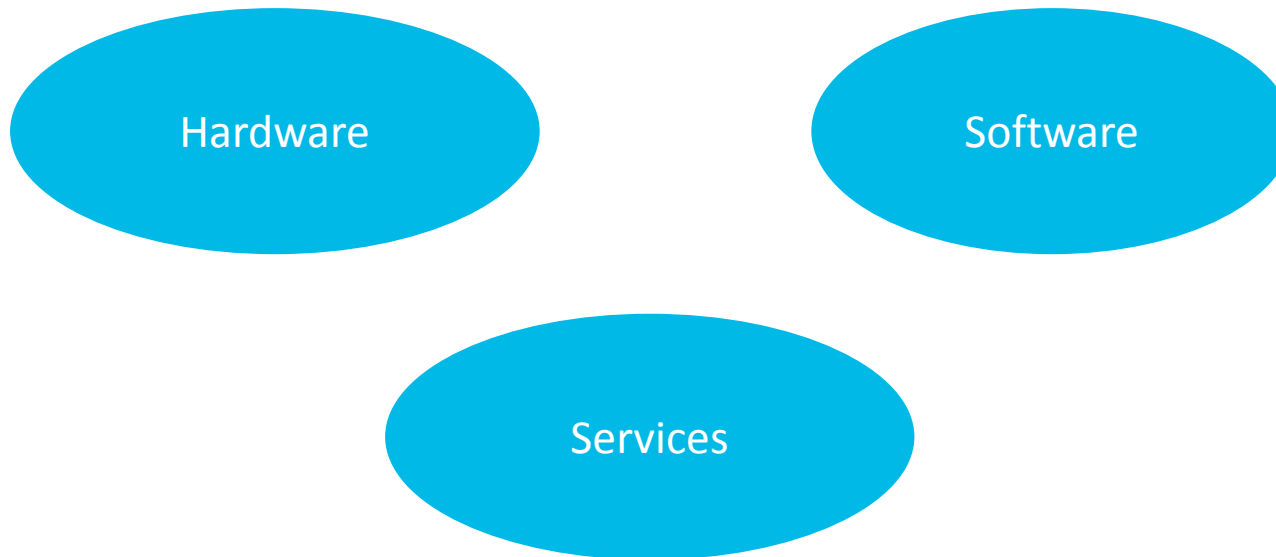# EMPIRICAL STUDY OF REQUIREMENTS ENGINEERING IN CROSSDOMAIN DEVELOPMENT

Sara Nilsson, Lena Buffoni, Kristian Sandahl, Hanna Johansson, Bilal Tahir Sheikh

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Challenge: integrated systems with cross-domain content

Hardware

Software

Services

How do companies work with requirements?

