CHAPTER 3

TOWARDS COLLABORATION WITH SOCIETAL ACTORS IN THE FIELD OF INDUSTRIAL AUTOMATION

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ABSTRACT

This chapter provides insights from a research-initiated Quadruple Helix Collaboration. A social lab on the future of work was established within an existing local innovation ecosystem. The lab provided space to reflect on the societal impacts of a new technology. This chapter shows the different resources that the four helixes may contribute to innovation processes in the field of industrial automation. Furthermore, it draws attention to the local innovation ecosystem of a Quadruple Helix Collaboration, as well as the importance of civil society in making a technological innovation a success.

INTRODUCTION

How could societal aspects such as ethical, ecological and social issues be taken into account in the future of work of industrial automation? This question motivated the Future-Work Lab at SmartFactoryOWL in Lemgo, Germany.

Industrial automation refers to cyber-physical systems that connect products, machines and workers via the internet. Industrial automation will fundamentally change the interaction between humans and smart machines. Depending on the area, automation may replace or complement human labor. Overall, it is predicted that industrial automation leads to more demanding jobs in terms of complexity and with higher compensation, which means that the demand for higher educational attainment will increase.

SmartFactoryOWL is a real-life laboratory for industrial automation. It is located in Lemgo, a small town in East-Westphalia Lippe (OWL), nowadays one of the strongest economic regions in Germany. SmartFactoryOWL is initiated by Fraunhofer IOSB-INA, a research institute working in the field of industrial automation. The institute is part of Fraunhofer, Europe's largest application-oriented research organization. The main aim of SmartFactoryOWL is to enhance the transfer of technology to industry and society and strengthen the ties to local companies and industry. For this purpose, it demonstrates new technologies to interested stakeholders, communicates its benefits and prospects and connects relevant innovation stakeholders. At SmartFactoryOWL, people and organizations in the field of industrial automation come together when they meet on a demonstration shop floor. Here, researchers demonstrate new technologies on machines not only to potential customers but also to government representatives and sometimes even civil society.

The European project *RiConfigure* strived to implement a Quadruple Helix Collaboration (QHC) at the SmartFactoryOWL, a collaboration structure enabling not only business, research and policy to take part in the innovation process but also societal actors. The central motivation for the SmartFactoryOWL to start such a collaboration was to consider societal aspects when developing further solutions in the field of industrial automation. In the research-initiated social lab that SmartFactoryOWL and Fraunhofer CeRRI set up between February 2019 and July 2020, overall 21 representatives of research, civil society, business and government met four times in person as well as digitally. At the meetings, they identified and reflected upon societal perspectives to innovation in industrial automation and tested methods to integrate and use this perspective for further developments. Fraunhofer CeRRI – a research organization working in the field of society-driven and participatory innovation processes – conducted and moderated the collaboration and developed the methods that were used in the collaboration.

Five participants in the meetings represented academia, six industry, four society and one government. Societal representatives came from labor unions and vocational education and training. Five participants represented intermediary organizations, which aim at bringing together actors from science, industry, society and/or government. Participants were motivated to participate, as it was supposed to provide space to not only discuss technological aspects of industrial automation but also reflect on the social and ethical implications of industrial automation technologies both within an organization as well as on society as a whole. All participants realized the importance of broad social issues such as education and training, the new way of working together between people and machines and the importance of increased employee participation.

THE LOCAL INNOVATION ECOSYSTEM

The SmartFactoryOWL is located within an existing local innovation ecosystem, comprising the university of applied science (TH-OWL), the Fraunhofer institute IOSB-INA, various intermediary organizations, vocational schools as well as small and medium-sized companies, all of which are in close proximity. Well-established and highly professionalized connections between science and industry exist, as employees of SmartFactoryOWL advice small and medium-sized enterprises (SME) in the area, work together in joint research and develop projects together. Connections to government exist at two levels. First, government has played a role as a rule-setter and financier. Federal and state governments finance research and industry projects and set policies, programs and strategies, in which the local innovation ecosystem evolves. In particular, they co-finance the SmartFactoryOWL. Second, at the local level, there are also direct professional contacts to the various mayors and the local governments in the region of OWL. These contacts provide local political support for the innovation ecosystem. This even manifests in support for setting up physical infrastructure, including buildings, parking lots, and streets. Actors from the academic sector, business and government have established various intermediary organizations over time to intensify contacts among the actors, translate the diverse needs and languages and consolidate common interests.

