# Servitization of on-campus mobility
# A sharing system for electric skateboards

**Danilo Marcello Schmidt**
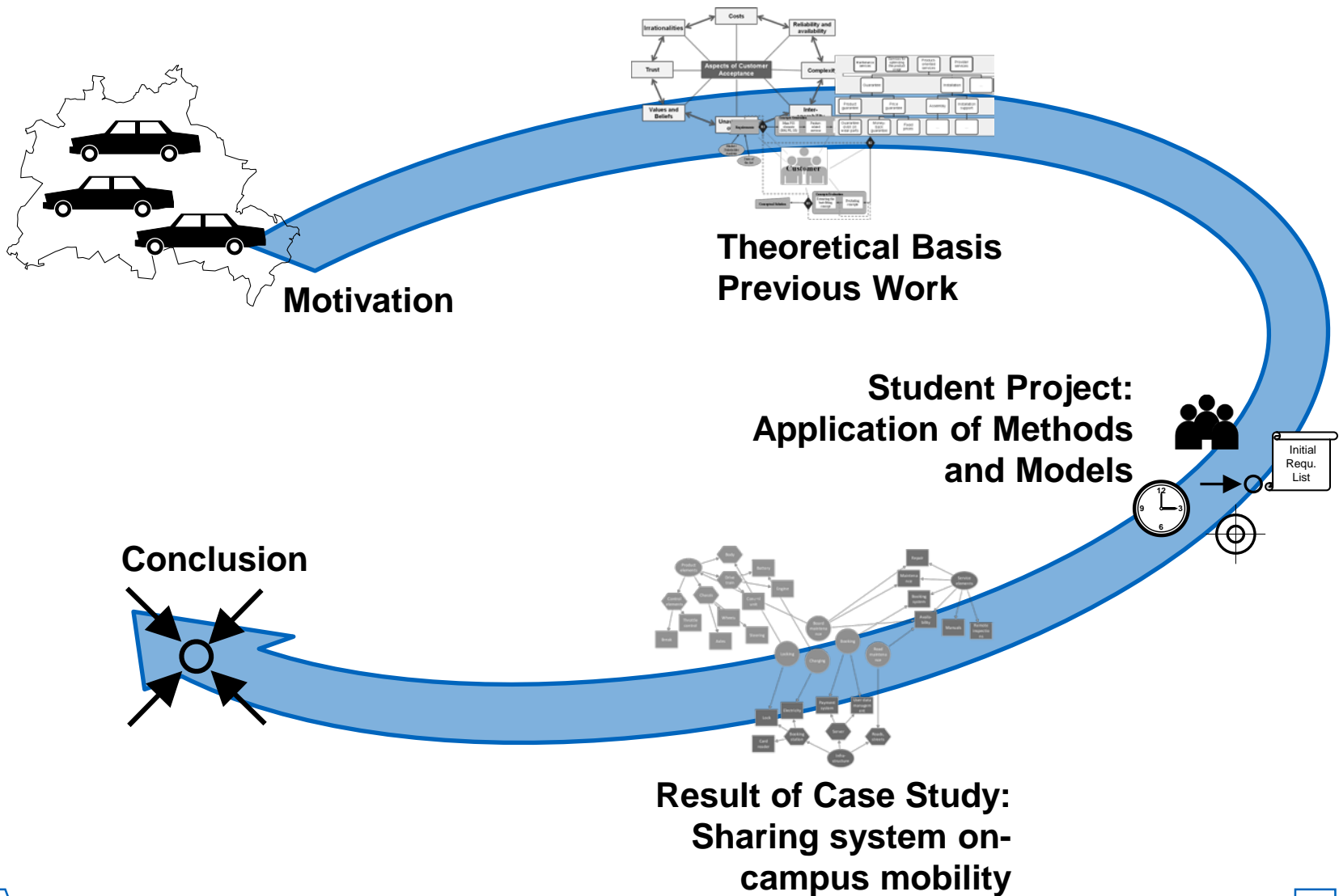
**Manuel Breyer**

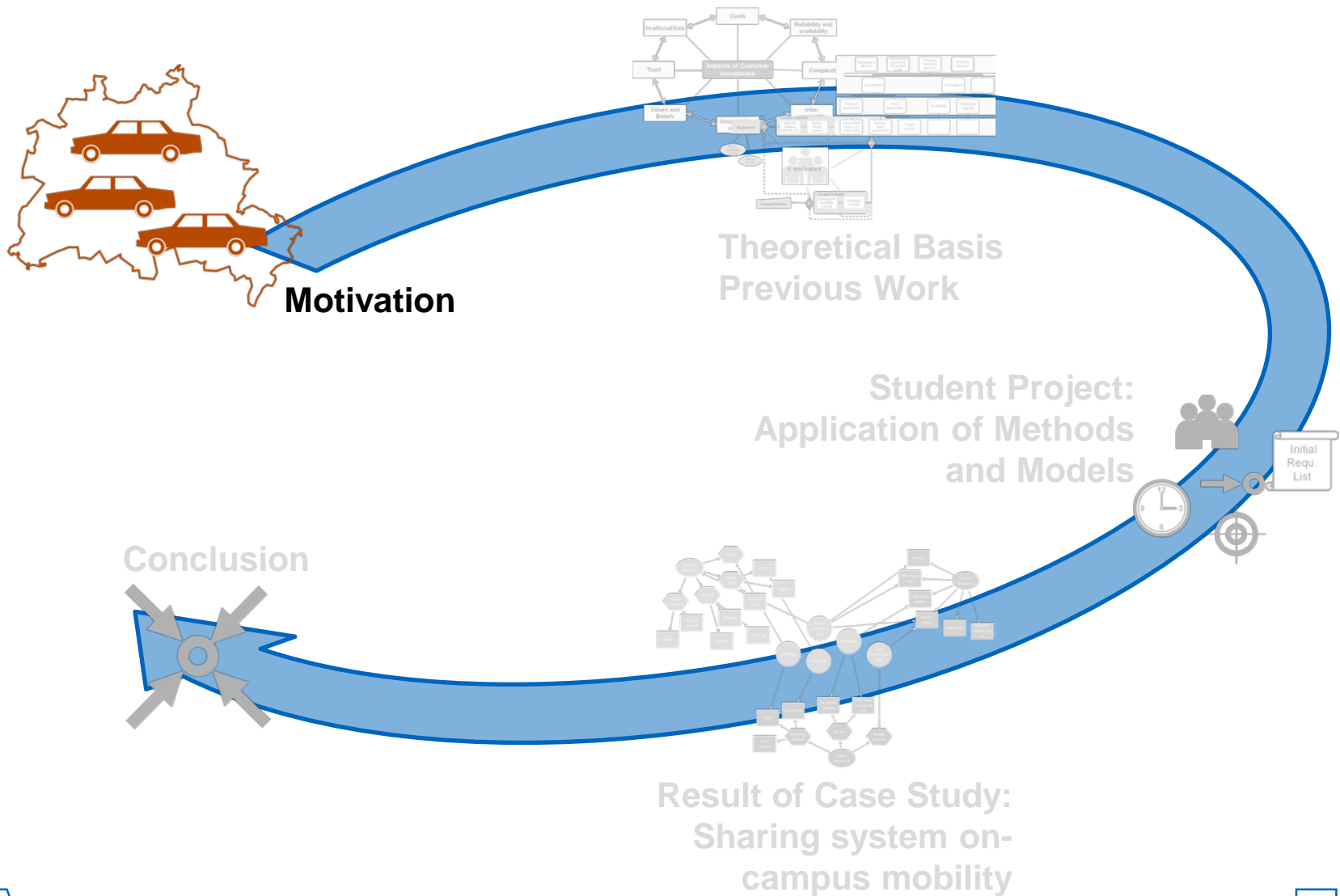**Udo Lindemann**

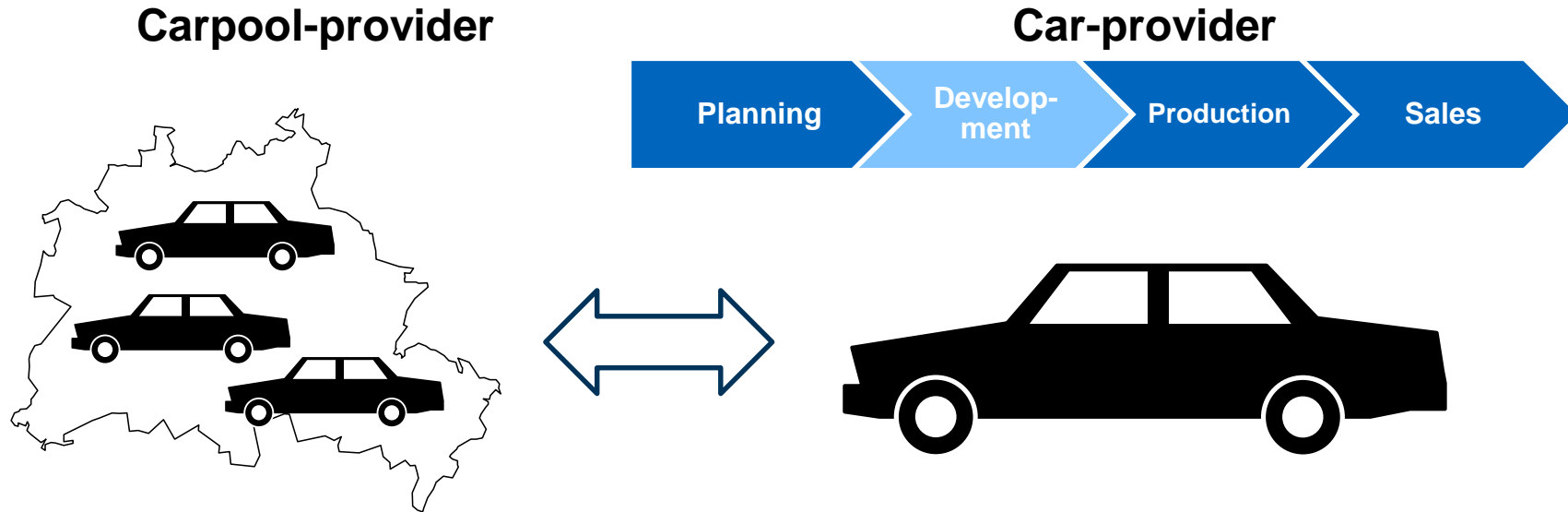**Institute of Product Development, Technical University of Munich**

# Agenda



Motivation

Theoretical Basis
Previous Work

Student Project:
Application of Methods
and Models

Conclusion

Result of Case Study:
Sharing system on-
campus mobility

Initial
Requ.
List

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# Introduction and motivation

## Carpool-provider

## Car-provider

| Planning | Develop-ment | Production | Sales |
