



From imagined scenarios to real-world applications:
Patterns of (re-)distributing work tasks between humans and robots in care
and industry

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The SoCoRob II project

“The social construction of human-robot co-work in context: narratives, robot platforms, and institutional settings (SoCoRob II)”, funded by the German Research Foundation (2023-2026).

We analyse the changes and patterns in the distribution of actions in work processes through the introduction of collaborative robots in the care and the industrial work contexts, based on prototype scenarios (Schulz-Schaeffer & Meister 2017).



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Ingo Schulz-Schaeffer



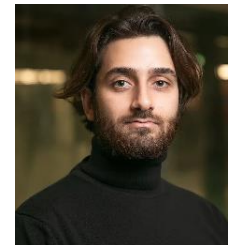
Tim Clausnitzer



Kevin Wiggert



Ana Burgueno-Hopf



Zorbey Özcan



Three levels of investigation on the social construction of robot co-work scenarios in manufacturing and care

1. Analyzing the negotiations in the development of the prototypical scenarios.
2. Analyzing (re)distributed agency of prototypical scenarios by comparing different development stages (mental models, early materialized prototypes, prototype scenarios in test environments, prototype scenarios in real-world settings).
3. Analyzing the prototypical scenarios in the intentional, effective and regulative action dimension.

In this presentation, we focus on the **second level** of analysis.



Analyzing the (re)distribution of work tasks

We want to find out how specific work situations in care and industrial settings change on the level of action steps through the introduction of collaborative robots instead of making generalized statements about the digitalization of work.

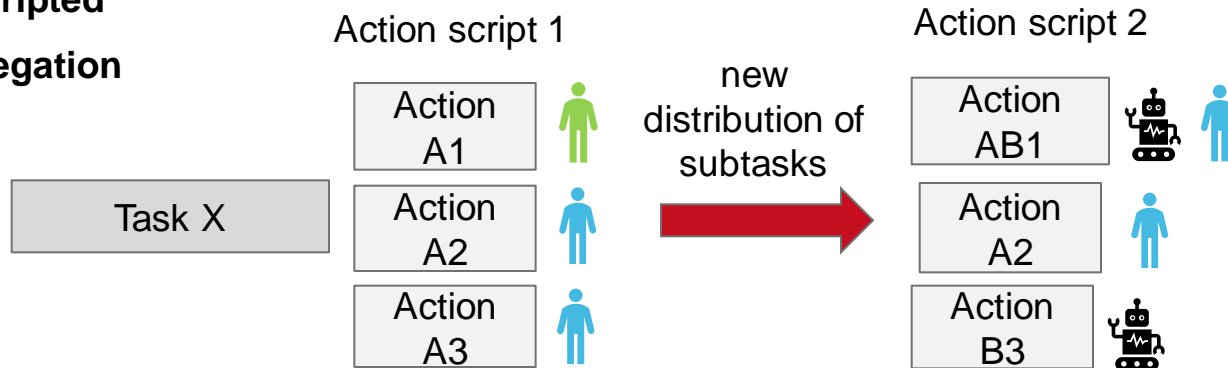
Using the concept of distributed action (Schulz-Schaeffer 2019) and the script concept (Akrich 1992), we can analyse how the actors involved in the development of the scenarios distribute the work processes among human and non-human actors and how the workforce deal with the intended distribution.

By comparing our data we found the following four patterns of (re-)distributing actions:

