

# Who realizes a PSS?: an organizational framework for PSS development

by

**Koji Kimita, Kentaro Watanabe, Tatsunori Hara, Hitoshi Komoto**

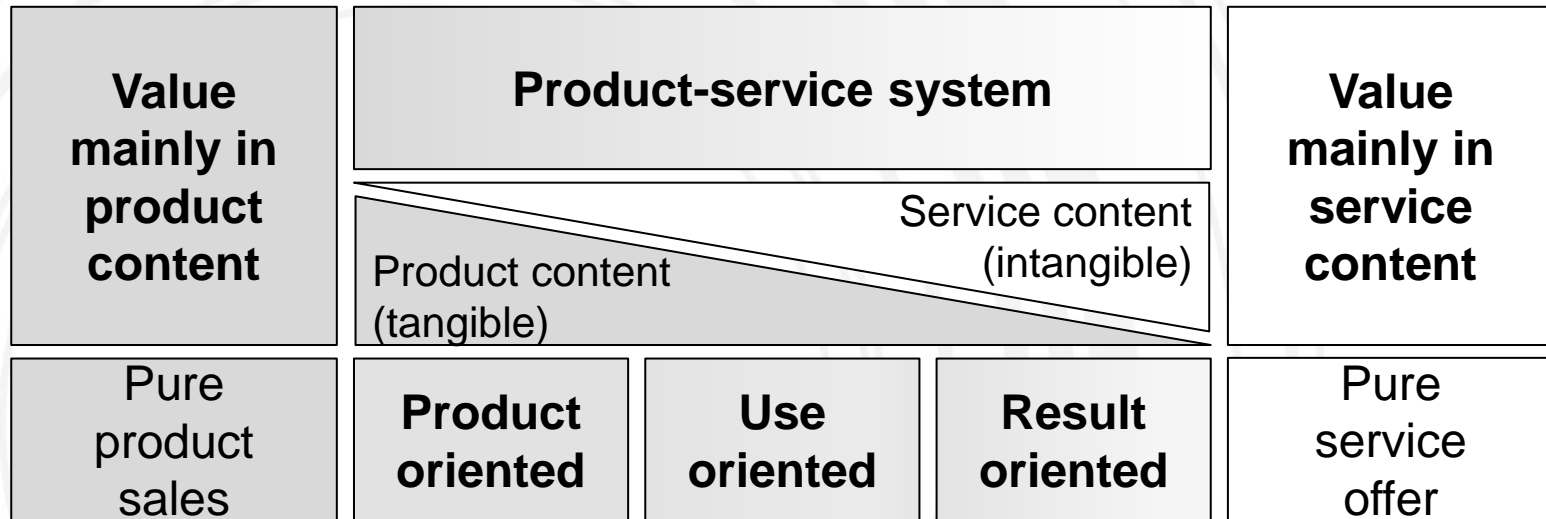
Presenting Author: Koji Kimita

AFFILIATION Department of System Design, Tokyo Metropolitan University, Asahigaoka 6-6  
Hino-shi, Tokyo, Japan  
[kimita@tmu.ac.jp](mailto:kimita@tmu.ac.jp)

# Introduction

## I Product-Service System

- A Product Service system (PS system, or product service combination) is a marketable set of products and services, jointly capable of fulfilling a client's need [Goedkoop 1999]



Service added to product; advice related to product

Product lease; Product renting/sharing; Product pooling

Activity management; Functional result

[Tukker 2004]

# Objective of this study

## I Problems in designing a Product-Service System

- HOW TO realize a PSS?
  - » Many researchers have proposed PSS development methods
- WHO realizes a PSS?
  - » Difficulties still remain with regard to constructing an organization for PSS development
    - Organizational change requires the involvement of new and varying types of stakeholders
    - Development process involving various stakeholders requires mutual understanding

## I Objective of this study

- Proposing an organizational framework for PSS development
  - » Represented as a network of organizations and members with specific roles
- Pointing out problems on constructing the organization for PSS development
- Introducing the PSS development methods that can solve each problem

# Organizational changes required for PSS development



## Changing organizational processes and capabilities

- Guidance strategies for implementing a PSS [Aurich 2004]
  - » Positing a design process in which manufacturing companies can integrate both product design and service design
- Capabilities required for realizing a successful PSS [Karni 2013]
  - » Each factor contains levels that represent paths toward the implementation of a PSS

## Involvement of new and varied types of actors

- Typology for PSS network organization [Meier 2008]
  - » Used to build a new network organization concept for PSS delivery

# An organizational framework for PSS development

## I Problem in construing the organization for PSS development

- Manufacturing companies need to change their organizational structures both internally and externally

## I Overview

- Developing a holistic approach toward constructing an organization for PSS development
  - » proposing an organizational framework that consider both the internal and external perspectives

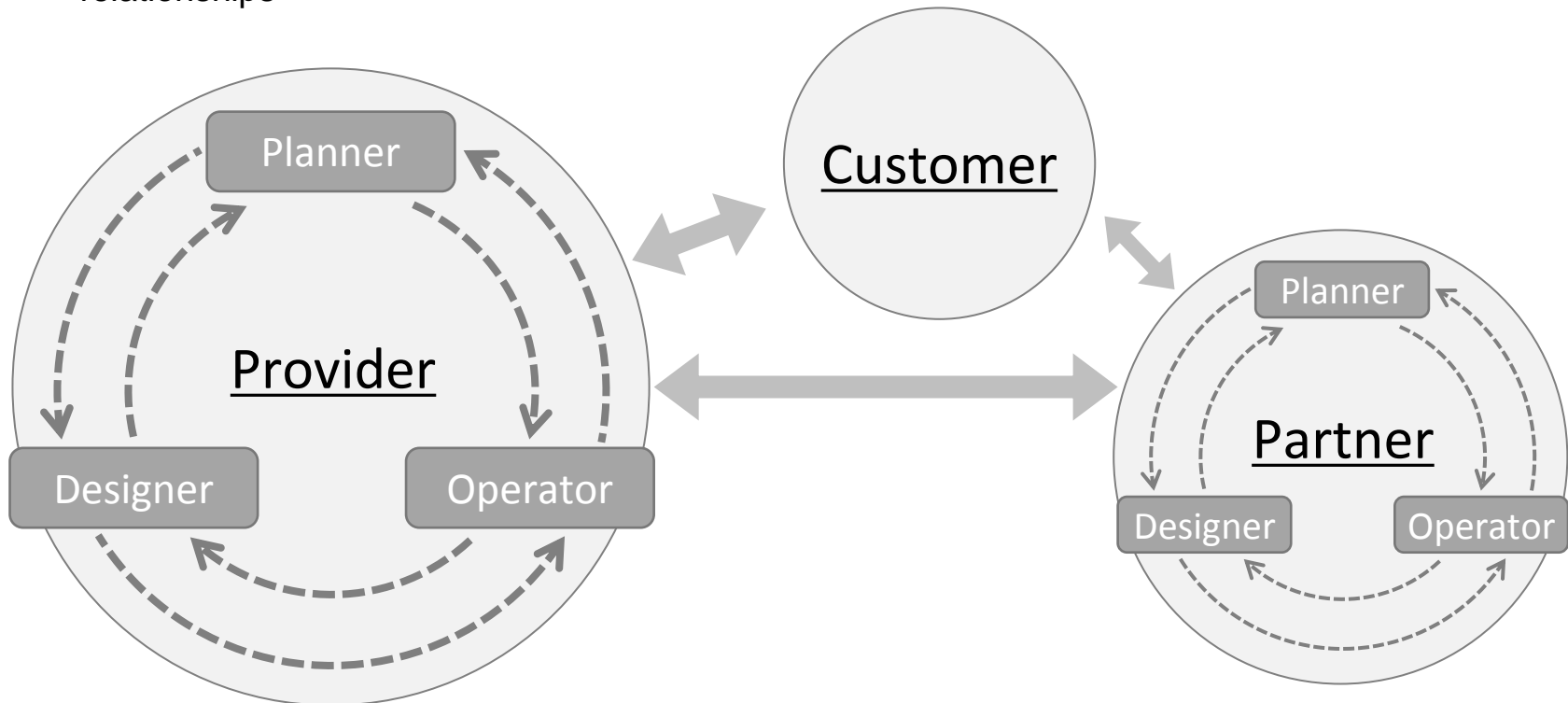
## I Methodology for building the framework

