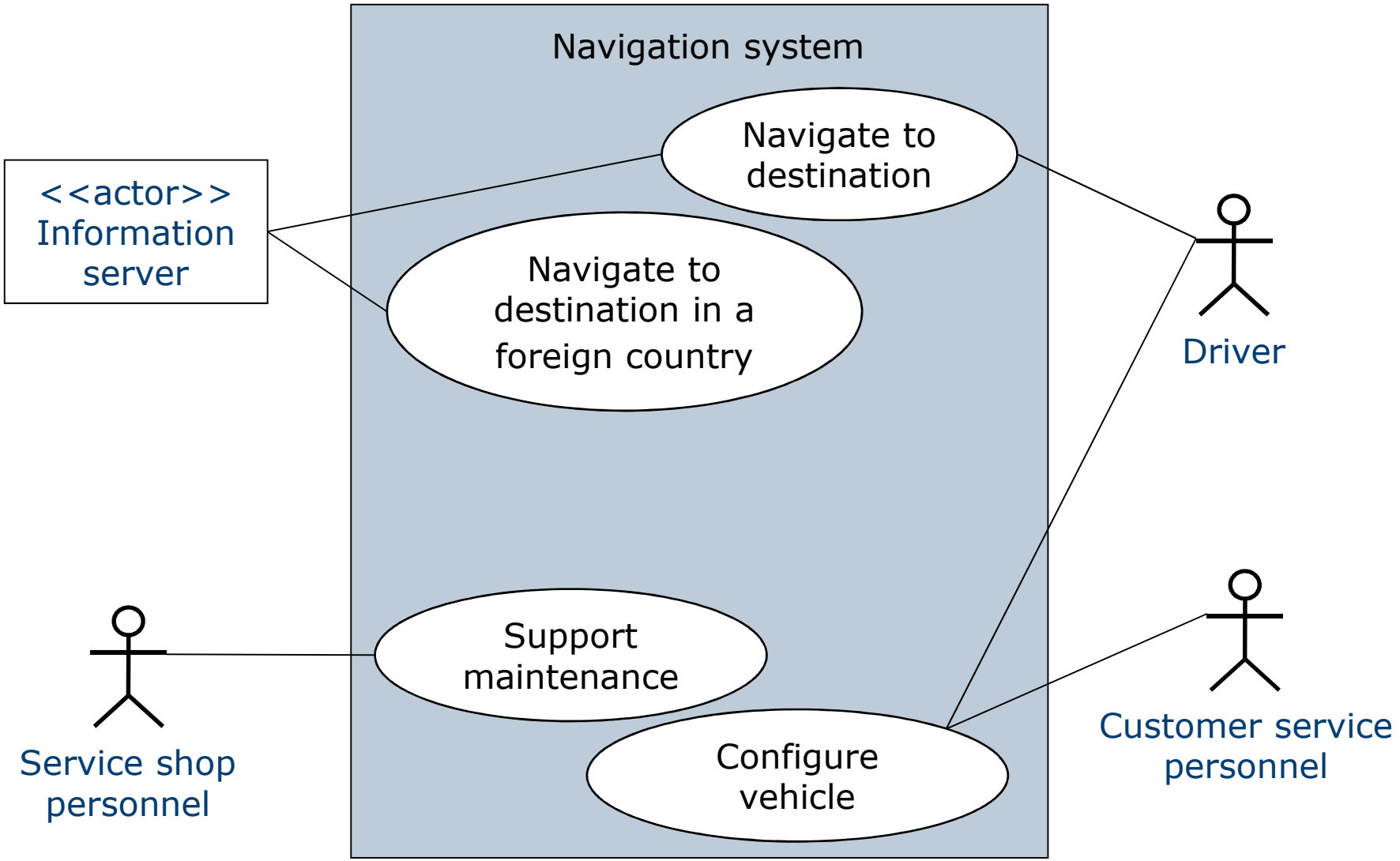
In Engineering: “Use Case Driven Development”



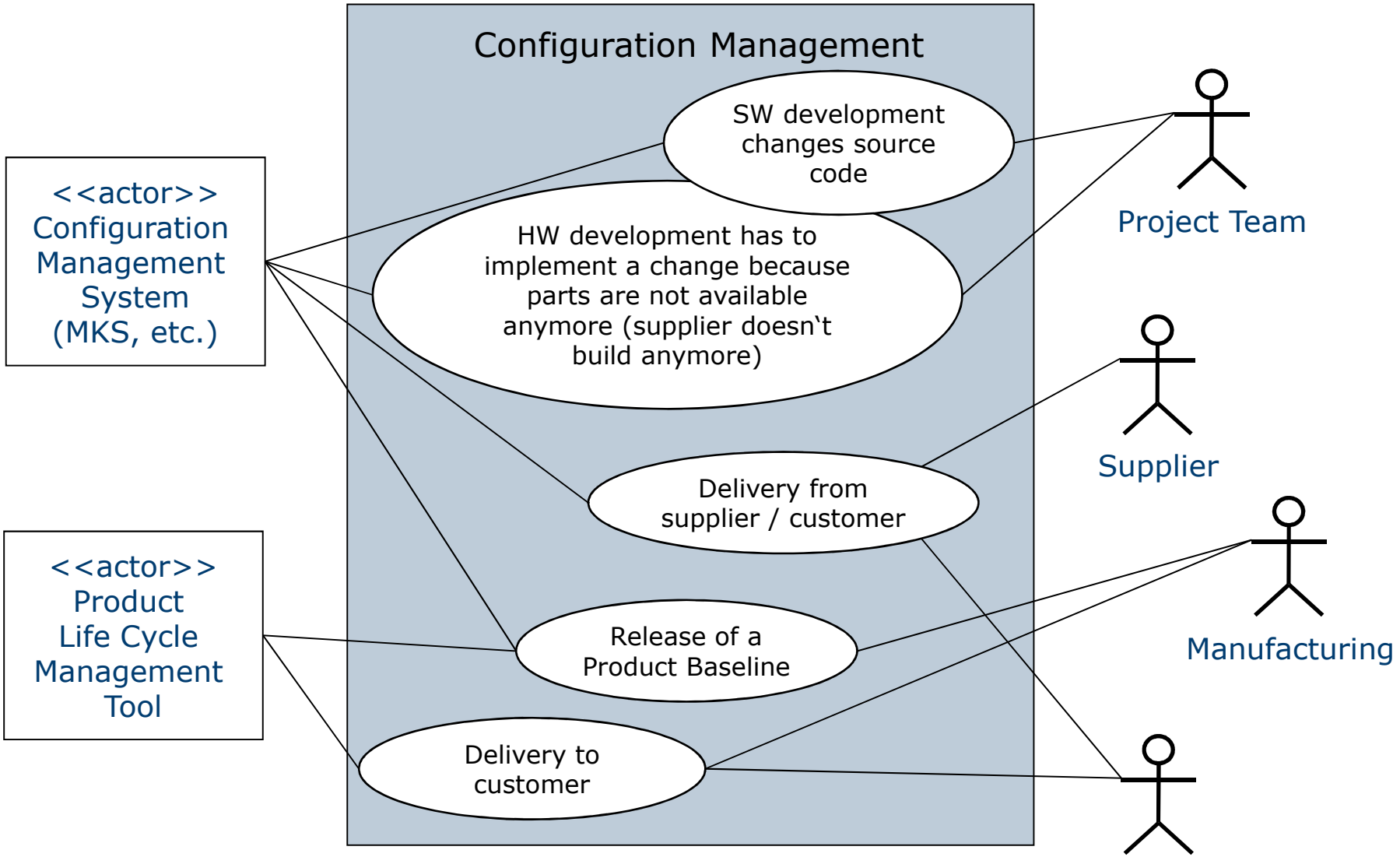
Use Cases: How to Define



Example: Use Cases for Products



Example: Use Cases for Processes



Example Configuration Management

Stakeholder, e.g.:

- Controlling
- Purchasing
- Development (SW, EE, ME)
- Manufacturing

Challenges:

- Ensure information flow
  (The right information to the right place at the right time)
- Different tools per discipline / department

Prerequisite:

