

Collaboration as the Key to the Successful Transfer of Innovation

Recommendations for Research and Development

acatech (Ed.)



Our economy is driven by innovation and new technological developments – it is these that determine the competitiveness of individual companies and entire nations. Both research institutions and companies' product development departments provide a source of potential innovations. However, simply promoting their research and development (R&D) activities is not enough in itself to create a strategy that is fit for the future. It is also critical to ensure that the solutions they develop are transferred into practical applications and are widely adopted as quickly as possible. This is currently one of the key challenges for R&D partners.

The fourth industrial revolution (Industrie 4.0), also referred to as the digital transformation, will have a big impact in the future competitiveness of German businesses. This is especially true in the automotive industry, where the race to connect objects, data and services in useful ways has already begun.¹ Logistics plays a central role in the management of the relevant value networks. The major changes introduced by digital transformation will require the integration and adaptation of technology fields, methods, standards, services, partner companies and academia. With the first prototype Industrie 4.0 initiatives already up and running in the automotive logistics industry, we can now build directly on their experience of using embedded information technology.² In spite of its current challenges, Germany's automotive industry has a good reputation both at home and abroad for its high process efficiency. It acts as a benchmark for other industries as far as innovative organisational strategies and implementations are concerned. Consequently, successful solutions developed by the automotive industry are likely to be adopted by other industries.

There is no single ideal or universally applicable roadmap for the development and implementation measures required by the digital transformation – each company must find its own

roadmap. However, as a cross-cutting function involving several different companies and business areas, the example of logistics clearly demonstrates that individual companies will not be able to carry out the necessary development measures in isolation. Instead, consortiums of companies should address the relevant issues jointly, since a wide range of partners are affected each and every time there is a change or whenever a new technology or method is introduced in a company or parts

At a glance

- The complex logistics of the automotive industry makes evident that individual companies cannot afford to transition to Industrie 4.0 on their own.
- The industry therefore needs to collaborate in the field of research and development (R&D).
- R&D projects – especially publicly funded ones – will need to be revised.
- The criteria that define successful research transfer are an integrated approach, speed, adaptability, market orientation and economic viability.
- New forms of collaboration are required, with close collaboration between all the partners from the initial establishment of the consortium right up to the transfer of the results.
- Agile, autonomous project management is increasingly a feature of successful research.
- Research projects must address how their results will be transferred and the associated legal questions right from the outset.
- A publicly funded network of connected regional transfer centres would support the transfer of research results.

1 | See acatech (Ed.): *Cyber-Physical Systems – Driving force for innovations in mobility, health, energy and production* (acatech POSITION PAPER), Heidelberg et al.: Springer Verlag 2011, p. 13.

2 | Ibid.



thereof. The partners have to create interfaces with the new technology, operate new processes, adapt their own systems and participate in the changes themselves. At the same time, they must ensure that their own optimisation objectives are not jeopardised and that there is no detrimental impact on their own corporate partners. Ideally, the development and implementation measures would be jointly established by all the companies in a given industry. For this to be possible, however, it will be necessary to test the effectiveness of current project management procedures.

While this applies to all project types, it is particularly true for publicly funded projects. The experts consulted during the course of the study most frequently cited the specification within the project application and implementation conditions as the factors that determined whether or not the results were successfully transferred – especially with regard to the configuration of the consortium. The organisation of the consortium partners, overall environment and measures taken were less commonly cited as drivers or constraints for successful research transfer. Five criteria that are key to transfer-oriented research were identified on the basis of the issues raised in the expert interviews:

- integrated approach
- speed
- adaptability
- market orientation
- economic viability

In publicly funded projects, corporate objectives must be reconciled with macroeconomic, political, social and scientific goals. It will not be possible to do so if the project outcome is focused exclusively on scientific results – indeed, this can fundamentally complicate or even threaten the implementation of the results. It is therefore necessary to find new ways of collaborating and new mechanisms for calls for proposals.

