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The influence of dynamic business models on IPS²-network planning – an agent-based simulation approach

by

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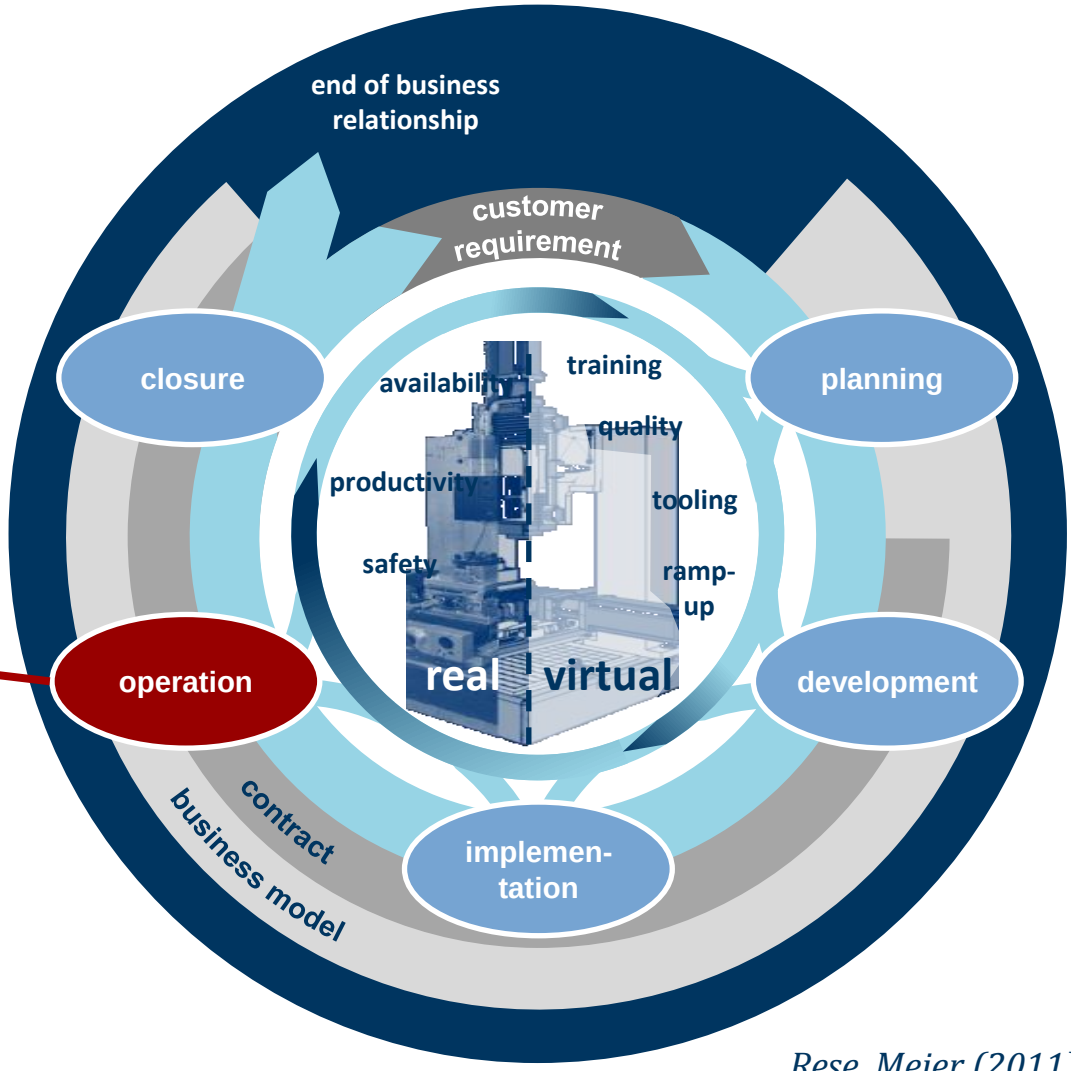
IPS² Lifecycle

- **utilization** of the IPS² by the customer
- **delivery** of services by the IPS² provider

Challenges for the IPS² provider:

- **perishability** of delivery processes
- **fluctuations** in capacity demand and supply
- large amount of **fix costs**, potentially significant idle capacity costs
- external and internal **uncertainty**
- **urgent** delivery processes
- **logistic** planning task

