

# Knowledge transfer in product development processes: A case study in small and medium enterprises (SMEs) of the metal-mechanic sector from São Paulo, Brazil

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## Abstract

This paper reports a research that evaluated the product development methodologies used in Brazilian small and medium-sized metal-mechanic enterprises (SMEs), in a specific region of São Paulo. The tool used for collecting the data was a questionnaire, which was developed and applied through interviews conducted by the researchers in 32 companies. The main focus of this paper can be condensed in the synthesis-question “Is only the company responsible for the development?” which was analyzed thoroughly. The results obtained from this analysis were evaluated directly (through the respective percentages of answers) and statistically (through the search of an index which demonstrates if two questions are related). The results point to a degree of maturity in SMEs, which allows product development to be conducted in cooperation networks.

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## 1. Introduction

Innovations are vital for organizations (Cavusgil et al., 2003). But innovations have become progressively more complex, expensive and involved in uncertainties and risks, due to frequent changes in customers' demands, higher market pressure, and quick and radical technological progress. As a result, SMEs face greater difficulties in aggregating innovations. Acquiring knowledge and skills through external collaboration has become, according to the authors, an effective and efficient way towards the success of innovations.

Large enterprises have advantages such as renowned brands, earnings in scale of mass-production and a greater influence on contract development both with customers and suppliers. Comparatively to large companies, SMEs tend to present greater flexibility, for they are able to

mobilize themselves to meet market demands in a shorter time than large companies (Baldwin, 2000).

Innovation is an important tool for companies to adjust to competition and changes in the market (Bommer and Jalajas, 2002), and the importance of innovation is justified, according to Clark and Wheelwright (1993), by the action of conjoined and critical forces such as intense international competition, market sophistication and quick technological changes. In this way, the authors state that, although the competitive advantages can be related to certain factors such as company size and larger resources, there is a growing predominance of companies flexible enough to bring together knowledge and technological capabilities to develop new products.

Product development process is defined by Otto and Wood (2001) as “the entire set of activities required to bring a new concept to a state of market readiness”. Ulrich and Eppinger (2004) mention that “product development is the set of activities beginning with the perception of a market opportunity and ending in the production, sale, and delivery of a product”.

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Clark and Wheelwright (1993) also interpret new product development as a process in which an organization transforms market opportunities and technical possibilities into the manufacturing of a commercial product.

The adoption of a project methodology is essential, since it helps the designers to rely on a trustworthy model for their work accomplishment and, despite the developer's desires to design for customers (meeting demanded attributes such as appearance, design, durability, etc.), there must also be a concern to design for the manufacturer (simple manufacture, usage of few resources, etc.), for the sales team (easy transport and stocking, etc.), among others (Kaminski, 2000).

Researchers around the world have dedicated themselves to this subject, producing works on SME characteristics regarding technological innovation and product development.

In Italy, 47 SMEs were analyzed in an attempt to identify resemblances among them in the areas of knowledge management and innovation (Corso et al., 2003). The paper points out the recent emerging trends in selecting standards of information technology and approaches to knowledge management, obtained from internal and external sources, in new product development. In North America, 235 research and development professionals were interviewed to try to establish the sources of innovation in SMEs (Bommer and Jalajas, 2004).

Managers from 157 small-sized firms operating in Turkey have answered a study that involves the interrelationships among a firm's market orientation, learning orientation and innovativeness (Keskin, 2006), and the results show that firm innovativeness positively affects firm performance.

Managers' stories of the partner selection process for new product co-development alliances also were analyzed by Emden et al. (2006) using a narrative analysis technique. The authors affirm that when firms collaborate for new product development, they do so with several different types of organization, such as suppliers, customers or universities and research centers.

A study that took place in Greece with 150 manufacturing SMEs (Salavou et al., 2004) considered the importance given by companies to strategy-oriented characteristics, such as market orientation and continuous learning, to be indicators of organizational innovation, that is, the number of product innovations adopted. The paper concluded that SMEs with these characteristics, when faced with strong competition, tend to become more innovative.

An empirical research applied to analyze critical success drivers for product development process in industrial SMEs (March-Chordà et al., 2002) used a sample of 65 SMEs located in the quite-developed region of Valencia, in Spain. This study has pointed the main obstacles for innovation, noting the excessively high costs of maintaining an innovative process and the uncertainties of acceptance of newly developed products by the market.

Liefner et al. (2006), in a survey with companies in China, have concluded that, in the process of innovation, companies in Beijing—as well as in other development countries—make use of knowledge originating in universities and public research organizations, mainly to design new products.

In certain peripheral regions of the European Union, the economy and living standards are below the European average. One of the main reasons is the low level of innovations in industrial SMEs, as concluded by a study presented by McAdam and McConvery (2004), which exploited the success or difficulty in incorporating innovations, involving 41 SMEs in Northern Ireland. The authors state that deficiencies in innovation induce these small and medium native companies to experience difficulties to grow and export, leaving them outside well-developed and successful production chains.

In an important area of firm activities—supply chain management—from a survey with 184 US companies (67 SMEs), Kim et al. (2006) suggest that managers need to focus on appropriate type of innovation to enhance supply chain activities and organizational performance.

Regional context is of high importance in SMEs because of its competitive advantages, justifies Bagchi-Sem (2001). This happens both regarding availability, costs and quality of production drivers, as well as regarding the presence and quality of suppliers. His project, developed in Canada, presents how much industrial SMEs, located in peripheral regions and focused on traditional production models, struggle to survive in a highly competitive global environment.

The author also identifies, in these peripheral regions, distinctions between companies focused in product innovation. The research was conducted with a sample of 54 SMEs belonging to 12 cities in Canada's Niagara region (excluding Toronto and its metropolitan area). The author concludes that innovative SMEs in that area (the ones that presented new or improved products) had better conditions of sales and exportations. The average percentage of new or improved products for innovative SMEs in the sample is equal to 27.5% on total sales, and 45% on exportation.

The area in which a SME is located is especially important in their innovative process, because the external relationships of SMEs are more restricted to the region than large enterprises, concluded Kaufmann and Tödting (2002). Excluding partners from their own business sector, mainly customers, SMEs maintain few external relationships in their innovative process. The lack of interaction with knowledge brokers (universities, for instance), outside of their business sector strongly restricts the external influences that stimulate innovation.

The investigated region in the research (Upper Austria) is one of the nine provinces (*Bundesländer*) of the Austrian country. The study involved a total of 204 companies in services and industrial sectors, and 140 were classified as SMEs regarding their employee number. The authors

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