- Conducted literature review on PSS organization
- Revealed key characteristics for internal and external perspectives

# Characteristics of the organizational framework

## Characteristics

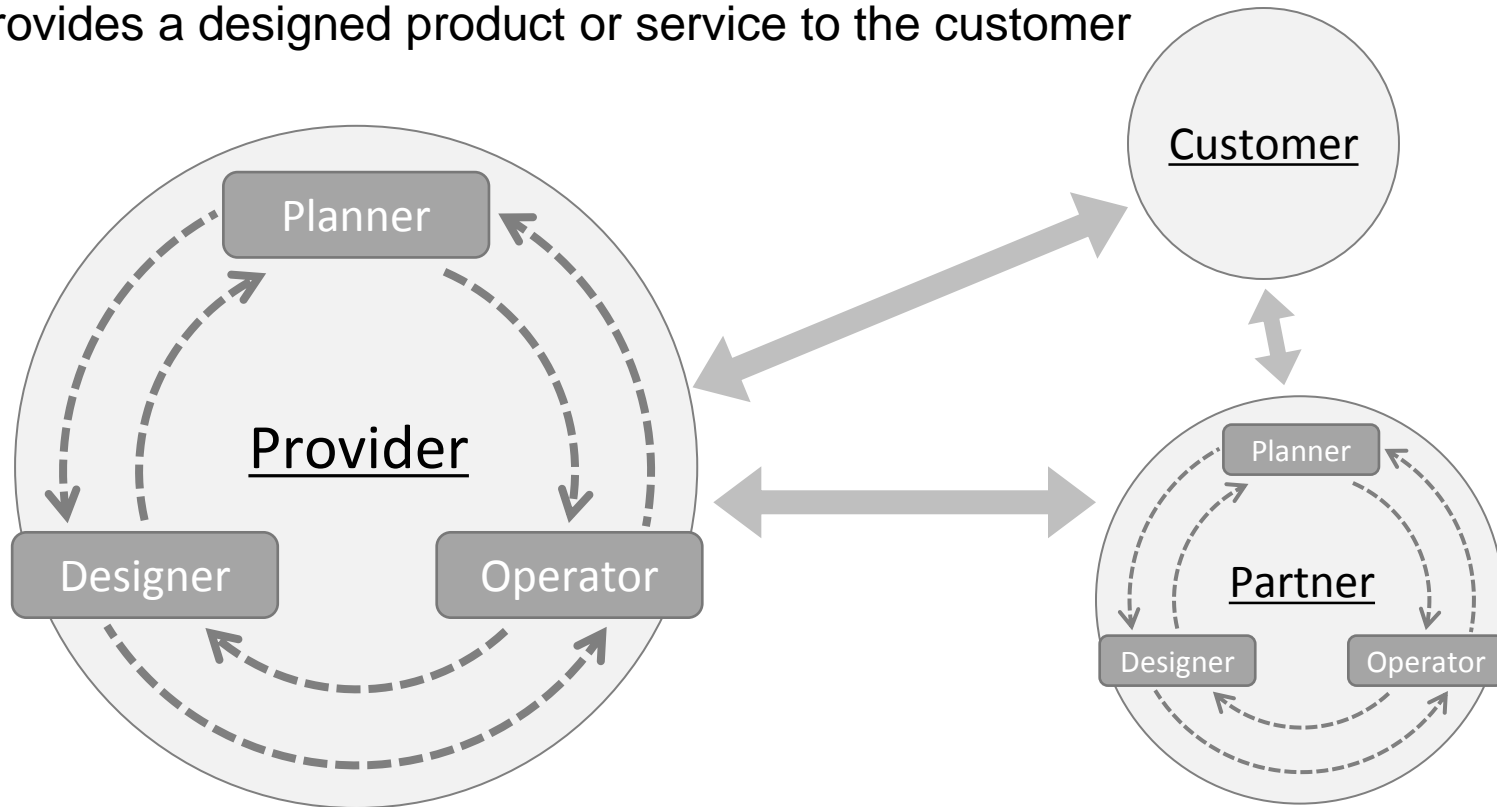
- Internal perspective
  - » Members that play essential roles in PSS development and the interactions required between them
- External perspective
  - » types of organizations that should be involved in PSS development and their necessary inter-relationships



# Internal organization

## Members

- **Planner** defines the responsibilities of one's organization through interactions with relevant planners in other organizations
- **Designer** determines the structure of a product or service
- **Operator** provides a designed product or service to the customer



# Internal organization

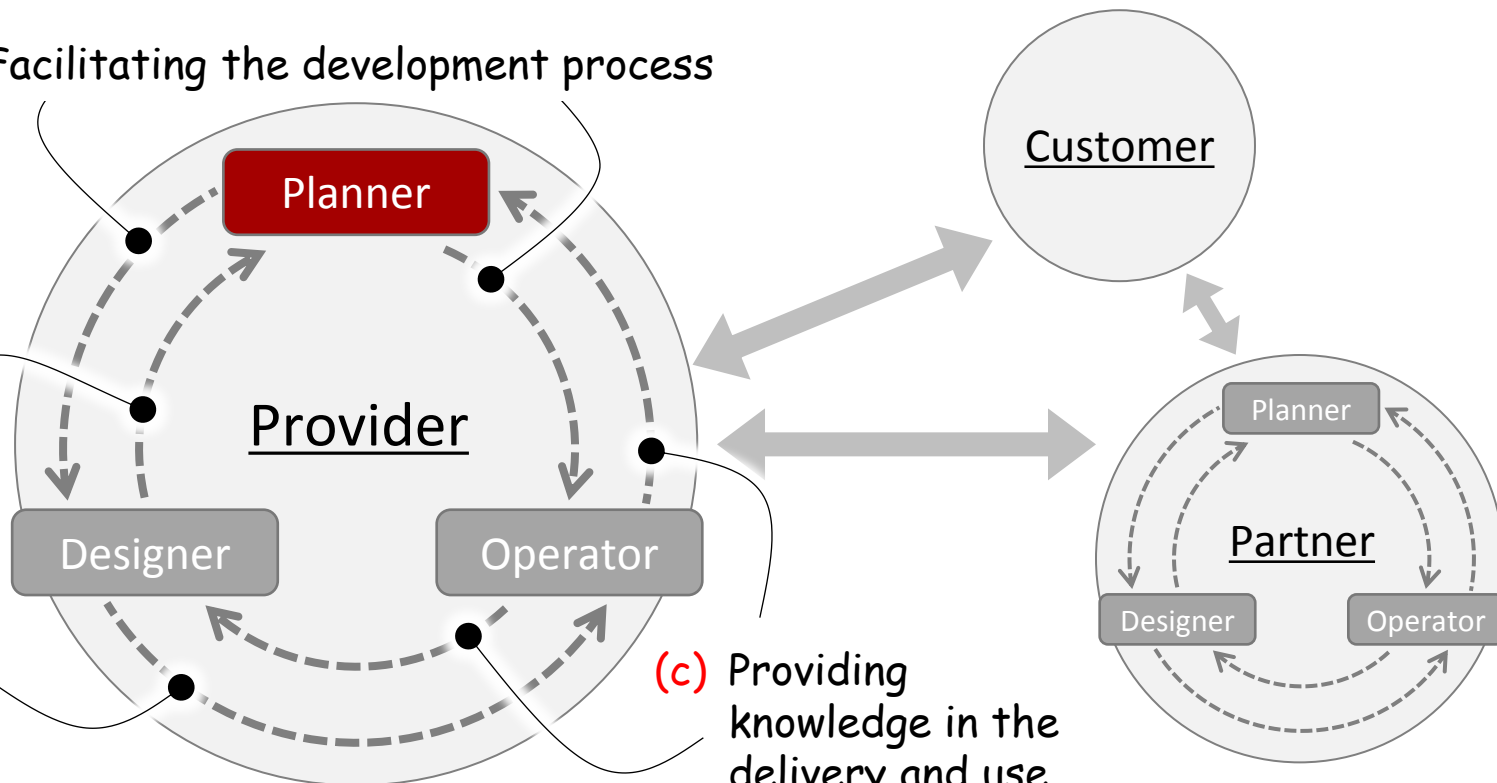
## Planner

- Facilitating the development process within the organization
  - » The implementation of a PSS involves dynamic changes