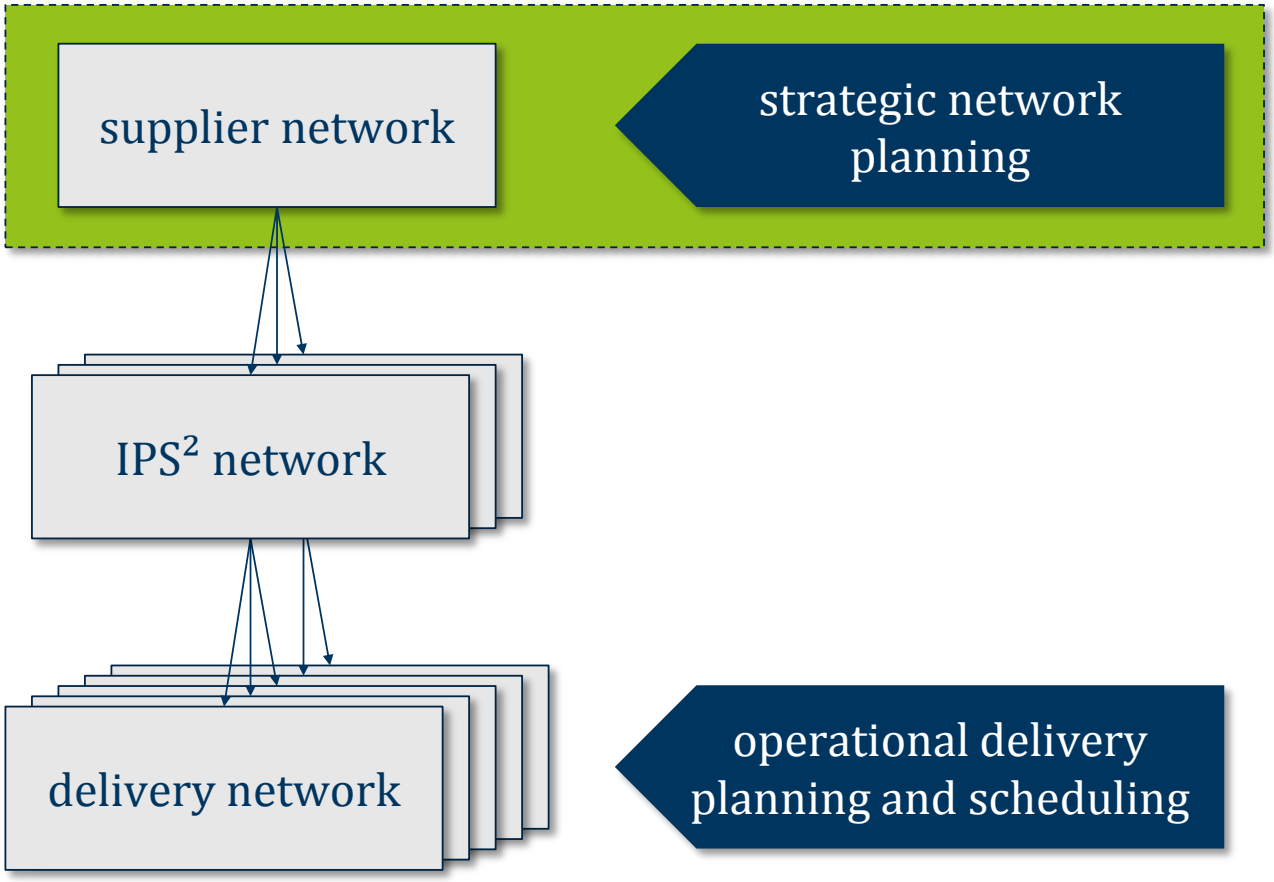


Rese, Meier (2011)

IPS² delivery in networks

network characteristics

planning level



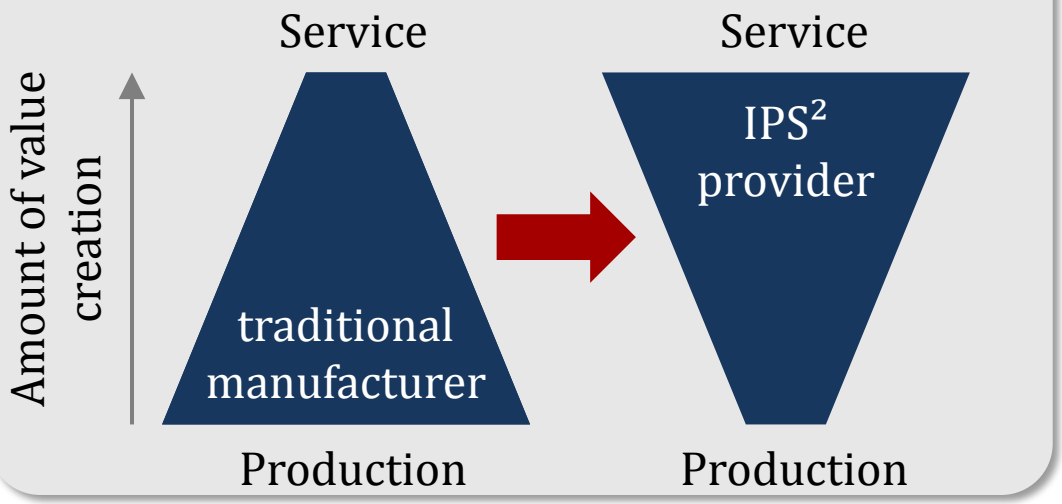
IPS² Business models

partial model	*business model characteristics*	
value	▪ customer value ▪ value architecture	▪ …
organization	▪ task distribution and process responsibility	▪ service initiative ▪ …
risk distribution	▪ risk sharing ▪ providers's risk assumption	▪ customers's risk assumption
revenue and costs	▪ basis for economic value ▪ revenue	▪ costs
property rights	▪ ownership ▪ access	

