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UNIVERSITY OF TECHNOLOGY



UNIVERSITY OF GOTHENBURG

RE for Large-Scale Agile System Development (#27)

Sprint 14 Reporting Workshop



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About the Project

RE for Large-Scale Agile System Development

Project mission: Accelerate large-scale agile system development by improving management of requirements and related knowledge.

- Chart challenges and best practices / methods / tools
 - Support flow and management of knowledge about strategic and operational requirements
 - Balance just-in-time and long-term as well as customer and system requirements knowledge
-

Sprint 14 Goals

- **Prioritize themes for workshop → managing requirements knowledge flow**
- **Several focused case studies with individual companies**
- **Deliverables**
 - Guidelines for managing the flow of requirements knowledge
 - Report on a variety of focused case studies
 - Publications



Sprint 14 Accomplishments

- **Significant potential speed-up** through new RE approaches, according to managers [RE]
- A suitable RE strategy is **context specific** [REFSQ]
- SAFe and LeSS provide **insufficient support**
- Future customer-supplier collaboration requires new approaches to **transparency and contracts** [ICSE]

Our work also resulted in **emerging guidelines, approaches, and tools**

- Guidelines for managing system artifacts (boundary objects vs. locally relevant) [ICSSP]
- Tool to allow XFTs updating system requirements (T-Reqs) [RE tools]
- Approach to design a suitable RE strategy for agile dev. of safety critical systems [SEAA]
- RE approach to support API strategies [ICSOB]

8 Publications

RE (2x: research, tools track)

REFSQ

ICSSP (best paper)

SEAA Euromicro

ICSOB

ICSE (SEIP, Poster)



Focus in breakout session –
Boundary objects
Other topics: Online
dissemination WS (June-20)

Sprint 15 Goal

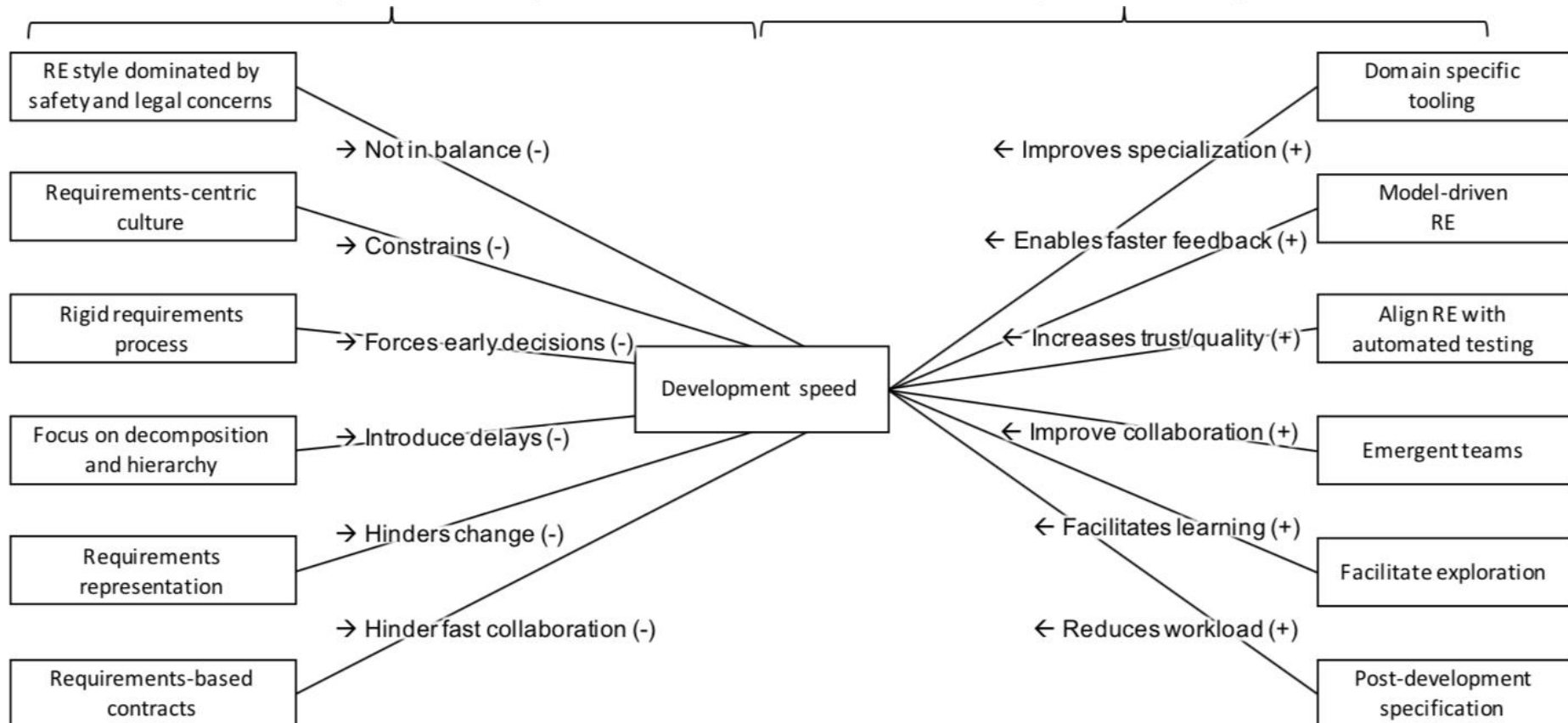
Our goal for Sprint 15 is to continue with what we feel is a very successful approach