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Purpose

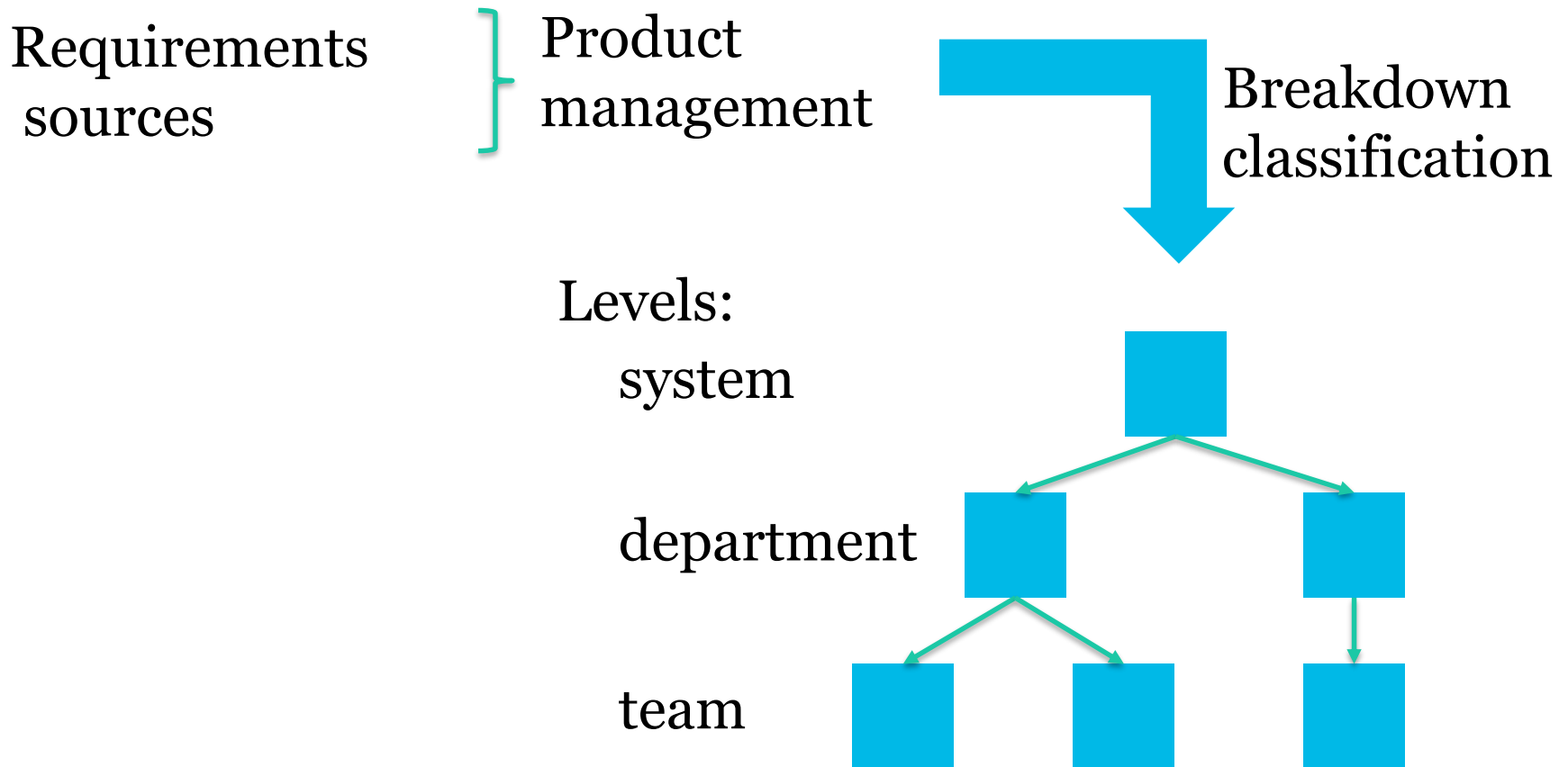|	
Analyze	current internal work with requirements
for the purpose of	exploring practices
with respect to	efficiency and effectiveness
form the point of view of the	developers
in the context of	four large companies with cross-domain development.

Method

- Recorded interviews with eleven, self-selected subjects in four companies (Johansson, Tahir Sheikh)

- Analyzing recordings, classification (Buffoni)

- Discussion and conclusion (Nilsson, Sandahl)

- Results verified with involved companies

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Context

Four companies:

- A, develops software as the main product, hardware is a special branch

- B, develops hardware and electronics

- C, develops hardware and services

- D, develops both hardware and software

- Development cycles 2-5 years

- Interviewees were developers or their immediate supervisors

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Generic Workflow

Requirements sources

Product management

Breakdown classification

Levels:
system

department

team

Requirements sources

- sales and after sales departments

- senior management that lays out the large-scale goals and road maps to follow

- a selected group of customers, customer visits

- focus or analytic groups that study market trends, buzz words that are often vague concepts identified by use-cases (e.g Internet of Things)

- previous products or projects, experience

Important for hardware

Tools

- Company A and C use PLM tools based on a global relational database

- Company D has a textual database

- Company B use Excel, each department has their own, but public format

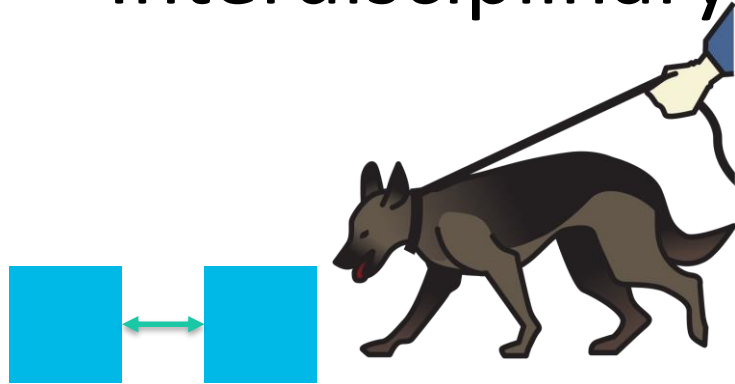- DOORS is mentioned by two companies, but deemed to cumbersome