(a) Facilitating the development process

(b) Clarifying the organizational responsibilities and operational requirements

(c) Providing knowledge in the delivery and use phases



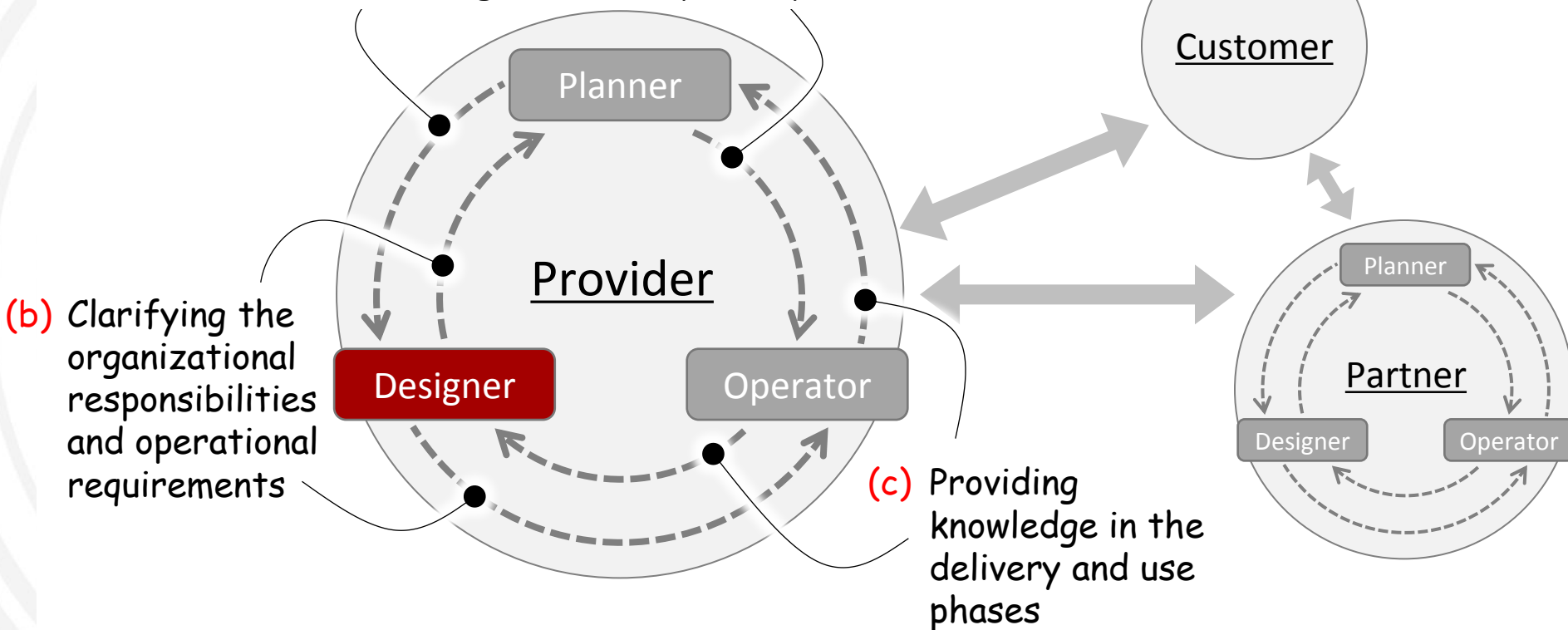


# Internal organization

## Designer

- Optimization of the product and the service structure is required
  - » Communicates with the planner for clarifying the overall responsibilities
  - » Involves the operator to consider requirements and constraints

(a) Facilitating the development process



# Internal organization

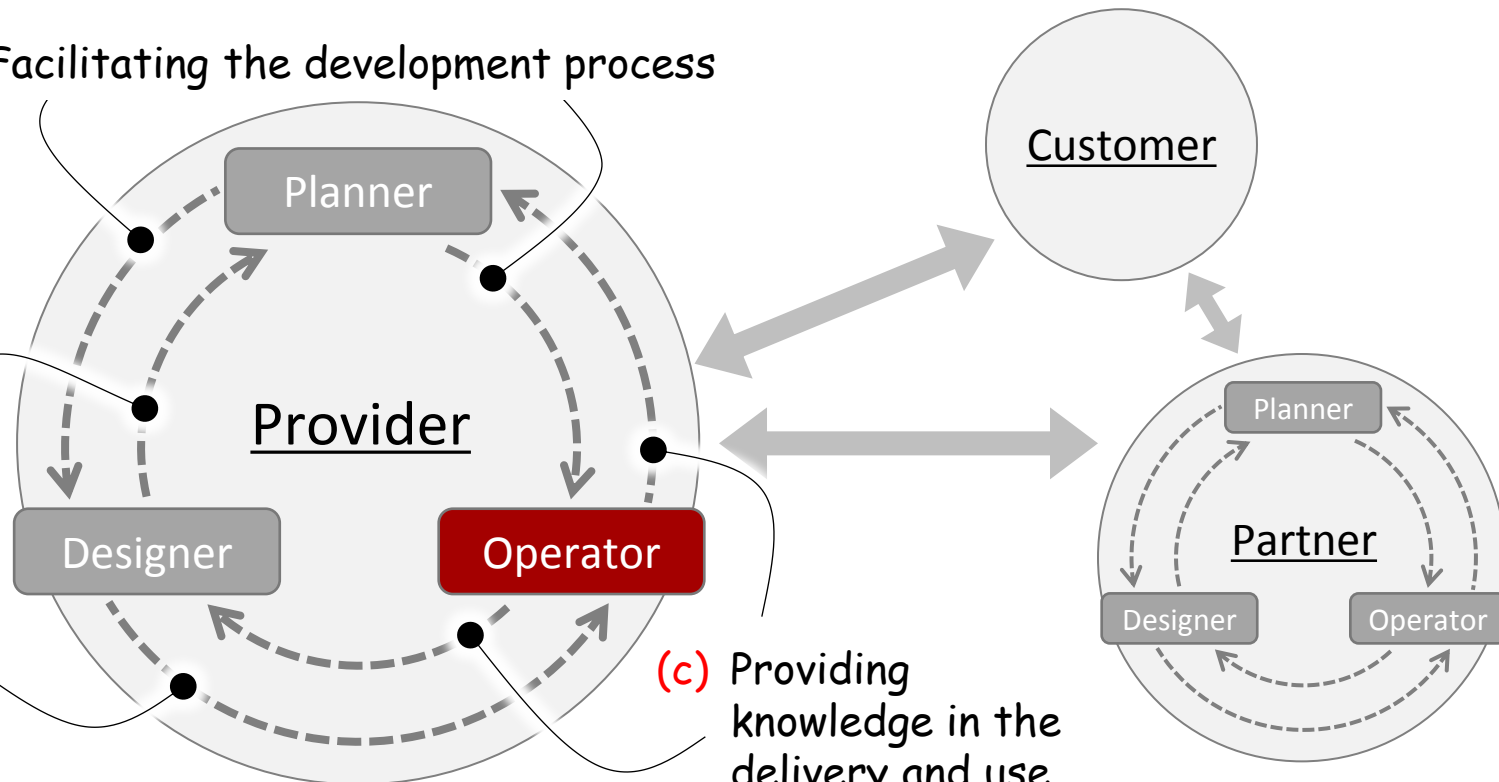
## Operator

- Obtain knowledge about the delivery and use phases, feeding it back to the planner and designer
  - » Provider can gain various kinds of knowledge during the delivery and use phases