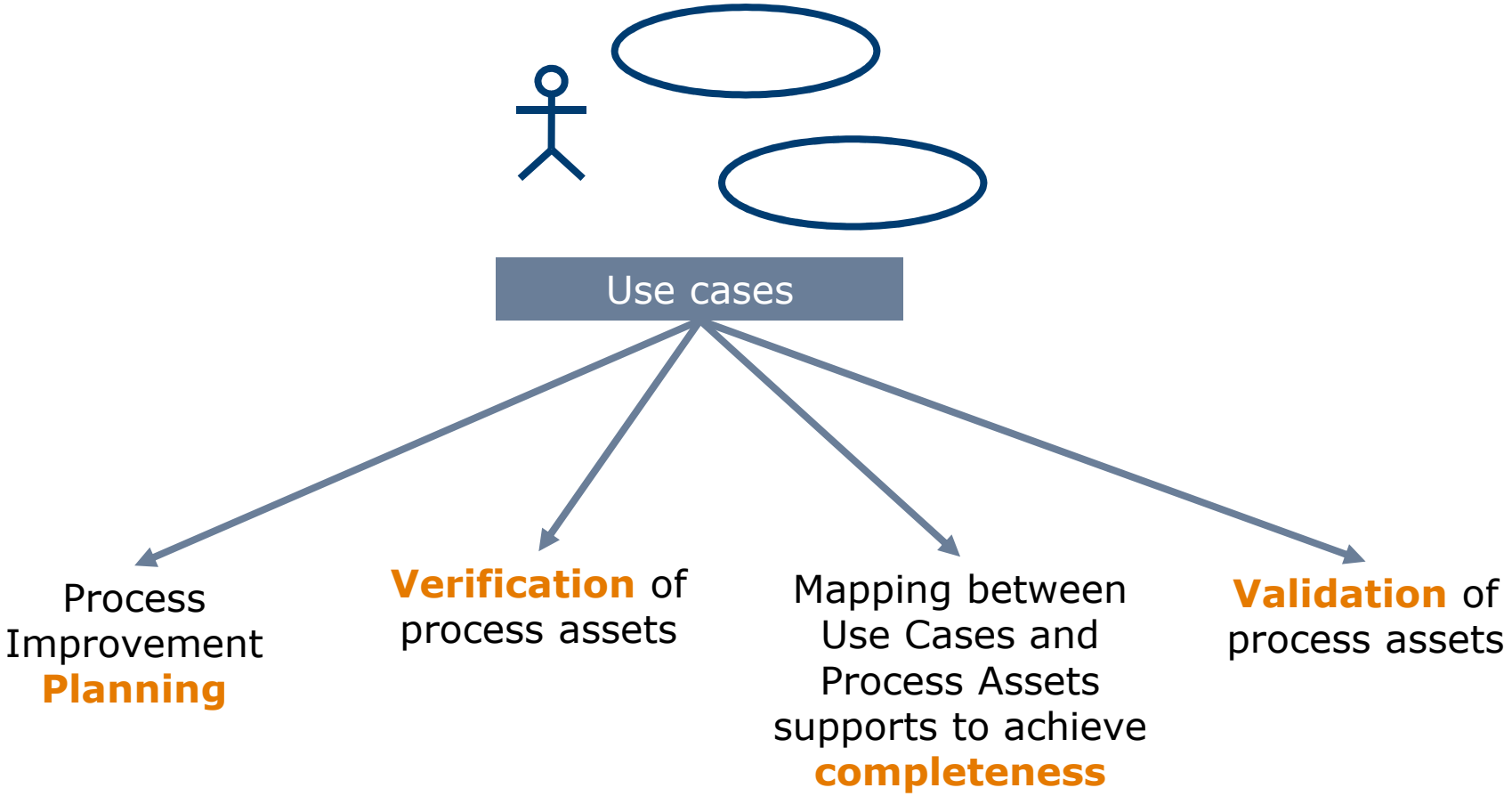
- Know who are the Stakeholders
- Understand the Stakeholder's needs
- Understand their current problems:
  Terms, Processes, Tooling

Summary Use Case Analysis

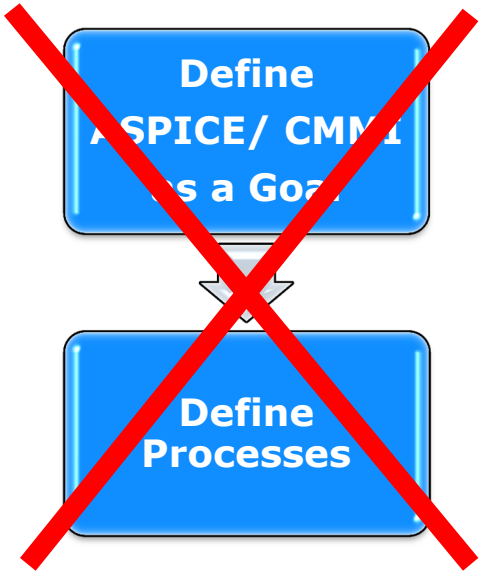
Systematic Use Case Analysis

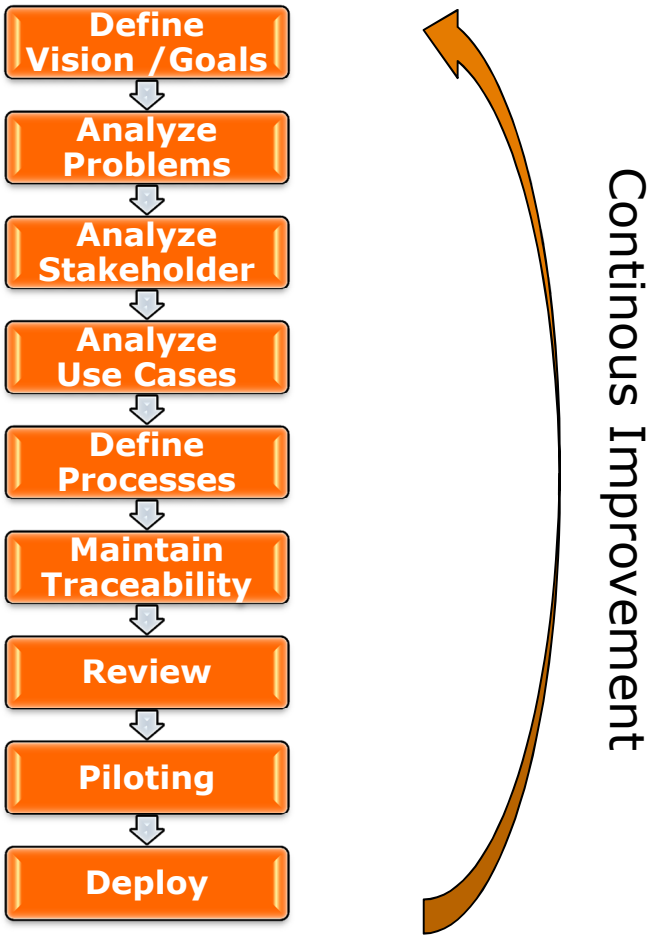
- leads to an **overview of actors**
  - Process Stakeholders (team and management roles, external stakeholder)
- places the **focus on the actors** (stakeholders) and therefore focus automatically **on the business needs** (instead on the "level")
- **reduces complexity** because the whole process is subdivided in smaller use cases and scenarios
- **Best practice**:
  - While discussing use cases ask the process stakeholders for current issues with this process!
  - Trace Use Cases and Process Issues to the solution!
- supports to create a **tool map** (overview of tools and interfaces between them)

Use Cases for Use Cases
(in context of process improvement)



Lessons Learned





Important Success Factors

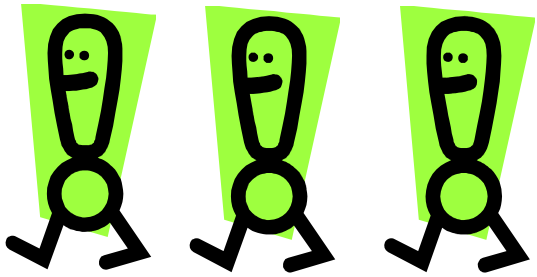
Management Commitment
- Orientierung an den Geschäftszielen
- Zeit/ Budget für SPI Aktivitäten
- Betreuung → Steering Committee

Verbesserungen messbar machen, z.B.
- *Erhöhung der Produktivität um X%*
- *Kosten pro Funktion um X% gesenkt*
- *Mitarbeiterzufriedenheit um X% erhöht*

Einbindung der Mitarbeiter
- SPI Ziele sind bei den Mitarbeitern verstanden
- Aus Betroffenen Beteiligte machen
- Aus Mitarbeitern Helden machen
- Eindeutige Verantwortlichkeiten

Regelmäßige / Häufige Arbeitstreffen

Feedback einsammeln



Konsequente Umsetzung, d.h.
- Training
- Pilotierung
- Prozesse
  - an spezifische Bedürfnisse anpassen
  - stetig optimieren
  - Werkzeugunterstützung
- (regelmäßige) Gap-Analysen
- Projektabschluss als Chance zur „lessons learned"
- Prozessdefinitionen sind keine „heiligen Kühe"!