There is no question that German and European companies need to deliver and implement development results in a faster and more targeted manner than they do at present. The acceleration of implementation processes, especially in small and medium-sized enterprises (SMEs), will call for new organisational structures and support mechanisms. Given their importance to the economy, they will require policy measures that could potentially even touch on matters of antitrust or company law.

The foundations for the required paradigm shift in research project management must already be laid out during school and professional education as well as professional development

processes, which should provide people with a basic understanding of collaborative working. In the future, collaboration projects should identify both the opportunities and the threats of the development measures so that it is clear who the winners will be as well as the losers.

Ultimately, research projects have to deliver both economic and individual benefits. A number of questions need to be resolved in this regard. For instance, what monetary opportunities will project members have from copyright arrangements? How can more new company start-ups be promoted? And how can implementation be accelerated through the sale of project results?

The INNOKEY 4.0 study identified a number of drivers and constraints for the transfer of R&D project results. These form the basis of the recommendations outlined below for transfer-oriented R&D, particularly in publicly funded projects. The recommendations are addressed to policymakers, businesses and education providers and are mutually dependent. In order to ensure successful research transfer, it is therefore both desirable and necessary to adopt an integrated approach to implementation based on coordinated measures. These recommendations are to be tested in a future follow-up project by accompanying a select research programme or large-scale project.

Recommendations

Recommendations for policymakers

As part of the government's overall measures to promote R&D, various federal government departments currently have initiatives in the field of Industrie 4.0. As the initiators and funders of a wide range of partnership projects in academia and industry, the ministries, together with the organisations chosen to run the projects, have a special responsibility to create appropriate frameworks, funding mechanisms and project structures for R&D projects in technology areas undergoing disruptive development. Against this background, acatech's recommendations are as follows:

1. **Support collaborative R&D through a forum for innovation and collaboration**

Industrie 4.0 has huge potential for supply chain process optimisation, not least in the automotive industry. However, no single company or consortium can develop all the fields encompassed by Industrie 4.0 on its own. Instead, experts in different areas must work together to ensure rapid development in the relevant fields. This joint development



approach requires a joint strategy within the industry in order to ensure that individual development roadmaps do not lead to incompatible processes. Consequently, an industry forum for innovation and collaboration should be established to coordinate a joint research agenda for the industry and oversee delivery of the agreed targets.

2. Promote value-added collaboration

The fact that Industrie 4.0 is characterised by connected processes and autonomous control makes research projects more complex. More than ever, they call for interdisciplinary, cross-company collaboration so that they can deliver appropriate solutions that are also valid for the industry as a whole. Improving collaboration between everyone involved in a project is one of the keys to success. Close collaboration between all the partners should begin during the initial establishment of the consortium and continue right up to the transfer of the results. Successful collaboration during the initial establishment of the project promotes a shared understanding of the issues and above all helps to ensure that they are addressed effectively and efficiently by the consortium.

3. Use agile project management methods

Since future development projects in the field of Industrie 4.0 will increasingly be subject to continuous realignment, it will be important to employ agile methods. The ability to respond in an agile manner to new circumstances both within and outside of the project will be a feature of successful research. This requires competent project management capable of identifying both a project's impacts and opportunities and any changes that may become necessary, adapting the project's work accordingly, mediating between the interests of the different parties and building a consensus. In the future, the competence of the project management should first be verified by the consortium.

4. Give project managers greater freedom

Research projects are subject to a range of internal and external factors that have a significant influence on how they progress and the quality of and demand for their results. These factors include consortium partners failing to take responsibility, partners intentionally withholding knowledge in order to protect corporate interests, changing market requirements and new technologies. At present, the project management is in principle limited in terms of how it can respond to the different factors that have an influence on the project. If a project isn't going well, the project management currently lacks the means e.g. to ensure that decisions are implemented across all the participating

companies, impose appropriate penalties on inefficient partners, rebalance the workload between the different partners or bring new expertise into the consortium by changing one or more of the partners. Project managers can only manage a project successfully if they also manage the project funds.