(a) Facilitating the development process

(b) Clarifying the organizational responsibilities and operational requirements

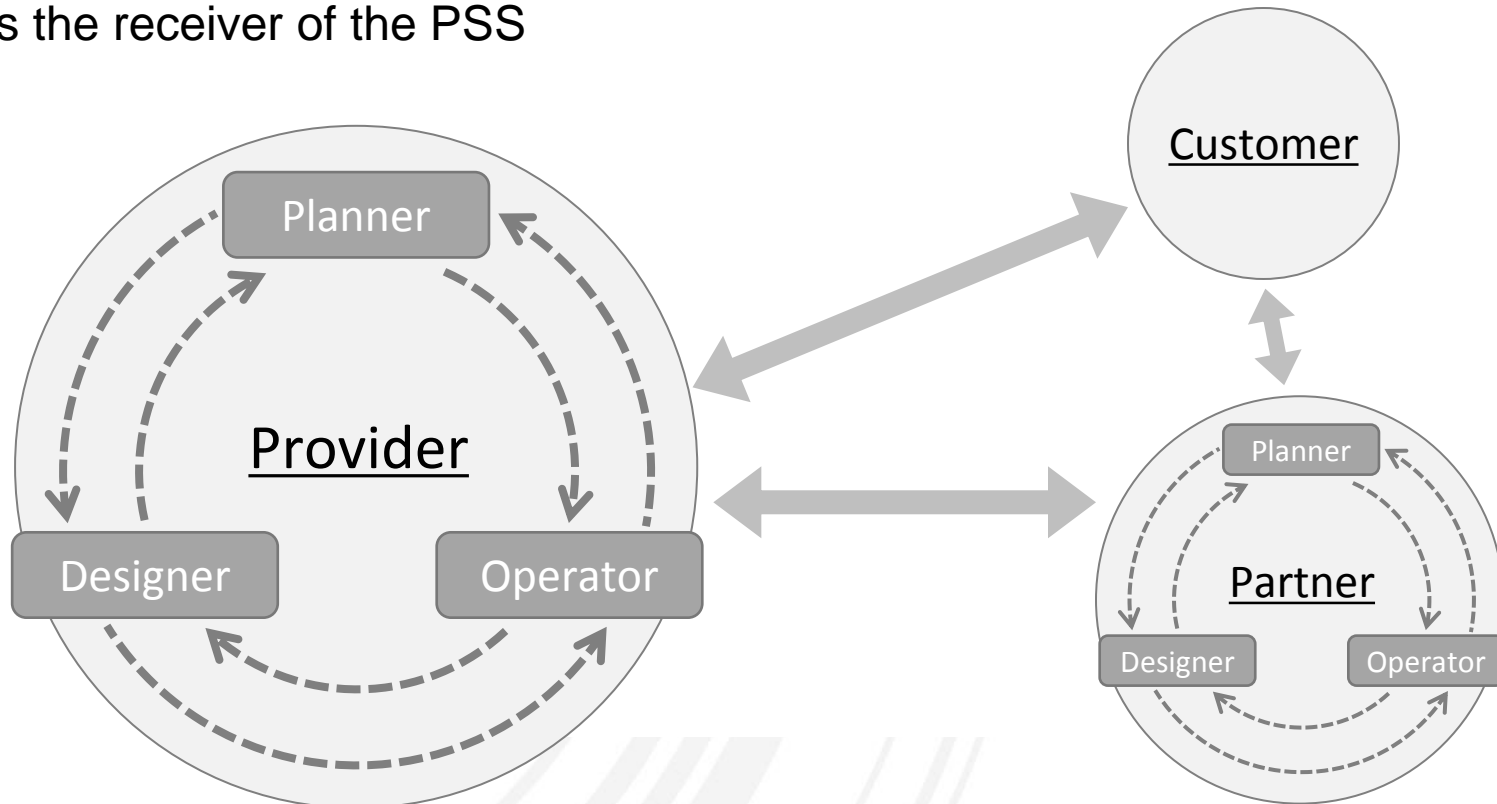
(c) Providing knowledge in the delivery and use phases



# External organization

## External organizations

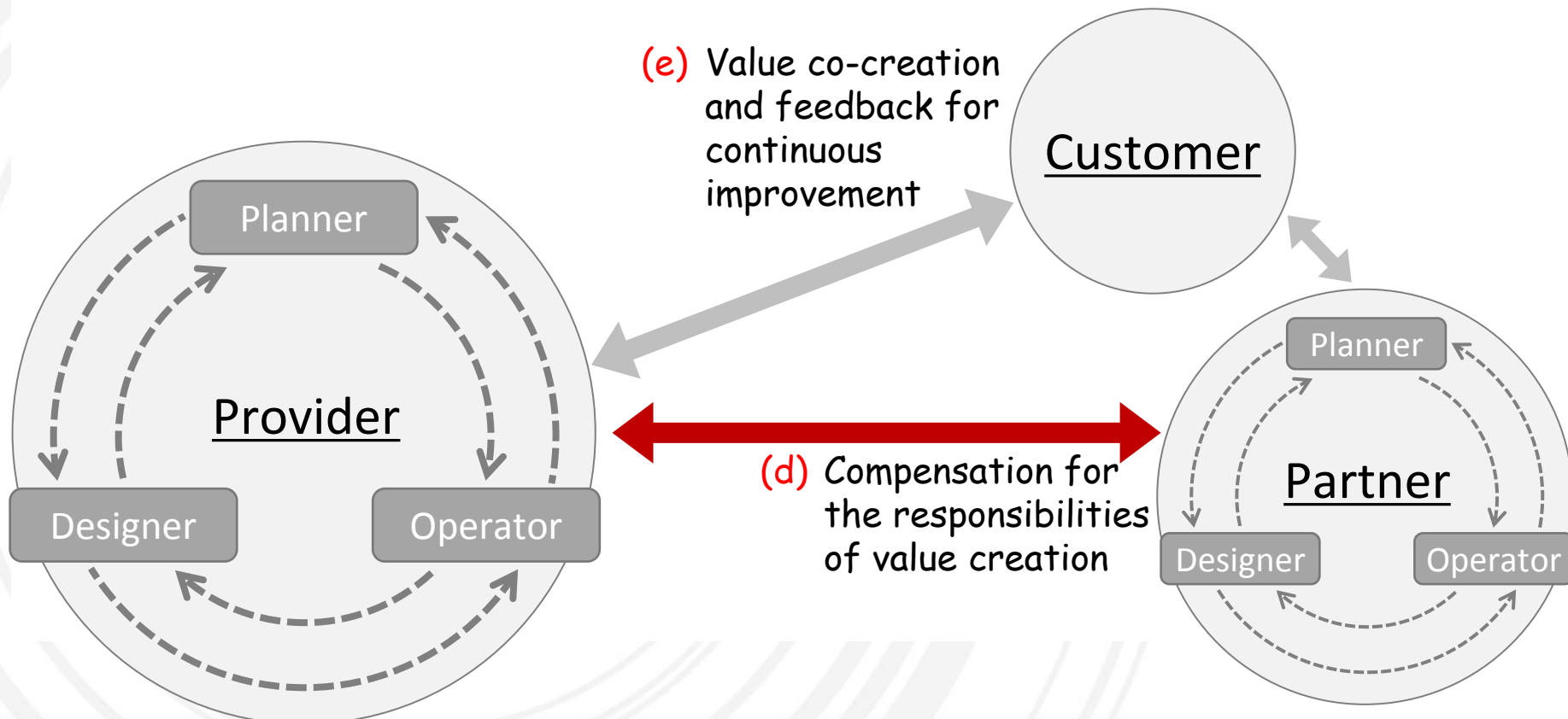
- **Provider** corresponds to an organization that wishes to realize a PSS and to construct an organization for the PSS development
- **Partner** supplies the components of the PSS, such as products and services
- **Customer** is the receiver of the PSS