Important Success Factors

Focus on Stakeholder
Goals & Needs

- Traceability
  Vision – Goals – Strategy –
  Use Cases – Problems – Solutions

Focus on **Process Integration**

- Mutual Comprehension
- What does my colleague need to be able to do the work?
- Build the "Big Picture"
  - Terms (Glossary)
  - Visualize Process Interfaces

Help the business, help the people!
Think about what do they really need!
(and not only about the level!)

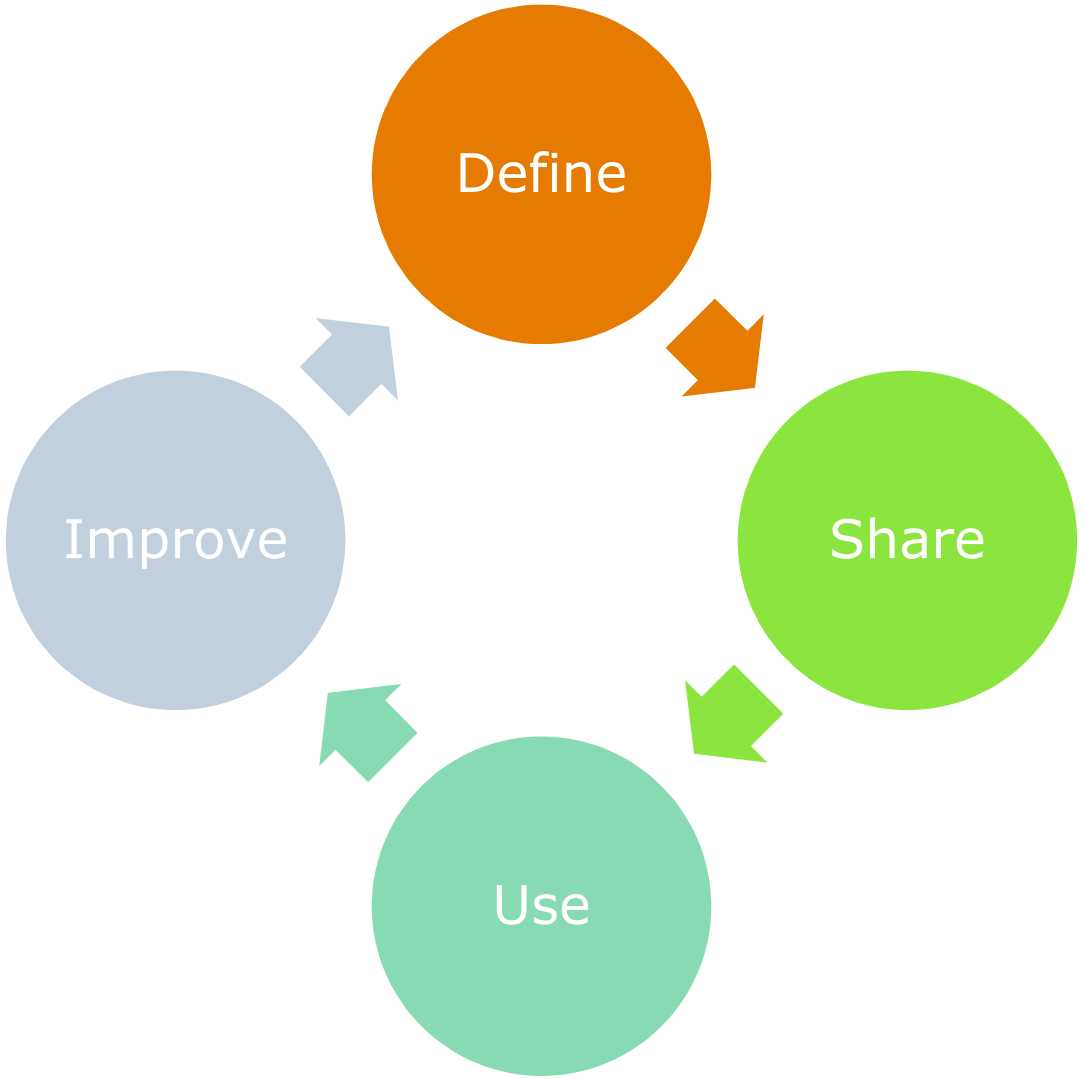
What is Process Management?

"Process management is the ensemble of activities of planning and monitoring the performance of a process. The term usually refers to the management of business processes and manufacturing processes."
Jörg Becker, Martin Kugeler, Michael Rosemann (eds.).*Process Management*. ISBN 3-540-43499-2

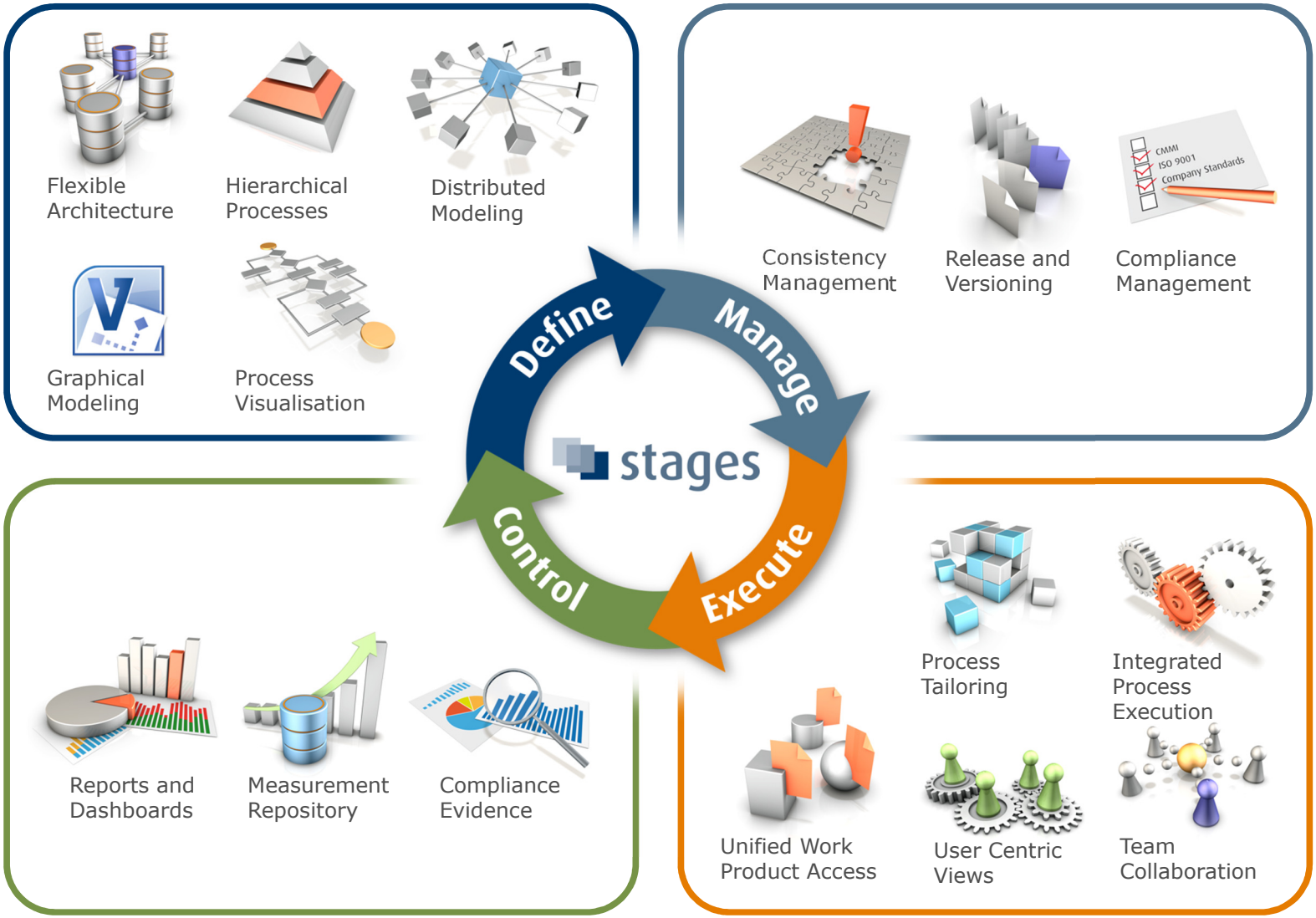
In product development the complexity of processes management is increased with the complexity of the systems developed.