|----------|--------------|------------|-------|

**Aim**:

- Offering a special car-model in their carpool

**Problem**:

- Integrating the module for booking into the car
- Development process has just started

Include services and interfaces to services into product planning
Orientation to customer acceptance even in early planning phases

# Objectives and focus of this work

- In previous work: models and methods for PSS design support were created
  - Decision-making process for PSS planning, Model of customer acceptance, Service catalogue
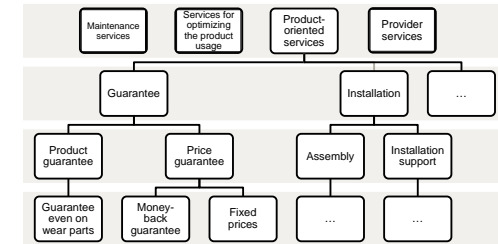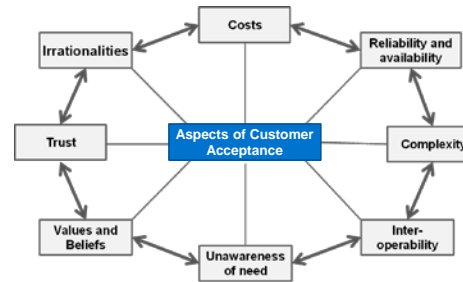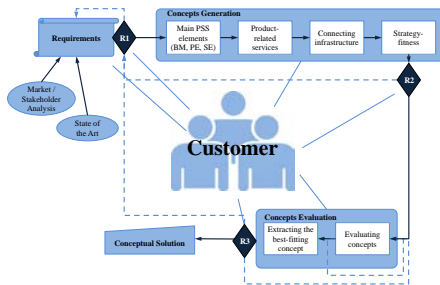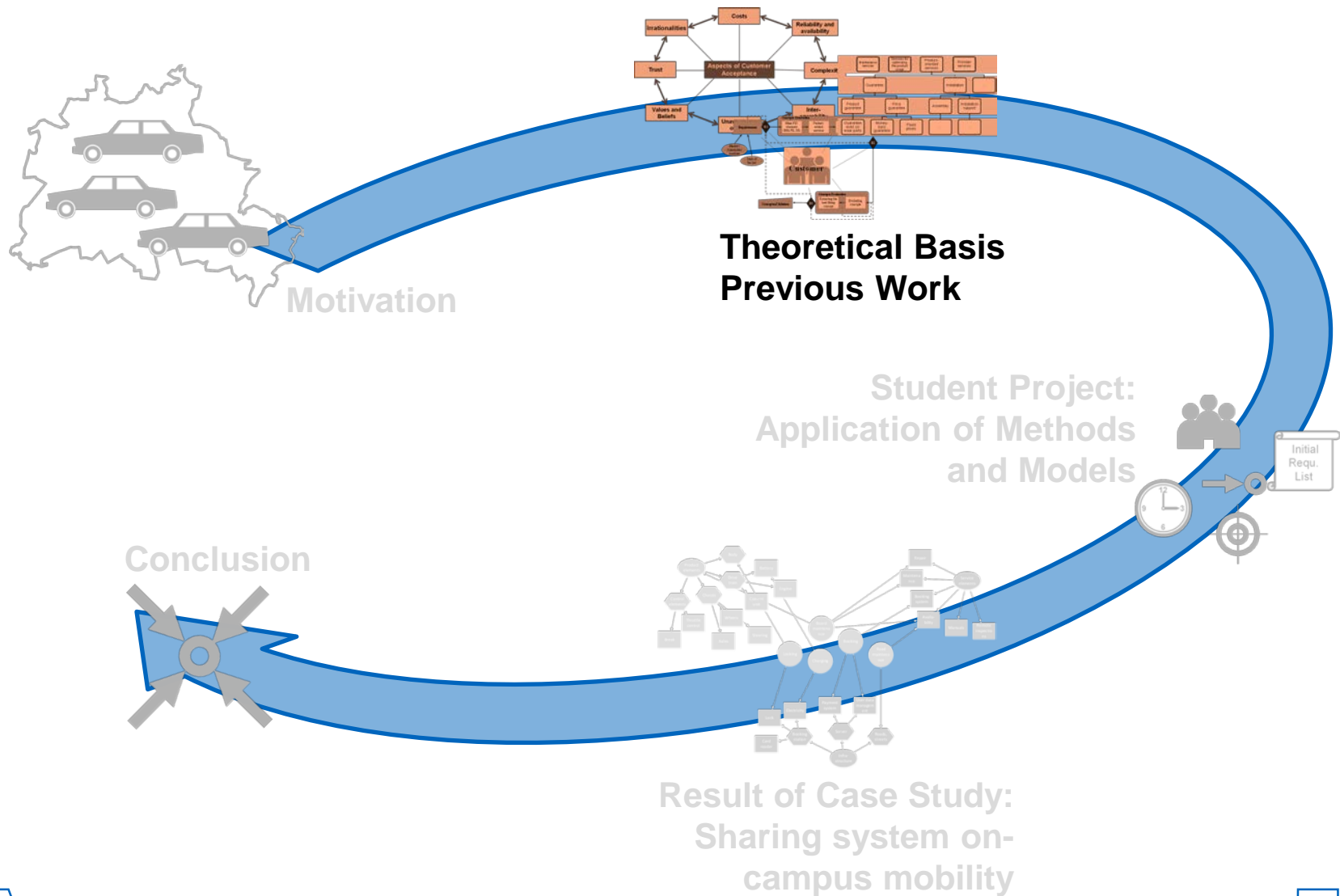


