



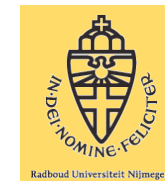
# Impact of Principles on Enterprise Engineering



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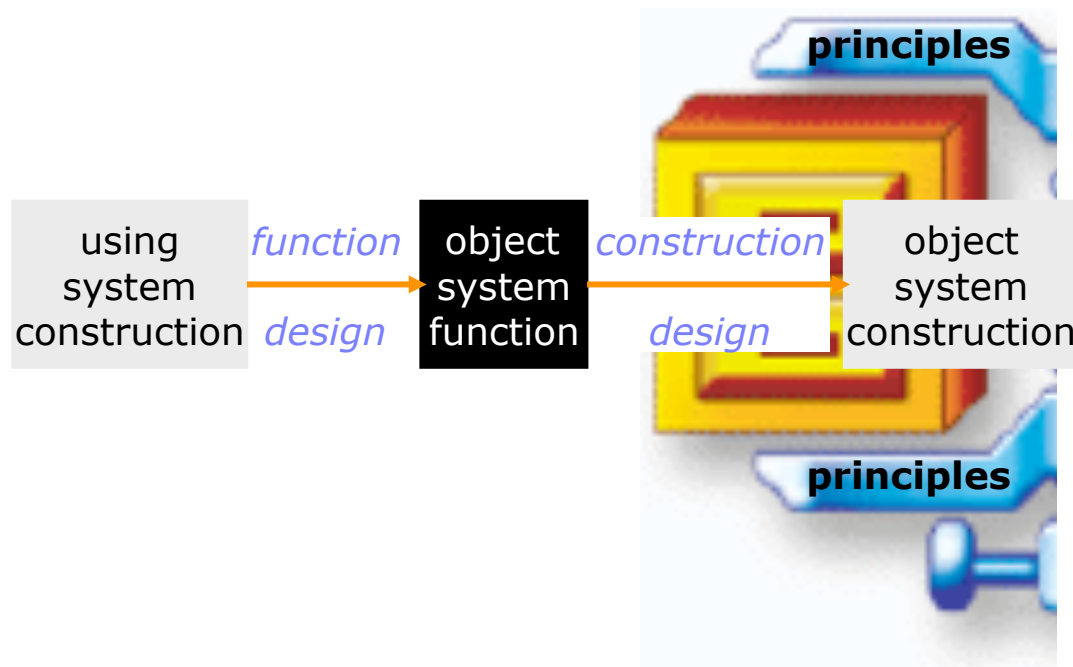
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in collaboration with Erik Proper



# Abstract

# Content



1. Introduction
  2. Architecture & Enterprise Engineering
  3. Operationalizing Design Restrictions: Principles
  4. Practical Applications of Principles
  5. Formulating Principles
  6. Conclusions & further research
- Issues for discussion

**HOW do Principles constrain the Engineering (incl design, implementation) of Enterprises?**

# 1. Introduction

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- enterprise architectures are used to direct the development of enterprises
  - xAF: "architecture = [conceptually] *normative restriction of design freedom*"
- how to restrain: by principles (IEEE1471-2000, TOGAF2004)
  - xAF: "architecture = [operationally] set of principles"
- further elaboration of the principle-concept shows lack of clarity / unity
  - what exactly is a principle (definition)
  - what is the actual use of principles in steering the (evolution of the) enterprise
  - what mechanisms/procedures are needed to make principles effective
- our opinion: understanding *usability* of the principle-concept should be input for its future *definition*