© Method Park

Process Improvement Cycle



Tool Based Process Management



Benefits Of Using Measures

- Measurement by itself does not control or improve.
- Measurement gives insight for objectively planning, managing, and communicating.
  - Historical data help us predict and plan.
  - Actual versus plan data help us determine progress and support decision making.
  - Analyzing trends helps us identify and focus on problem areas.
  - Project data provide a basis for objective communication.

Management with a Navigation System

Measurement is used routinely by those who are proactive:

- Are you confident you know where you are, where you are going, and your performance outcomes (quantitative understanding)?

Use measurement results to answer the following questions:

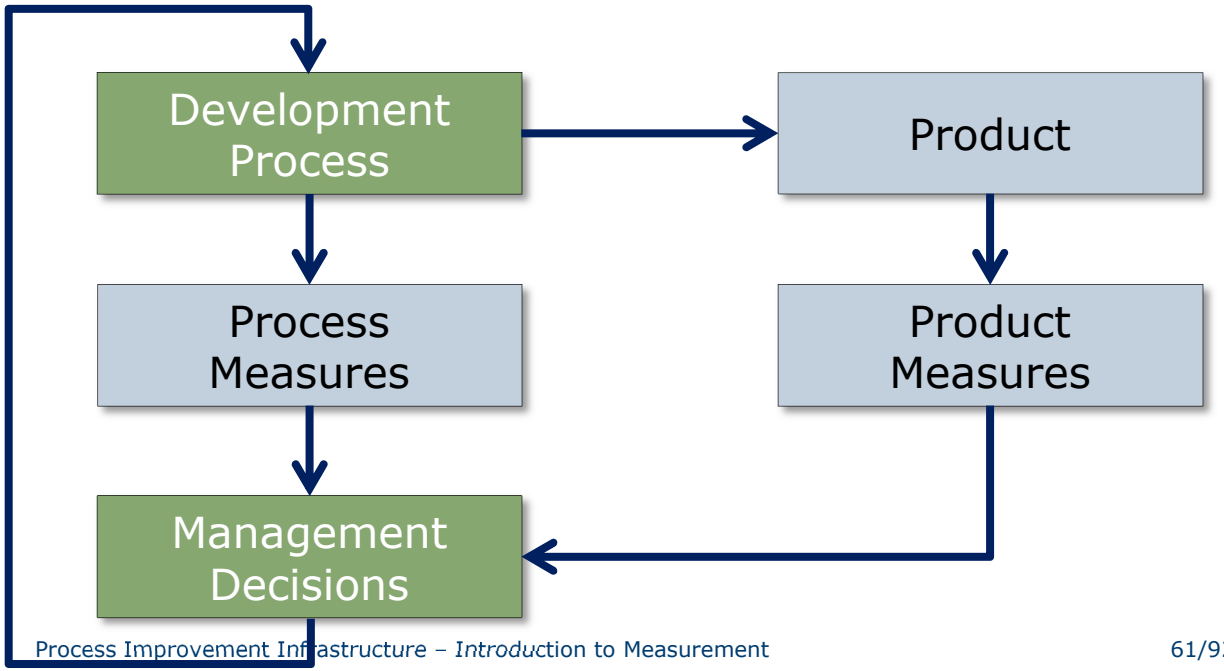
- Will you be successful?
- Are customer expectations and your capabilities aligned?
- What if you were to do something different?

Role of Measurement in Automotive SPICE

The Idea:

- Development processes need management decisions.
- Development processes create products.
- We should use objective data about our
  - products (→product measures) and
  - development processes (→process measures)

  to make „good" management decisions.



Role of Measurement in Automotive SPICE

methodpark

Focus on Optimization

ods are used
ses

Focus on Efficency

methods are used
ocesses

Focus on Effectiveness

- *Measuring the*
ss
arning
organization using data

CL 5 Optimizing
- PA.5.1 Process Innovation
- PA.5.2 Process Optimization

CL 4 Predictable
- PA.4.1 Process Measurement
- PA.4.2 Process Control

CL 3 Established
- PA.3.1 Process Definition
- PA.3.2 Process Deployment

CL 2 Managed
- PA.2.1 Performance Management
- PA.2.2 Work Product Management

- *Setting performance objectives*

Process and Management Focus

CL 1 Performed
- PA.1.1 Process Performance

- *Evidence for processes' "Base Practice"*

Project and Product Focus

- *Process "MAN.6 Measurement" supports how to implement measurement*

CL 0 Incomplete

Role of Measurement in Automotive SPICE

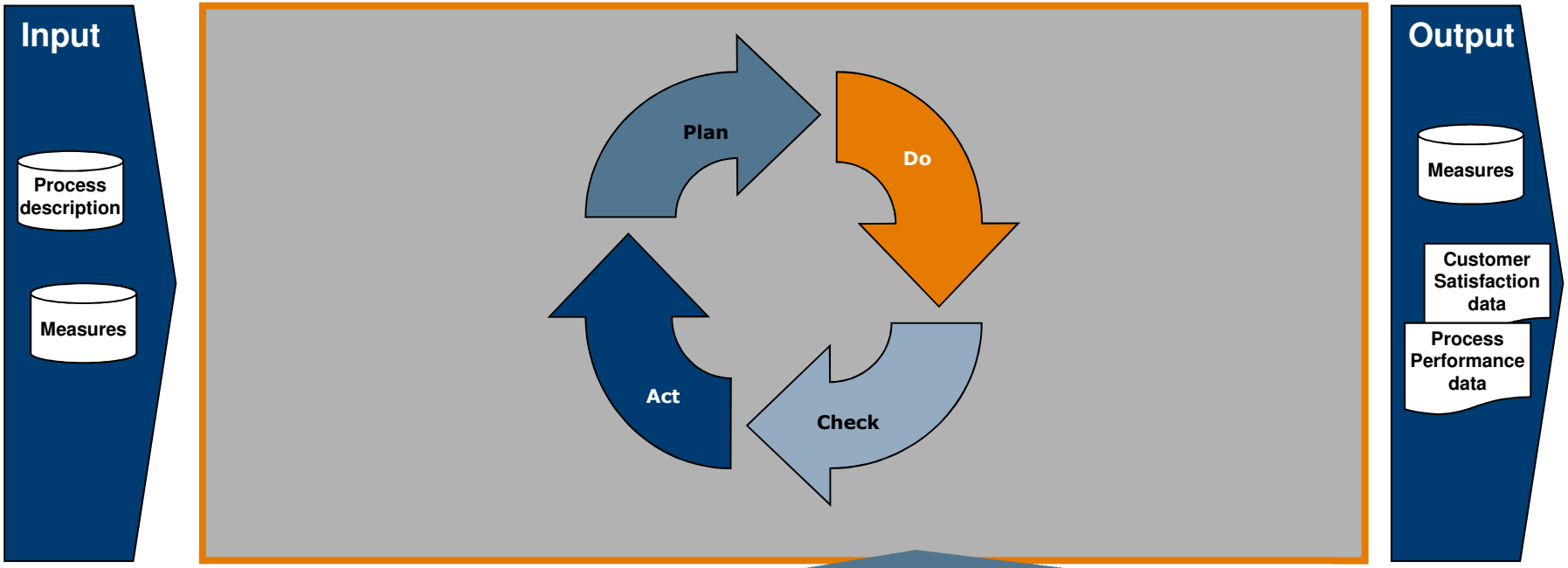
Only Few Examples

Automotive SPICE	Measures should be used for
The purpose of the System requirements analysis process is to transform the defined customer requirements into a set of desired system technical requirements that will guide the design of the system.	▪ Did we transform all customer requirements into a set of agreed system requirements?
The purpose of the Software construction process is to produce verified software units that properly reflect the software design.	▪ Did we verify all software units against their design specification? ▪ How many software units were verified?
The performance management attribute is a measure of the extent to which the performance of the process is managed.	▪ Which performance objectives are defined and did we meet them?
The process definition attribute is a measure of the extent to which a standard process is maintained to support the deployment of the defined process.	▪ Is a standard process maintained? ▪ Does the standard process support the process deployment?