➢ **BUT: Those methods haven't been evaluated yet**

➢ **Objective: Evaluation by application in a student project**
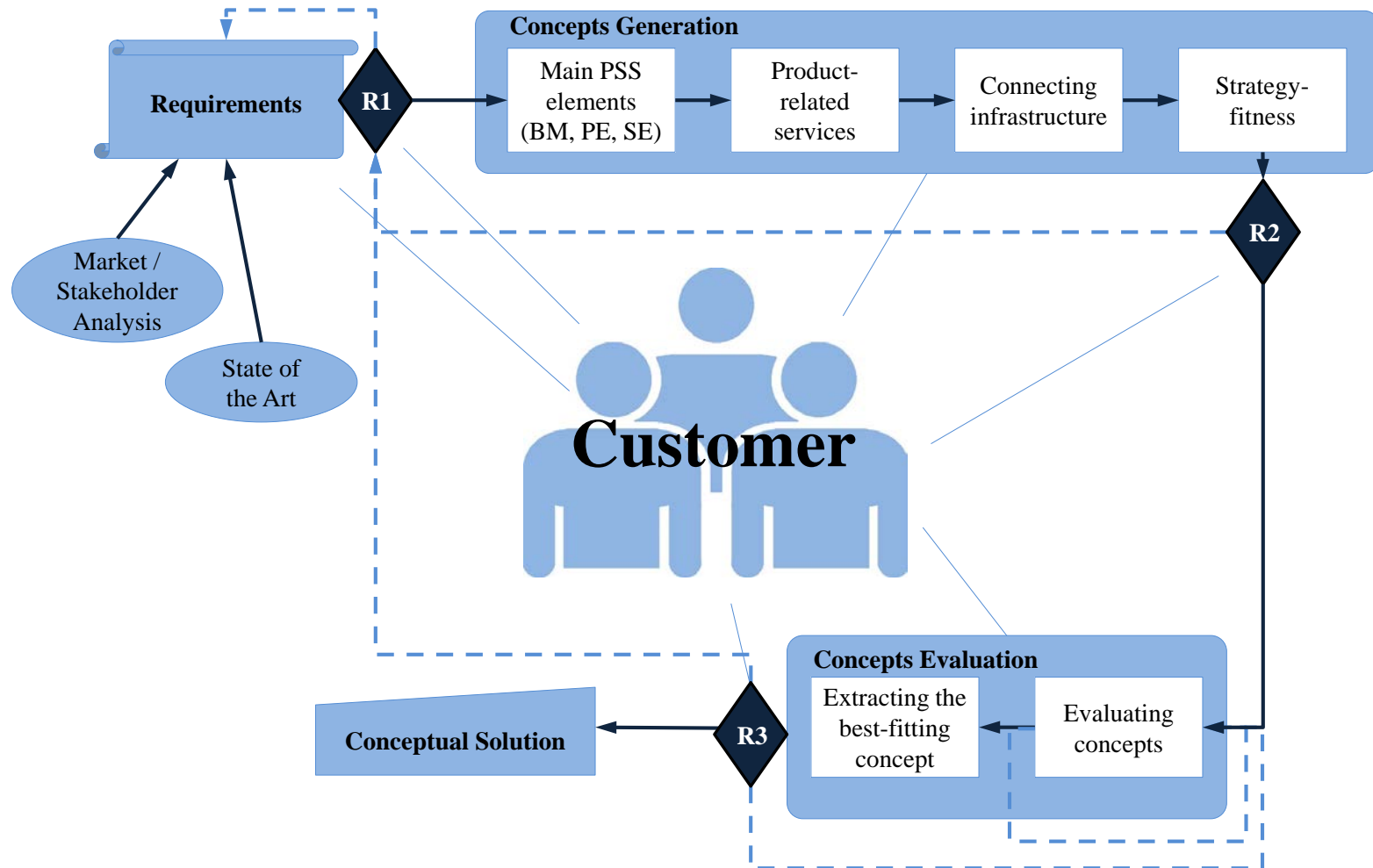
- Focused companies and products: Providers of complex technical products, mainly SMEs, for both B2B and B2C markets