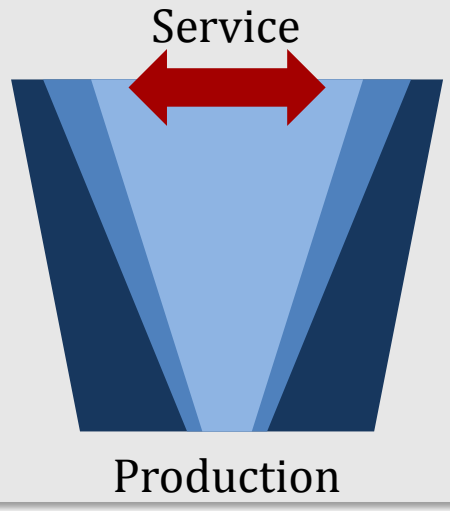
Rese et al. 2012

Motivation and objective

Migration towards IPS² providers



Capacity adjustments

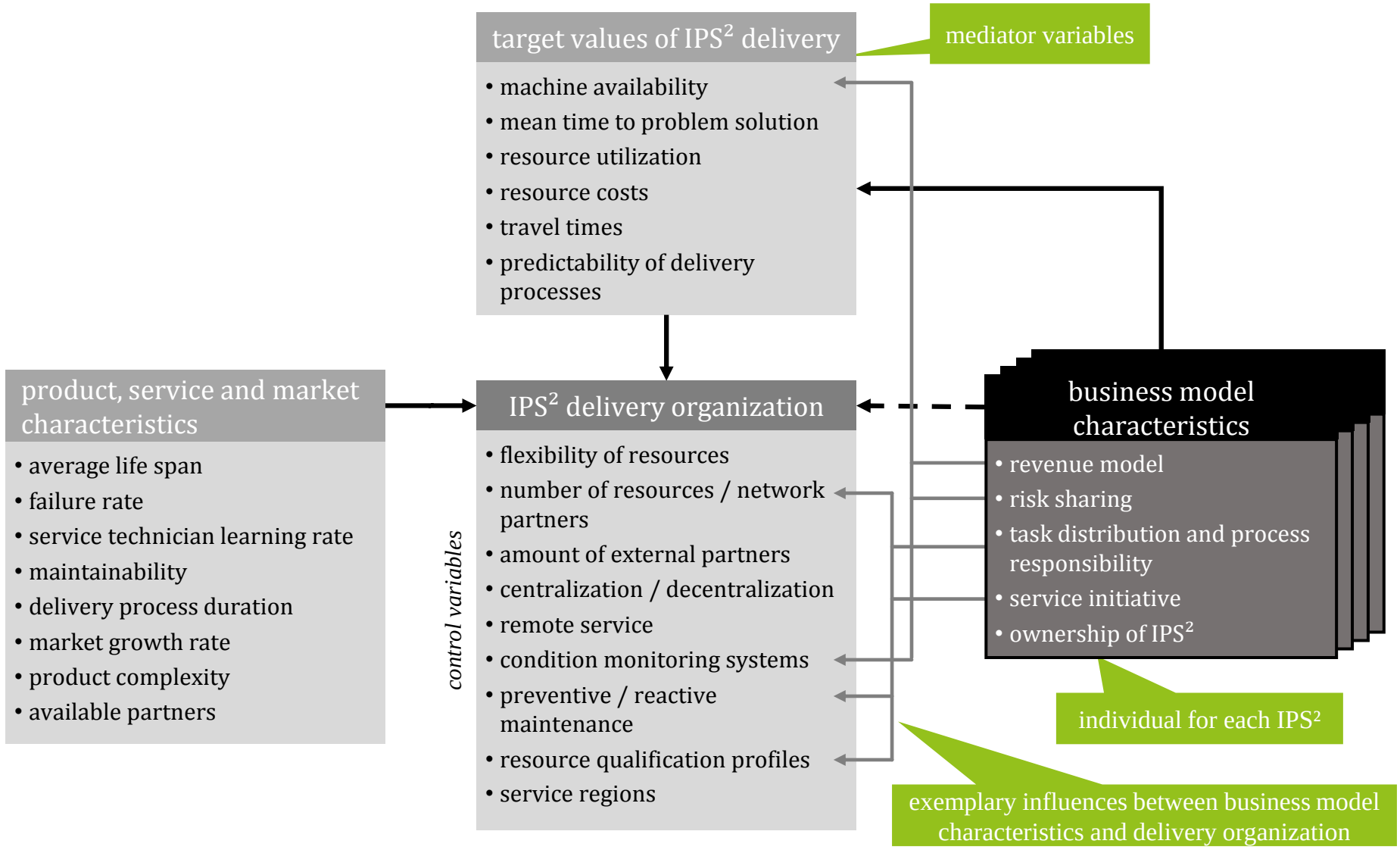


Objective

- systematic decision support in strategic network planning
- various strategic management options
- interconnected influencing variables

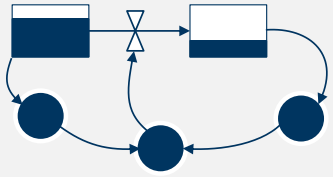
scenario- and simulation-based planning method