Overview of MAN.6

MAN.6: Measurement

Purpose is to collect and analyze data relating to developed products and implemented processes, to support effective processes management and products quality.

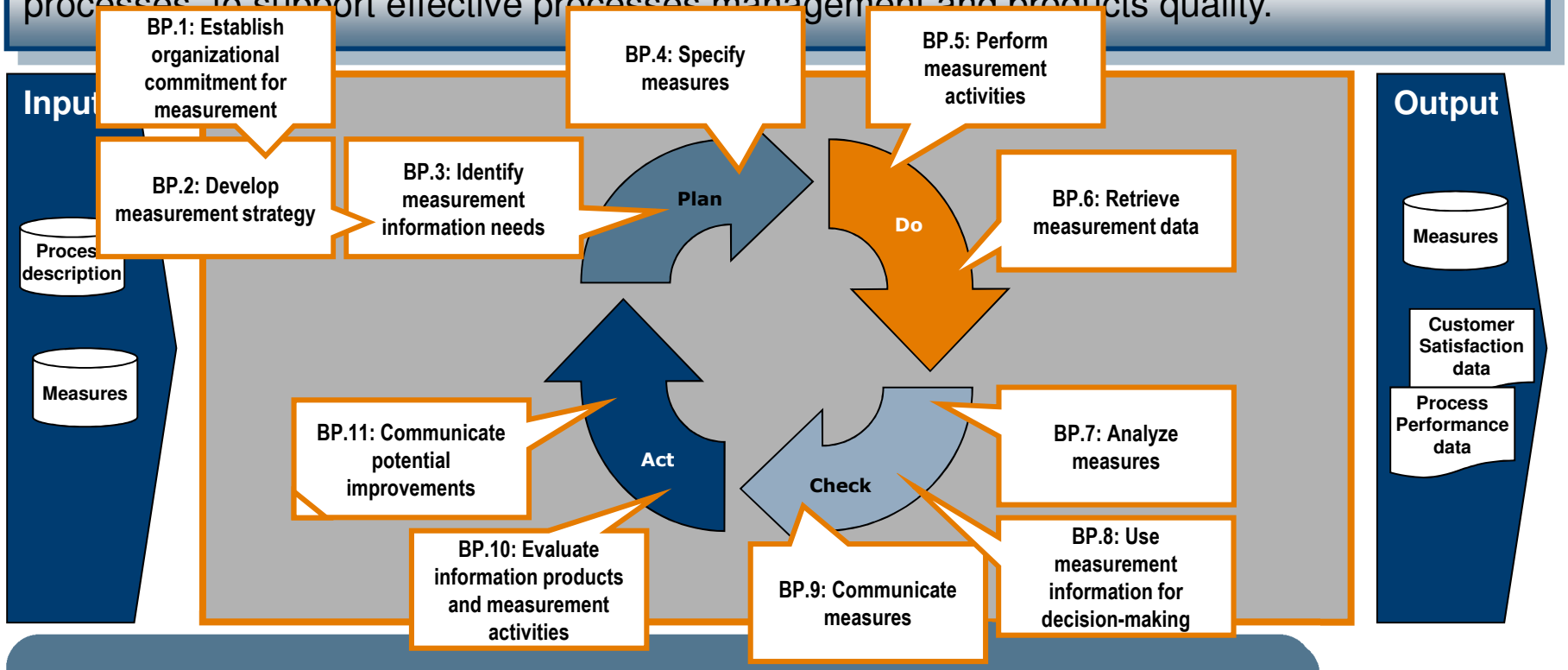


- Definition of a comprehensive approach for data collection and analysis
- Creation of a basis for both, process management and product quality improvements

Overview of MAN.6

MAN.6: Measurement

Purpose is to collect and analyze data relating to developed products and implemented processes to support effective processes management and products quality.



- Definition of a comprehensive approach for data collection and analysis
- Creation of a basis for both, process management and product quality improvements

Do's and Don'ts 1/2

Measures must be

- oriented towards processes and products
  (→ and never towards people)
- part of your daily work
  (→ and not additional work which is done when you have time for it)
- easy to understand why and how they are collected
  (→ and not unclear why you are collecting them and what is the benefit of these measures)
- collected and interpreted by project team members
  (→ and not by a central group without any feedback to the project team)
- clearly defined
  (→ and not unclear how they are calculated and interpreted)

Do's and Don'ts 2/2

Measures must be

- collected exactly
  (→ and not unclear who has to collect the data when and how often? Point in time of collection and data precision have impact on results / interpretation of measures)
- supported by tools
  (→ and not cause high effort to collect/ interpret/ report the measures)
- demanded by management
  (→ who else should be interested in measures if not your management?)

Goal-Driven Measurement (GDM)

When using goal-driven measurement, the primary question is

NOT:

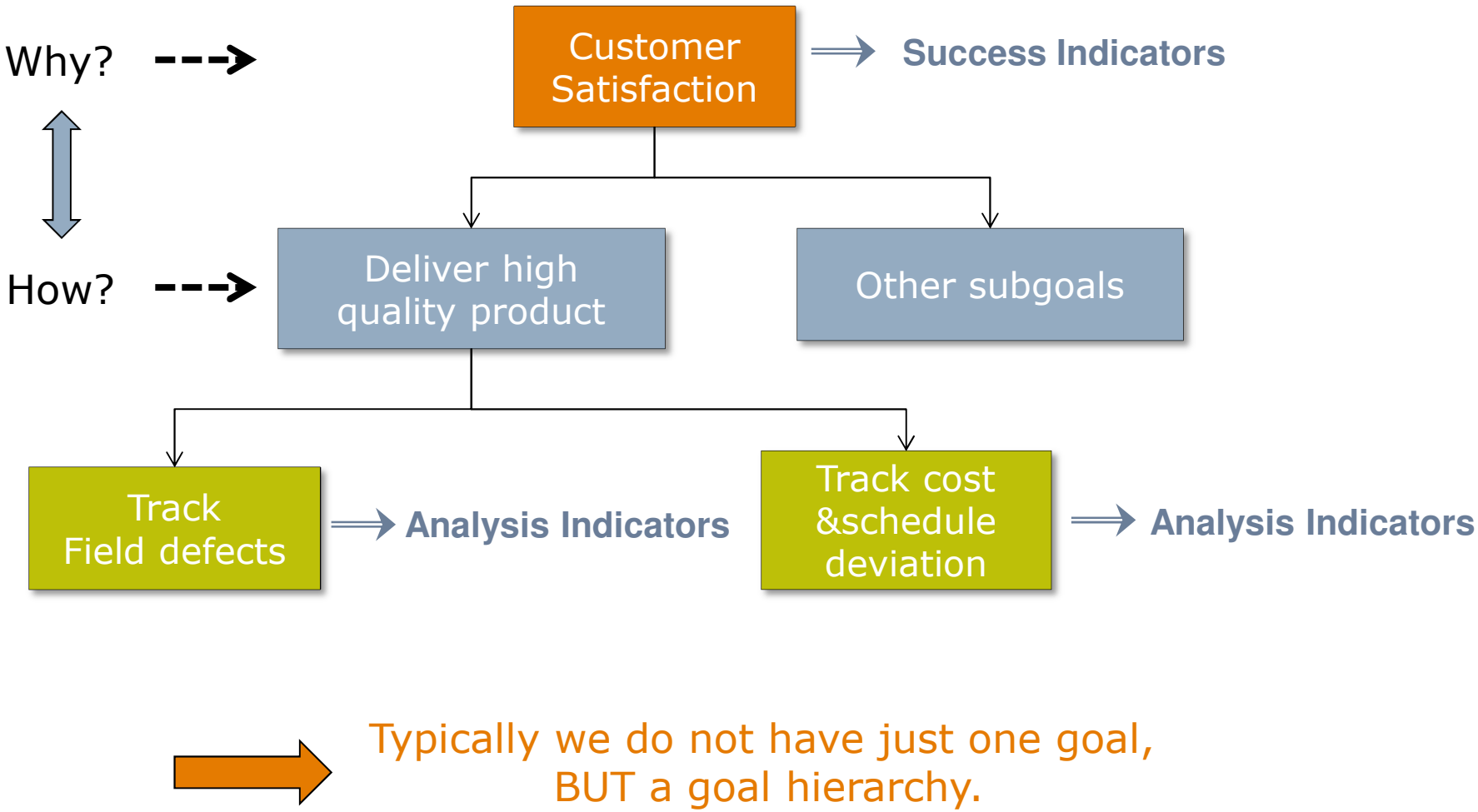
"What metrics should I use?"

rather, it is:

"What do I want to know or learn?"
"What decision do I want to make?"