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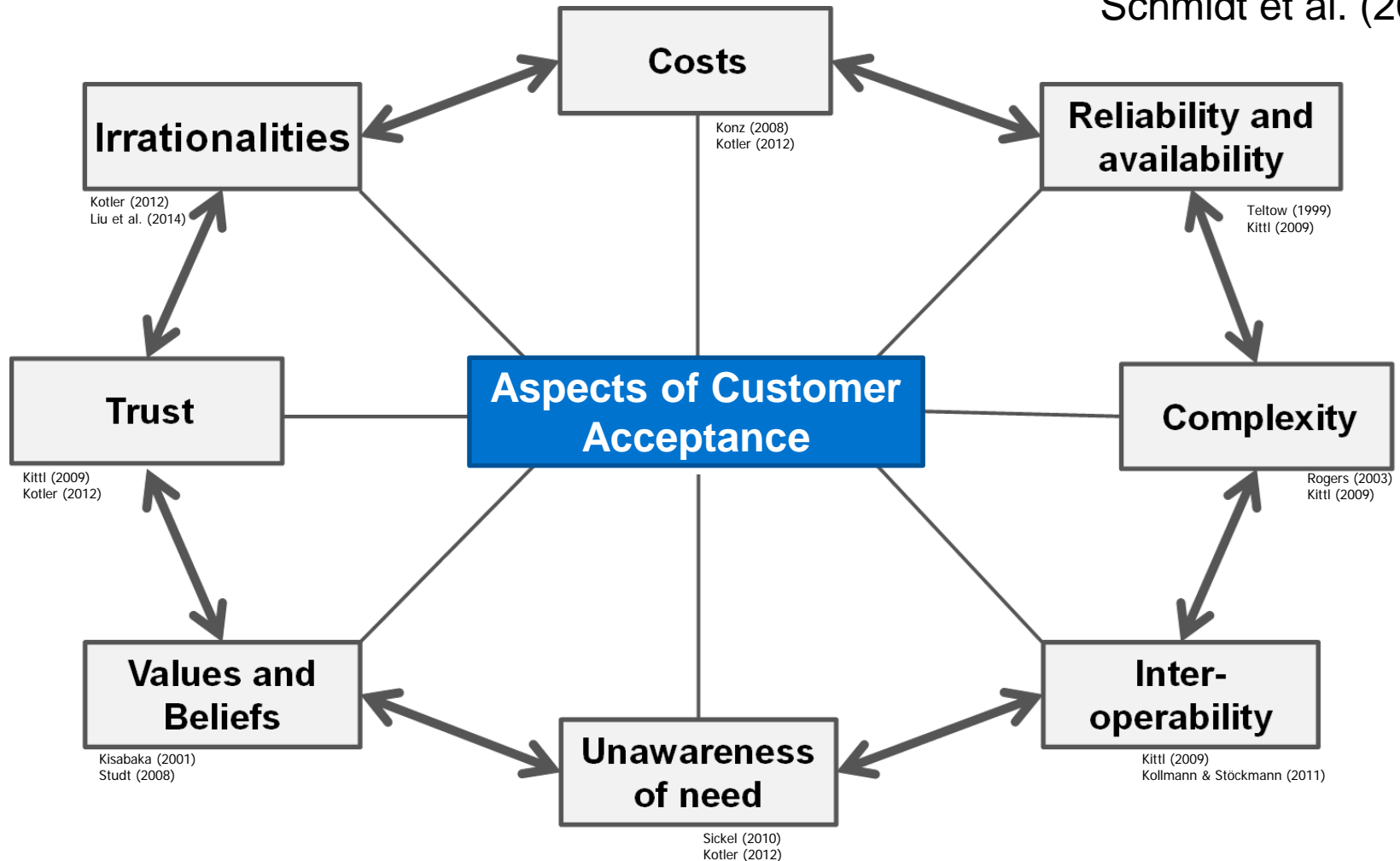Sharing system on-
campus mobility

# Decision-making process for PSS planning

Schmidt et al. (2015a), Schmidt et al. (2015c)

# Model of customer acceptance
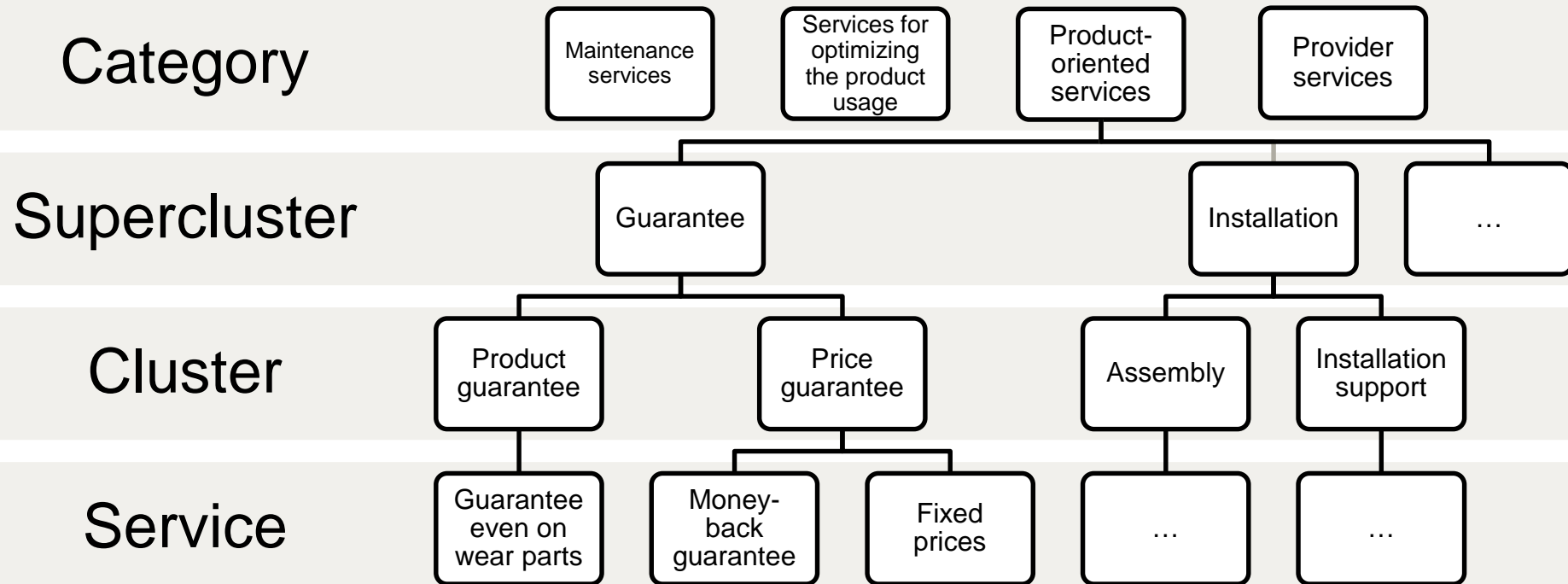
Schmidt et al. (2014)



- 59 aspects were identified, categorized to 8 main aspects
- Aspects are caused in products' attributes and customer behavior

# Hierarchy of Service Catalogue

Schmidt et al. (2015d)

| **Category** | Maintenance services | Services for optimizing the product usage | Product-oriented services | Provider services |
|---|---|---|---|---|
| **Supercluster** | | Guarantee | Installation | ... |
| **Cluster** | Product guarantee | Price guarantee | Assembly | Installation support |
| **Service** | Guarantee even on wear parts | Money-back guarantee / Fixed prices | ... | ... |

- Service Classification Scheme to support PSS designers in identifying service offers

- Objectives of evaluation: Applicability, Usability, Benefit for PSS development
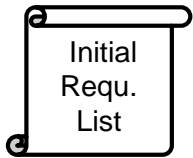
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Product Development