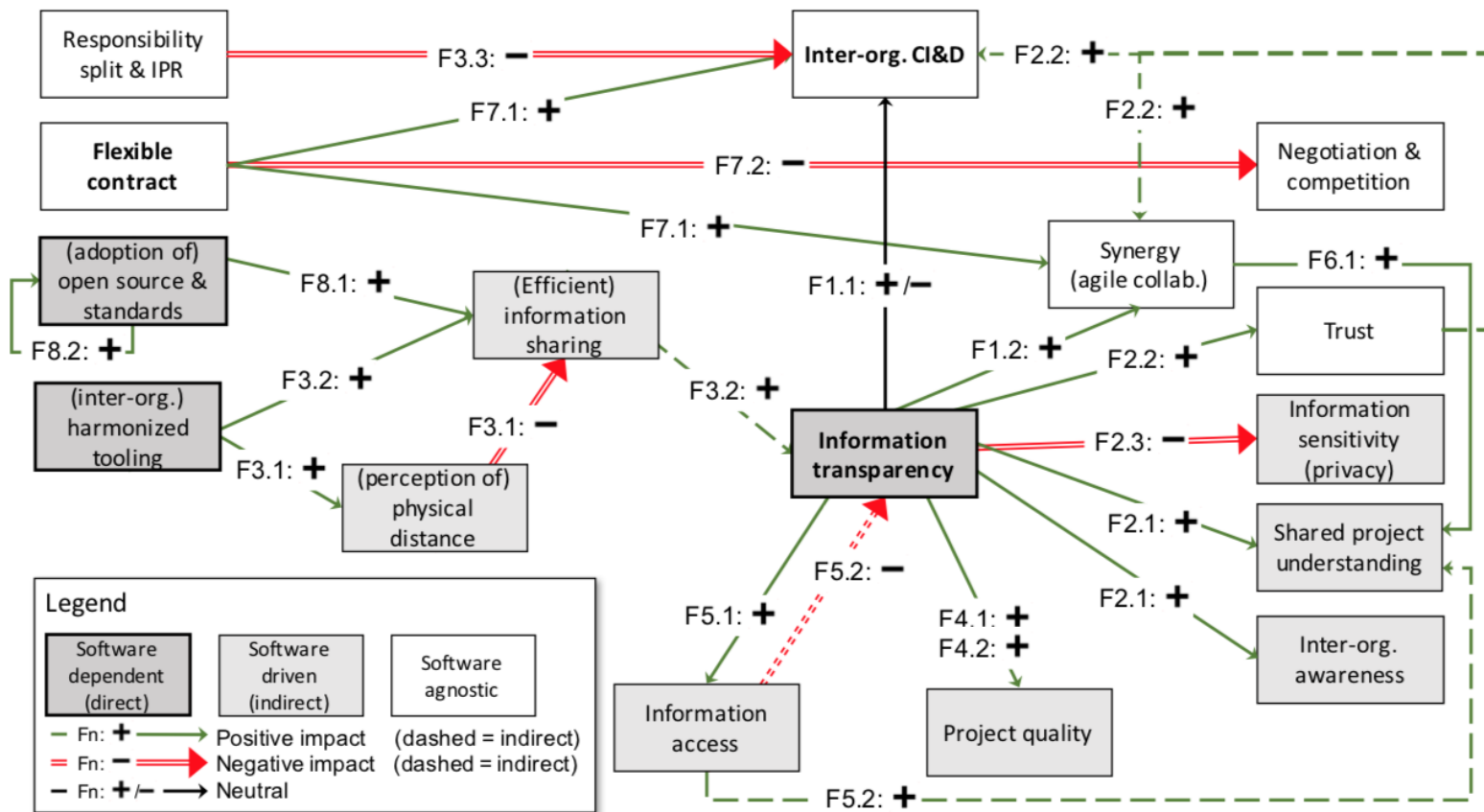
- **Focused cross-company workshop on RE practices**
 - Focus to be selected in kickoff workshop
- **Complementary focused case studies with individual companies**
 - Data requirements for systems of systems (beyond functional specification)
 - RE strategy for agile development of safety-critical systems
 - Interfaces as RE boundary objects
 - System requirements modeling by developers
 - More?