5. Establish transfer centres and disseminate project results

A lack of clarity regarding responsibilities, tasks, follow-up investments, rights to existing systemic developments and obligations with respect to joint activities to ensure utilisation and dissemination of the results can cause delays in the transfer of good research results. In order to ensure widespread take-up of Industrie 4.0, project results should be disseminated in a targeted manner and shared with the target groups through appropriate transfer measures. The entire industry should take responsibility for communicating the relevant project results, taking decisions on industry-wide technology developments and implementing them in a coordinated manner. The establishment of a network of connected regional transfer centres by the funding agencies would provide targeted support for these transfer processes within the industry.

6. Set up a contingency fund

In the future, projects will be subject to continuous realignment. The ability to respond in a rapid and agile manner to new circumstances both within and outside of the project will be a feature of successful research. This includes the realisation that the results of an applied research project may not deliver the practical benefits that the partners from industry were initially hoping for. In these situations, the relevant actors from the companies, research institutions and funding agencies involved in the project must accept that it may be necessary to discontinue the project and find ways of facilitating this or the withdrawal of some of the partners. It is especially important to make sure that the research institutions' interests are taken into account and that the research itself can be continued. A contingency fund set up by the funding agencies would provide projects with protection against this type of risk.

Recommendations for industry and academia

7. Plan collaboration as an objective throughout a project's lifetime

Industrie 4.0 has huge potential for supply chain process optimisation in the automotive industry. The wide range of fields encompassed by Industrie 4.0 means that close cooperation is required between everyone involved in a



consortium. Companies must strengthen and support collaboration throughout all phases of a project. We believe that consortium partners' collaboration skills still leave a lot to be desired. As a result, consortiums often suffer from information asymmetries or have partners who intentionally withhold knowledge. In addition to project execution tasks and responsibilities, it is particularly important to ensure earlier planning of collaboration requirements during the implementation stage.

8. Teach collaborative working skills

The fierce competition between different companies in the automotive industry constitutes a serious obstacle to collaboration. Effective collaboration is badly hampered by a fear of sharing information with project partners and competitors. The representatives of the organisations in the consortium must be willing to cooperate and empowered to do so by their companies. Future training and professional development, especially in secondary to quaternary education, should provide modules on how to organise, understand and

engage in collaborative, interdisciplinary work processes in order to teach people the necessary collaboration skills.

9. Support the transfer of research results through ongoing market orientation

One of the federal government's overarching goals is to secure the competitiveness of German industry. In order to deliver this goal, it is necessary to accelerate the development and transfer of good solutions. Consortiums must actively promote the transfer of their solutions and already start the planning process during the preparation of their project applications. Inadequate planning is currently resulting in a lack of clarity regarding responsibilities and tasks, as well as rights to existing systemic developments and obligations in the transfer process. In order to support the transfer of research results, the current exploitation plans should be recast into transfer and collaboration strategies that describe the consortium's joint activities to ensure utilisation and dissemination of the results already during the project's lifetime and the subsequent implementation stage.

acatech INNOKEY 4.0 Study

This acatech POSITION PAPER is based on the project "*Kollaboration als Schlüssel zum erfolgreichen Transfer von Innovationen am Beispiel der Automobillogistik*" (Collaboration as the Key to the Successful Transfer of Innovation: The Example of Automotive Logistics – INNOKEY 4.0), funded by the Federal Ministry for Economic Affairs and Energy (BMWi). In this project, acatech and the Fraunhofer-Institute for Material Flow and Logistics (IML) investigated joint R&D initiatives using the example of the automotive logistics industry. Drivers and constraints for the successful transfer of R&D project results into industrial applications and measures for addressing some of the current problems were identified through structured interviews with experts from academia and industry carried out in June and July 2016. The results were validated in March 2017 through an online survey of representatives of SMEs, large-scale enterprises, universities, other higher education institutions and research institutions.

Editor: acatech – National Academy of Science and Engineering, 2017

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