1. Scripted delegation
2. Scripted redelegation
3. Repairing the script
4. Ignoring the script

Four patterns of (re-)distributing action

1. Scripted delegation

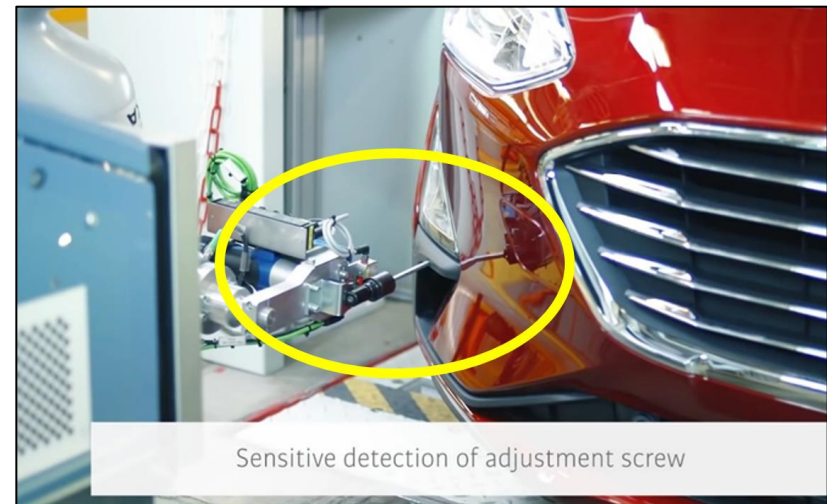




Four patterns of (re-)distributing action

1. Scripted delegation

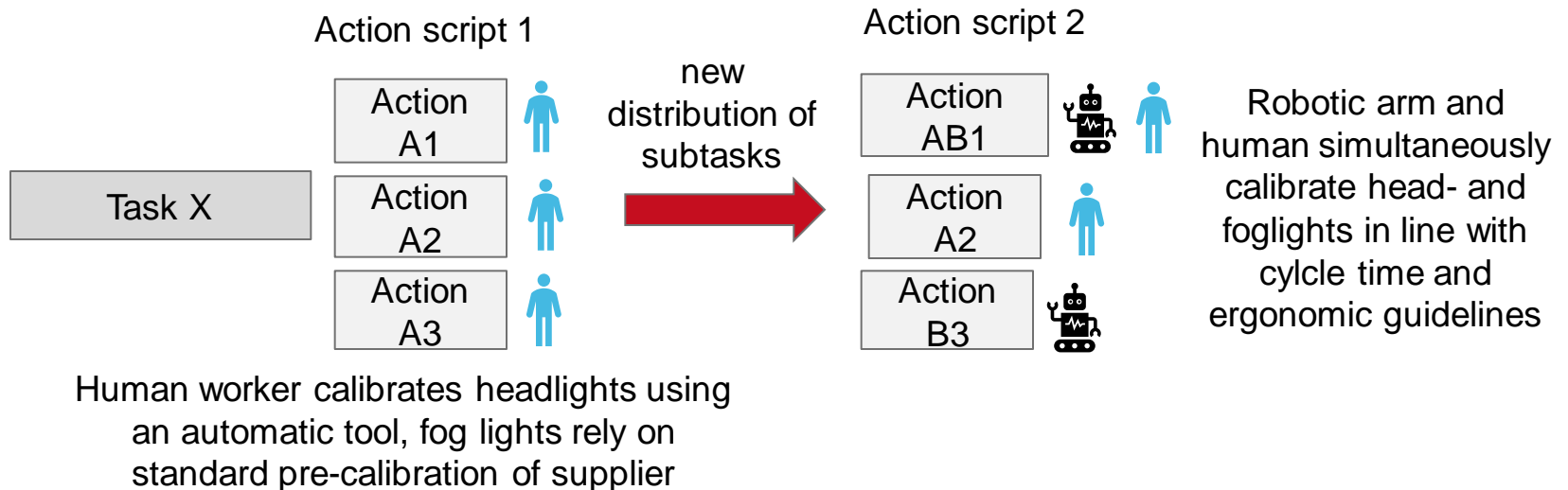
Our example: *Calibrating head- and foglights at a Ford plant*



Four patterns of (re-)distributing action

1. Scripted delegation

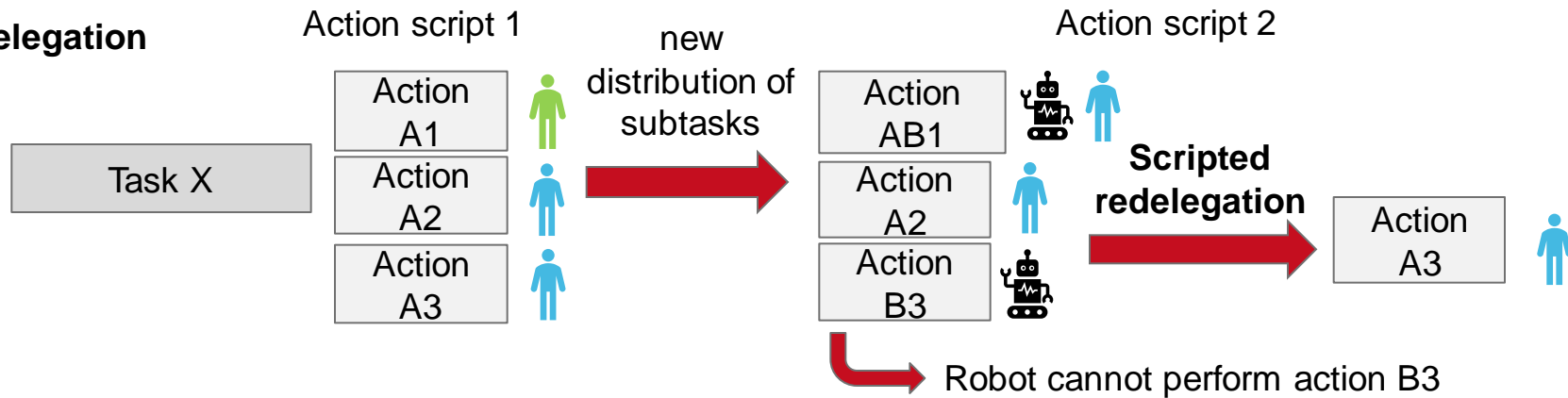
Our example: *Calibrating head- and foglights at a Ford plant*