Goal-driven measurement is
NOT based on a predefined set of metrics
BUT on information needs.

Goal-Driven Measurement (GDM)



Goal-Question-Metric

Each metric is defined with the goals to be achieved

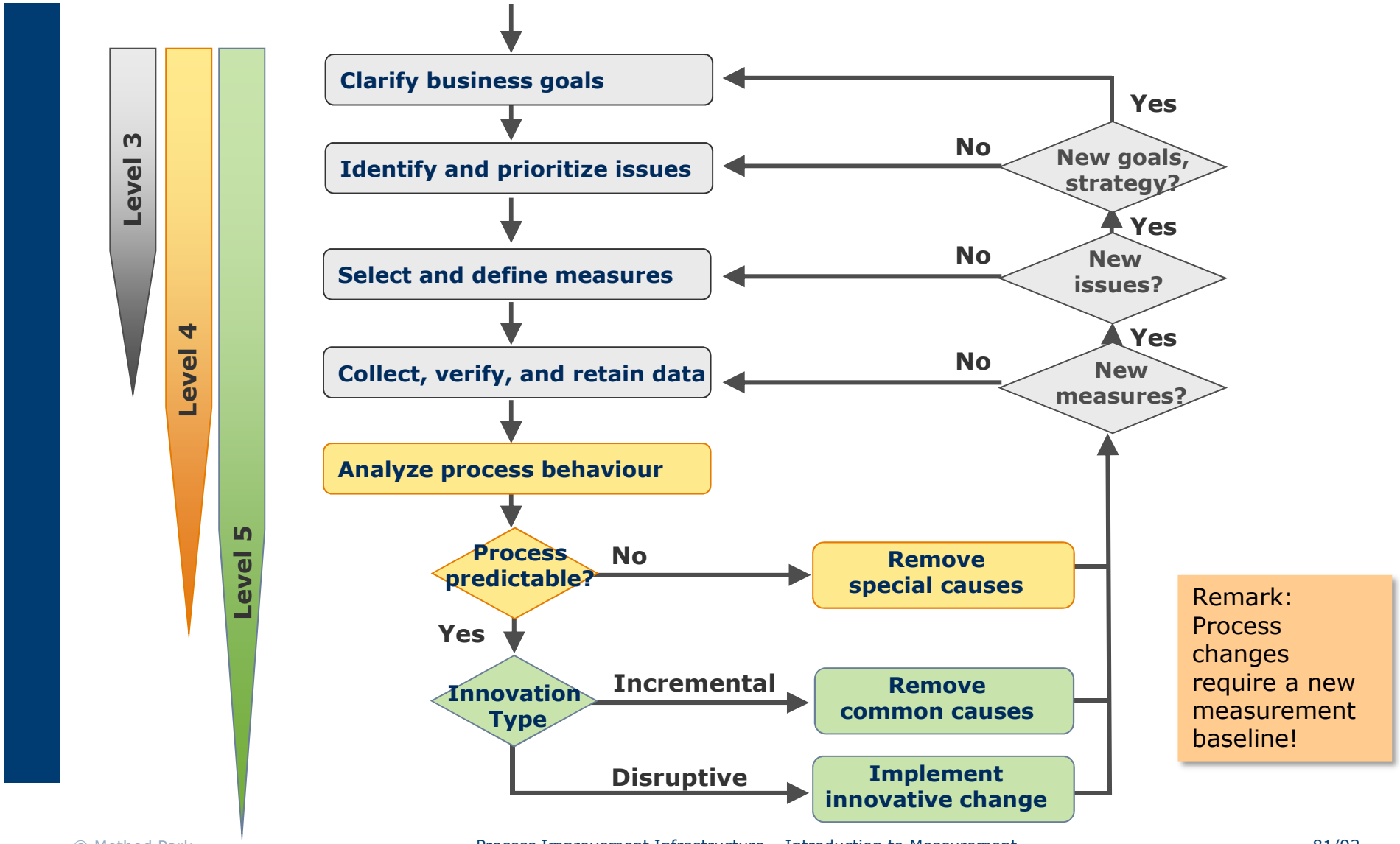
- Determination of specific goals
  ... before the metric is defined
- Top-Down-Definition of metrics
  ... starting from the goal, metrics are defined
- Bottom-Up-Interpretation
  ... if data is captured, they are interpreted within the context of the goal

  ... definition and interpretation is done in close cooperation with project team members

Goal-Question-Metric

- Determine information needs and objectives from stakeholders
- Deriving measurement goals
  (and dependencies between goals → goal hierarchy)
- Analysis/ definition of impact factors related to measurement goals
- Analysis how these impact factors influence the measurement goals
- Definition of measurement plan
  - Definition of metrics
  - Definition how metrics must be interpreted; what are targets for the metrics (what is "acceptable" versus what is "not acceptable"?)
    - Role model: Which role has which responsibilities in measuring
    - Phase model: Definition of timeline/ milestones. When must activities be implemented? Data must be collected, analyzed and reported when and how often?
    - Tooling: Data is collected with which tools? Where is the data stored?
- Collect and Validate data
- Analyze data
- Store and communicate results

Measurement on Capability Level 4 and 5

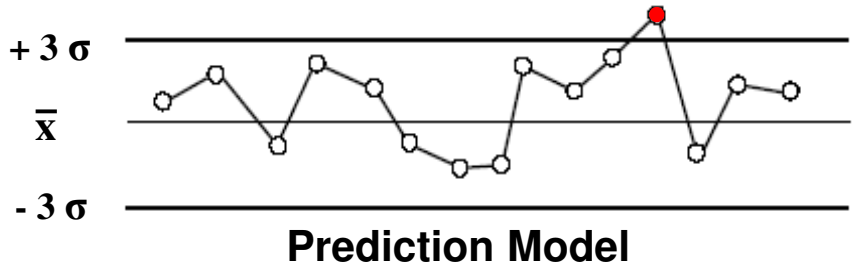


Remark: Process changes require a new measurement baseline!

Goal of CL 4: Predictability

CL 4 is dedicated establishing a quantitative understanding of process performance

- for the defined quantitative objectives metrics are gathered and analyzed to monitor the achievement of business objectives
- based on known parameters a prediction model will be established
- the results of real performance are continuously analyzed and deviations are identified