## focus of this presentation:

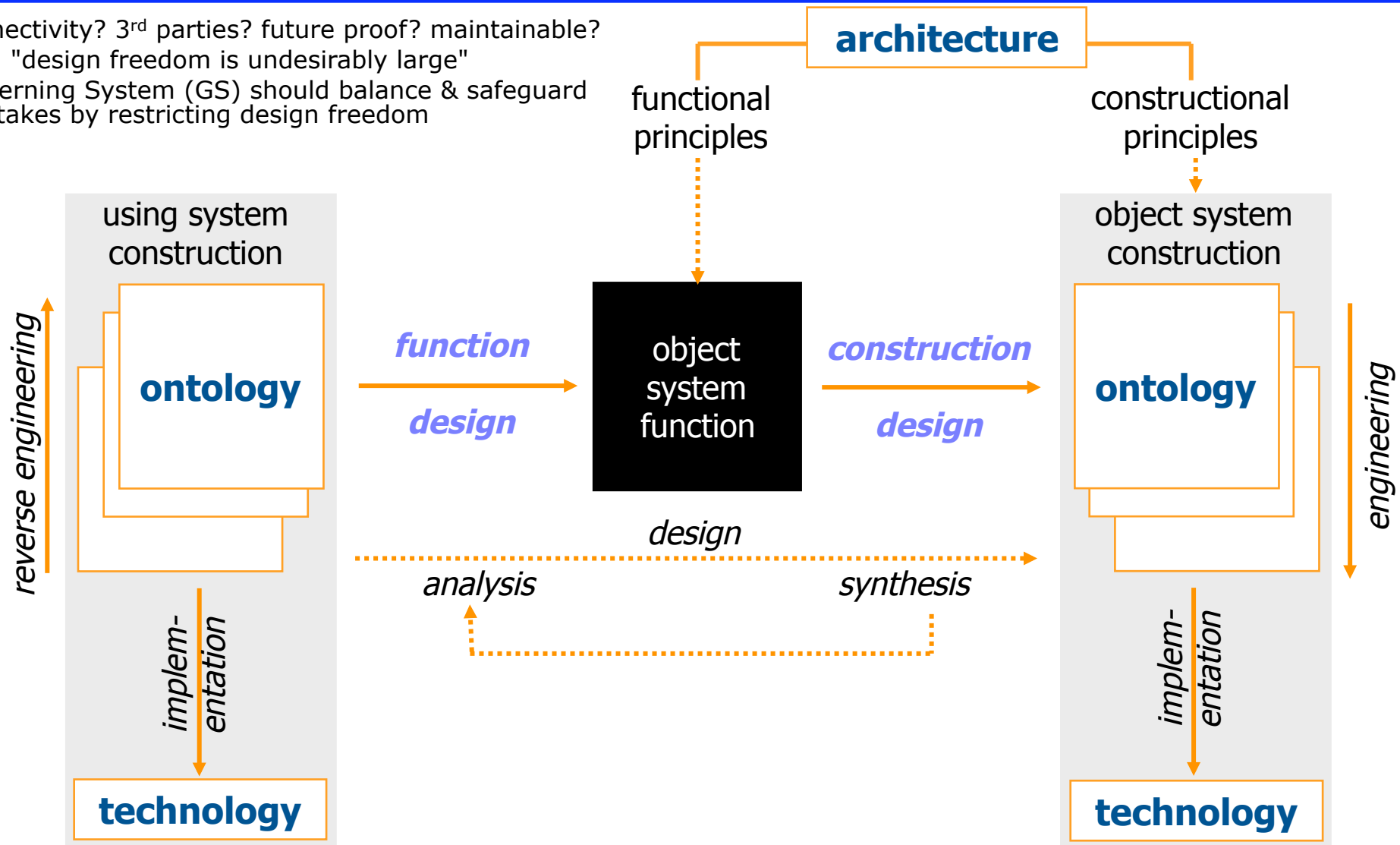
- **what are the *steering abilities* of principles (real-life case analysis) §4**
  - **hypotheses on how to formulate principles §5**
- basis = existing work on positioning architecture and principles (§2) and making them SMART (§3)

# 2. Architecture & Enterprise Engineering

## Positioning *architecture* in Generic Systems Development Process

Sources: xAF (2003), Dietz (2006)

- connectivity? 3<sup>rd</sup> parties? future proof? maintainable?
- xAF: "design freedom is undesirably large"
- ➔ Governing System (GS) should balance & safeguard all stakes by restricting design freedom