Four patterns of (re-)distributing action

2. Scripted redelegation

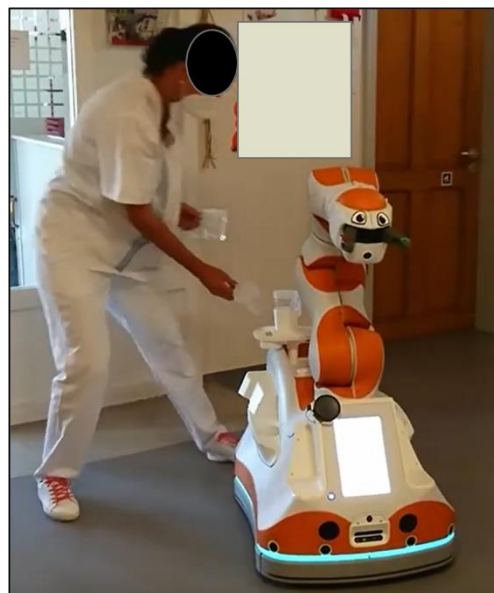




Four patterns of (re-)distributing action

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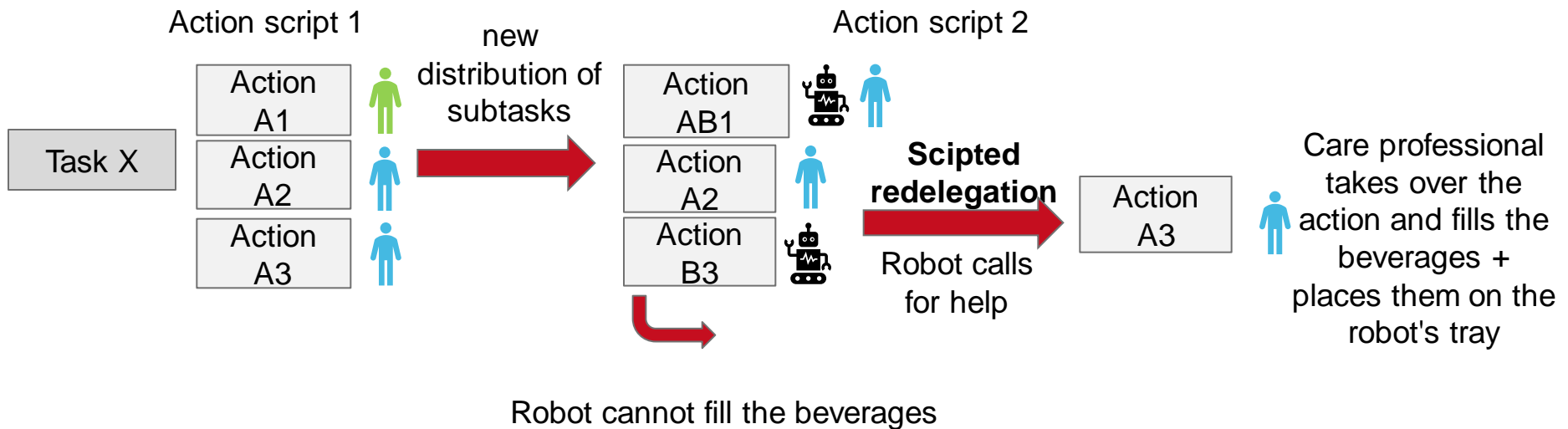
Our example: *The robot cannot fill & fetch beverages*