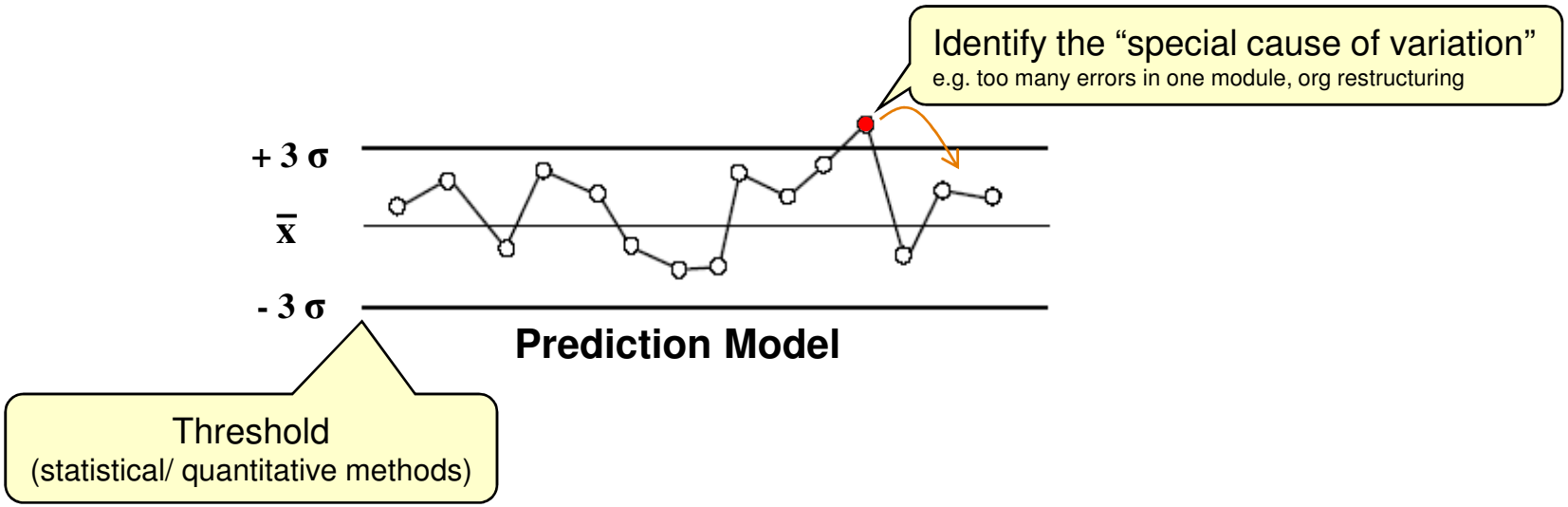
Prediction Model

Goal of CL 4: Predictability

The goal is to recognize **special causes** of variation based on quantitative information as early as possible.

If thresholds are violated:

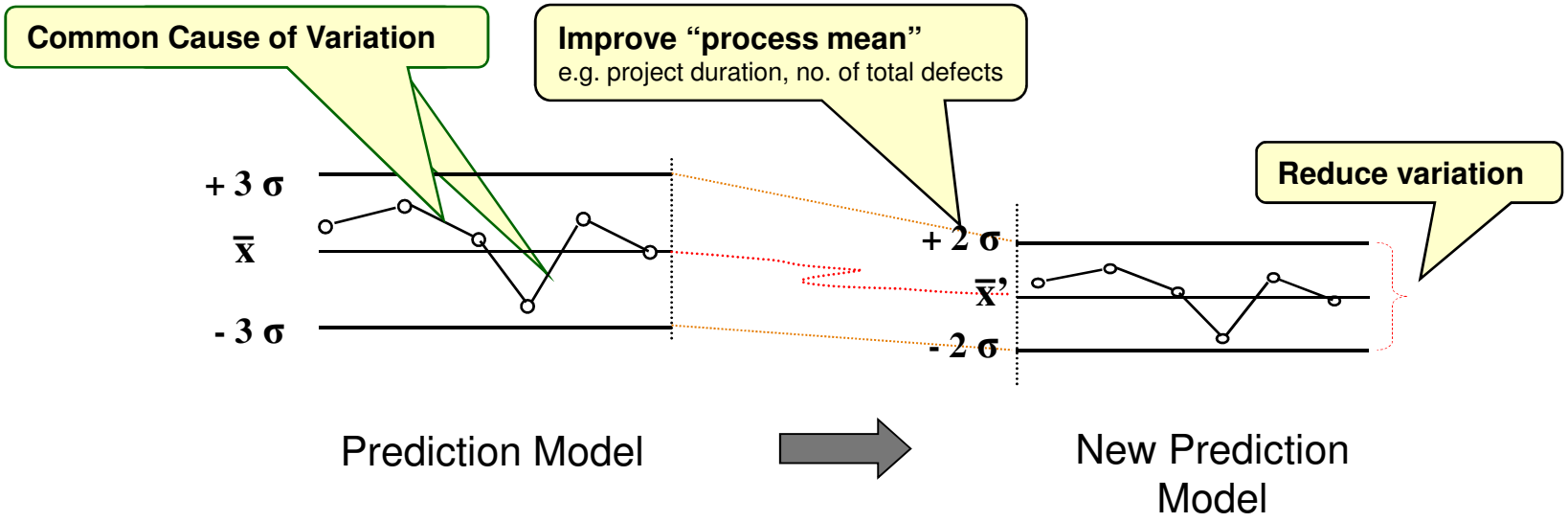
- Identify the reasons ("special cause of variation")
- Define mitigation action
- Re-establish the predicted process performance



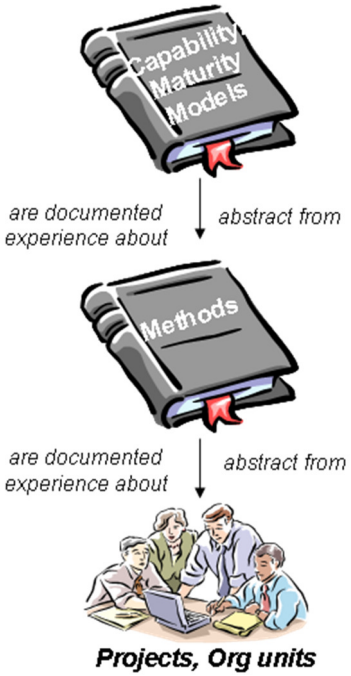
Goal of CL 5: Optimizing

Based on the quantitative understanding in the prediction model process improvement is planned and impact is analyzed:

- Looking for **common causes** ➔ reduction of variance in process performance (reducing the "noise of the process")
- Refinement of thresholds
- In order to ultimately support business objectives!

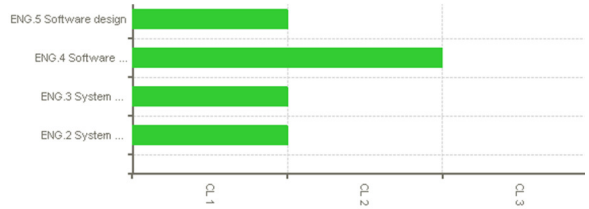


General idea of performing an assessment



…and determine the capability profile

3



2

…mapping the information to the model…

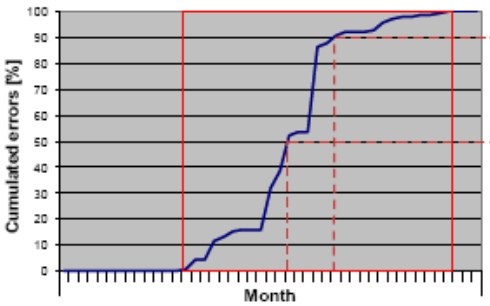
1

Reading through the defined HOW, performing interviews on the actual DOING, investigating work products and tool repositories…

Benefits of Assessments

BMW experience (published at conference „SPICE Days 2009"):
Process and product quality are highly related to each other
90% of defects are now found 11 month instead of 2 months before SOP

– Good example for goal-oriented product maturity

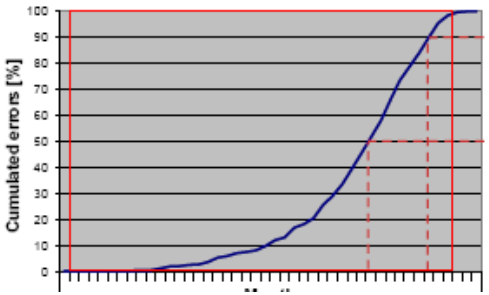


90% of all errors found 11 month before SOP

50% of all errors found 16 month before SOP

Goal-oriented product maturity value: 58%

– Bad example for goal-oriented product maturity



90% of all errors found 2 month before SOP

50% of all errors found 8 month before SOP

Goal-oriented product maturity value: 25%

Benefits of Assessments

Assessments …

- lead to a capability rating of processes
  (internal and external)
  (= analysis of strength and weaknesses)

- are used to rate the competence to deliver high quality components

- are the starting point for improvement action plans
  - short-term: elimination of major weaknesses
  - Mid-/ long-term: Systematic process improvement to develop high quality products
    → less integration and test effort
    → less quality issues
    → less cost

