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How German Companies apply Roadmapping: Evidence from an Empirical Study

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ABSTRACT

Roadmapping is a method able to integrate different planning levels and to allocate options within these levels, using the metaphor of guidance through the complexity of a geographic landscape. Roadmaps enable companies to explore and choose the best possible route from available options. Today, roadmapping (and strategy in general) is confronted with new challenges. Industry trends such as an increasing digitization, smart systems and the internet of things are forcing companies to consider fields in their roadmapping processes that are extending beyond traditional core competencies. The aim of the presented research is to identify current roadmapping practices applied in industrial companies in Germany. To reach this aim, characterizing parameters for roadmap design, as well as future challenges, recommendations and pitfalls were investigated with the help of practitioners from industrial companies in an internet survey.

1. Introduction and motivation

Roadmapping is a methodology that has been researched extensively and is considered to be well established in industrial companies (see, for example, Phaal, 2004, p.130; Barker & Smith 1995, p.22f.; Groenveld, 1997, p.48f.; Farrukh et al., 2003, p.7f.; Ulrich & Eppinger, 2008, p.41f). Despite many studies on roadmapping, there is relatively little information available on how roadmapping is successfully integrated into company systems and, more specifically, how companies use roadmapping in the context of current industrial challenges such as increasing digitization, smart systems and the internet of things.

An assumption motivating this research is that only a few companies take benefit from the full potential of integrated roadmapping within their organization. As a starting point for further research activities in more focused areas, a study has been carried out within German industries to find out about the application areas and the content that companies apply roadmapping for, and about the organizational and methodological integration of roadmapping. To complement the current state of knowledge, participating companies were questioned about the expected future challenges of roadmapping, including recommendations and pitfalls, to enable learning for other companies aiming to implement the roadmapping approach.

2. Literature review and research design

The study was based on a deductive empirical analysis aiming to verify hypotheses derived from literature (Atteslander & Cromm, 2003, p.5). Existing studies and underlying literature were considered as a basis, especially taking into account current developments

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that are challenging the traditional usage of roadmapping. The study was carried out as a semi-qualitative study to gain information from pre-defined questions related to three categories, as well as an additional category to explore more unstructured design parameters of roadmapping in industrial companies in a qualitative manner. For this semi-qualitative study, due to its objective of collecting information on the application of roadmapping in practice from an unknown sample, the survey method was selected (Robson, 1993, p.49f). The medium of an internet survey left the sectors to be involved as well as the detailed geographic location of the participants open. In addition to the prerequisite of participating companies to apply roadmapping, the geographic location of Germany was defined as a prerequisite for participation. Both prerequisites were mentioned on the entry page of the survey. A sample of 81 responses out of an overall number of 156 was selected as a basis for the analysis. The selection of the final sample out of the received answers was based on controlling the prerequisites and on the level of completeness of the answers received from participants. The survey was available in the timeframe between July and September 2015 in German language.

2.1. Existing studies on the practical application of roadmapping

There are numerous definitions of roadmapping in the literature, including complementary tools and phases of the roadmapping process (see Carvalho et al., 2013). Within the study, the definition of roadmaps covering and integrating different planning levels was applied, that is in the literature often used synonymously with the term ‘technology roadmap’ (see, for example, Farrukh et al., 2003; Phaal et al., 2004; Moehrle et al., 2013). One of the most common forms of a roadmap is the one proposed by the European Industrial Research Management Association (EIRMA, 1997). This form differentiates between commercial and technological levels, referring to, for example, technologies, products and markets, with a key focus on the interlinkage between these. This integrated perspective, which distinctively covers more than one planning level, is used as a baseline for this work, especially for the application within industrial companies (Da Costa et al., 2002, p.32f).

Among the most relevant research activities in the practical application of roadmapping in industrial companies is a study from the Centre for Technology Management of University of Cambridge that surveyed UK based companies about the application of roadmapping (Phaal and Farrukh, 2000). Roadmapping is often referred to as technology roadmapping, considering technologies as one of the key levels in addition to products and markets (Phaal, 2004; see e.g. Barker and Smith, 1995). Based on the close link between roadmapping and technology planning, there are overlaps in hypothesis considered in previous studies also to related topic areas (Bürgel et al., 2008). For a deeper understanding of the information management processes that are necessary to create content for corporate roadmapping, technology planning, as well as other disciplines of strategic and operational planning, provide valuable inputs. Among most recent studies, 186 R&D units were investigated concerning their usage of roadmapping and more especially the interlinkage between this usage and performance of the R&D units (Lee et al., 2011). Table 1 provides an overview of empirical studies on roadmapping in industrial companies.

A more extensive knowledge base exists in the analysis of roadmapping in practice through single case studies. A more extensive knowledge base exists in the analysis of roadmapping in practice through single case studies. Examples of roadmapping applications include technology transfer at Siemens Corporate Technology (Bhawanani et al., 2006), the development of a technology roadmap for white goods within Arçelik R&D (Schimpf et al., 2011), powertrain technology roadmapping at Ford Otosan (Daim et al., 2011), the application of roadmapping to plan innovations at Motorola (Grinnell et al., 2002), evolutionary roadmapping of technological trajectories at Shimano (Li and Wang, 2011), roadmapping for manufacturing technologies at Siemens (Lischka and Gmünden, 2008) and technology roadmapping at Pirelli to support business decision making (Motta et al., 2015). This list could be extended to include a long list of anonymized case studies as well as roadmaps for industrial sectors or technology fields.

Given the multitude of documented case studies, it is often stated that roadmaps are commonly applied within industrial companies. This statement is principally based on single examples and most often refers to examples where products or technologies are planned with the help of roadmaps (see, for example, Barker & Smith, 1995, p.22f; Groenveld, 1997, p.48f; Farrukh et al., 2003, p.7f;

Table 1
Empirical studies in the thematic area of roadmapping.

Year of reference	Description	Sample
2000	Analysis of technology planning in the UK Phaal and Farrukh (2000); Phaal, (2004, p.133f).	149 UK-based manufacturing companies out of an overall sample of 2000.
2006	Identification of success factors for the design and visualization of roadmaps Machate, (2006, p.210f)	Analysis of 10 companies in semi-structured qualitative interviews.
2006	Analysis of small and medium-sized enterprises (SMEs) concerning elements, resources, processes methods structures and content of technology roadmapping Laube and Schwandner (2006); Laube (2009).	107 managers from technology-oriented small and medium-sized enterprises (SMEs).
2008	Comparison of 21 multinational organizations concerning the organizational integration of technology monitoring and scanning Bürgel et al. (2008).	21 multinational companies from different sectors and countries.
2011	Analysis of the successful application of technology roadmapping and potential success factors such as process support, software application, organizational support Lee et al. (2011).	186 R&D units within stock market-listed companies in Korea that have implemented roadmaps.
2016	Analysis of the integration of design research into strategic planning of new product development Kim (2016).	Semi-structured qualitative interviews with 46 professionals from 18 companies in the United States.

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