# 2. Architecture & Enterprise Engineering

## definitions and questions

- benefits of architecture: improved integration, adaptability, agility, ease of collaboration, interoperability, free flow of information (xAF, CIAO!, TOGAF)
- *enterprise* = heterogeneous system, constituted as layered integration of 3 aspect systems
  - those (homogeneous) aspect systems are: **Business** system, **Informational** system, **Datalogical** system
- *enterprise engineering* = body of knowledge/know-how on development, implementation & operational use of enterprises, as well as their practical application in engineering projects
  - → engineering now (1) includes all life-cycle phases of a system (2) system type = heterogeneous
- *enterprise architecture* = architecture (set of principles) as applicable to the enterprise
  - → principles can influence (1) any aspect system, (2) its integration and (3) any life-cycle phase
- xAF: "principles embody general requirements for a class of systems"



perspective	general	special
functional	<ul style="list-style-type: none"> <li>• accounting should be in conformity with European law</li> <li>• the maximum speed of cars should be at least 80 km/hr</li> </ul>	<ul style="list-style-type: none"> <li>• this accounting system should handle \$ and €</li> <li>• the maximum speed of this car should be at least 180 km/hr</li> </ul>
constructional	<ul style="list-style-type: none"> <li>• ICT-applications should be component based</li> <li>• in cars, minimal 25% of the material should be synthetic</li> </ul>	<ul style="list-style-type: none"> <li>• this system must be programmed in C++</li> <li>• the body of this car should be fully synthetic</li> </ul>

- several questions now emerge:
  - a. how do principles, usable as a steering instrument for the GS, look like? §3
  - b. how do principles restrict and impact enterprise engineering? §4
  - c. what process should we follow to formulate (a set of) principles? §5