Within this innovation ecosystem, no dedicated formats and processes exist to integrate societal aspects into the innovation processes. However, representatives of academia and industry have gradually become aware that media, personal interaction and the public discourse affect their work. Environmental issues such as climate change and energy consumption, ethical issues such as data protection, and societal issues such as acceptance, the need to create (new) jobs and the digital divide of society are important for the success of new technologies.

Becoming aware of the role of society for innovation, the SmartFactoryOWL has developed new formats of science communication to enter into contact with society over recent years. It has organized hackathons, an open factory day, and even provided space for voting rooms for local elections. It has also sought direct access to citizens and set up a bureau in the city center, where citizens could inform themselves about the risks and opportunities of new technologies.

THE FUTURE-WORK LAB: QHC IN INDUSTRIAL AUTOMATION

SmartFactoryOWL and Fraunhofer CeRRI invited actors from the local innovation system to discuss the future of industrial automation. At the first meeting, participants agreed that "the future of work in industrial automation" should be the central topic that they wanted to discuss in the social lab.

This topic relates to the impact of industrial automation on jobs. Media coverage and public discourse was quite critical in this regard. Studies have gone public arguing that industrial automation may cost up to 60,000 jobs in Germany alone. Moreover, it relates to ethical aspects regarding human-machine interaction. Having the space to discuss this aspect, learn about the technologies and the different perspectives in this regard motivated stakeholders from all innovation sectors to participate at the lab.

For the researchers at Fraunhofer IOSB-INA, this focus was new. Most of the time, they collaborate with engineers, technology and business experts in their research projects. In such projects, this perspective does not come to the fore, although it emerged that particularly workers' committees may be a "show-stopper" for projects and new technologies, as one of the lab members described. If they oppose such projects, companies are not allowed to invest in such new technologies. On the other hand, if their critical stake was taken into account in the further development of automation technologies, it was more likely that the research projects would come to a successful end. Moreover, in other projects, people at SmartFactoryOWL recognized that societal acceptance is relevant to successfully and efficiently implementing new technologies.

The future-work lab provided space for such discussions. The participants used specific methods to reflect on their particular role in the innovation processes and the competencies and resources that actors may provide to the future of work in industrial automation. One of these methods – a noticeboard – allowed participants of the lab to systematically display the needs and resources of different stakeholders regarding industrial automation (see FIGURE 4). Stakeholders could present and respond to ideas, solutions as well as questions regarding future of work in industrial automation and allocate them to the categories of "ethical questions", "social aspects" and "regulatory aspects".

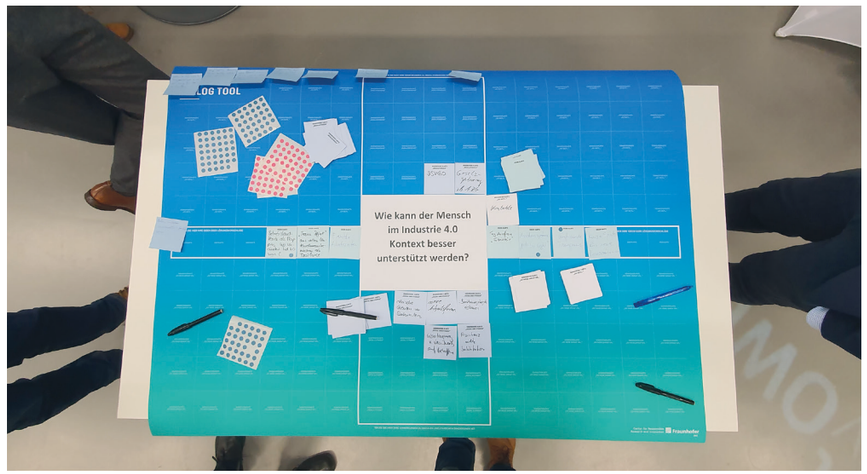

FIGURE 4_
Method used in the social lab to reflect on the different perspectives of the participants