Sprint 15 Plan	Activities	Conferences
August/September	Kickoff workshop	- RE conference - SEAA Euromicro
October	Run Workshop: - Cross-company - Focused case studies	
November	Compile results Cross-company WS	- Agile automotive PEP - Profes
Deliverables	Report: Guidelines and best practices Report: Smaller case studies	Publications

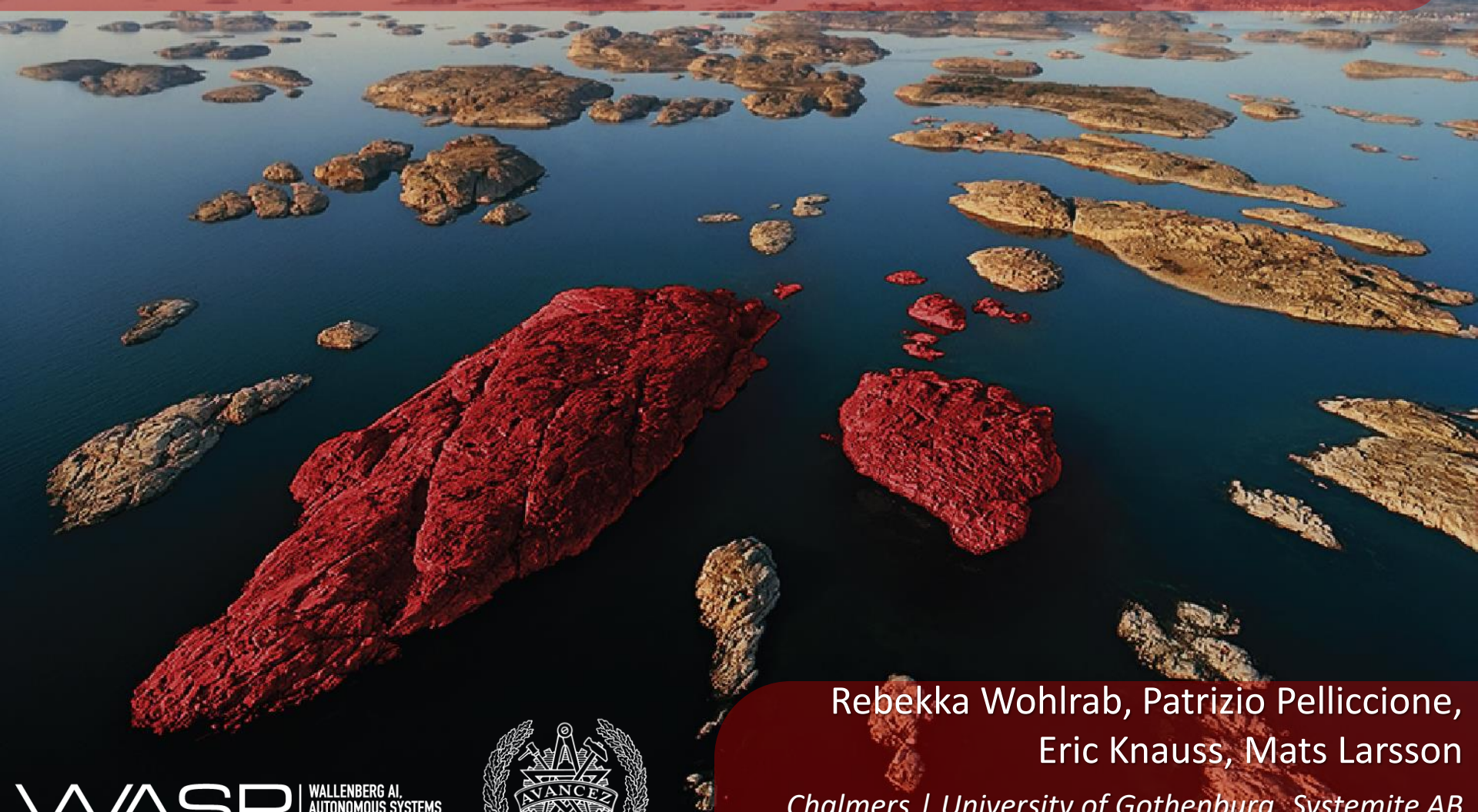
RQ1: Impact of current way of RE

RQ2: Aspects for future way of RE





Boundary Objects in Agile Practices: Continuous Management of Systems Engineering Artifacts in the Automotive Domain



WASP | WALLENBERG AI,
AUTONOMOUS SYSTEMS
AND SOFTWARE PROGRAM

SYSTEMITE



CHALMERS

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Chalmers | University of Gothenburg, Systemite AB

