Search strategies for cross-industry innovation

Development of a multi-job multi-method matrix with BMW

The realization of the overriding principle of sustainable mobility requires a fundamental change in technology management in automotive sector. Viable technologies for energy-efficient and powerful vehicles need to be developed quickly, applying already existing technologies from other industries to avoid time-consuming and costly developments. Moreover, the automotive industry is known for its distinctive vertical R&D alliances between manufacturers and suppliers and the focal position automobile manufacturers (OEMs) play therein. However, vertical R&D alliances between OEMs and suppliers trap OEMs in a setting where they are increasingly running the risk of failing to seek out alternative technologies. Ultimately, automotive OEMs’ may miss opportunities for innovation and their innovativeness may suffer substantially. Cross-industry innovation prevents firms from becoming locked in to a specific field through combination of distant pieces of knowledge and interaction with „idea suppliers“ from distant technological domains. In this age, a systematic and integrated approach in technology management across industries is a prerequisite for success. For example, in the field of electric mobility, links between vehicle manufacturing and renewable energy industries will help to take advantage of spillovers from mutual learning processes.

The BMW Group consistently worked on technological innovations to increase energy efficiency and is in the process of professionalizing its external technology sourcing even further. With many years of experience in conducting open and cross-industry innovation projects in the automotive sector, we support BMW in optimizing its outside-in technology management. In recent cooperation with BMW’s central unit for outside-in technology management, which is under the management of Christian Huber and part of BMW’s research and development department, we have touched upon the question: How to systematically search for radical inputs across industries in the front-end of technology management?

How BMW’s technology managers find out relevant knowledge outside the core in a targeted way

The search for promising technologies from outside the core is dominated by uncertainty, oscillation between different sources of new technologies, and analogical transfer. We aimed at the systematization of several search strategies to increase technology manager’s effectiveness in the identification of potentially valuable technologies from both adjacent and distant industries. To this end, a so-called multi-job multi-method matrix based on search approaches that serve as a synopsis of search strategies for cross-industry innovation was developed (see Figure 1). The matrix suggests the appropriate use of search methods and their functional consequences according to different job definitions:

- **Optimization of cost and quality:** E.g., electric mobility requires efficient, safe, affordable and powerful battery systems; on the other hand, reductions must be made in weight, volume, and charging time. Innovation in this field will come from information and communication technology enterprises. IBM, for example, is currently on a pioneering challenge to produce the very first commercially viable metal-air battery in the world.

- **Solving of concrete problems:** E.g., the reduction of energy consumption and CO2 emissions requires alternative bearing concepts to improve energy efficiency. Here, the innovation impetus will come from firms in renewable energy industry optimizing bearing concepts for wind power plants, for example.

- **Generation of technology stimulated innovations** (see section on “Search strategies in use”).

Across all job definitions, relevant methods are scenario planning, patent snapshot, mass screening (publication search and bibliometrics), patent search, pyramiding (expert search), and cross-industry workshops. Thereby, the chances of identifying analogous solutions are increased if
the problem with the job definition is abstracted to the level of its key technical functions, allowing abstract search terms to be generated. In a joint workshop, we presented techniques to help succeed in desk research, as well as tools for searching technological know-how and experts.

Search strategies in use

With respect to the job definition of generating technology stimulated innovations, a pilot project for the development of a cross-industry map of patent data for the field of energy management was conducted.

In the course of the analysis, the project team first developed abstract search terms such as ‘energy absorption’ and ‘transformation of kinetic energy’.

With these terms in mind, the team members were able to build associations with different kinds of technologies, applications and industries in which the absorption and transformation of energy is crucial. Thereby, identification of analogical solutions was facilitated using systematic-discursive creativity methods such as the Osborn checklist as well as results from our network analysis (see article by Sebastian Heil about distant collaboration). The latter inspired technology managers in which industry an appropriate technological solution might lie. The team members then started to search patent databases with the focus on the previously identified key terms and target industries. In this way, they identified several promising technologies of distant areas such as low-energy houses, white goods and aeronautics.

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