Technische Universität München
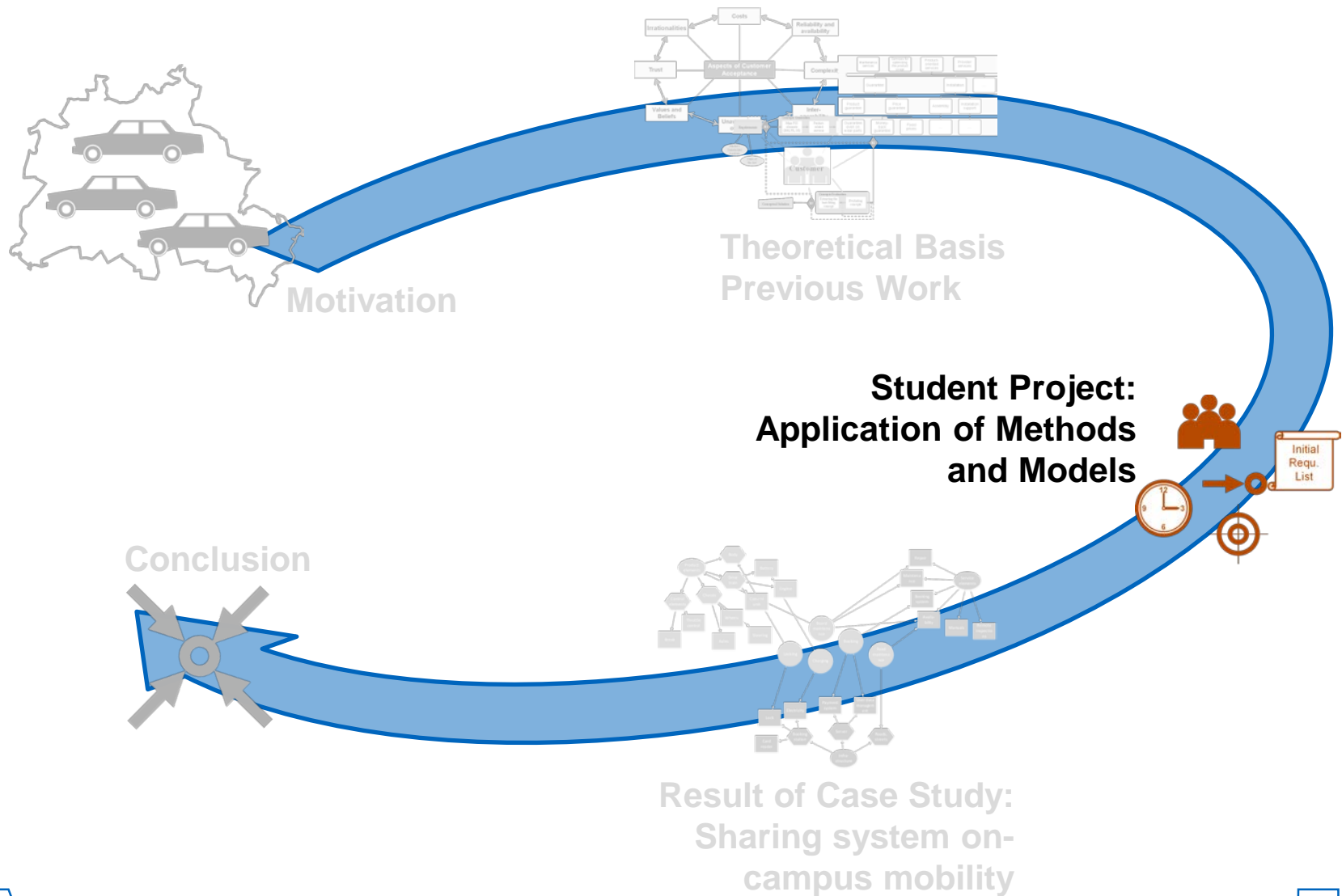
# Setting of student project

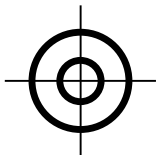Development of an innovative mobility solution for university campuses

Initial Technical Requirements were given (e.g. electric drive, more than two wheels)

Team: Three master students and one PhD student from mechanical engineering; no experience in service engineering

After six months: a rough prototype

PSS, Customer Acceptance, User Experience, Agile processes
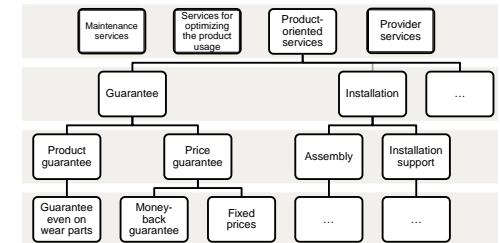
# Procedure adapted to student project



Model of Customer Acceptance
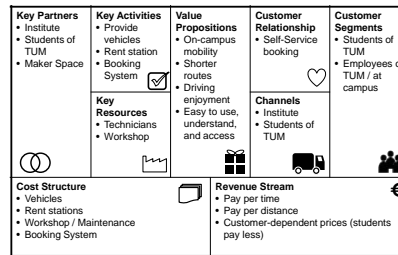


Business Model Canvas



Service Catalogue

Basic

Initial Determination

Target tuning

Identification

**Requirements** — **R1** → **Concepts Generation**

User Tests, Focusing on User Experience

**R2**

- **2 iterations**
- **2 prototypes**

**Conceptual Solution** ← **R3** — **Concepts Evaluation**
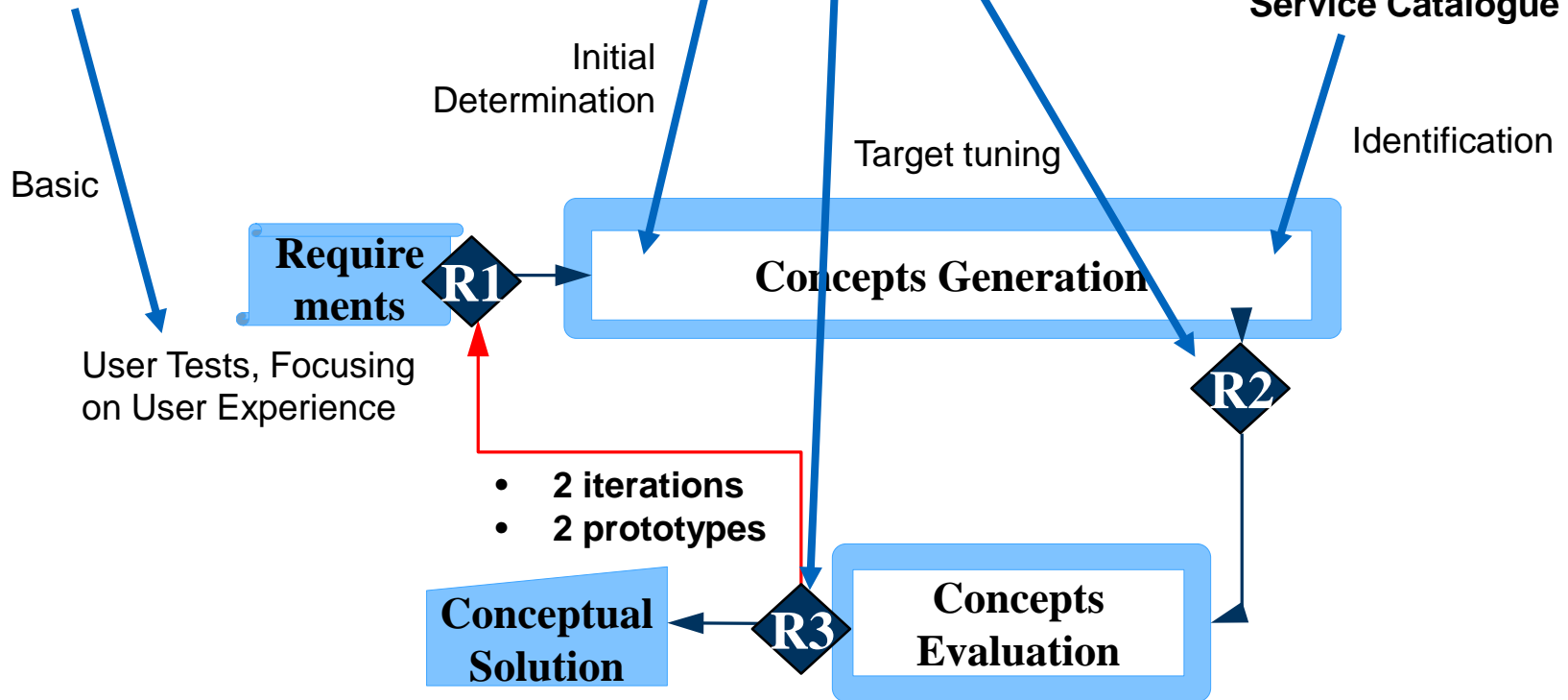
# Application: business model canvas