Four patterns of (re-)distributing action

2. Scripted redelegation

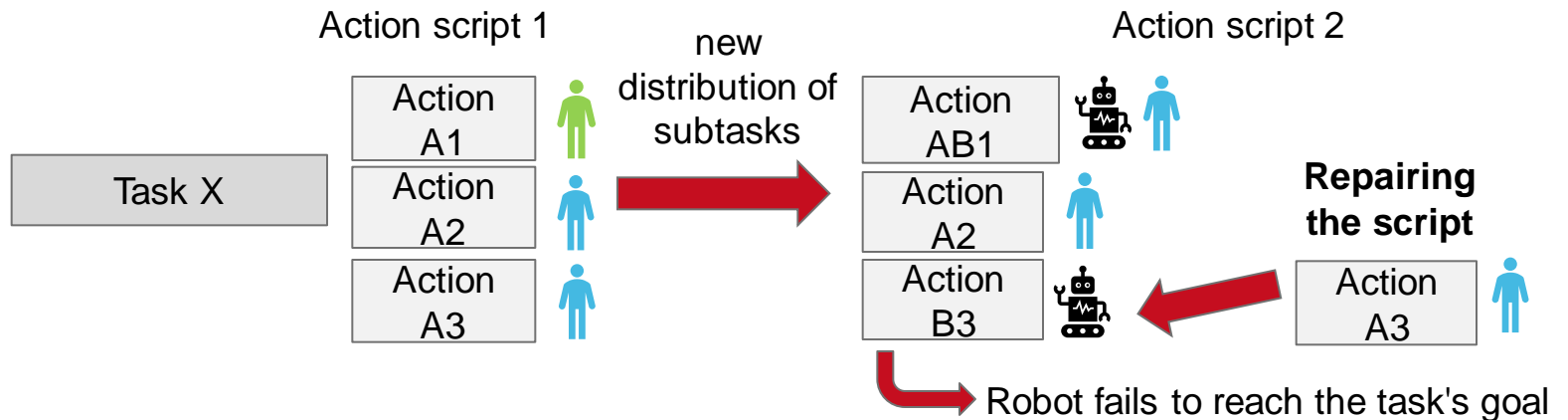
Our example: *The robot cannot fill & fetch beverages & loses the disinfection lamp*





Four patterns of (re-)distributing action

3. Repairing the script





Four patterns of (re-)distributing action

3. Repairing the script

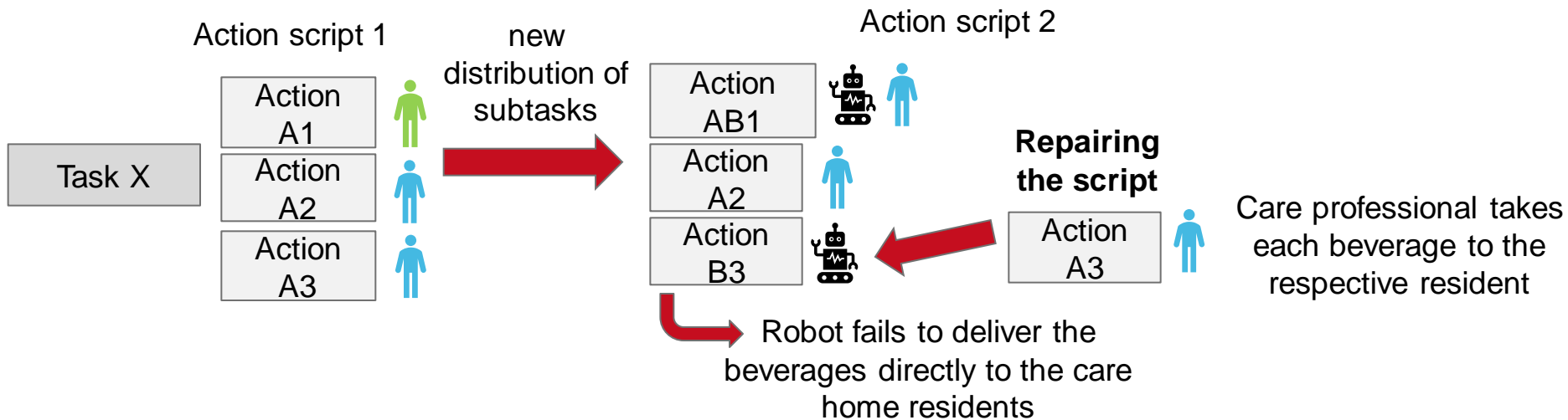
Our example: *The robot fails at delivering beverages*