Influences on IPS² delivery organization

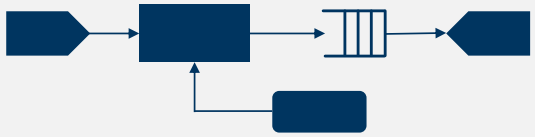


Simulation modeling methods

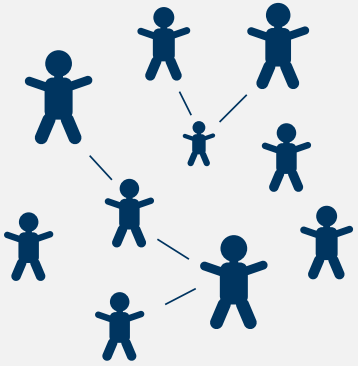
System Dynamics



Discrete Event Modeling



Agent Based Modeling

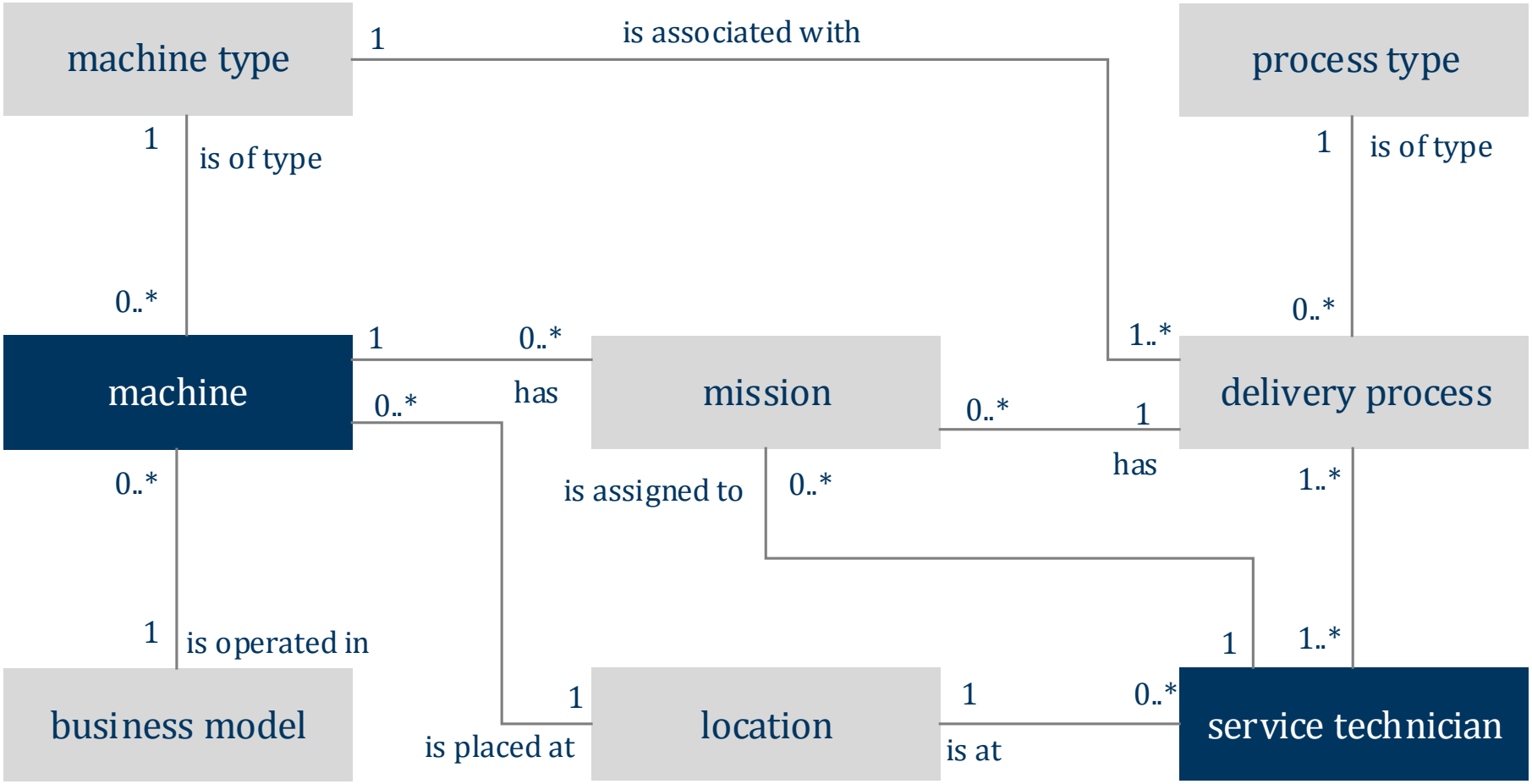


- agent behavior is defined by events and discrete internal states
- behavior and dynamic of the modeled system result from the individual agent behavior (bottom-up modeling approach)

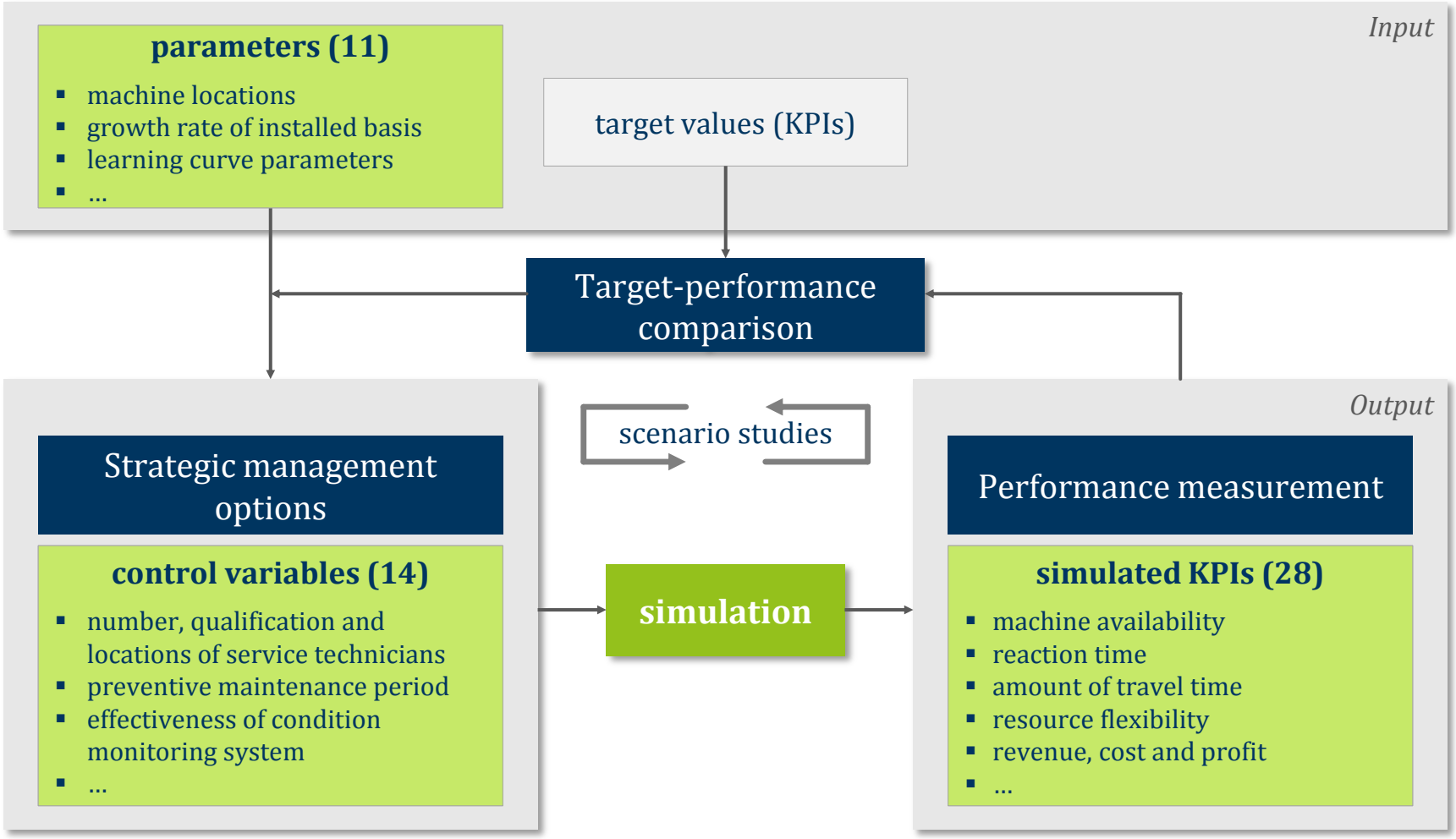
- system elements are modeled as agents, which can act autonomously and react to external changes and stimuli
- agents move freely in the modeled (service) area