June 7, 2018

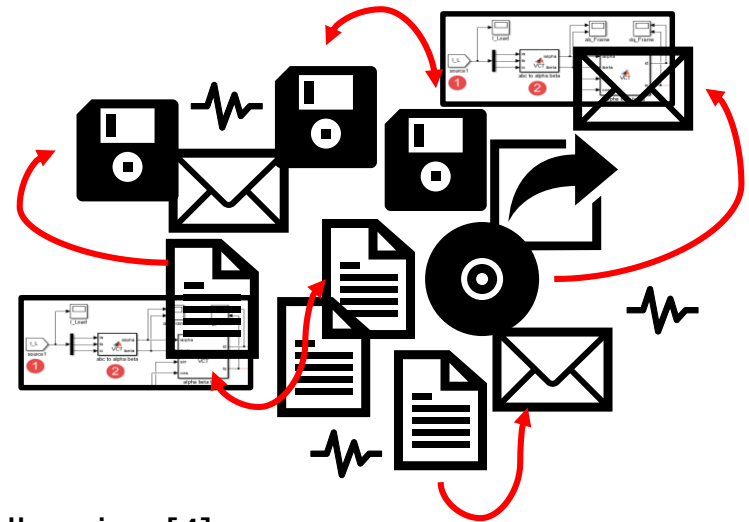
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Agile systems engineering and documentation

Automotive companies want to adopt agile methods for systems engineering.
But...

100 MLOC of software in modern cars [1,2]
 100.000s of requirements
Number of ECUs growing to more than 100 [1]
Around 7000 bus signals [1]

In large-scale agile:
Finding the "right" amount of documentation is challenging [4]
Lack of case studies and practical guidance [3,5]



Enormous amount of artifacts and traceability!
How to manage this information in a continuous way?



- [1] Alming, A. 2017. Architecting the next generation of vehicles. Presentation at WASP PhD School.
- [2] Ebert, C., & Favaro, J. 2017. Automotive Software. *IEEE Software*, 34(3), 33–39.
- [3] Kajko-Mattsson, M. 2008. Problems in agile trenches. In ESEM'08.
- [4] Rüping, A. 2003. Agile Documentation: A Pattern Guide to Producing Lightweight Documents for Software Projects (1 ed.). Wiley Publishing.
- [5] Dingsøyr, T., Moe, N., Faegri, T., Seim, E.. 2017. Exploring software development at the very large-scale: a revelatory case study and research agenda for agile method adaptation. *Empirical Software Engineering*.



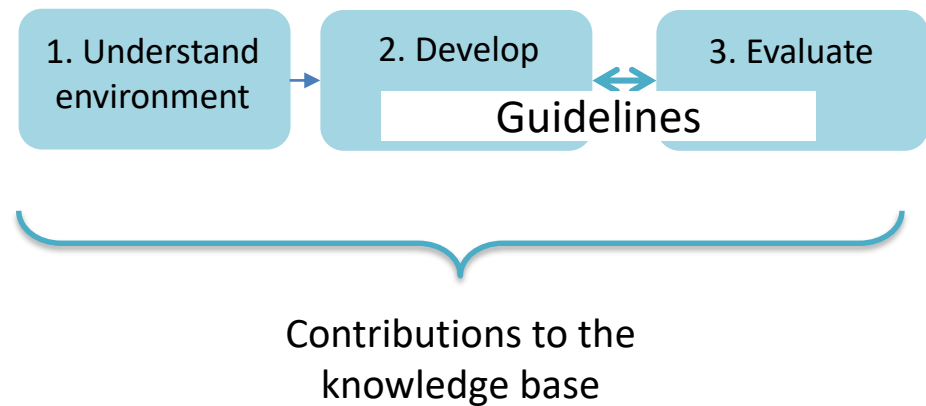
Research Questions and Method

- RQ1: What are **practices to manage artifacts** in agile automotive systems engineering?
- RQ2: What practical **challenges** exist with managing systems engineering artifacts in agile automotive contexts?
- Develop **guidelines** for practitioners