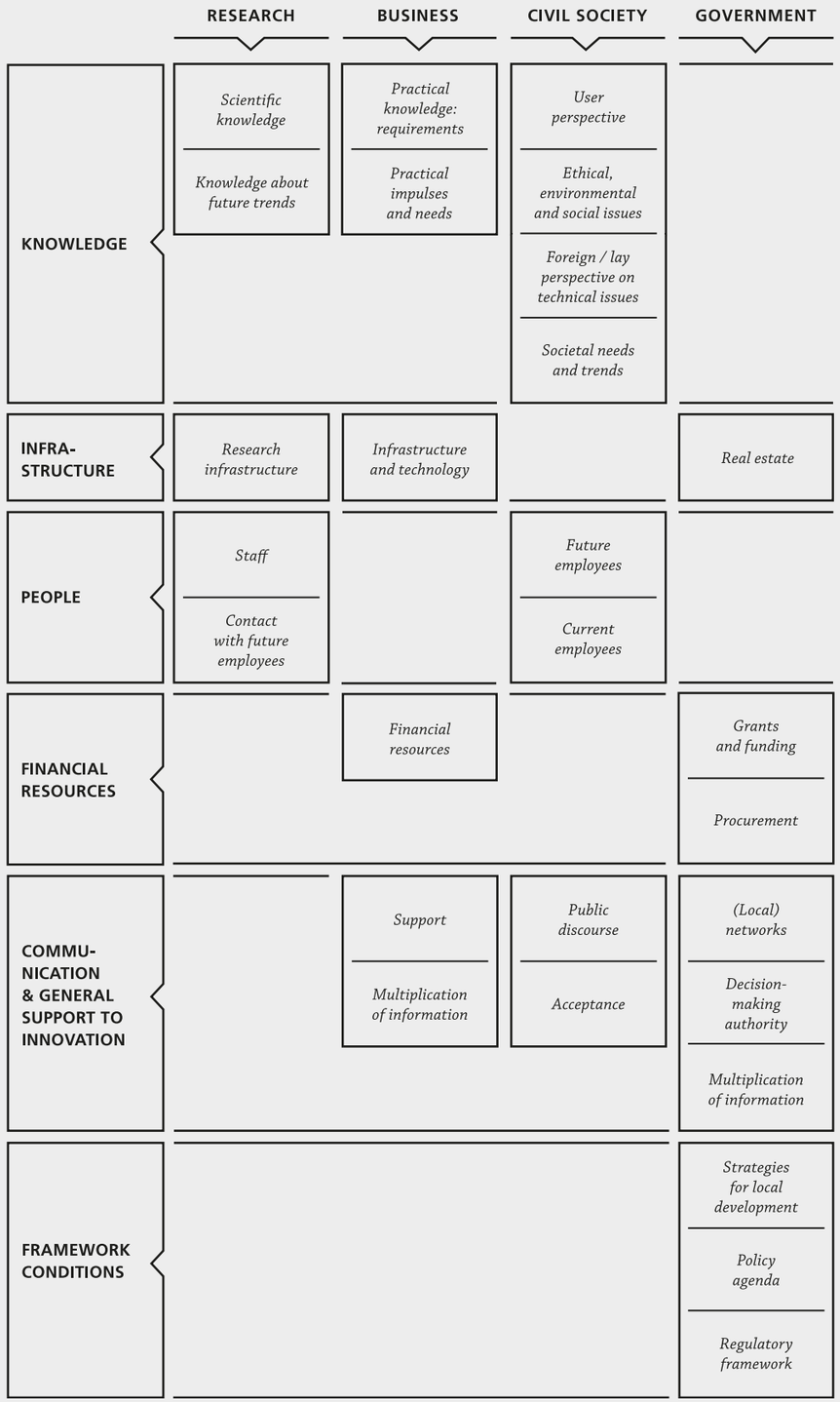

FIGURE 5_
Competencies and resources of innovation actors in the field of industrial automation

As a result of the discussions, participants identified different competencies and resources that the various actors could contribute to innovation processes in industrial automation (see FIGURE 5).