Four patterns of (re-)distributing action

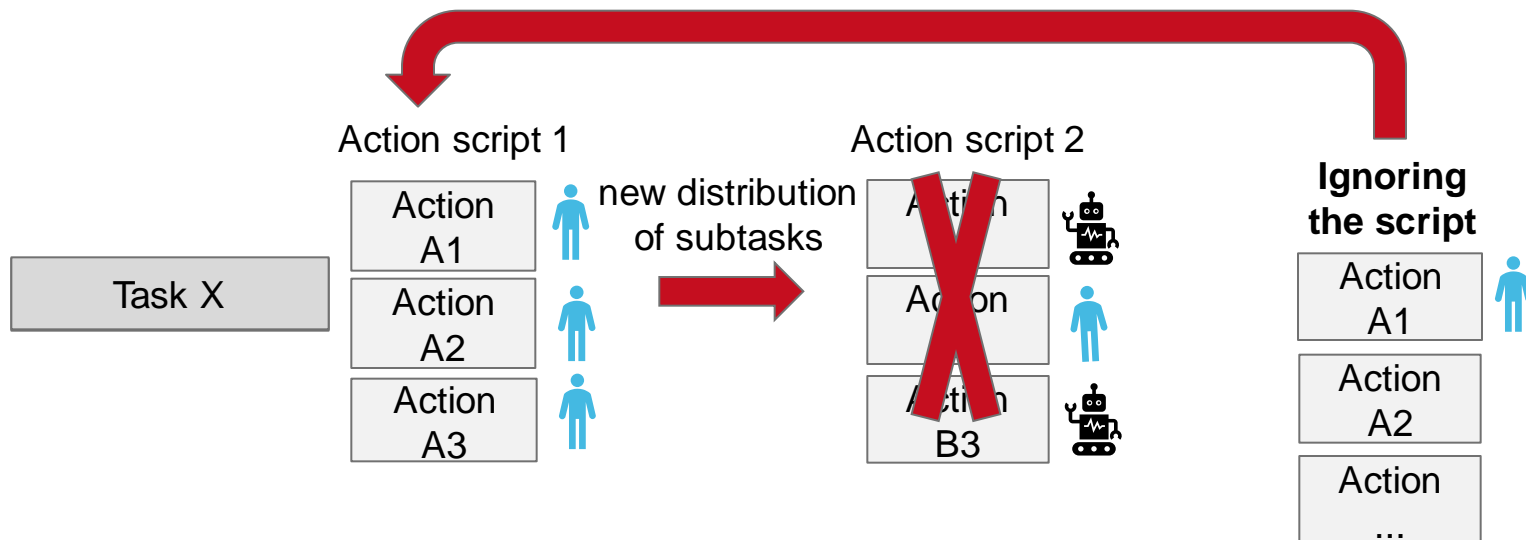
3. Repairing the script

Our example: *The robot fails at delivering beverages*



Four patterns of (re-)distributing action

4. Ignoring the script





Four patterns of (re-)distributing action

4. Ignoring the script

Our example:

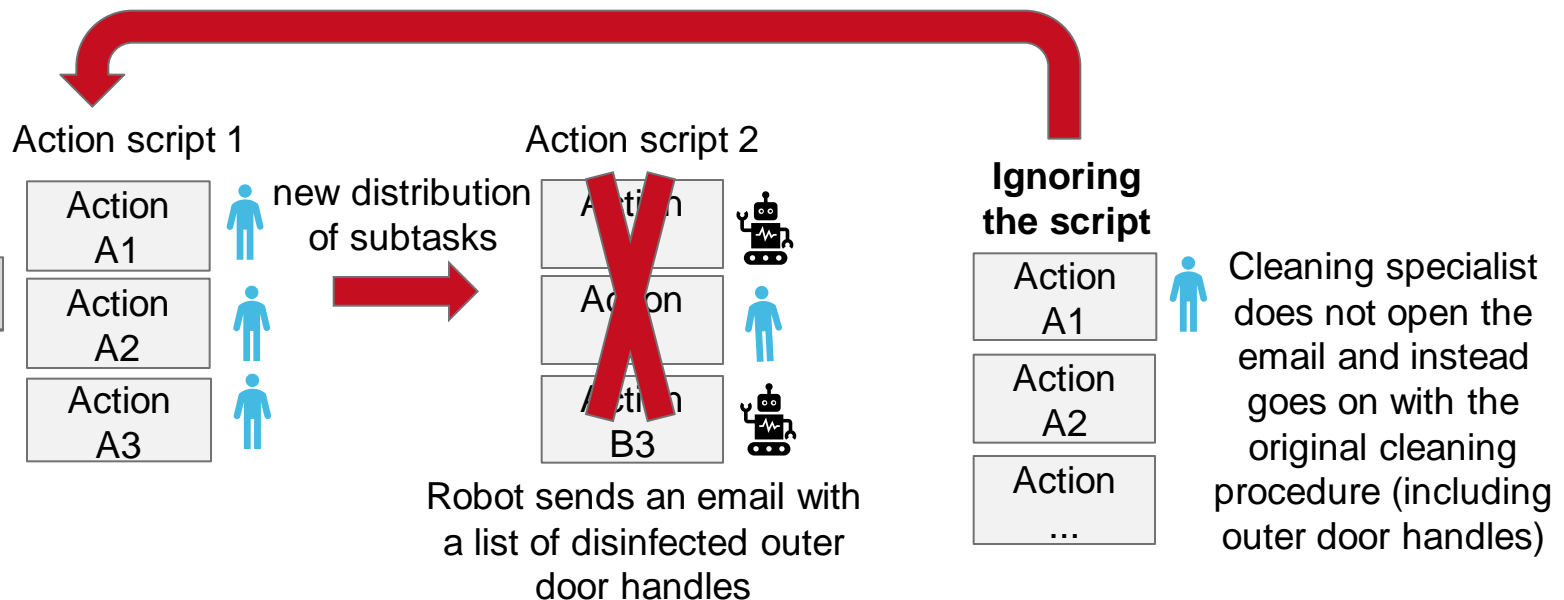
The door handles get disinfected twice



Four patterns of (re-)distributing action

4. Ignoring the script

Our example: *The door handles get disinfected twice*





What are the reasons for the observed patterns of distribution?

1. The degree of testing and evaluating the scripts
2. Degree of target and framework specifications for the script
3. Underestimation of technical limitations of robots from the stakeholders involved
4. Institutional settings (discourses, organisational access to expertise on robot implementation, business models of robot manufacturers for industrial and care robots)



1) The degree of testing and evaluating the scripts

Testing and evaluating scripts for robot-co work in the care sector:

- Error-ridden scripts are integrated into care homes without extensive testing in laboratory studies
- This leads to redelegations, repairs, and scripts that are even ignored by the care workers.

Testing and evaluating scripts for robot co work in manufacturing industry:

- Actors in manufacturing are testing the scripts in extensive feasibility studies, before they implement the robot scenarios.
- In these laboratory studies, the engineers and process planners carry out failure mode analyses and improve errors in the script until the script matches the target specifications.
- If the scenarios do not pass the feasibility studies, they are not used in production. This also applies to developments from research projects.



2) Degree of target and framework specifications for the script

Clear targets and framework conditions for the script reduce subsequent redistribution and repair work, as well as situations in which workers ignore the script.

In manufacturing, production engineers are confronted with tough target and framework conditions for robot applications: specified cycle times, spatial restrictions, strict ergonomic and safety standards, and specified installation times. These clear objectives concretise the search space for a suitable socio-technical solution.

In nursing care, we do not see such strict evaluation and framework criteria

Instead: Non-transparent communication and big promises from manufacturers as well as unrealistic objectives

The over-ambitious targets lead to repairs and delegations in real-world applications



3) Underestimation of technical limitations

Care sector

- Care managers and care workers often underestimate the technical limitations of robots
- This leads to overambitious scenarios
- The unrealistic scenarios are often the result of a lack of technical expertise and “over-participation” by laypeople

Industrial manufacturing:

- Large corporations have decades of experience in the deployment of traditional industrial robots. They have organisational units for the implementation of robots in work processes.
- Small and medium sized enterprises have access to expertise in robot integrations through an established network of external implementation consultants



4) Institutional Settings

What we want to investigate in more detail over the next three years:

- Discourses on the introduction of care and collaborative industrial robots: The rhetorical power of narratives and their influence on prototypical scenarios
- Institutional roles of intermediaries between manufacturers and users
- Institutional role of security and ergonomic standards for the design of prototype scenarios
- Institutionalised knowledge about robot implementations in large industrial companies, small and medium-sized industrial companies and nursing homes.
- Robot platforms: how their design and associated business shape the prototype scenarios



Thank you for your attention!