6 automotive companies
53 practitioners

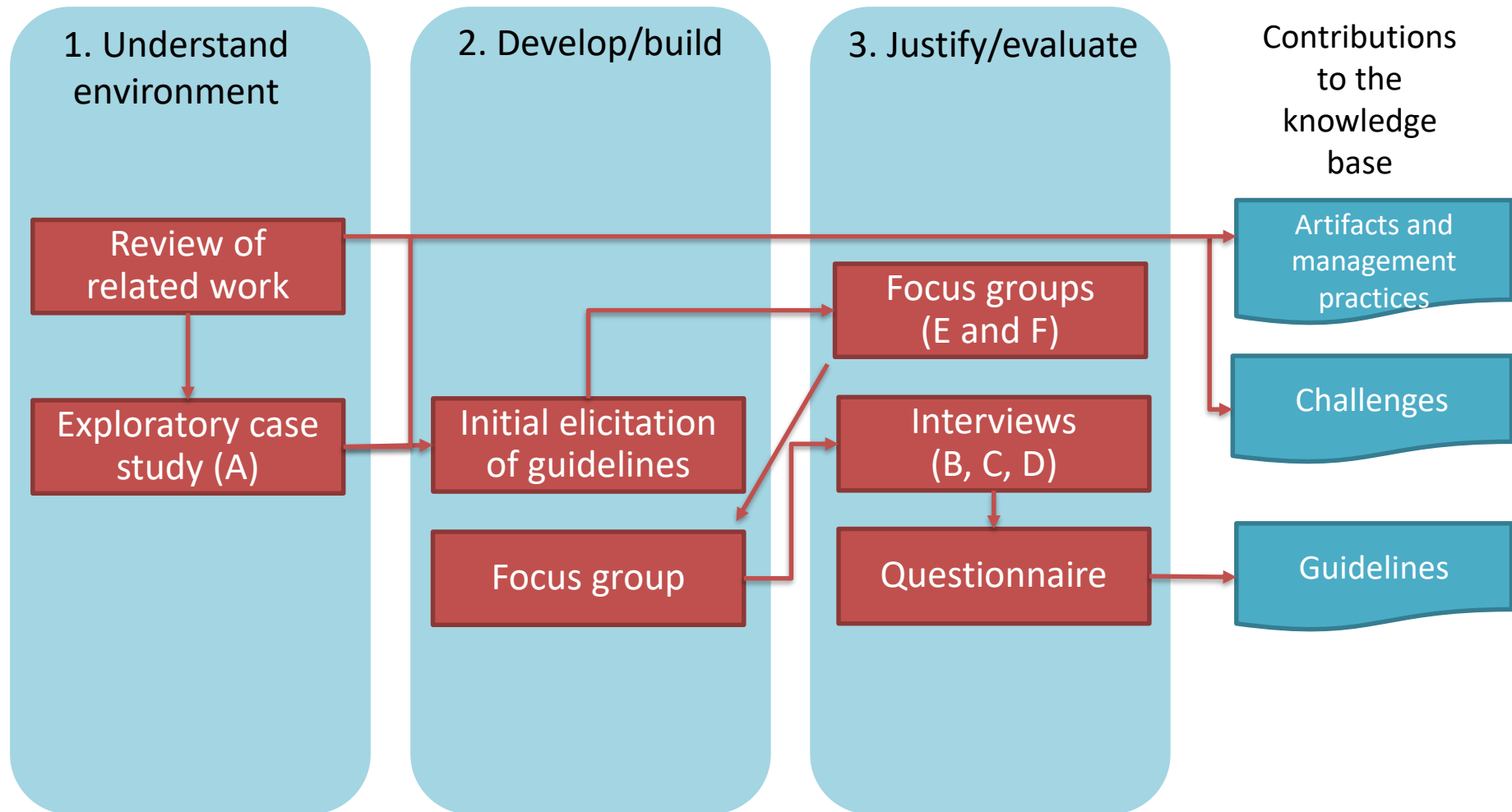
Design-science method [6]



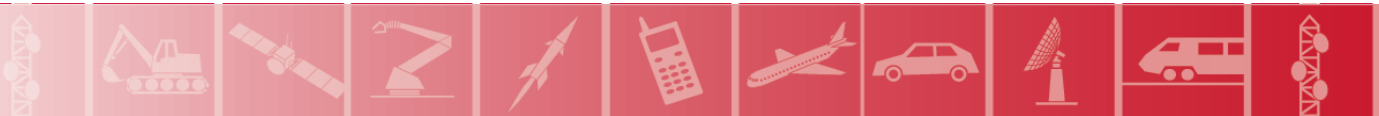
[6] Alan R. Hevner, Salvatore T. March, Jinsoo Park, and Sudha Ram. 2004. Design Science in Information Systems Research. MIS Quarterly 28 (2004), 75–105.



Design-science method



A, B, C, E: automotive OEMs, F: automotive supplier, D: supplier of an information management tool used in automotive