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"Traceability can always be improved" (*)

origin
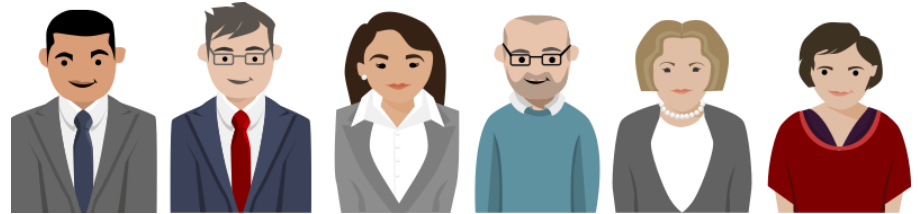
exact hardware
specifications

?

(*) all companies
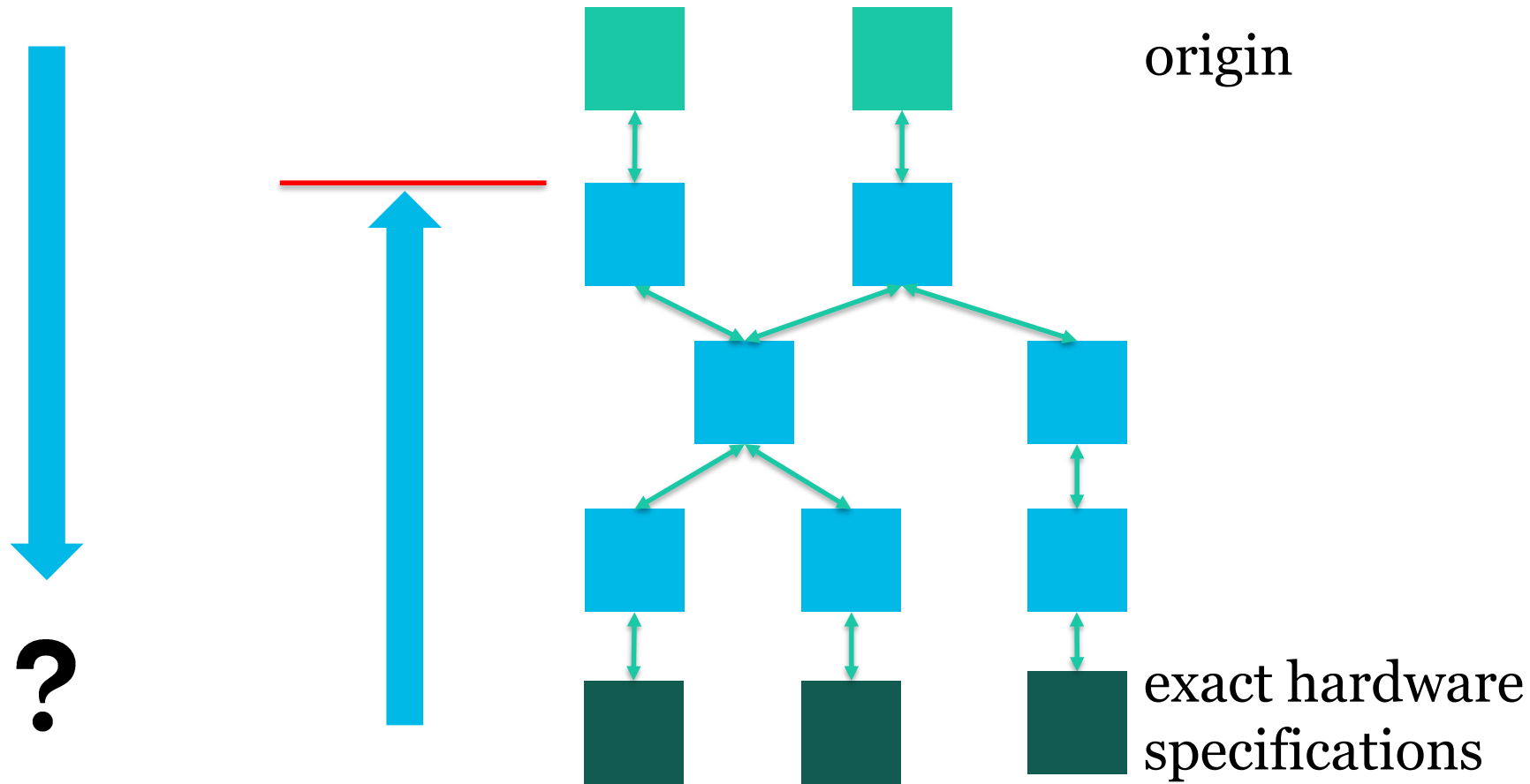
Interdisciplinary requirements