| Key Partners | Key Activities | Value Propositions | Customer Relationship | Customer Segments |
|---|---|---|---|---|
| • Institute<br>• Students of TUM<br>• Maker Space | • Provide vehicles<br>• Rent station<br>• Booking System ☑<br><br>**Key Resources**<br>• Technicians<br>• Workshop | • On-campus mobility<br>• Shorter routes<br>• Driving enjoyment<br>• Easy to use, understand, and access | • Self-Service booking ♡<br><br>**Channels**<br>• Institute<br>• Students of TUM | • Students of TUM<br>• Employees of TUM / at campus |

| Cost Structure | Revenue Stream |
|---|---|
| • Vehicles<br>• Rent stations<br>• Workshop / Maintenance<br>• Booking System | • Pay per time<br>• Pay per distance<br>• Customer-dependent prices (students pay less) |

→ **Station-based e-board sharing system**

# Application: model of customer acceptance

- User surveys focusing on requirements (just ideas from the model):

  - Need for on-campus mobility

  - Low willingness to pay

  - Easy to use and to book

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Installation of charging system and battery | | | | | | | - | - |
| Mounting of the charging system to the pedelec | | - | | | | | - | - |
| Protection against humidity and moisture | | | | - | - | | | - |
| Cooling of the charging system | | | | | | | - | |
| Connection between charging system and socket | | | | | | | - | |
| . . . | | | | | | | | |
| *Anti-theft protection* | | | | | | | - | - |



**Model of Customer Acceptance**

- Detailed analysis of the customer acceptance was skipped

  - PSS concept too abstract

  - Product and services not known at this stage

> ➢ Product/services must be roughly known to investigate customer acceptance
> ➢ Model of customer acceptance might support in identifying customer require.

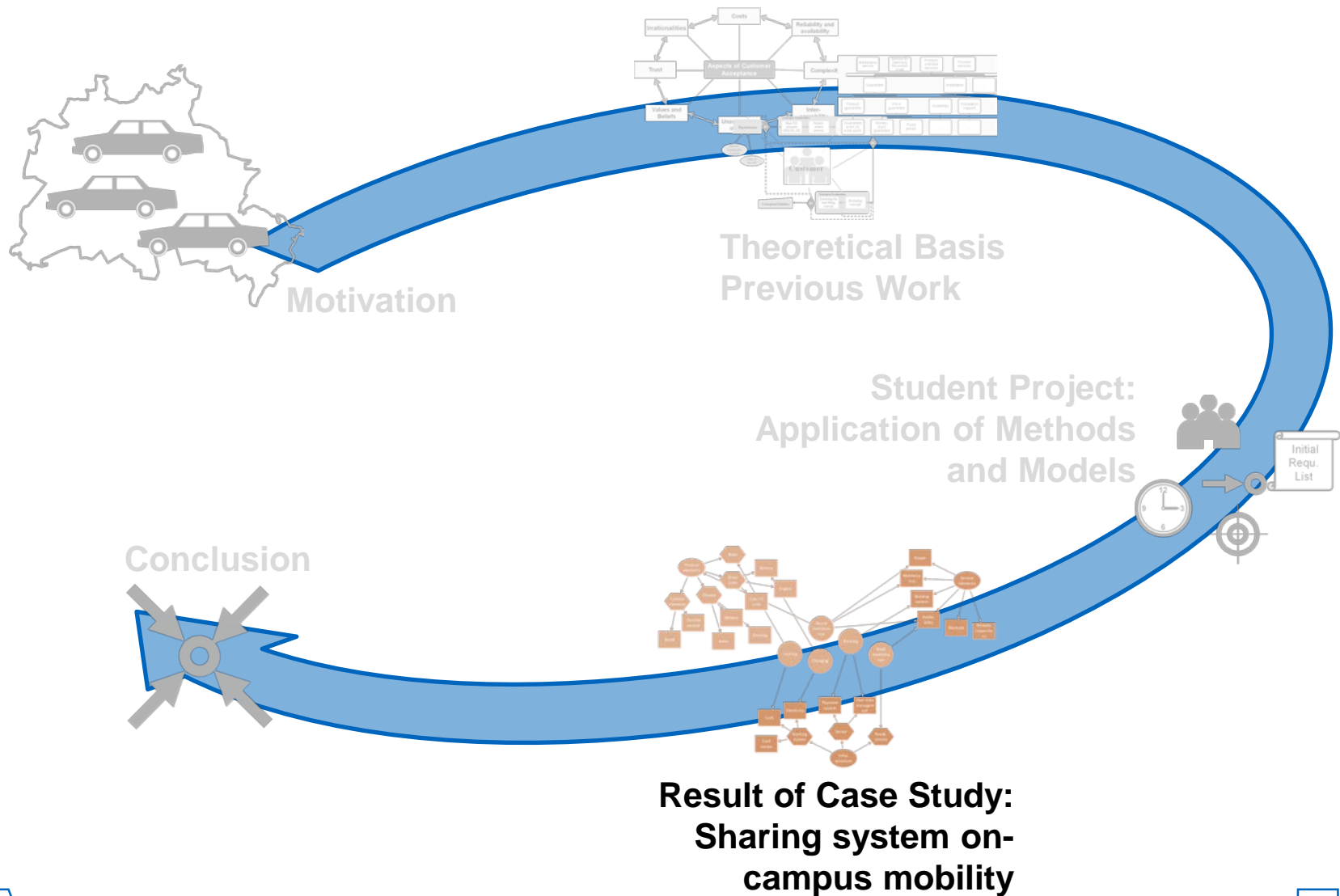# Application: service catalogue


**Service Catalogue**
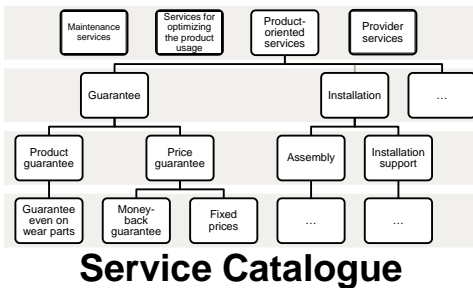
- Identification of relevant services for e-board sharing system, based on business model canvas