Participants with roles and experience

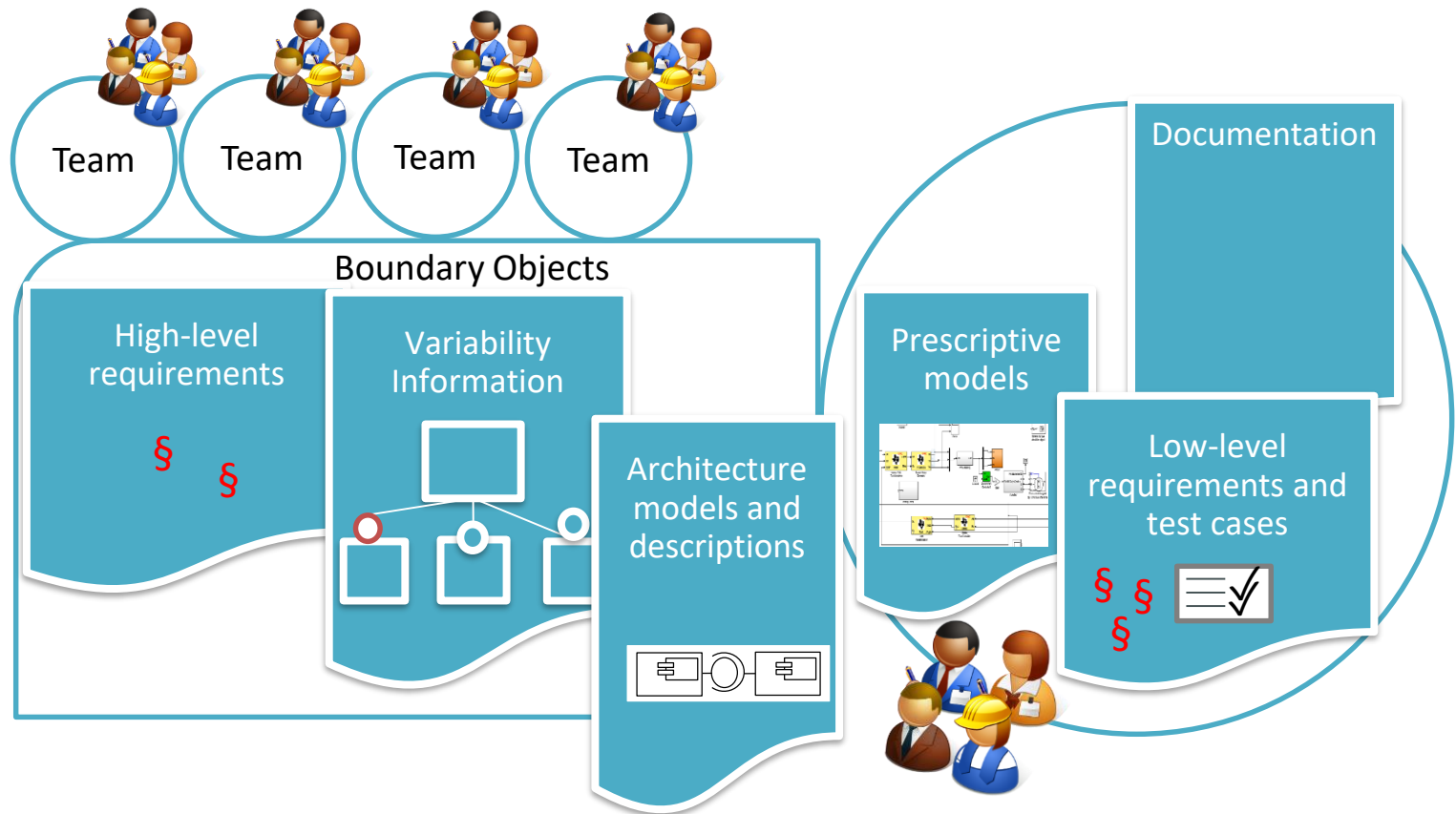
	Company	Role	Experience
1	A	Logical architect	> 20 years
2	A	Chief architect	> 17 years
3	A	Product owner	> 15 years
4	A	Requirements manager	19 years
5	A	Process manager	> 25 years
6	A	Team leader of funct. dev.	17 years
7	A	Product owner	15 years
8	A	Scrum master	> 2 years
9	B	Software architect	9 years
10	C	Systems architect	20 years
11	D	Chief Technical Officer	> 30 years
12–28	E & F	Mainly testers	1–30 years
29–53	E & F	Mainly developers	1–30 years