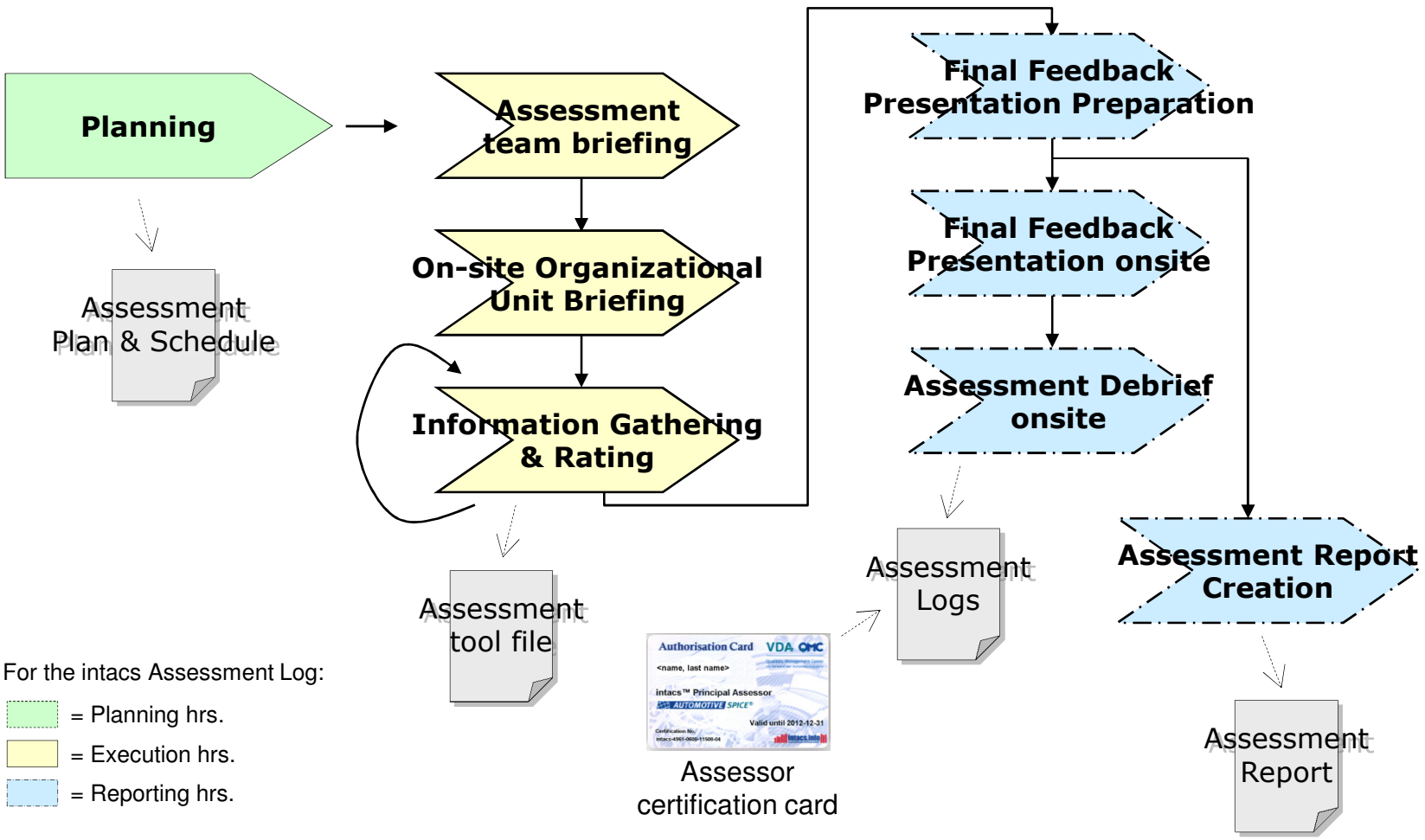
    → higher customer satisfaction and better competitiveness

What a process assessment is (and what it is not)

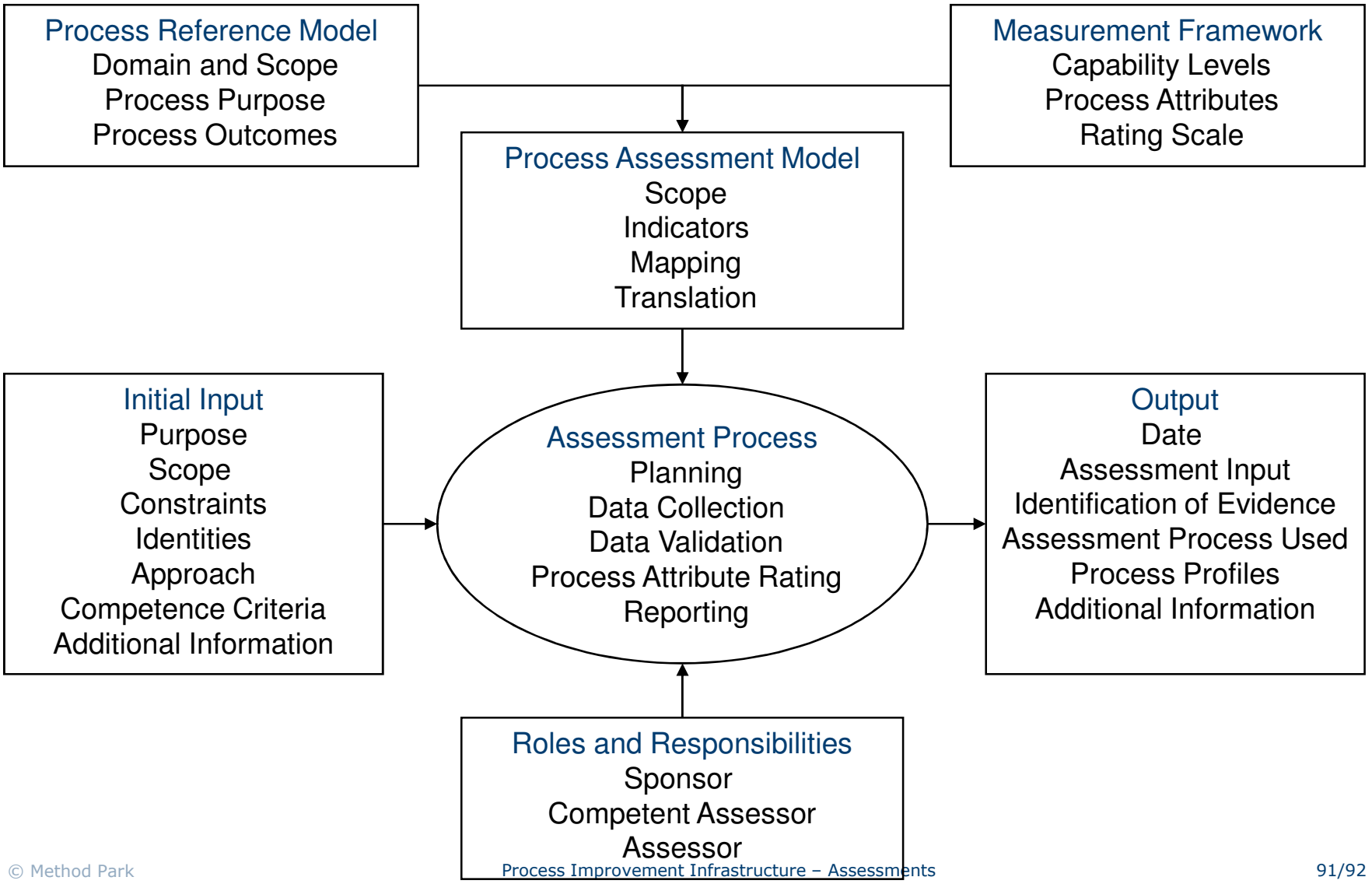
A process assessment…

- is a method for measuring process capability
  (i.e. *not* a process improvement roadmap or a process change management method)
- analyzes processes (…of the DOING and HOW levels, see above)
  (i.e. *no* technical work product reviews, judgment of individuals' performance, statements about "sexy-ness" of methods or tools, or evaluation of a product)
- only addresses the current situation in terms of a snapshot in time
  (i.e. *no* consideration of wants & needs or future activities)
- provides a comparison to the international automotive process expertise in order to identify process risk
  (i.e. *not* a strict checklist of what to do)
- triggers purposeful improvements for establishing long-term steering of processes and projects in order to increase both efficiency and product quality
  (i.e. not a standalone activity in itself)

Assessment Process



Assessment Process (ISO 15504-2)



© Method Park