# External organization

## Partner relationship

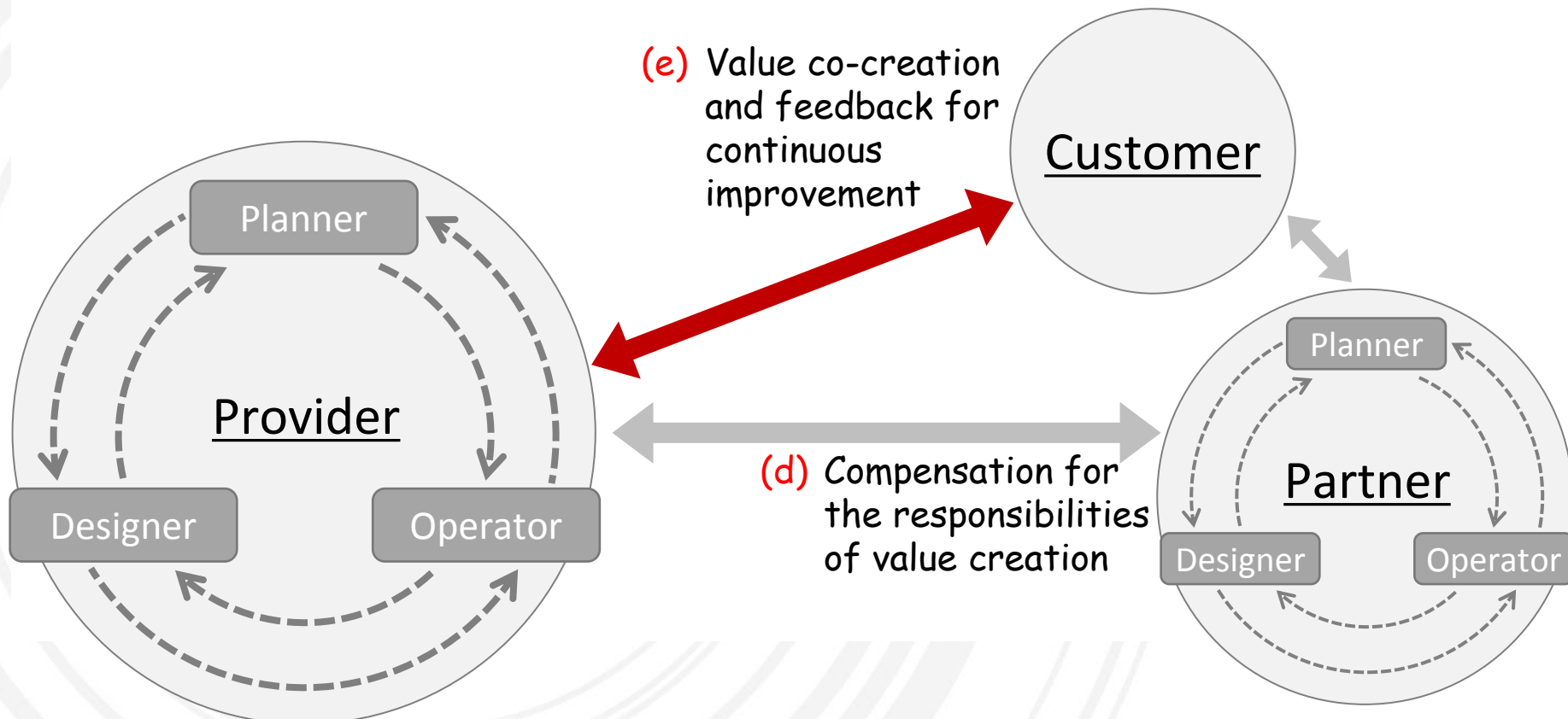
- It is necessary for the provider to collaborate with the partner(s)
  - » Provider needs to manage the product through its lifecycle as well as support the customer's activities



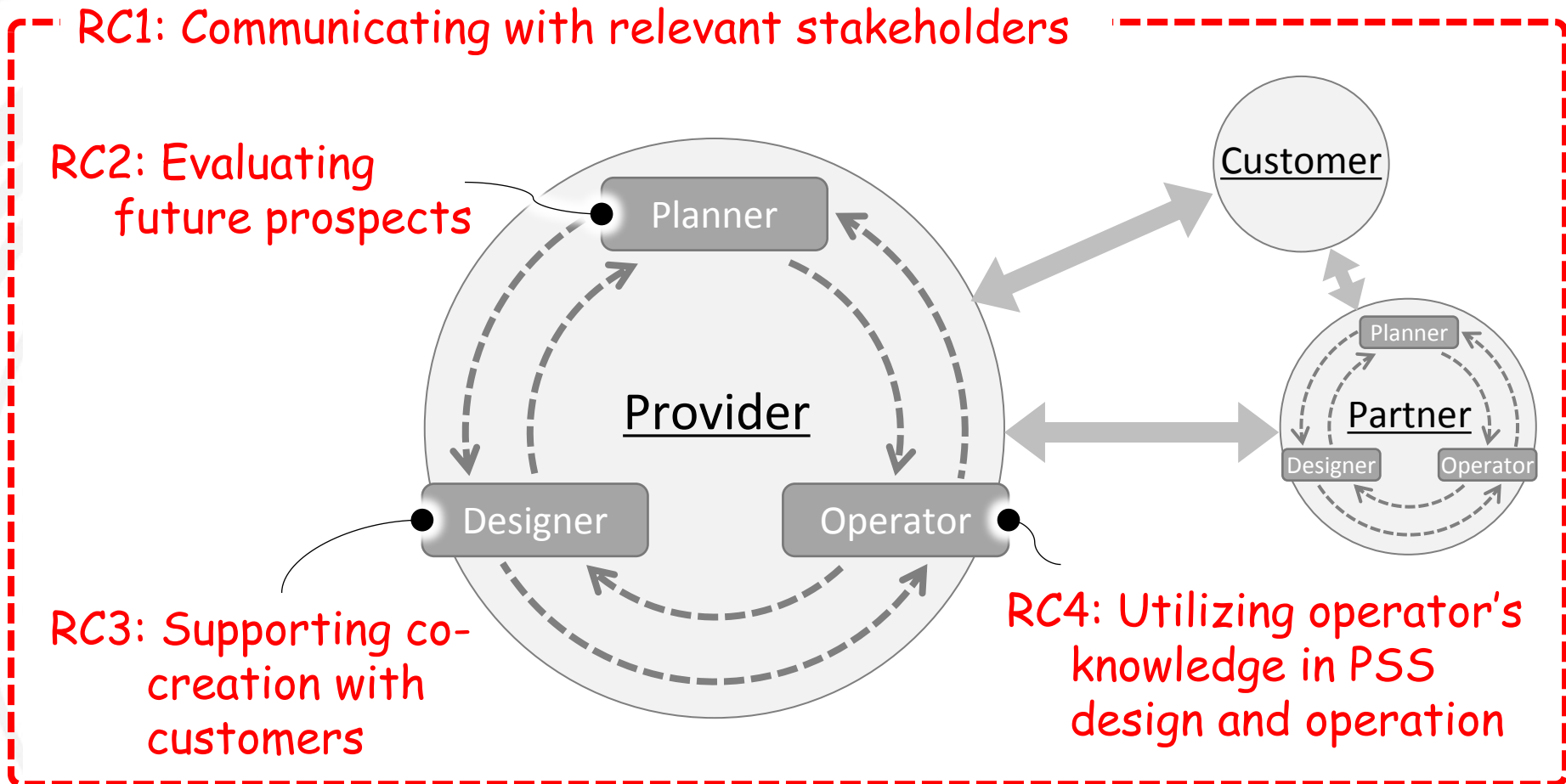
# External organization

## Customer relationship

- Early involvement with the customer is essential for PSS design
- Customers are regarded as co-producers in the value creation process
  - » playing an important role in giving productive feedback, facilitating continuous improvement