+ 41 anonymous questionnaire respondents

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RQ1: Boundary Objects

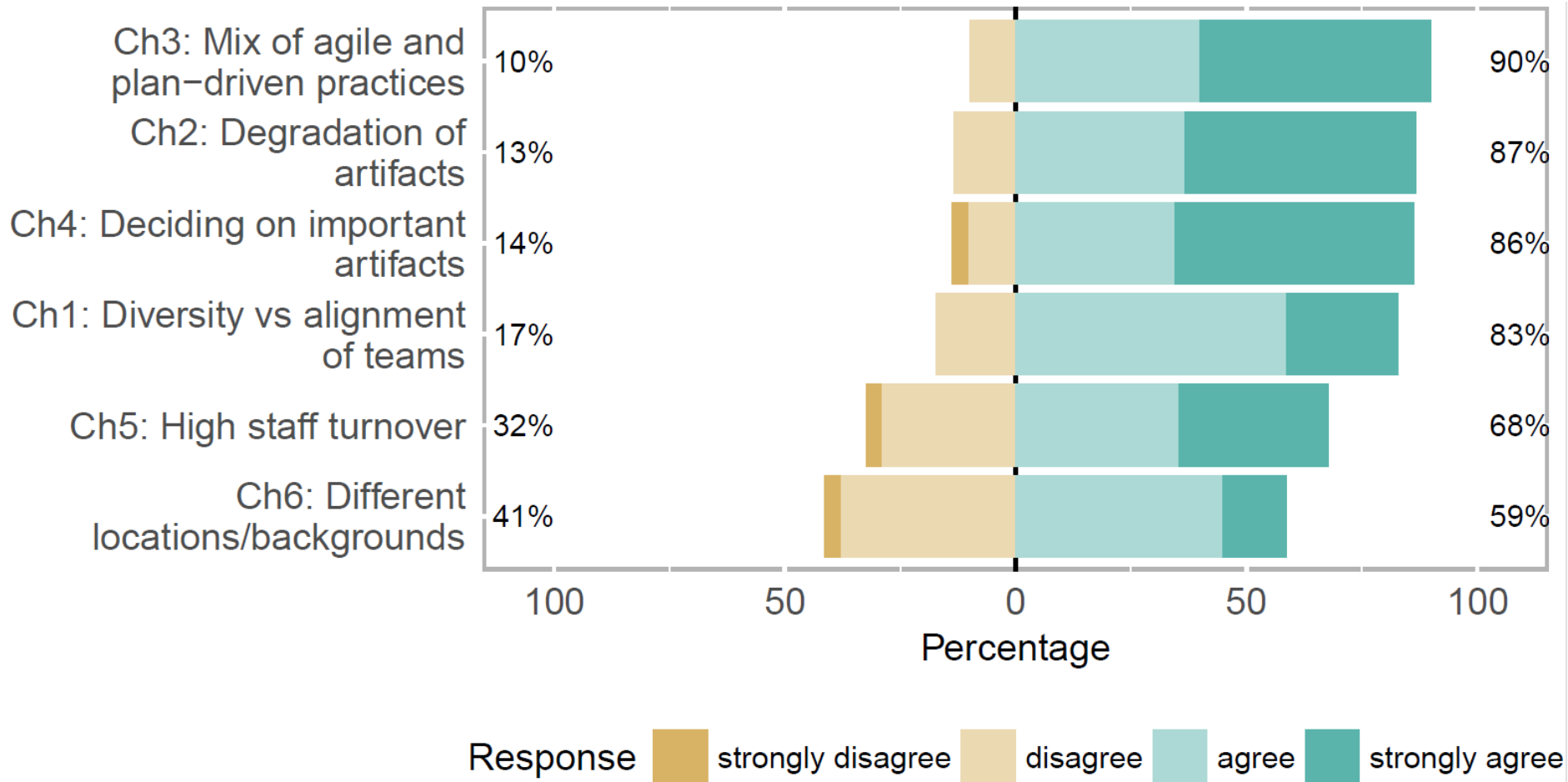


“Boundary objects are objects which are both plastic enough to adapt to local needs and constraints of the several parties employing them, yet robust enough to **maintain a common identity across sites.**” [33]

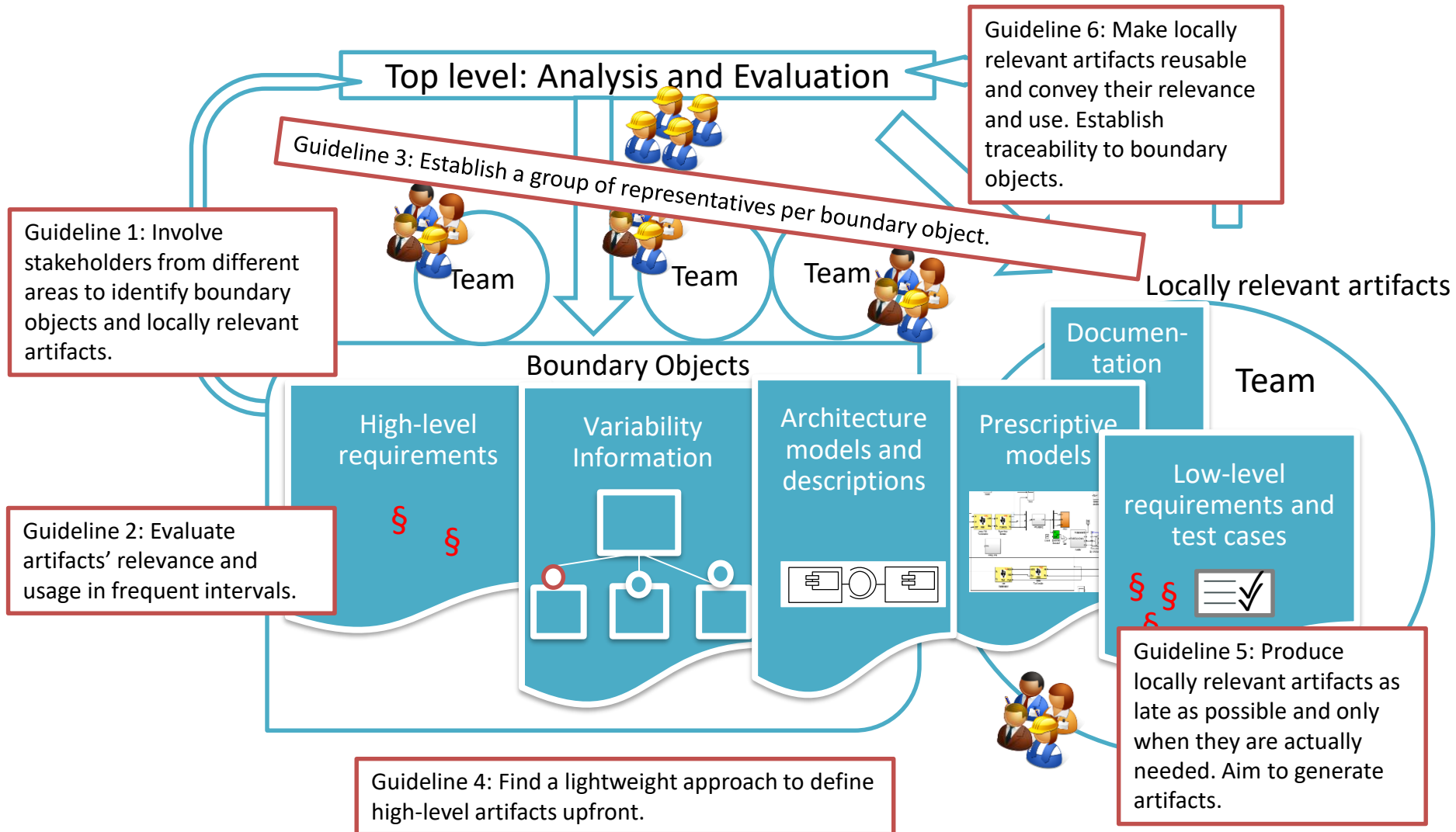
[33] Susan Leigh Star and James R. Griesemer. 1989. Institutional Ecology, ‘Translations’ and Boundary Objects: Amateurs and Professionals in Berkeley’s Museum of Vertebrate Zoology, 1907-39. *Social Studies of Science* 19, 3 (1989), 387–420.