# 3. Operationalizing Design Restrictions: Principles

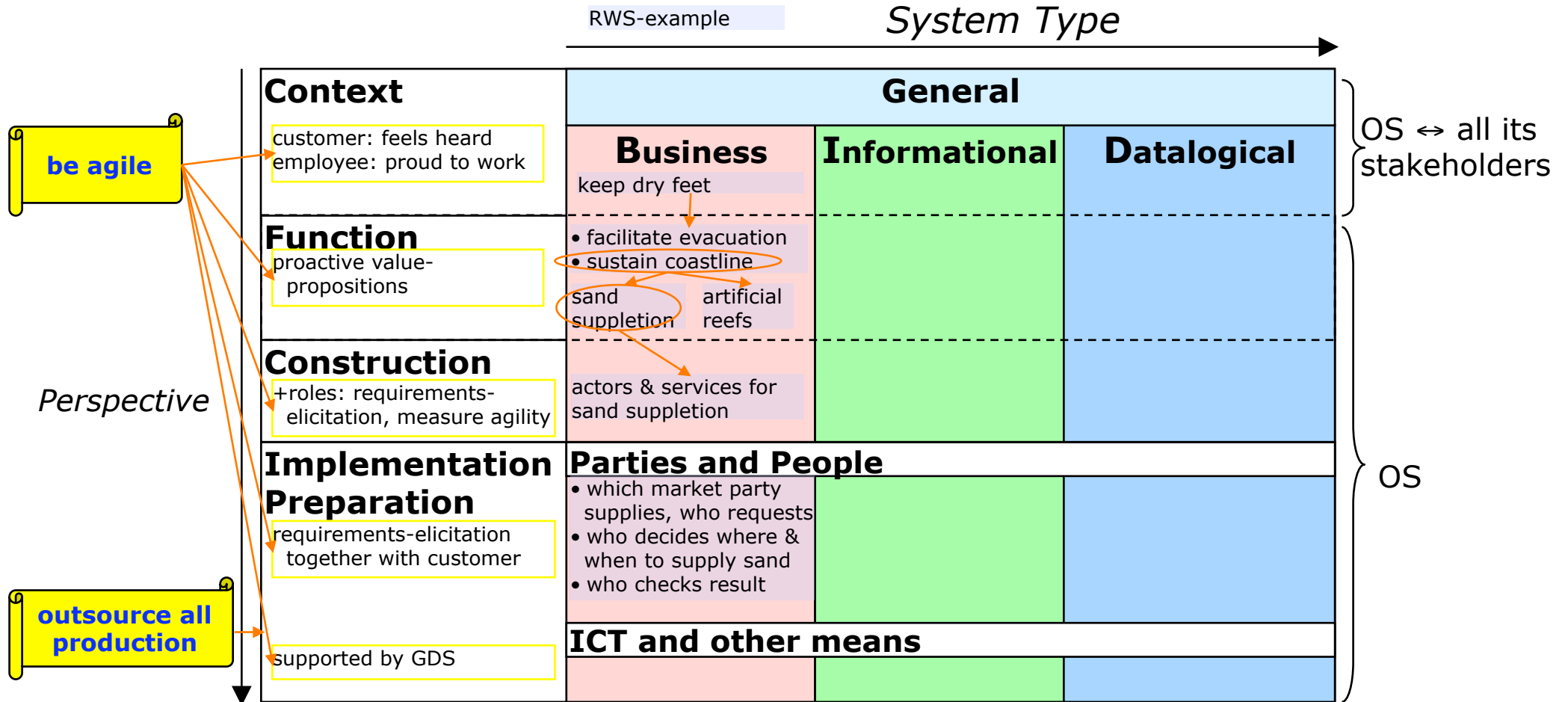
- to enable principles to steer development, principles should be specific
  - also be measurable/falsifiable and have a rationale (SMART), be stable
  - also the set of principles should be consistent, coherent and small
- how to make principles specific (enough)?
  - the core is mostly an informal statement, like "*Users have access to the data necessary to perform their duties; therefore, data is shared across enterprise functions and organizations*" (TOGAF 2004)
  - necessary start, but not enough precision to concretely limit design space
- Bommel (2006) investigated a business rule-like approach → ORC, e.g.
  - Each Enterprise-function has access to Data which some User [who supports that Enterprise-function] needs for some Duties
  - Each Organization has access to Data which some User [that belongs to that Organization] needs for some Duties
  - business rules constrain 1<sup>st</sup> order system behavior, principles 2<sup>nd</sup> order

**assume now that principles are specific (enough), how do they limit design space?**

# 4. Practical Applications of Principles

## Introducing the Enterprise Engineering Framework (EEF)

- EEF describes the areas of attention/activity of an Enterprise Engineer



**On every level in the Perspective-dimension, principles can make a difference**

# 4. Practical Applications of Principles

## Impact of 1 principle in Enterprise Engineering Framework

government doesn't ask the same question twice

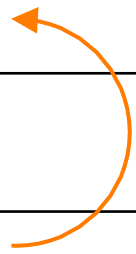
Context	General		
	Business	Informational	Datological
<b>Function</b>	<ul style="list-style-type: none"> <li>government cost reduction</li> <li>lower tax-burden citizen</li> <li>simpler use gov-services by citizen</li> <li>gov should prevent abuse linking data</li> </ul>	<ul style="list-style-type: none"> <li>EU-auth will request information</li> <li>government responsible for secure saving &amp; sharing of data</li> </ul>	<ul style="list-style-type: none"> <li>data requested in several formats</li> <li>emerging standard –formats dataX</li> <li>backup data expected</li> <li>request can come 24*7</li> </ul>
<b>Construction</b>	<ul style="list-style-type: none"> <li>customer-oriented government</li> <li>government with house on order</li> <li>separate governments act as unity</li> <li>better lead-time gov-services (QoB)</li> </ul>	<ul style="list-style-type: none"> <li>sharing data with EU-auth must be possible</li> <li>better information (QoI: response time, actuality, reliability, ...)</li> </ul>	<ul style="list-style-type: none"> <li>data must be shared in several (standard-) formats</li> <li>citizen-data-sharing only encrypted</li> <li>technology infra should be 24*7</li> <li>can combine data from diff sources</li> </ul>
<b>Implementation Preparation</b>	<b>Parties and People</b>		
	<ul style="list-style-type: none"> <li>more time for officials for better underpinned decision-making (because of saved time)</li> </ul>	<ul style="list-style-type: none"> <li>less time spent for getting info</li> </ul>	<ul style="list-style-type: none"> <li>no longer record duplicate in several formats / systems → less people required</li> </ul>
	<b>ICT and other means</b>		
	<ul style="list-style-type: none"> <li>less physical guichets needed</li> <li>introduce DIGID (=Dutch unique electronic citizen id)</li> </ul>	<ul style="list-style-type: none"> <li>connecting gov-websites to authentic registrations</li> <li>pre-fill tax forms with available info</li> </ul>	<ul style="list-style-type: none"> <li>less questionnaires</li> <li>national TI for public dataX → ESB</li> <li>redundant infrastructure</li> <li>standardization of data storage</li> </ul>

