

A Methodology for the Identification of Technology Indicators

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Summary

Technologies influence the product development and the production process significantly. For technology-intensive companies, especially in automobile industry and mechanical engineering branch, technologies have become a key factor for competitiveness. Therefore, it is important to identify the key characteristics of technologies such as advantages or barriers, to compare them as well as to analyze the technology trend in order to grasp the current development of technologies, and to develop suitable technology strategies, which leads to an urgent demand of researchers and decision makers on the extraction of technology-relevant knowledge.

There is a vast amount of information available. However, decision makers are not well informed about technologies. There are three basic problems of the information procurement in the context of technology monitoring. First of all, there is no clear definition of the technology-relevant information. Secondly, the development of communication and information technology has resulted in a dramatic increase of the amount of information in recent years, most of which is digitally available. It is no longer possible to process that much information manually. The last problem is the lack of methodology, which can guide decision makers in companies to search and analyze the technology information that they desire.

Considering the first challenge mentioned above, a new term “Technology Indicator” is defined. Technology Indicators are those indexes or statistical data, which allow direct characterization and evaluation of technologies throughout their whole life cycles. For example, technological maturity, market segment, degree of innovation, key player (country, company...). Those Technology Indicators offer a direct view of technologies to decision makers. To cover the second and the third open issues, a methodology for the (semi-)automatic identification of Technology Indicators is proposed in this dissertation.

The proposed methodology is based on the combination of four basic methods: Information Retrieval, Bibliometric Analysis, Ontology, and Expert Consultation. The four methods chosen are combined in such a standard process to give a guide to decision makers for the information procurement. The start point is to analyze the requirements of technology investigation. Input of this methodology is a large amount of raw information retrieved by using Information Retrieval. Then the information is pre-processed, decomposed into words, standardized, and statistically analyzed. A Technology Indicator Ontology is developed in this dissertation, with which the Raw Technology Indicators can be easily identified. The Raw Technology Indicators are then concretized with contents and values by interpreting the co-relationships of the keywords and

other results after the statistical analysis. Finally, the Technology Indicators are evaluated by experts through Expert Consultation. The result of the methodology is a list of identified Technology Indicators with their technology-specific contents and values. It is noticed that the methodology also facilitates a simple process of regular update in order to catch up with the current changes of technology.

The methodology is integrated in the innovative Technology Database, which is developed by Heinz Nixdorf Institute and aims at supporting the product innovation process (see section 2.2). The Technology Indicators extracted are input into the database together with other relevant information (e.g. figures, or other general information written in continuous text). On the output side of the database, those indicators are visualized in formats of Technology Reports and Technology Roadmaps, which are automatically generated from the Technology Database. The Technology Report is constructed in a fixed structure and represents detailed information of technologies. The Technology Roadmap is a plan that shows which technology can be used in which products at what time. Both of them help decision makers to know technologies better and to speed up their decision-making process.

The methodology proposed for identification of Technology Indicators has proven feasible in several case studies. It combines quantitative analysis and qualitative analysis to make the results more reliable and accurate. It standardizes the procedure of information procurement and consequently guides decision makers to simplify information processing processes. With the methodology, it is possible to search, process, and analyze a huge amount of information in one turn. Furthermore, the methodology realizes semi-automatic analysis of literature for the purpose of investigation of technologies and facilitates a trivial update process.

To sum up, the methodology fulfils the requirements of the information procurement to a great extent. Based on the case study, it is also convincible that the methodology is suitable for practical application.