# Summary

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| Paper Title | David against Goliath? Collaborative innovation in R&D partnerships of low-tech and high-tech firms. Empirical evidence from German industry |
| Paper Author | Kirner and Som |
| Tags | Innovation, low-tech, R&D, collaboration management, absorptive capacity |
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# Key Takeaways

1. Companies that are involved in R&D processes on a low level (low-tech firms) are an important economic factor: relevant role in the value chain in all sectors, many of them are innovators but without R&D.
2. They have disadvantages when it comes to science-based and technological innovations. Compensate this through collaboration with R&D intensive firms → high benefits for both partners: low-tech firms have close relationship to customers and specialization in market niche, high-tech firms can contribute in bringing resources and technological competences.
3. But few collaborations between high- and low-tech firms due to asymmetries (that bring risks and challenges to both collaboration partners)
4. Success factor: transparent, regular, thorough communication
5. Organizational interfaces and processes have to be adapted to bridge cultural and behavioral differences

# Paper Overview

* In Germany, “low-tech” firms (=firms that do not perform R&D or only on a low level) are present in the low-, medium- and high-tech sectors. They are to equal shares suppliers and producers which means that 50% of low-tech firms are affected by shifts in customer preferences and innovation pressure. “Low-tech” firms occupy a key position in manufacturing industries but don’t seem to influence the innovation performance negatively as assumed first in this paper. Non-R&D-intensive firms mostly smaller than R&D-intensive firms
* Innovation patterns of “low-tech” firms:
	+ strong technological absorptive capacity (= they recognize, access and successfully adapt new technological solutions that have been developed externally)
	+ make use of their closeness to their customers and ability to develop customized solutions flexibly
	+ knowledge-intensive product innovation

The authors of this paper deduce that “low-tech” firms seem to use external resources such as their customers or collaboration with research institutions to gain innovation information.

* Absorptive capacity leads to competitive advantage as knowledge is managed efficiently, there can be distinguished by two interdependent dimensions:
	+ Search and acquire new, external information about technological trends
	+ Adapt internal processes and resource configurations exploiting their full potential
* Absorptive capacity should not only base on the recognition and implementation of R&D- or science-based knowledge. A broader use of the absorption capability should be based on the ability to recognize, evaluate and benefit from external developments, trends and information regarding their market environment and customers (type: science-based vs. customer-based and resources that can be absorbed from external partners, level: recognition vs. implementation). Main reason for high level of absorptive capacity: individual innovation paths and priorities of the firm
* Recognition and implementation belong to organizational learning processes and are both relevant for innovation and competitive success:
	+ Explorative learning: when a firm is able to identify, recognize and access new sources of information
	+ Exploitative learning: when new information is being applied and implemented by the firm
* R&D-intensive firms need less efforts to achieve a high level of absorptive capacity than non-R&D-firms, especially for science-based knowledge → availability of professionalized R&D-activities is a strong enables of firms’ science-based absorptive capacity. That means that non-R&D-intensive firms need to develop a strategy, implement processes and choose internal resources to build up and maintain absorptive capacity. R&D collaboration depend on internal R&D personnel potential to manage external ideas and is linked to the size of the firm. The smaller a non-R&D-firm is, the smaller the advantage regarding the possibility of absorbing external technological knowledge.
* Well-functioning R&D collaboration brings improved knowledge sourcing and advantages of risk sharing and cost reduction that non-R&D-intensive firms can profit of. The more low-tech firms collaborate, the higher the product innovation performance. Large unused potential of collaboration between non-R&D-intensive and R&D-intensive firms. But collaboration is not self-evident due to asymmetric aspects: investment of managerial resources, organizational and cultural differences, resources, different motives for collaboration, asymmetric bargaining power. Especially horizontal R&D collaborations difficult to regulate in advance. Collaboration should bring a benefit to both partners

What is asymmetric collaboration?