Advantages of agent based modeling

Simulation model



Procedure of simulation-based scenario planning



Evaluation scenario

- fictional company (IPS² provider)
- 1000 installed machine tools in Germany
- 4 machine types (A, B, C, D)

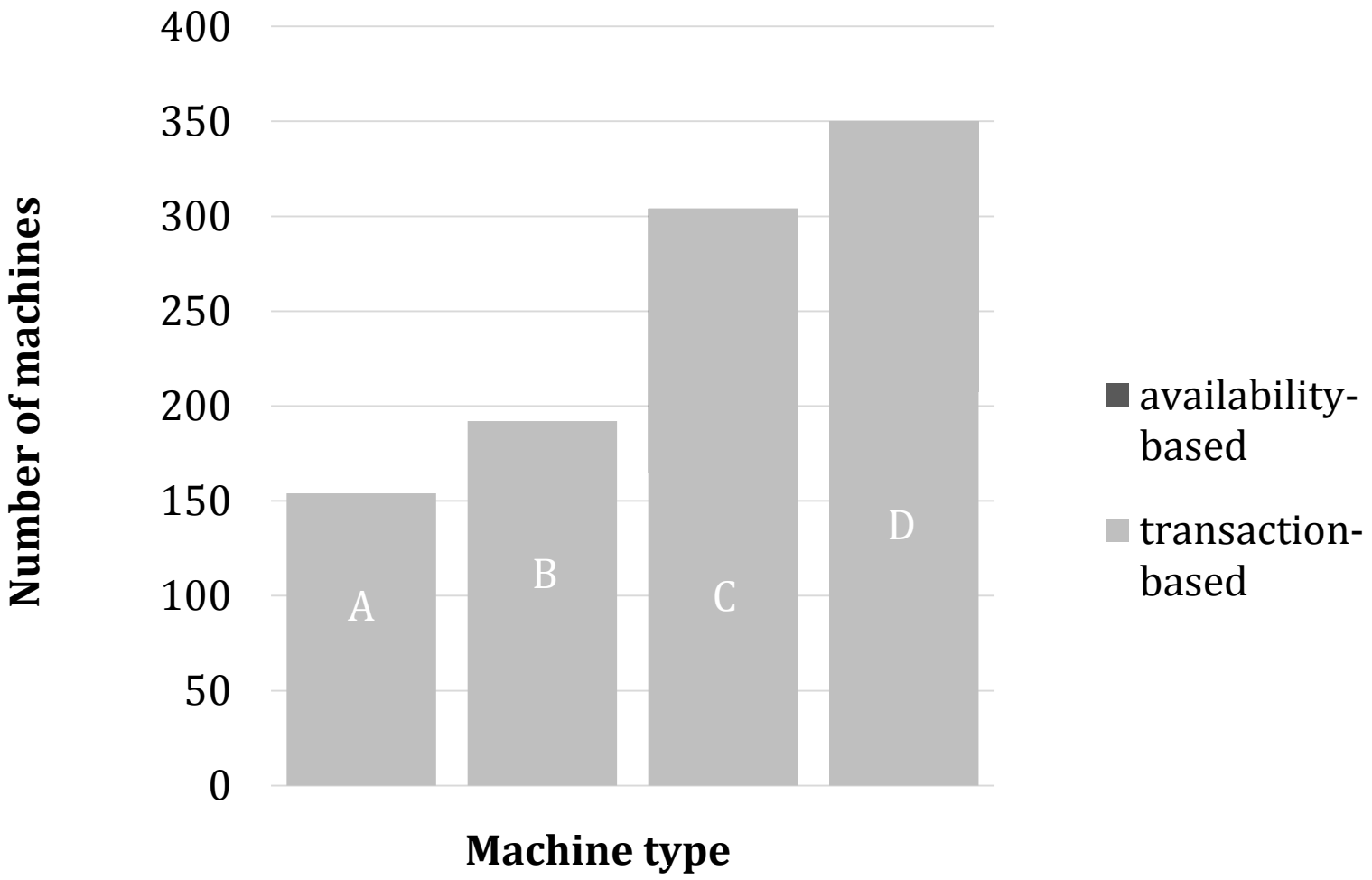
- 22 full-time service engineers with individual skills
- three types of delivery processes: preventive maintenance, repair and installations

Scenarios:

How should the IPS² and the provider network change, if availability-oriented business models are offered?

