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Innovation processes: Which process for which project?

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ABSTRACT

The innovation process has traditionally been understood as a predefined sequence of phases: idea generation, selection, development, and launch/diffusion/sales. Drawing upon contingency theory, we argue that innovation process may follow a number of different paths. Our research focuses on a clear theoretical and managerial question, i.e., how does a firm organize and plan resource allocation for those innovation processes that do not easily fit into traditional models. This question, in turn, leads to our research question: Which configuration of innovation processes and resource allocation should be employed in a given situation, and what is the rationale behind the choice? Based on a large-scale study analyzing 132 innovation projects in 72 companies, we propose a taxonomy of eight different innovation processes with specific rationales that depend on a project's contingencies.

1. Introduction

Research and practice in innovation management have been deeply influenced by certain reference models that play different roles simultaneously, such as setting an objective to be achieved, establishing a mindset, influencing decisions (even if implicitly), and indicating good management practices. Utterback (1971) was a pioneer in modeling innovation processes as a single managerial process that consists of a set of the following primary activities: idea generation; problem solving, from which the output is an original technological solution or an invention; implementation, from which the output is market introduction; and diffusion, which aims to make a significant economic impact. Several researchers have derived particular sets of activities for their models. Focusing on the auto industry, Clark and Fujimoto (1991) proposed an organizational framework (heavyweight manager and other contributions) for innovation processes. Wheelwright and Clark (1992) introduced the idea of the development funnel. Cooper (1990, 1993, 2008) and Cooper et al. (1997, 2002) proposed that the product development process might be represented as a stage-gates sequence, which later became an influential model in innovation management.

These models and their followers were originally proposed for new product development (NPD), and they consider the innovation process to be a linear sequential flow of predefined phases: idea generation, idea selection (screening), development, and launch to the market. For instance, the titles of Cooper's (1993, 2008) papers explicitly use the words “from idea-to-launch”, which suggests that “idea generation” starts the process and “launch” ends it.

However, several authors have demonstrated their disillusionment with this *one-size-fits-all* approach, primarily from the project management field (Shenhar, 2001; Andres and Zmud, 2001; Shenhar and Dvir, 2007; Kok and Biemans, 2009; Sauser et al., 2009). For instance, Shenhar (2001) argued that there is no single approach for project management that fits all cases. Additionally, studies of the initial planning for academic spin offs (Vohora et al., 2004; Gomes and Salerno, 2010) and exploratory studies conducted in other companies have suggested that many companies successfully employ different types of innovation processes. This preliminary research indicated to us that Shenhar's perspective may be applied to the management of innovation processes, which would indicate that arrangements other than “idea generation – selection/development – launch” are possible and desirable.

These previous insights from real cases inspired us to conduct a research project that focused on the following question: Which innovation processes best fit different types of projects? More specifically, what would be a typology of innovation processes, and what would be the rationale for each type of process?

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The traditional models have focused on large companies with established R&D departments and time-consuming projects that require significant resources to be developed over months or years and that typically produce durable goods. These models do not adhere to other types of important projects, such as those with a high degree of uncertainty and complexity, which are typical of radical innovation that involves new technological breakthroughs and/or new markets. Pich et al. (2002) and Rice et al. (2008) argued that this environment calls for new models, tools, and management techniques. In this way, our contribution consists of proposing a set of pertinent processes that depend on the specific characteristics of the innovation project.

To respond to our research question, we incorporate the contingency theory proposed by Lawrence and Lorsch (1967) and Thompson (1967)—with roots in Woodward (1965)—as the anchor for our scientific inquiry. This theory holds that the way to organize a business depends on the nature of the environment in which the organization is situated. We interpret the contingency approach as a way to cope with uncertainty; in classical terms, this primarily indicates technological and market uncertainties. Employing this theory with process(es) of innovation, we conducted case studies using 132 real innovation projects and analyzed the flows, characteristics, and contingencies that explain the rationale of each project. Our primary goal is to improve the current literature on innovation management by proposing a categorization of innovation processes and contingencies that explain their rationale. We move a step ahead of mere criticism of the rigidity of mainstream models by identifying alternative innovation processes from large-scale empirical research and thereby add to the knowledge about innovation management.

2. Literature review

Traditional models for managing innovation have focused on new product development (NPD) activities. Developing products involves engaging in a bundle of activities, including managing and transforming resources, gathering information and expertise on specifications and creating products that meet (or create) market demand (Wheelwright and Clark, 1992).