According to the participants, the four sectors provide different resources and competencies regarding the future of work in industrial automation. "Government" shapes the framework conditions for innovation and provides financial resources. Furthermore, it offers networks to multiply information and organize support for innovation. "Civil society" mainly contributes a different sort of knowledge to innovation processes.

Societal actors have a lay perspective on technologies, allowing them to draw attention to needs, overall trends and ethical, environmental and social implications of technologies. However, society is most important for industry 4.0 as it may grant or deny the acceptance of the technology. Thus, society has a thorough impact on the success of innovation. "Business" provides practical knowledge, infrastructure and financial resources, while "research" adds primarily scientific knowledge and research infrastructure as well as personal resources and contact with future employees.

RESULTS AND LESSONS LEARNED

The future-work lab provided a format dedicated to reflecting on the societal dimension of industrial automation. As such, it revealed to the participants the complexity of industrial automation, which is not only a technological issue but one that affects human-machine interaction, the future of work, education and new business models. Industrial automation is a complex problem, particularly when it comes to implementing such automatized processes. The participants became aware of the diverse perspectives and the different resources and competencies that actors from business, civil society, research and policy may contribute to innovation in industrial automation. Furthermore, for the initiating researchers, the future-work lab explicated that an early dialog with civil society actors – with those being affected by a technology – may increase the acceptance of a new technology. With the QHC model, the project provided an analytical tool to reflect on this. As a result, SmartFactoryOWL and Fraunhofer IOSB-INA are going to open up their processes beyond direct project partners. In new projects, SmartFactoryOWL now enters into contact with these people early on to enhance the acceptance of future technologies.

What can we learn from this case for the overall question? How QHC can be set up in practice?

This chapter shows that QHC in research in industrial automation can be productive. However, some conditions must be fulfilled. We derived four such conditions from future-work lab.

1. Let a well-known and trustworthy player establish the QHC

SmartFactoryOWL and Fraunhofer are central players in the local innovation ecosystem. They have useful and resilient contacts with business, research and government in this area. They not only have a renowned name but – as a research institute – they are also recognized as a neutral and trustworthy player.

2. Establish a QHC with regional ties among the partners

In the future-work lab, all participants come from the same area, i.e. OWL. Thus, there was a common goal among the participants to support the economic, industrial and innovative basis of this area. The participants either knew each other, had the same stakeholders or some other kind of connections.

3. Let civil society be represented by professional organizations

In this case, civil society was represented by professional organizations that had already contact with the initiating stakeholder. When organizing the future-work lab, the SmartFactoryOWL invited organizations and people with whom they already had contact: labor unions, educational institutes, and intermediary organizations. It was easy to enter into contact with them, as they already had their mail address and phone numbers. As the representatives of civil society were used to meetings with industry and academia, it was not necessary to change the format or culture of the meetings. The meetings of the future-work lab took place during work time in a classical workshop format.

4. Collaborate about strategic not operational issues

The future-work lab was not about operational but strategic issues. Participants did not discuss one particular project or one particular technology. Instead, they used the time and space to reflect on the potential impact of industrial automation technologies and discuss various perspectives of it. It was mainly about learning and trust building, and less about explicit outputs.

CONCLUSION

Although setting up a functioning QHC is quite challenging, the benefits are vast. Such processes reveal new knowledge, uncover potential risks and show-stoppers, and increase acceptance for the particular innovation. Moreover, a democratic potential is revealed. In a reflection session, a participant in the lab said: "We live in a democracy. Civil society expects to participate in the creation of new technologies. We need to take this into account, otherwise new technologies may not succeed." While this is already important for high-technological fields like industrial automation, this need multiplies in what is called mission-oriented research, namely research that provides solutions to societal challenges.

FURTHER READING_

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