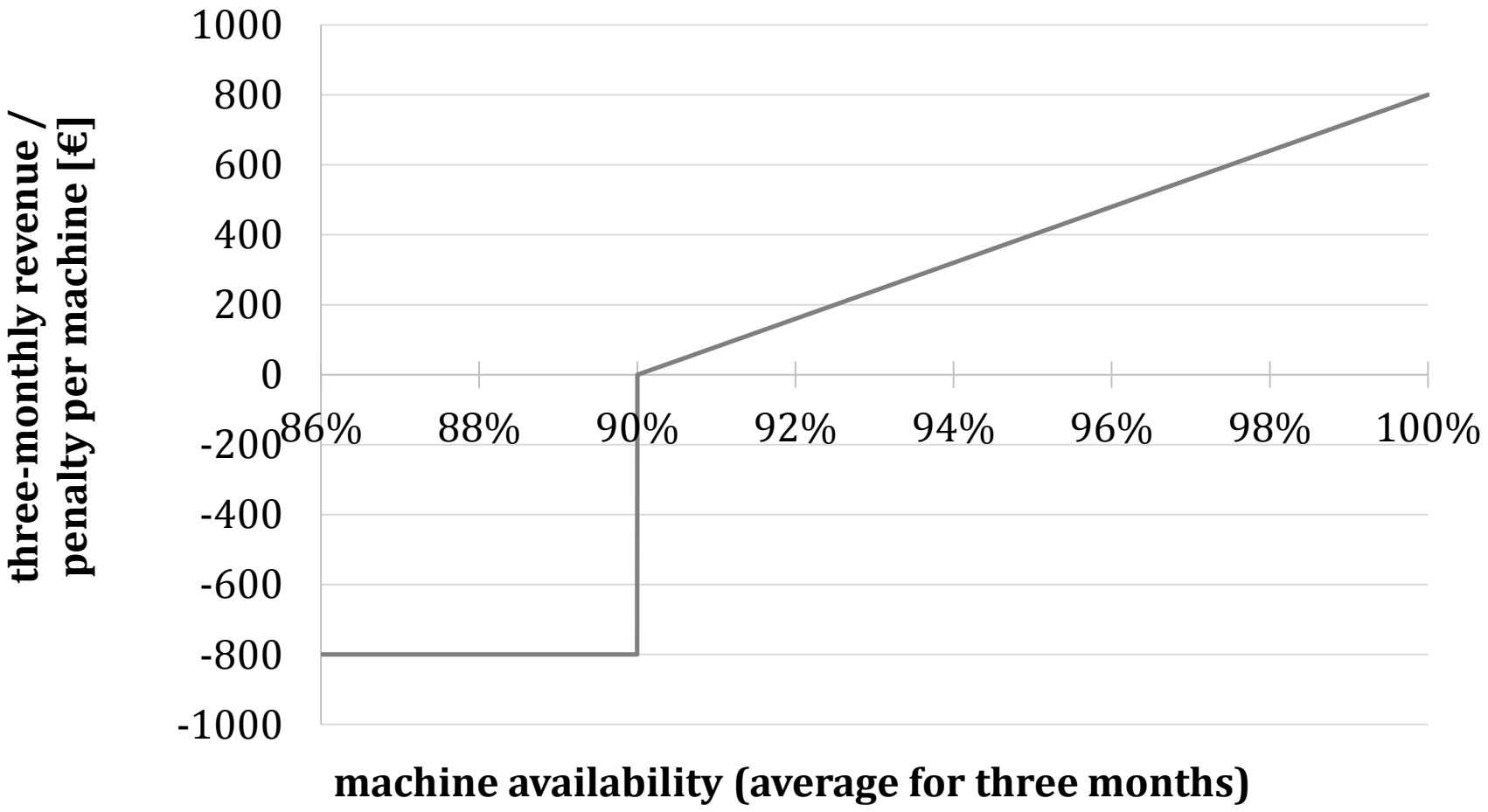
S0	S1	S2	S3
transaction-based	25 % of customers: availability-oriented business model		
		condition monitoring system	
initial situation	→ strategic management options		cooperation with service partner

Installed Basis (S1-S3)