- Product-oriented services
  - Supporting the user in understanding the e-board (practical advice, manuals, description)
- Maintenance services
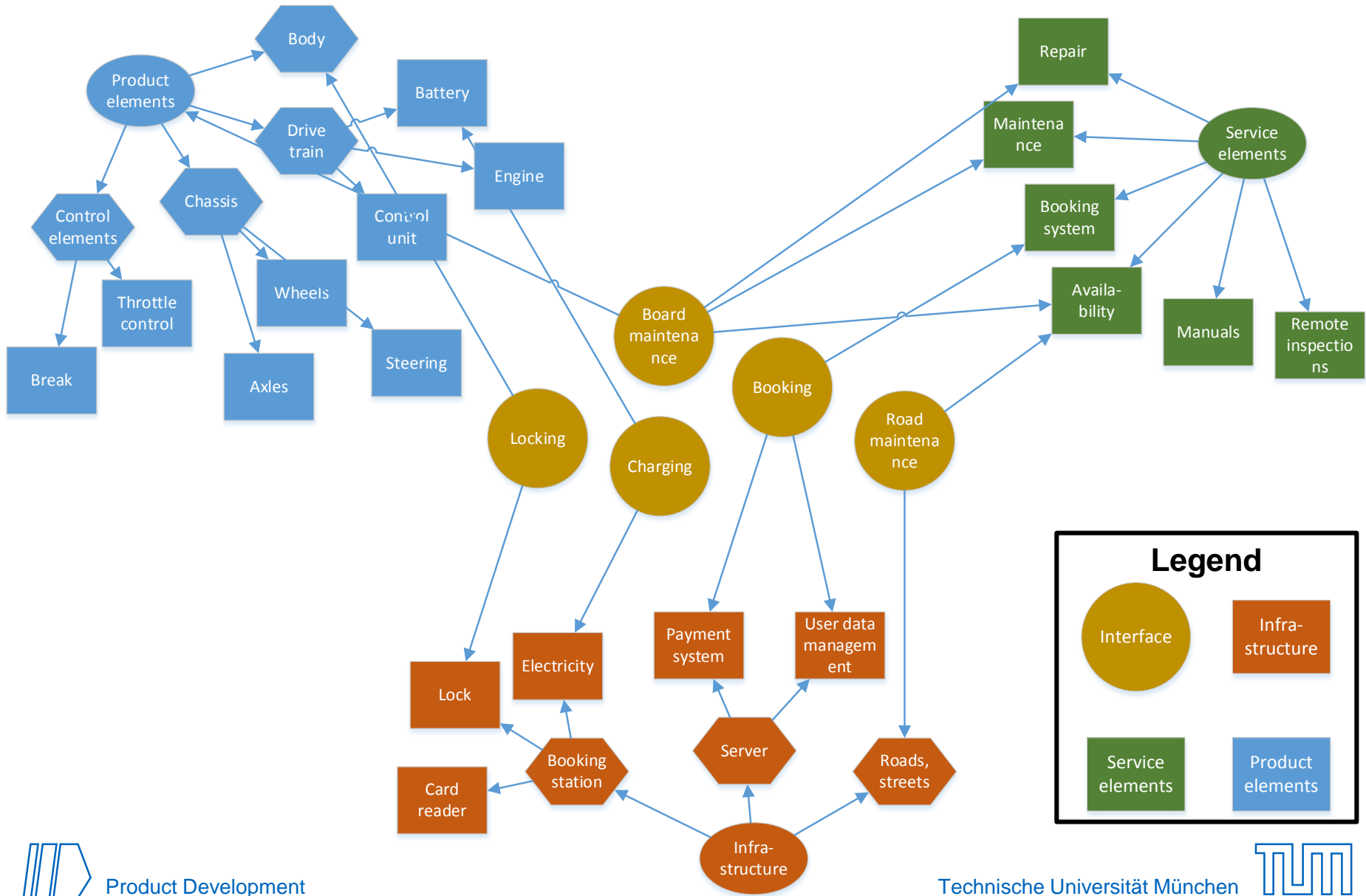  - Enabling a continuous usage of the e-board (availability, repair, maintenance, remote inspections…)


**Service Structure E-Board**
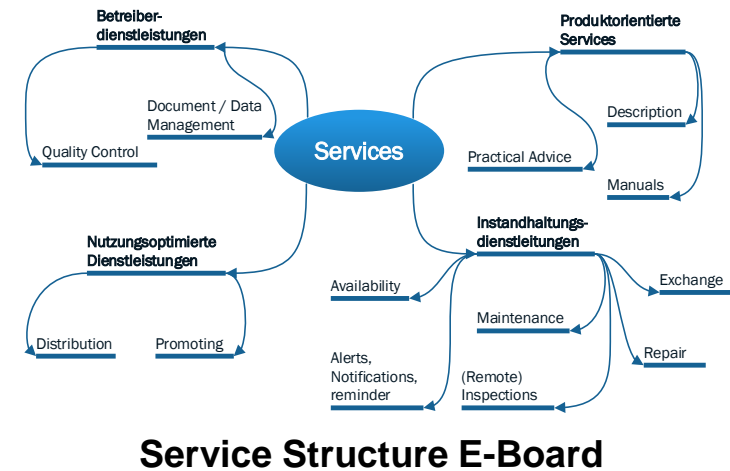
> ➤ The catalogue supported PSS designers
> ➤ Some services were misunderstood (possible cause: different market)

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# PSS structure of e-board sharing system (excerpt)

# Prototypes of two iterations
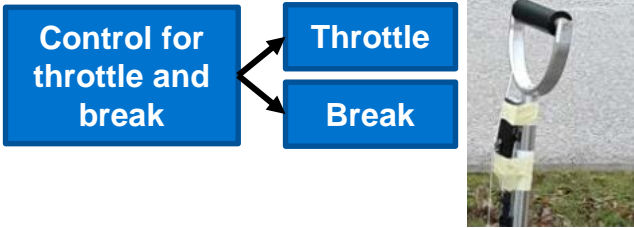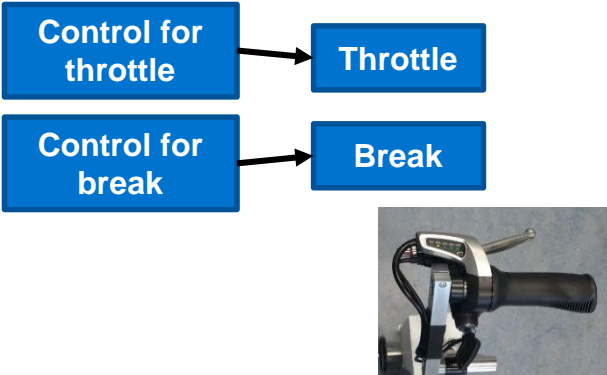
## 1. Iteration