# Research challenges for constructing PSS organization

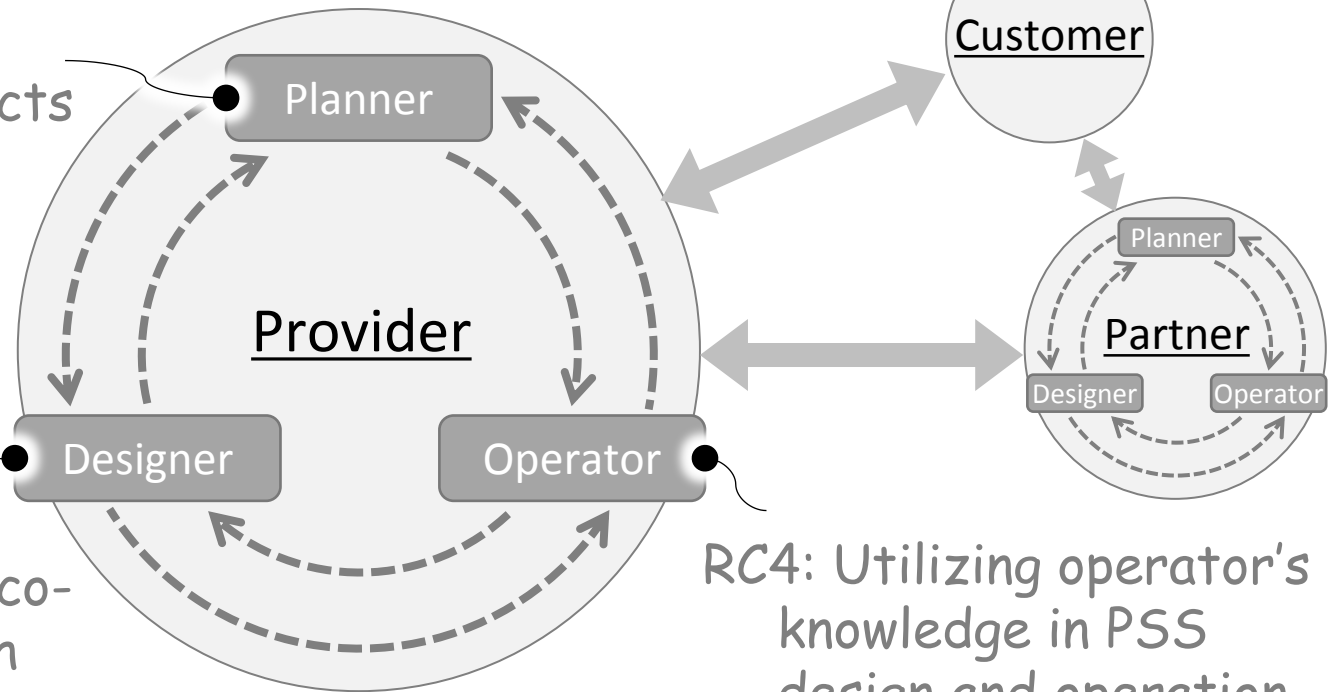


# Research challenges for constructing PSS organization



## RC1: Communicating with relevant stakeholders

RC2: Evaluating future prospects



RC3: Supporting co-creation with customers

RC4: Utilizing operator's knowledge in PSS design and operation

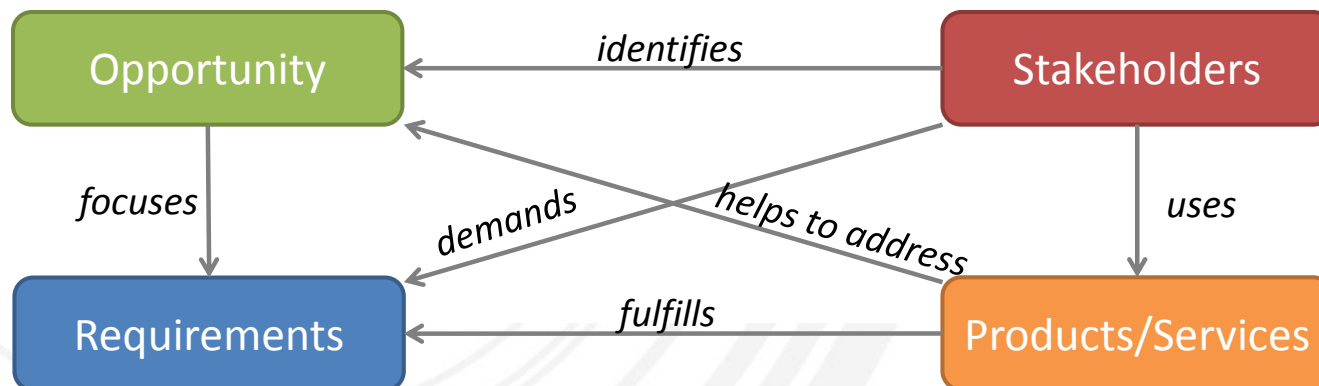
# Task management tool: PSS kernel

## RC1: Communicating with relevant stakeholders

- Planner has to consider the development process holistically
  - » Defining the responsibilities of the organization through interactions with the relevant planners in other organizations
  - » Facilitating the development process internally by collaborating with the designer and the operator

## PSS kernel

- Provides the essential elements for a PSS based on the concept of Software Engineering Methods and Theory (SEMAT)
  - » SEMAT is a practical software development framework





# Task management tool: PSS kernel

## Major factors

## States

## Checklists

Opportunity

- |                     |                   |
|---------------------|-------------------|
| ① Identified        | ④ Viable          |
| ② Solution Needed   | ⑤ Addressed       |
| ③ Value Established | ⑥ Benefit Accrued |

Stakeholders

- |               |                            |
|---------------|----------------------------|
| ① Recognized  | ④ In Agreement             |
| ② Represented | ⑤ Satisfied for Deployment |
| ③ Involved    | ⑥ Satisfied in Use         |

Requirements

- |             |              |
|-------------|--------------|
| ① Conceived | ④ Acceptable |
| ② Bounded   | ⑤ Addressed  |
| ③ Coherent  | ⑥ Fulfilled  |

Products/Services

- |                                 |                          |
|---------------------------------|--------------------------|
| ① <b>Actor network Selected</b> | ④ Ready                  |
| ② Demonstrable                  | ⑤ Operational            |
| ③ Useable                       | ⑥ Continuous Improvement |

*Actor network Selected*

- Criteria for selecting actors are agreed.
- Actors are identified.
- A plan for contracts are defined.

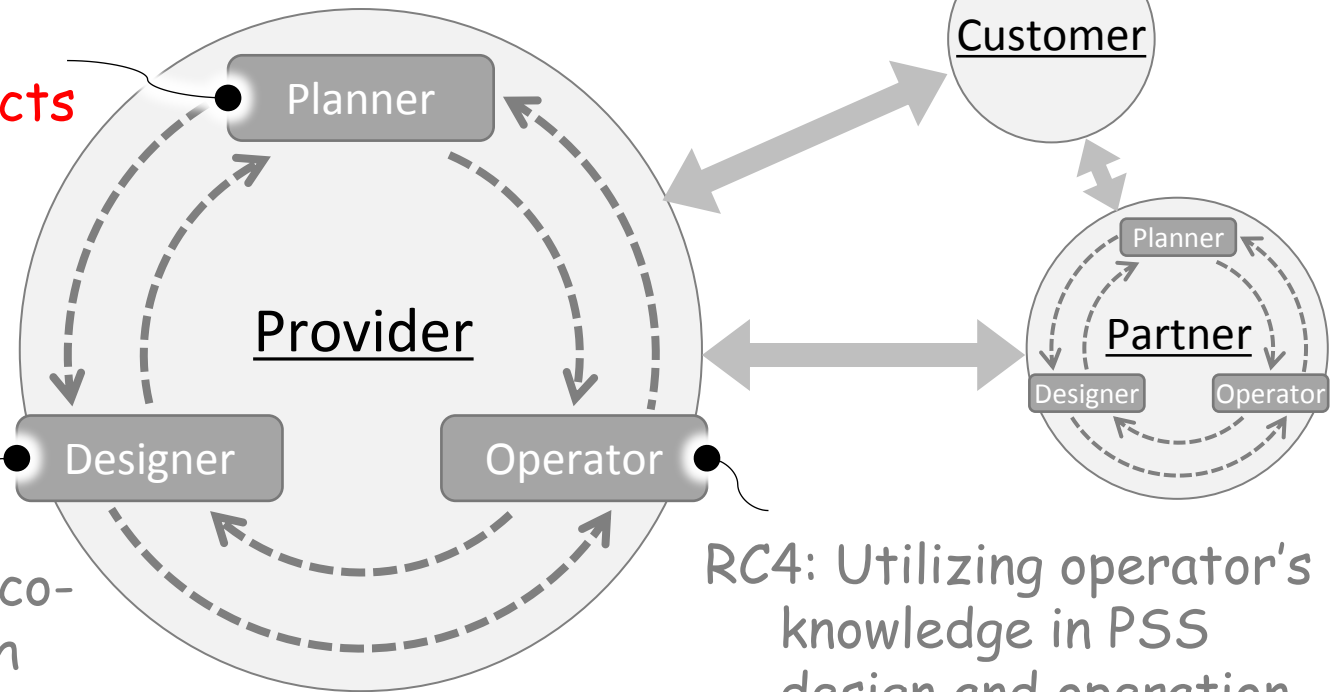
1/6

# Research challenges for constructing PSS organization

RC1: Communicating with relevant stakeholders

RC2: Evaluating  
 future prospects

RC3: Supporting co-  
 creation with  
 customers



RC4: Utilizing operator's  
 knowledge in PSS  
 design and operation

# Scenario modeling and simulation

## RC2: Evaluating future prospects, such as demands and supply

Wow! I can better communicate with designers about market situation and trends based on quantitative information

Wow! It helps picture my PSS regarding its scale, appropriate time and place for implementation!