EEF helped students to systematically detect implications of this principle in 7h

# 5. Formulating Principles

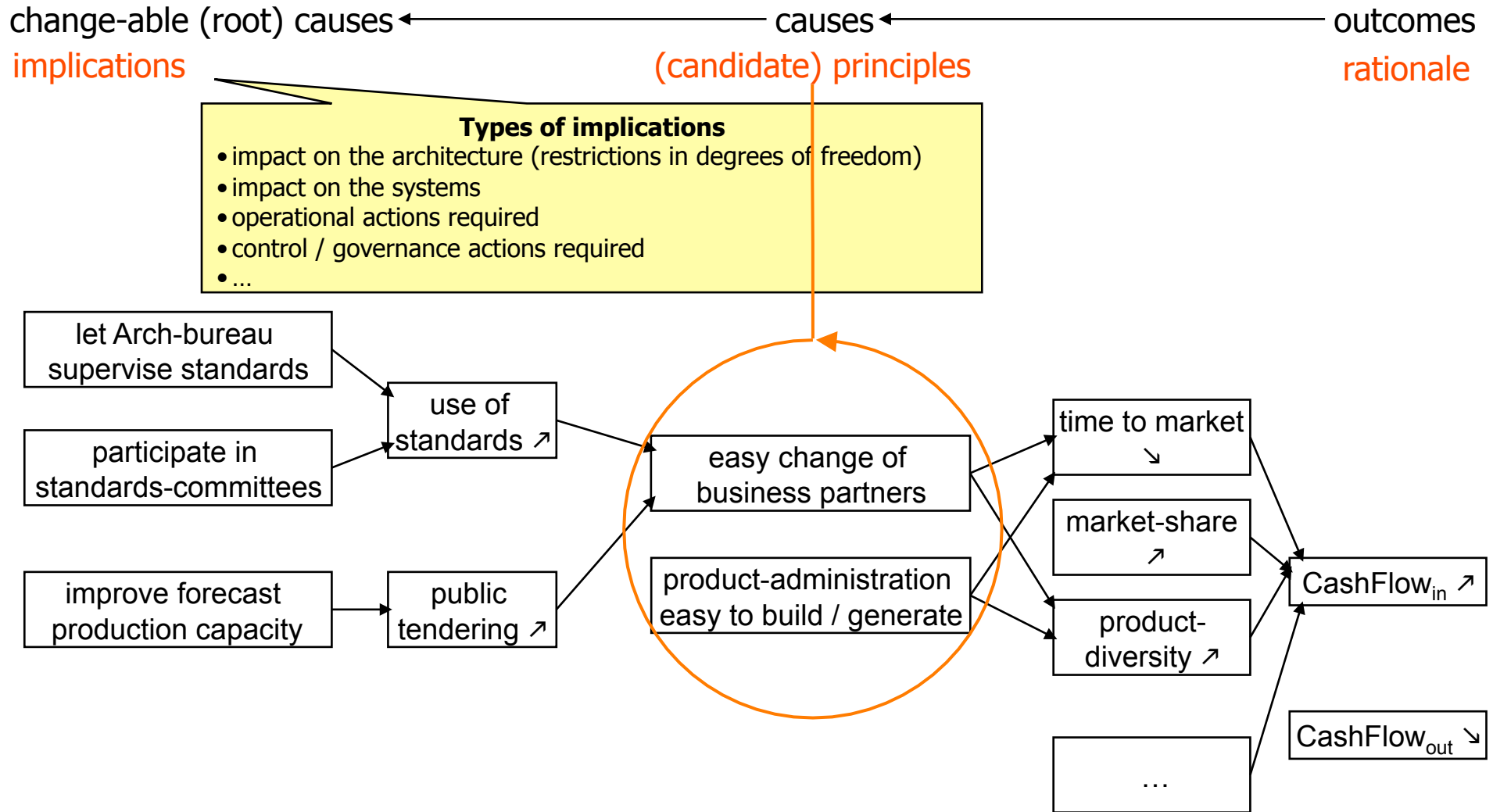
## (a) special case of process for collaborative formulation of policies