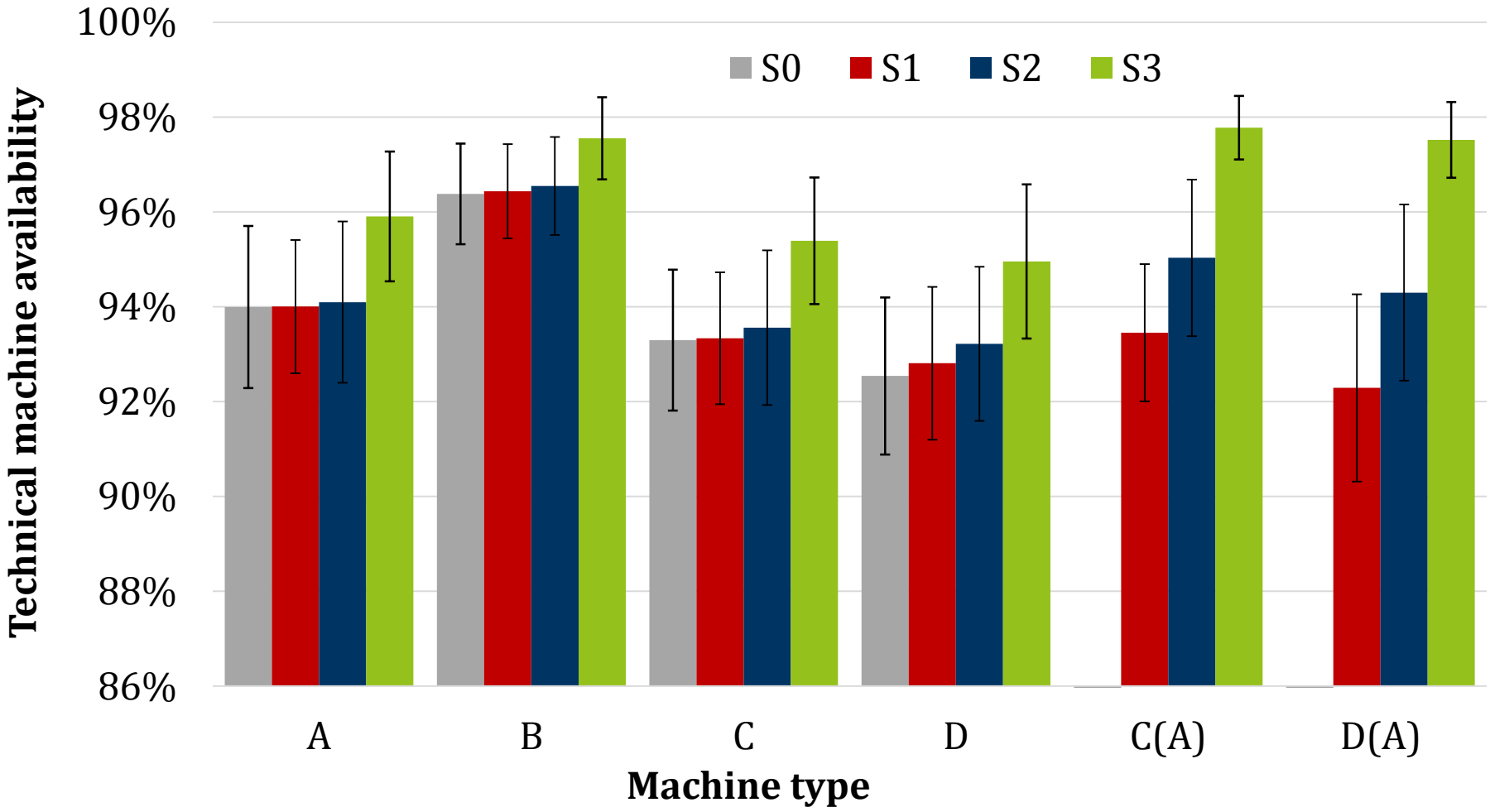


Revenue model (S1-S3)

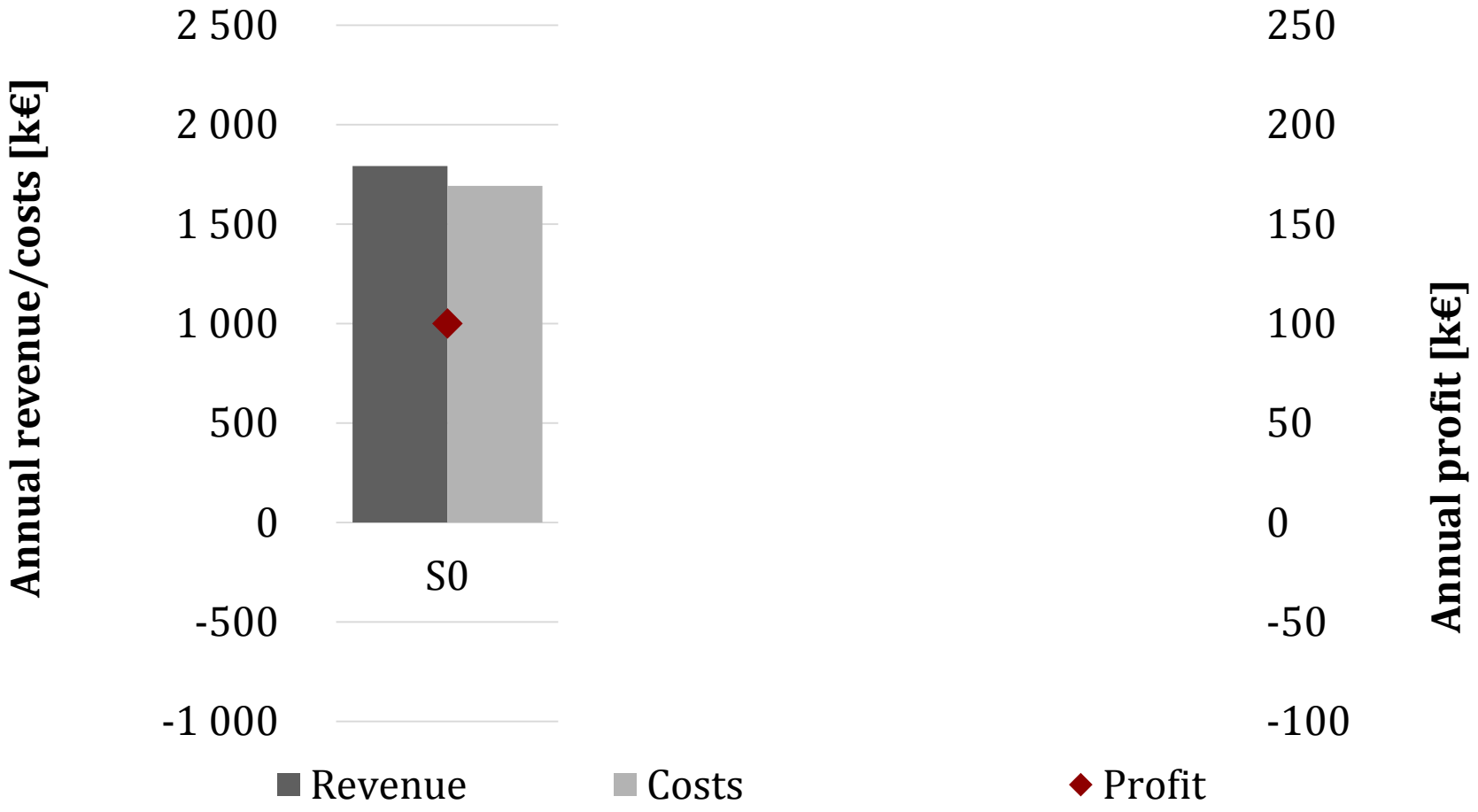
For availability-based machine types C(A) and D(A):