Stat. information  
Market information

Future needs of service contents (e.g., mobility) and capacities of service channels (vehicles) in specific time and locations.

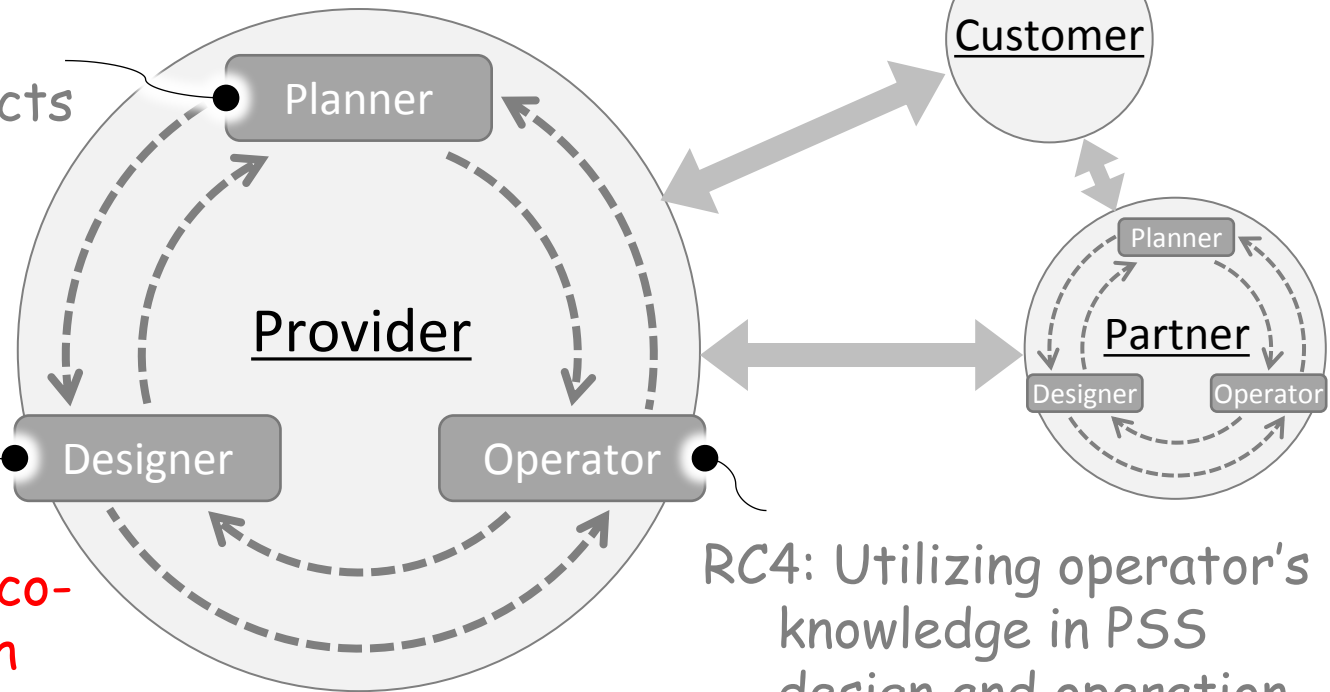
Year	ICEV	HEV	PHEV	BEV
2010	~38	~0	~0	~0
2015	~35	~1	~0	~0
2020	~30	~2	~0.5	~0.2
2025	~25	~3	~1.5	~0.5
2030	~20	~4	~3	~1.5

# Research challenges for constructing PSS organization



RC1: Communicating with relevant stakeholders

RC2: Evaluating future prospects



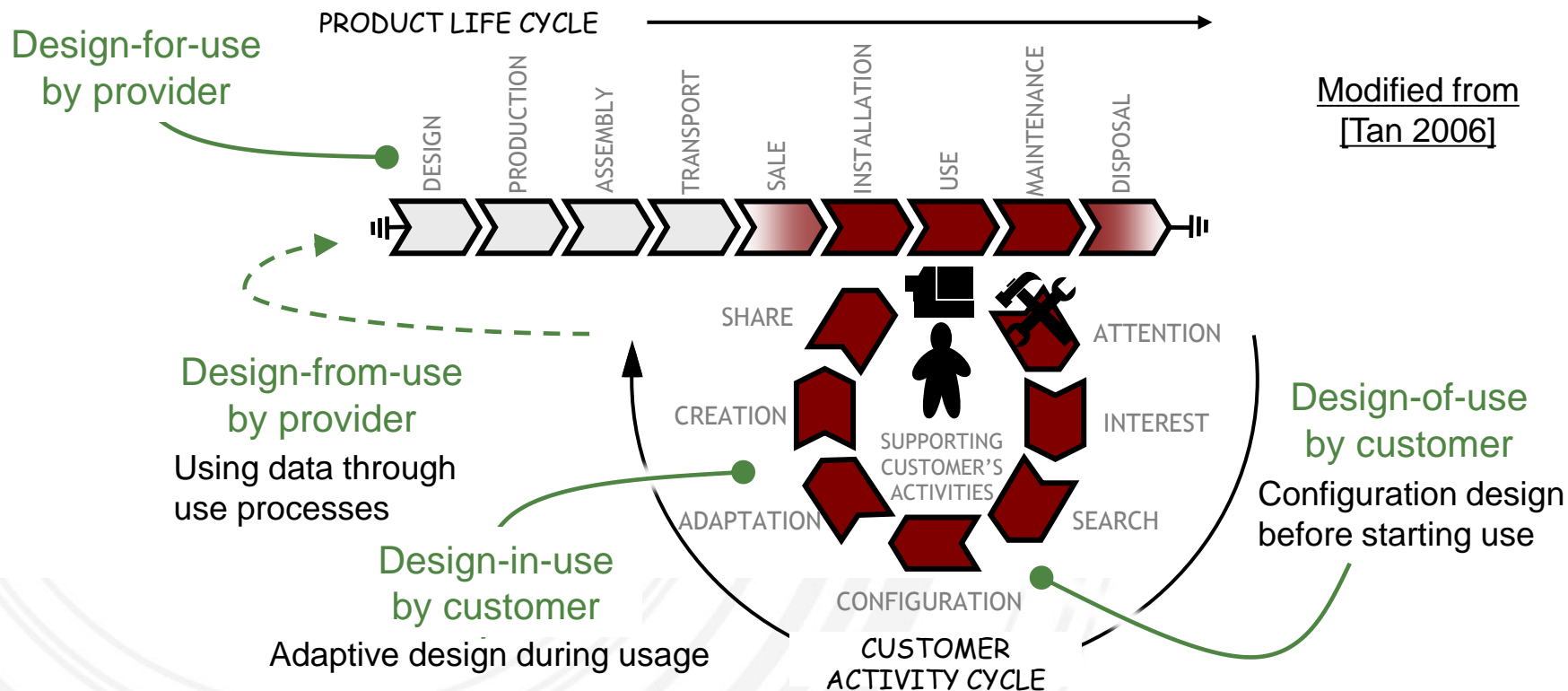
RC3: Supporting co-creation with customers

RC4: Utilizing operator's knowledge in PSS design and operation

# Mutual relationship b/w design and use

## RC3: Supporting co-creation with customers

- Prerequisite: fully understanding customer's activity cycles in use phase
- How to enhance value-in-use considering customer's contribution to PSS dev. ?
  - » A need for a holistic view of design as tightly coupled with practical use that continues during in use phase (e.g., [Hara et al. 2013])