step	who
1. Formulation of the objectives for having the principles <ul style="list-style-type: none"><li>clarifies which stakeholder's concerns and objectives should be addressed</li></ul>	ind
2. Identify & prioritize key objectives for principles	coll
3. Formulate candidate principles that address the stated objectives.	ind
4. Identify & prioritize key principles	coll
5. Elaborate key principles <ul style="list-style-type: none"><li>make each principle specific and measurable (see §3)</li></ul>	coll
6. Evaluate completeness of set of principles (go back to 4 if needed) <ul style="list-style-type: none"><li>does the set of principles meet the set objectives?</li></ul>	coll



# 5. Formulating Principles (b)

Based on cause-effect reasoning ...



# 5. Formulating Principles (b)

## ... and embedded in scenario-analysis

1. agree on scope and relevant stakeholders
2. identify concerns of stakeholders, based on role and personal interests
3. identify candidate-principles, derived from vision, mission and strategy
4. identify implications of the candidate-principles, using EEF (see §4)
5. detect contradictions in principles, including underlying assumptions
  - e.g. "standard-packages preferred" and "no vendor lock-in" are not contradictory in efficient market
  - clear dependence on market-efficiency; H2 stimulate the market?
6. define sufficiently different scenario's and find no-regret principles
  - otherwise: extra investments or installing of "early warning indicators"
7. prioritize according to different stakeholders & their typical concerns
  - again no-regret principles can be found
8. give integrated advice on over-all prioritization of principles

**negotiations can use insights in (1) different interests (2) underlying assumptions**

# 6. Conclusions & further research

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## *conclusions*

- impact of principles can be **systematically detected**, using EEF
  - → mutual coherence, potential contradictions, traceability
- formulating principles is a special case of collaborative policy formulation
- using cause-effect diagrams connects principles
  - with concerns and rationales of stakeholders
  - with implications
  - with (the impact of) other principles

## *further research*

1. **documented real-life impact** of in limiting design space during enterprise engineering
2. elaborate strategies to **formalize** principles and underlying domain concepts
3. more insight in **levels** of principles: organizational hierarchy, industry, regulatory bodies
4. more explicit **definition** of principle, including (formal) language to allow/enforce
5. **organizationally embed** enforcing principles (e.g. building permits)
6. formulation principles real-life **tested**
7. stronger link principles ↔ **strategy**

# Issues for discussion

Remark / question	Suggestion / start for an answer
1. What is the original contribution?	<ul style="list-style-type: none"><li>steering ability from principles in real life</li><li>hypothesis for 2 processes to arrive at principles</li></ul>
2. H2 make principles SMART?	<ul style="list-style-type: none"><li>starts with Bommel et al; future work required</li></ul>
3. To what extent is the case real?	<ul style="list-style-type: none"><li>case "government doesn't ask same question twice" is real-life; students did the analysis</li></ul>

Thanks for your attention!

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