The literature in the field is vast: a search in the Web of Knowledge database on December 22, 2013, showed 7510 records for the topic “product development” and “management”; the number of records in the Scopus database were 15,328 (article title, abstract, keywords). Authors have explored a variety of topics related to NPD. For example, Cooper et al. (2002) argued that the most successful companies in NPD employ formal processes with well-defined decision-making criteria. In this sense, a number of new product development process (NDP) models have been proposed in the literature. Cooper (1990, 1993) proposed the idea of well-defined stages and decision points for conducting development projects (stage-gates), which was further improved by Cooper et al. (2002) and Cooper (2008). Wheelwright and Clark (1992) proposed the development funnel model; this model is characterized by many ideas conforming to a large entry and a funneling process that progressively selects projects instead of merely tunneling them through phases. Other topics related to product development have also been treated in the literature; for instance, Brown and Eisenhardt (1995) performed a broad literature review of the organizational issues related to project development, and there is also a vast literature on concurrent engineering and project management.

Nevertheless, as noted by Krishnan and Ulrich (2001), the various approaches to product development management typically focus on a single theme or area (primarily on marketing, organization, engineering projects, and operations management) and do not discuss the relationships among these themes or areas. In that sense, Fernández et al. (2010) focused on how functional units impact new product performance based on a technological turbulence framework. Knudsen and Mortensen (2011) discussed the negative effects of openness on product development performance. Sarpong and Maclean (2012) shed light on the role of product innovation teams in mobilizing the different visions of organizational stakeholders. Kahn et al. (2012) analyzed the best practice of new product development and emphasized the importance of strategy on NPD efforts. Killen and Kjaer (2012) proposed a framework for modeling project interdependencies in project portfolio management. Lowman et al. (2012) explored the risk of outsourcing in pharmaceutical new product development. Gassmann et al. (2012) proposed a framework for integrating separated explorative activities in current business units of firm. Akgün et al. (2012) investigated the sensemaking capability of new product project teams. Leon et al. (2013) analyzed how iteration front-loading may improve new product development performance. Killen and Hunt (2013) built a framework for developing capabilities related to portfolio management. Yao et al. (2013) employed repeated real options to explore the impacts of technical and economic uncertainties on product development. Ignatius et al. (2012) showed the influences of technological learning on NPD performance. Eling et al. (2013a) investigated the impact of the cycle times on new product performance. Cankurtaran et al. (2013) employed a meta-analysis approach to address the speed of new product development, following Griffin's research trajectory on cycle time. Eling et al. (2013b) developed a conceptual framework for understanding the role of intuition on decision making during the execution of fuzzy front end. De Clercq et al. (2013) used the contingency approach to investigate contextual ambidexterity and firm performance. Pérez-Luño and Cambra (2013) showed that relationship among market orientation and the incremental and radical generation and adaptation of innovations. Wang and Li-Ying (2014) studied the relation between NPD performance and inward technology licensing.

These studies also do not address instances of product design with significant uncertainty or complexity (Pich et al., 2002; Sommer and Loch, 2009). Kim and Wilemon (2003) performed a comprehensive review of the literature on various definitions of complexity (including the number of components, their interaction, the degree of product innovation, and the number of disciplines and areas involved in the project) and suggest that the sources of complexity derive from technology, markets, developmental levels, marketing, and organizational dynamics; we will use these sources as the starting point for our field investigation.

Other works have proposed a more comprehensive view of innovation process and its management. Goffin and Mitchell (2010) proposed the Pentathlon framework, a five-dimensional model for innovation management. Hansen and Birkinshaw (2007) proposed the idea of the innovation value chain, in which the NDP is an important activity, but there are other equally important activities before it, parallel to it and after it, such as idea generation, selection/conversion, and diffusion. Moreover, Hansen and Birkinshaw (2007) sought a degree of integration among traditionally isolated approaches and proposed organizational forms that enable teams and middle managers to develop ideas and even build prototypes without prior authorization by a board or committee. For example, products such as Post-It Notes, which were previously rejected by 3M's marketing department (3M, 2002), would not have made it to the market without the possibility of “prior development of ideas”. This approach breaks the linear models/chains of decision making through which ideas must be approved to be further developed, which is suggested by the funnel and stage-gates models. However, one important