* Asymmetry involved in collaborations between large and small organizations are mostly described as fragile relationships due to difficulties in providing fair dealing, convergent interests and different competitive pressures or dependencies. In this paper, asymmetry is used to label and operationalize inequalities and differences looking at interorganizational relationships between non-R&D-intensive and R&D-intensive collaboration partners. Here different levels of structure asymmetries/heterogeneity:
	+ Industry/sector: symmetry between firms located in the same sector/industry is expected to be higher as between firms located in different industries. This is due to technological paradigms, shared assumptions and patterns of innovative behavior inside the same industry → asymmetries in terminology, mental models of problem solving, different technological bases, knowledge culture.
	+ Firm/organization: product complexity, production structure, export orientation, internal organizational structures/routines/culture. Big differences may lead to problems concerning definition of shared collaboration targets, joint work processes and overall coordination.
	+ Individuals: professional background, work style, communication
* The higher the level of heterogeneity, the more difficult a collaboration between high-tech and low-tech firms are.

How to overcome barriers in asymmetric R&D collaboration

* Barriers of initiating and maintaining a collaboration are higher in asymmetric collaborations than in symmetric collaborations. The Innovation benefit has to be clear to both parties before the collaboration starts
* The R&D-intensive partner needs to have a clear vision of the potentially reachable benefit of the asymmetric collaboration to outweigh the higher investment in coordination and communication. Possible benefit for R&D intensive firms are:
	+ Access to a specific (niche) market
	+ Access to a highly specialized (process) knowledge – they can be further developed in a new context through joint R&D efforts

Case study

* Collaboration between traditional medium sized firm from the textile sector, ~100 employees (low-tech) and a large firm from the medical technology sector, ~2000 employees (high-tech).

Low-tech firm: competitive advantage based on high vertical range of manufacturing → outstanding volume, variant flexibility, high quality, quick reaction times. Position in the value chain: specialized supplier in a niche market. Complete lack of internal R&D activities, tasks of engineering and process development located at the employees in production

Management decided to open up a new field of business (due to increasing competition and potential to enter in new market) in the medical sector through collaboration. Goal: transfer core competences of the company into a product of the medical industry.

→ initiation of a collaboration with a big company with institutionalized R&D and R&D expenditures more that 7% share on sales

* Asymmetries:
	+ Sectoral level:
		- Knowledge and innovation type: low-tech company: productivity and cost-driven competition → technical/ organizational process innovations, based on practical and tacit knowledge, high-tech company: technological leadership and R&D-based product innovation based on highly formalized scientific knowledge.
		- Documentation and standardization: low-tech company: (almost) no documentation and standardization
	+ Firm level: Low-tech company: incoming innovation projects mainly inserted by sales (as customers requests), handled by production management and top management, sales as only communication towards external partners, no organizational interface on the technological level. High-tech company: structured, clear hierarchy levels, defined communication rules for internal and external communication
	+ Individual level: low-tech company’s employees not familiar with specific terminology, software tools or instruments of product development in the medical industry, formal education level asymmetries, no recognition of potential benefit through that collaboration
* After a year of collaboration: both about to quit from the collaboration. Low-tech firm: frustrated, degraded to supplier role, could not open CAD-drawings…, High-tech firm: no counterpart on low-tech side, to developed for low-tech firm…
* But: organized a workshop to save the situation with a neutral mediator. Following measures taken by the management
	+ Of the low-tech firm:
		- Ensure technical communication compatibility (e.g. CAD-Software)
		- Systematic documentation and proactive communication
		- Creation of professional innovation capabilities (innovation process and management)
		- Establishment of defined contact person who has overview of technical and organizational activities
	+ Of the high-tech firm:
		- Early and transparent communication of future product specification/ ideas/ fields of application
		- Disclosure of the product development strategy to allow for early identification of future collaboration potentials
		- Establishment if direct contact person between CEO of low-firm and R&D development of high-tech firm
		- Forwarding customer and end-user feedback
	+ Joint measures:
		- Establishment of regular and formal communication activities with all relevant employees involved
		- Definition and implementation of inter-organizational process operations
		- Definition of tolerances when defining tasks and requirements
		- Joint testing of prototypes