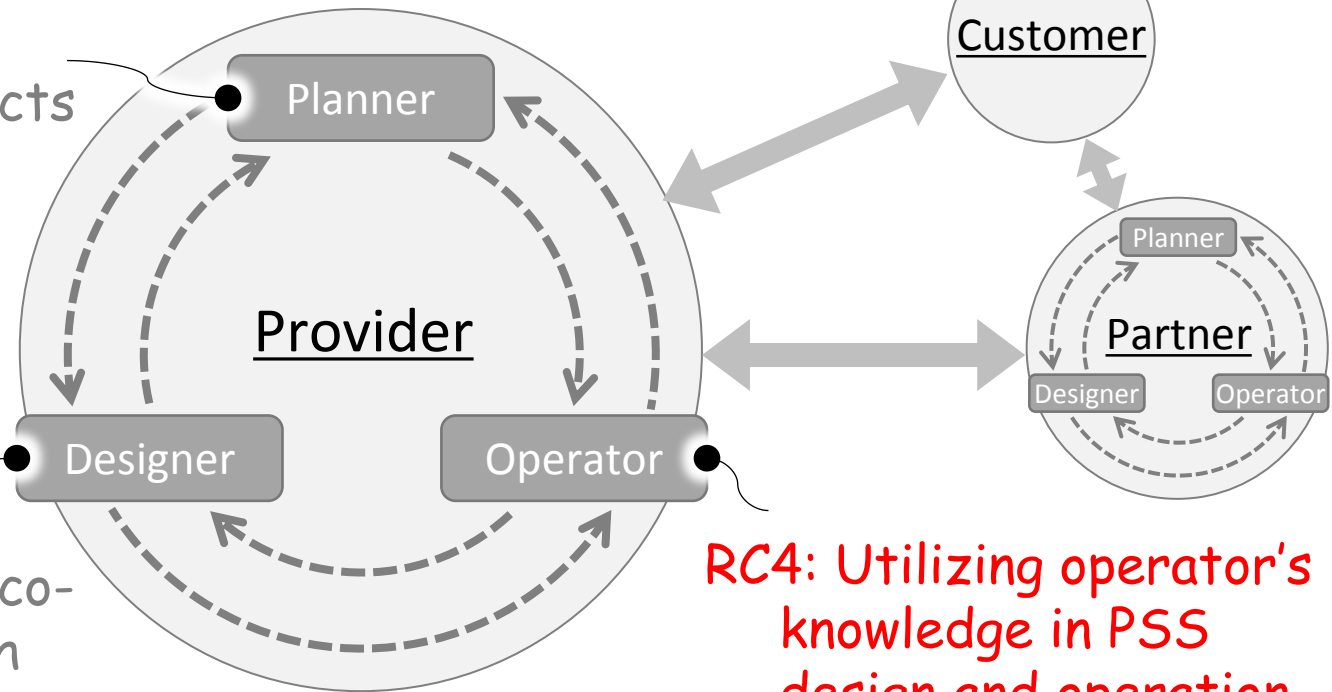


# Research challenges for constructing PSS organization

RC1: Communicating with relevant stakeholders

RC2: Evaluating future prospects

RC3: Supporting co-creation with customers

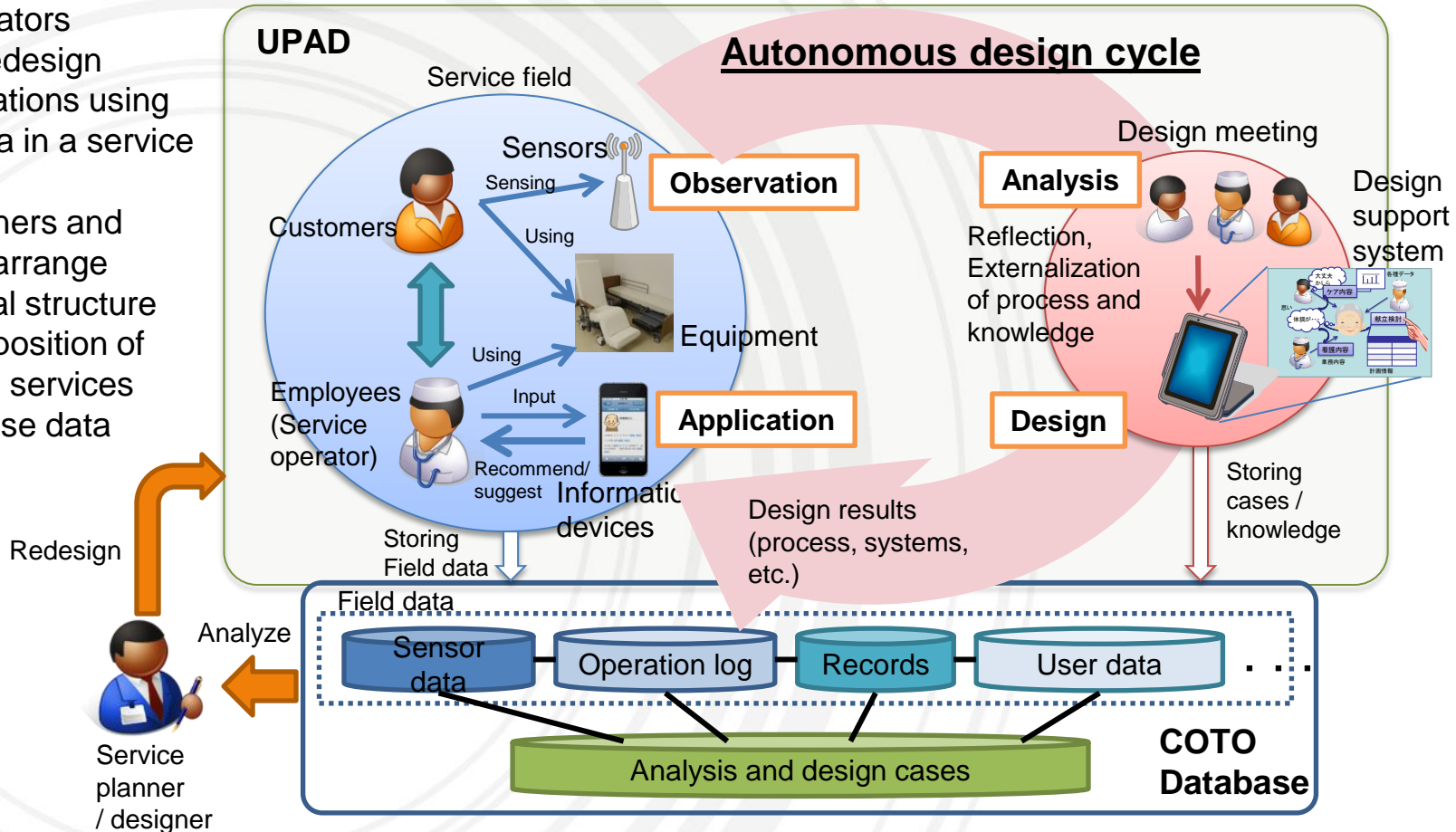


RC4: Utilizing operator's knowledge in PSS design and operation

# Continuous redesign of service operations by service operators

## RC4: Utilizing operator's knowledge in PSS design and operation

- Service operators reflect and redesign service operations using collected data in a service field
- Service planners and designers rearrange organizational structure and the composition of products and services based on these data



# Discussion

## I Effectiveness of the proposed framework

- Constructing an internal and external structure for PSS development
- Determining the boundaries of development processes within one's organization
- Detailed processes of PSS development can be identified
- Identifying who conducts these processes and to clarify the roles of the members

## I Future works

- Clarifying the detailed processes within PSS development by considering the interactions among internal and external members
- Specifying required methods for PSS development so that manufacturing companies can realize the transition from selling products to offering PSSs
  - » Undertaking comprehensive reviews of PSS development methods
  - » Allocating an existing method to the proposed framework in order to identify the processes that are rarely supported by existing methods



# Conclusion

## I An organizational framework for PSS development

- PSS development represents both internal and external perspectives
- The external perspective includes the organizations that are essential for PSS development, as well as their relationships
- The internal perspective consists of members who play important roles, and their interactions with each other
- Planner is defined as the member who takes responsibility for being the bridge between the internal and external organizations

## I Research challenges for constructing PSS organization

- RC1: Communicating with relevant stakeholders
- RC2: Evaluating future prospects, such as demands and supply
- RC3: Supporting co-creation with customers
- RC4: Utilizing operator's knowledge in PSS design and operation



# Task management tool: PSS kernel

## 1. Arrangement

- Arrange all the cards in order of state phase

## 2. As-is Analysis

- Overview all the cards and evaluate checklist of each cards

## 3. Setting next goals

- Identify cards including unachieved checklist as next goal of the development team

## 4. Discussion

- Discuss about priority of the future tasks and selection of the supporting tools to achieve next goal