## 2. Iteration

# Implications from iterations

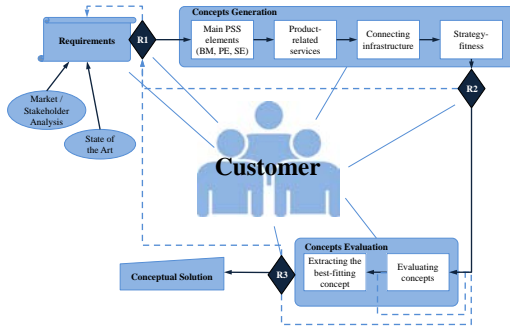| System | 1. Iteration | 2. Iteration |
|---|---|---|
| Body of e-board |  |  |
| Control units for throttle and break |  |  |
| Interface User – Booking station | Basic booking station | • Locking mechanism<br>• NFC-reader<br>• Microcontroller |

# Impression of second prototype

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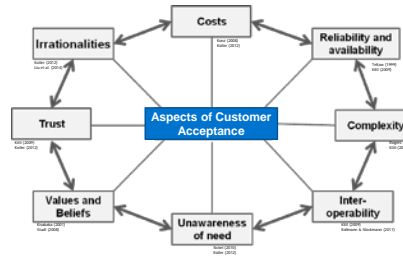Sharing system on-
campus mobility
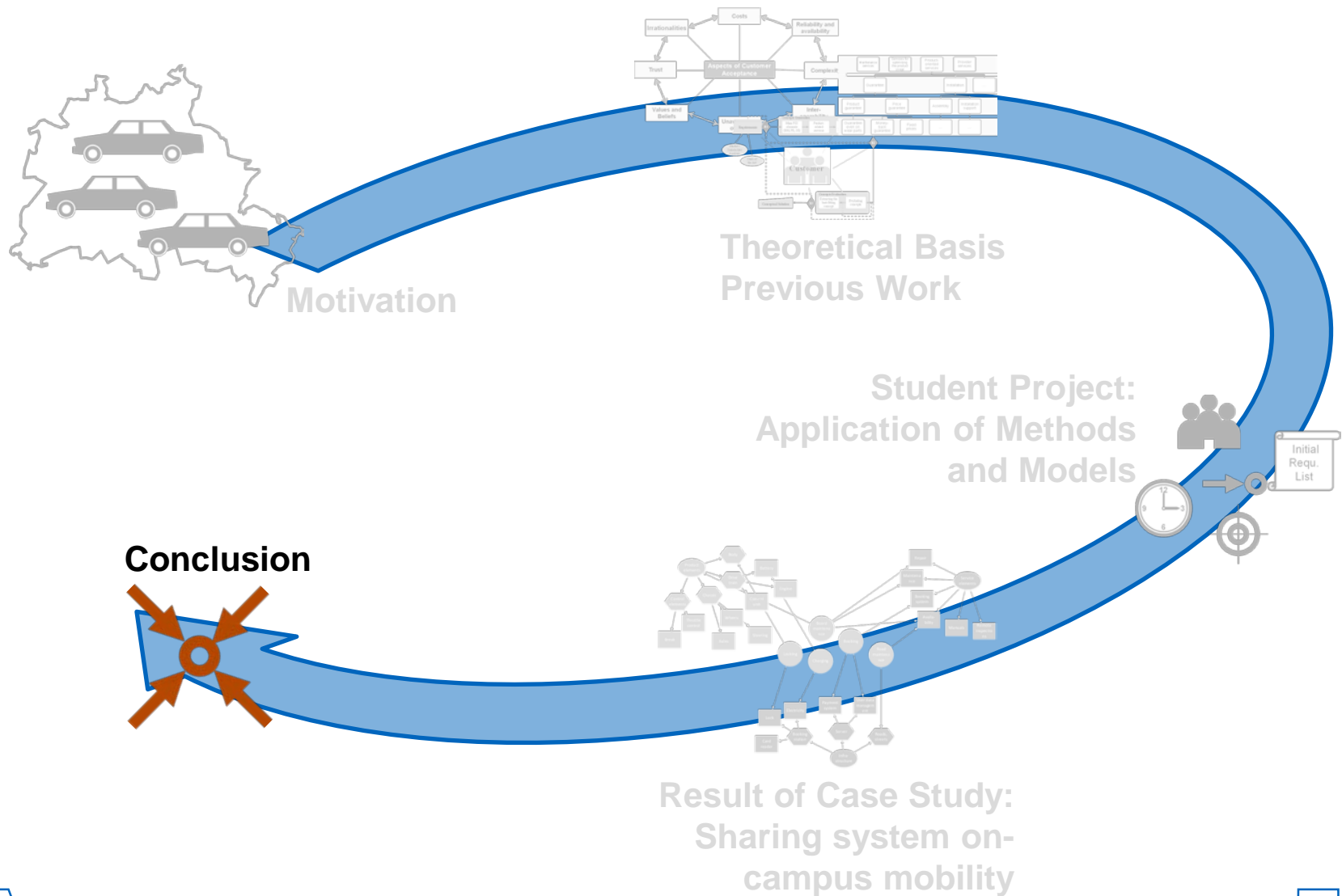
# Conclusion



**Decision-Making Process**

- Suitable measure for engineers and unexperienced designers
- Very abstract, extendable by business model canvas
- Process only not sufficient: further methodical support required



**Model of Customer Acceptance**

- Just used as a basic for identifying customer requirements
- More useful if the product/service is better known
- Other case studies for evaluation
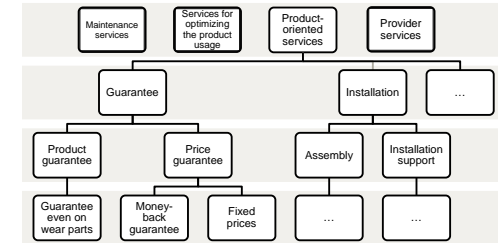


**Service Catalogue**

- Better differentiation between B2B and B2C services necessary
- Services should be better described to prevent misunderstanding
- Support in selecting suitable services might help designers

# Thank you for the attention!

Osterwalder et al. (2010)
A. Osterwalder and Y. Pigneur, Business Model Generation – A Handbook for Visionaries, Game Changers, and Challengers. New York: John Wiley & Sons, 2010.

Schmidt et al. (2014)
D. M. Schmidt, P. Bauer, and M. Mörtl, "Product-Service Systems for influencing customer barriers and customer acceptance," Journal of Economics, Business and Management, vol. 3, 2014.

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D. M. Schmidt, O. Malaschewski, and M. Mörtl, "Decision-making Process for Product Planning of Product-Service Systems," Procedia CIRP, vol. 30, pp. 468-473, 2015.

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D. M. Schmidt, O. Malaschewski, D. Fluhr, and M. Mörtl, "Customer-oriented Framework for Product-Service Systems," in 7th CIRP Conference on Industrial Product-Service Systems, St. Etienne, 2015.

Schmidt et al. (2015c)
D. M. Schmidt, D. Kammerl, A. Preuß, and M. Mörtl, "Decision Methodology for Planning Product-Service Systems," presented at the International Conference on Business, Information, and Service Science, Taipei, Taiwan, 2015.

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