RQ2: Challenges

It is challenging for us to deal with...



Guidelines



Conclusions

- Distinguish between boundary objects and locally relevant artifacts
- Helps to identify important artifacts and align the work of different teams
- Next steps:

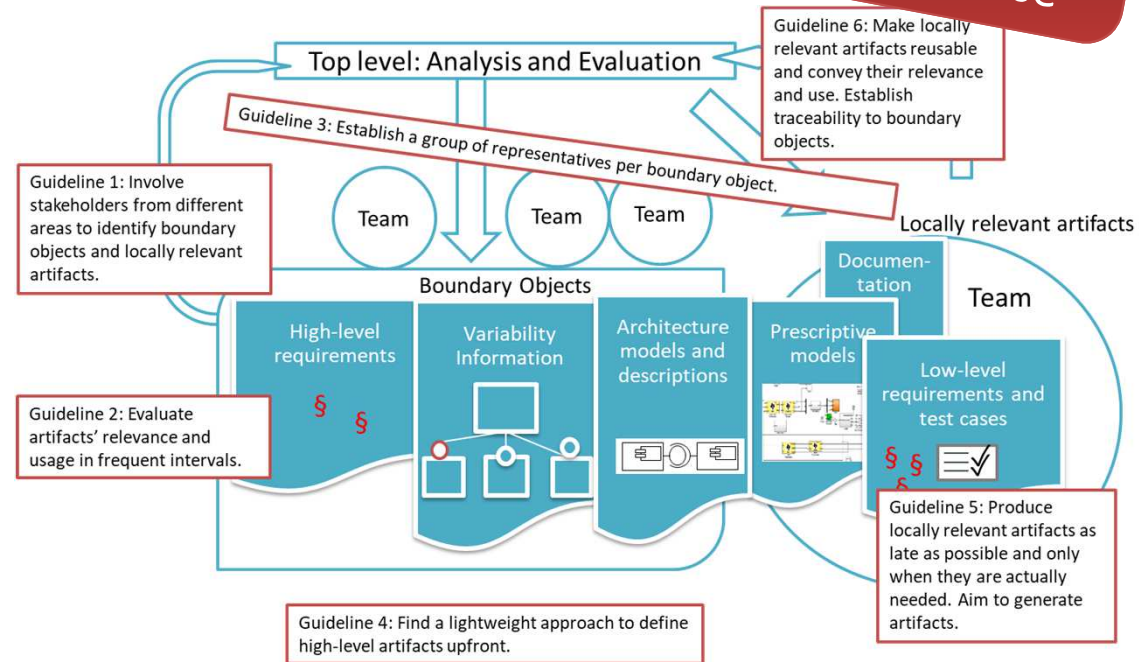


Tailor guidelines to concrete artifacts (e.g., for architecture)



Implementing tool support to identify and manage boundary objects

SystemWeaver®



Thank you!
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