- *"you have to consider all the requirements all the time"* (Company C)

- *"communication is key for successful cooperation and the people factor is very important"* (Company A)

Interdisciplinary requirements

Cross-functional teams (A and D)

Interdependency tracker (B)

Representatives (D)

Moderators (A)

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Illustrations: openclipart.com

Interdisciplinary requirements - challenges

- Have other departments re-prioritize takes time
- Differences in department size
- Physical distance
- Lack of tools for international collaboration
- Cost of constant organizational review

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Interdisciplinary requirements

- *"Thinking of other departments … a more integrated mind set is something that should be aimed for"* (Company D)

Some take-aways

- Processes remarkably similar

- Human communication is the key practice

- No formal specification notations

- Increased focus on safety requirements

- Problem of combining safety and agile methods

- Cost-effectiveness of traceability and prioritization

- Some interest in modelling

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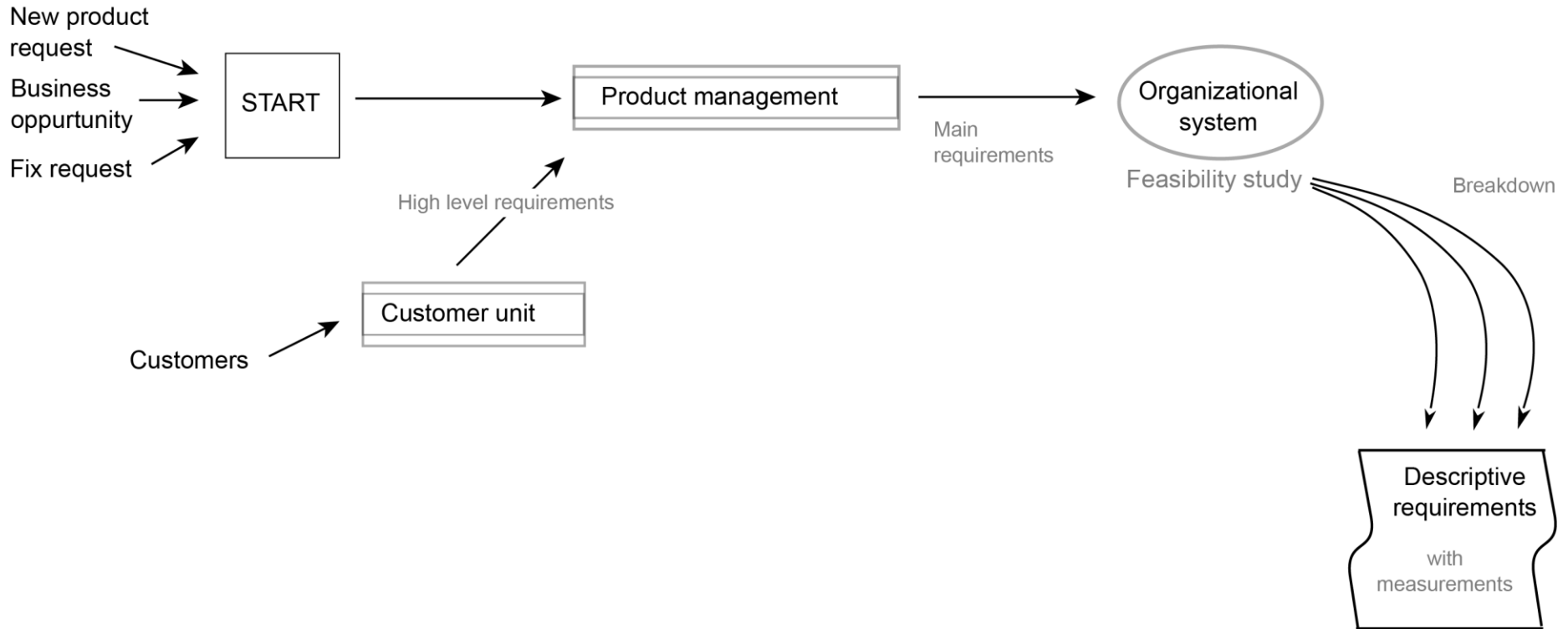UNIVERSITY

Conclusion and future work

- The challenges are similar

- Efforts in requirements reduce problems later

- It is possible to identify good practices

- Practices vary between companies

- Will continued studies form a more coherent picture ?