Machine availability



Revenue, costs and profit



Summary and Outlook

summary

- strategic network planning for IPS² delivery is a complex task with diverse **influencing factors** and a multitude of **management options**
- manufacturers, which **migrate** to become an IPS² provider, as well as existing service and IPS² providers need **systematic decision support** in strategic network planning
- the organization of IPS² delivery is strongly influenced by dynamic **IPS² business models**
- an **agent-based simulation model** can be used as a decision support system in order to systematically explore alternative management options
- the simulation-based planning approach has been **evaluated** in an industrial setting and demonstrated in fictional evaluation scenarios

outlook

- further development of the simulation model to include **technical resources**
- use the method to configure complete **paths for IPS² migration**
- combination and integration with **operational IPS² resource planning and scheduling**

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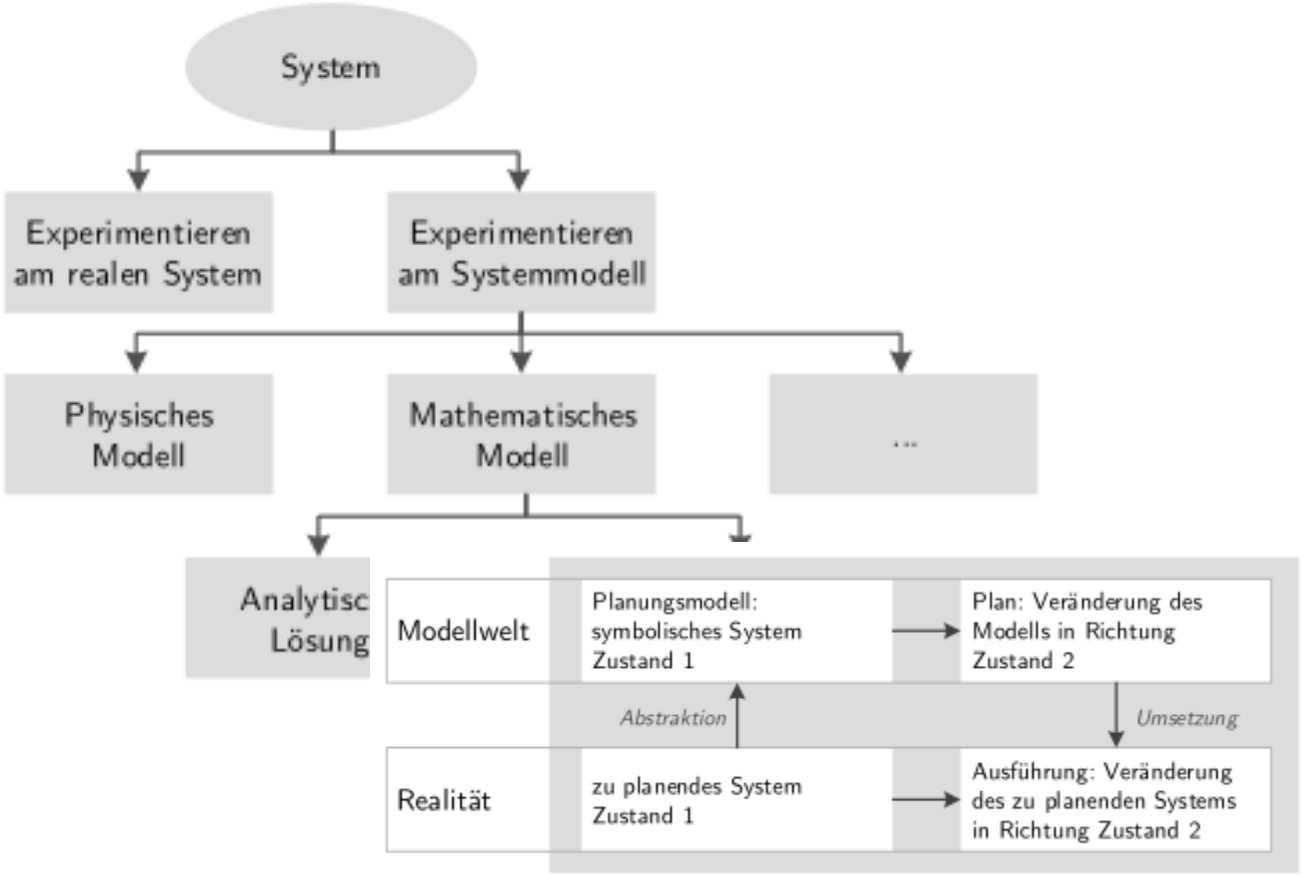
Planning methods

Requirements

- asdas
  - asd
- asd



IPS² network planning

Requirements

- asdas
  - asd
- asd