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Thank you for listening!

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Linkedin: *https://se.linkedin.com/in/saraknilsson*
ResearchGate: *https://www.researchgate.net/profile/Sara_Nilsson5*
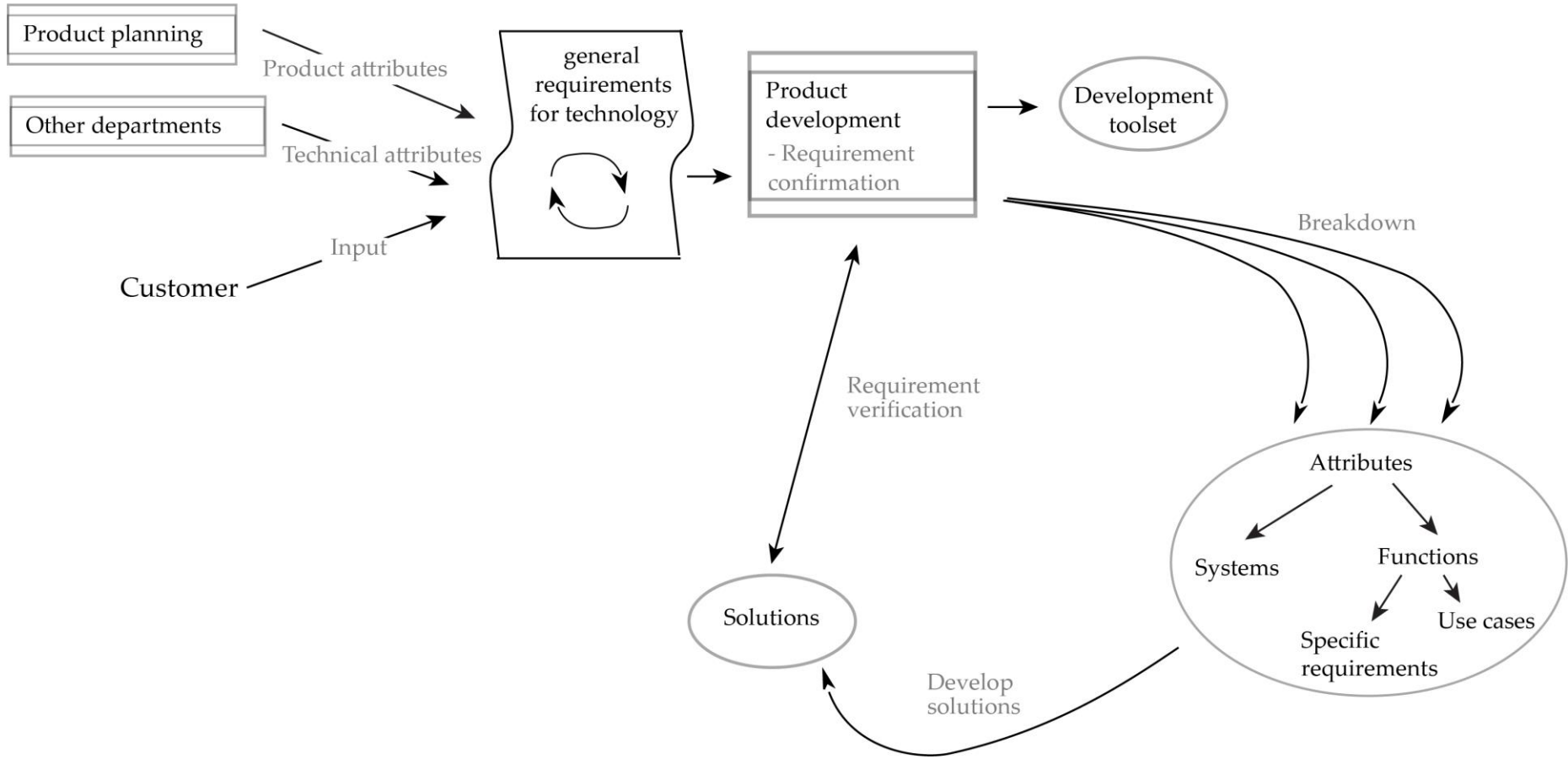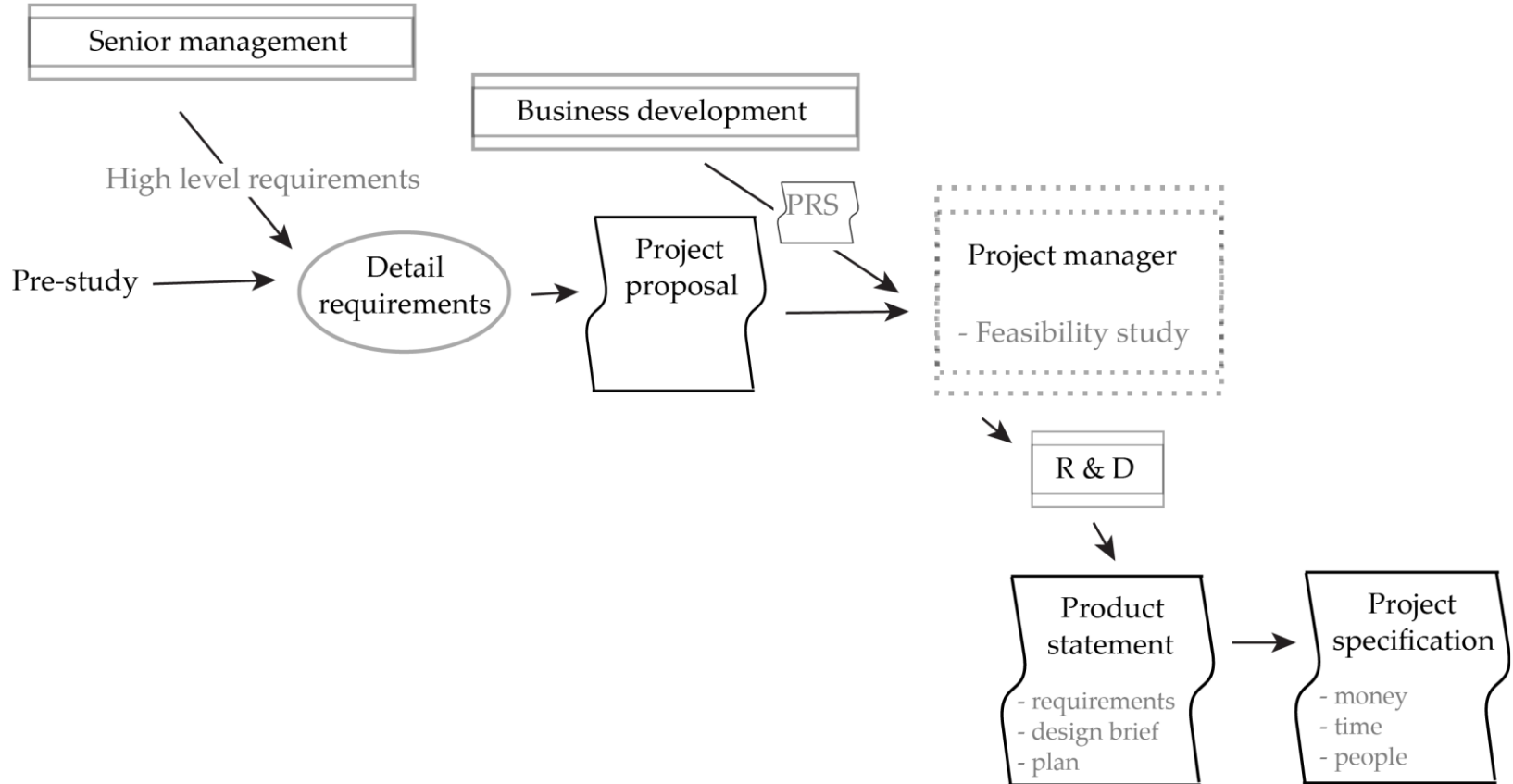
Workflow company A

Workflow company B

Workflow company C

Workflow company D