

Value Addition through Development and Technology Transfer: A Study in the Electro-Electronic Industry

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This paper analyses how technology transfer helps defining technology strategies to be established for small businesses in electronics production supply chain in Brazil. To accomplish this, literature study, qualitative approach and technique of content analysis were conducted to support the interpretation of data collected through a case of multiple small companies of electro-electronic industry in the state of Rio Grande do Sul, Southern Brazil, based on interviews. The interviews were recorded, transcribed, and analysed in order to identify significant excerpt to our subject. Questions were separated by blocks (constructs) in order to contemplate the theoretical framework. It was found that these companies use technology transfer and technology strategy in adding value to ensure competitiveness through the acquisition of technologies in their products and processes. This practice influence the decision making related to the selection and acquisition of new technologies based on the strategy outlined. As large organizations, small companies also need to be prepared to keep up with technological developments in the market. The competitive environment requires these companies to continue to search for new technologies to be deployed in their products and their processes in order to make them competitive in the market and to compete with large organizations.

1. Introduction

Pursuing permanence in a competitive market, companies need to innovate and seek new alternatives to absorb new markets, surpassing its competitors. Innovation focused on enhancement of products has been shown as an alternative to the conservation of economic and financial factors of a company, making it a competitive strategy. In this sense, Fonseca et al. (2014) say that new technologies were developed to solve problems. For small and medium companies (SMC) a big problem are the financial problems.

Although innovation studies are presented analysing large companies (Chesbrough and Vanhaverbeke, 2006), emerging research already are directed to small and medium companies (Cosh and Jin Zhang, 2012). Developing technology and innovation are elements that provide economic prosperity for SMC, making them competitive. However, these companies do not always have the set of internal resources and skills needed to effectively develop their innovations.

Considering these internal resources in SMC, we recognize that to be successful in the development and adoption of new technologies require a workforce capable of transforming innovation in competitive strategies in order to integrate them in production processes (Sung and Gibson, 2005).

In this scenario of innovation and competitiveness, the scope of this study is to understand how the technology transfer contributes to develop technological strategies aimed to add value in the supply chain of a product. The authors researched the scenario of electronics industry in the state of Rio Grande do Sul, Brazil. The sample of our research is represented by six micro and small companies operating in the local industry and competing with large companies and multinationals in the sector.

To justify our goals, we had done a research to found papers, by using key words: technology transfer; technological strategies; and electronics industry, in the databases of SCOPUS, EBSCOhost, and SCIELO. The results show no paper was found.

This study is divided into seven sections, besides this introduction. In the second section, the value chain of technology and innovation is presented, than technology strategy (in the third section), and technology transfer in the fourth section to complete theory, while in the fifth section the methodological procedures are discussed. In the next section, the results obtained are analyzed and discussed and, in the last section, the conclusions are presented.

2. Value Chain of Technology and Innovation

Add value to a product is important for competitiveness of enterprises (Lindgreen et al., 2012). The term "value creation" and the expression "value creation process" are used in the customer's perspective. The reason for this is that customers are seen as recipients of value from resources they have obtained (Flint et al., 2011). The value can be conceived in terms of cost-benefit consequences occurring in relations between the parties involved (Corsaro and Snehota, 2010).

But to create value, the perception of the product by the costumers needs to be better than the expectations. For that, companies want to add more value by putting together added value by components of other companies (Pinnington and Scanlon, 2009).

In negotiations of feedstock, suppliers may engage in extensive personal interaction with clients and, thus, actively influence the value process (Grönroos, 2011). To analyse added value, companies use research and development (R & D) departments as well as marketing departments: to know what customers want and which will recognize technical features in products that make them competitive and desired (Lindgreen et al., 2012). Also a better quality of the goods and the services may influence the added value to costumer.

On the other hand, the R & D departments build products and services with the intention of satisfying a market need, adding value to their products and, finally, to companies. Another strategy adopted is to develop product families in order to provide variety and customization in the developed products (Sudarsan et al., 2005). This variety and customization give customers better option for decisions of buying a product or service and add also value to the company.

Delivering value is linked to combinations of products and services that create unique benefits for each customer (Brady et al., 2005). For customers, the more expensive products and services should offer bigger and better benefits (Sharma and Iyer, 2011). On other hand, less expensive products and services also can have excellent cost-benefits relation and add also value to companies.

Besides, value chain-based solutions involve the provision of an integrated combination of consumer goods and services that are designed to meet the specific needs of the customer (Sharma and Iyer, 2011). These requirements correspond to the production of new products or the implementation of a new process to improve the development of the production chain (Flint et al., 2011).

Based on the intention to develop innovative products for the perception of value attributed by customers, companies seek to adopt technological strategies to strengthen their businesses and increase competitiveness (Sharma and Iyer, 2011).

3. Technology Strategy

Tzu (2008) comments that many meanings arise for this term; despite its rise in the military world it is quite used in the business world. The formulation of a strategy should respect the four fundamental principles: a) the principle of choice of the battle site -- the selection of markets where the company will compete; b) the principle of concentration of forces -- the organization of company resources; c) the attack principle -- the implementation of the competitive actions of the company; and d) the principle of direct and indirect forces -- the management of contingencies (Fernandez, 2005). The same author reports that the water flows in accordance with the format of the land where you are going, which directs us to the reasoning of Fernandez (2005), which cites the requirement for a company to format its strategies according to the competition.

In the words of Chau et al. (2003), the strategy must allocate the company in a unique and valuable position in the market. A company needs to have a strategy to achieve sustainable competitive advantage, which means having a lasting advantage over time.

Lai et al. (2004) report that, more broadly, an appropriate strategy is to make decisions that determine the organization, involving perceptions and intuitions of the human being, which explains so many variations on the concept. In this environment, the strategy becomes important for survival. The competitive strategy

helps the organization to face actions in order to bring a higher return on the investment made by the organization; it comes from the value that the company creates for its clients as opposed to the cost that has to create it.

Hamel (2011) mentions that, ultimately, it is difficult to make projections and plans for the long term of limited value. In the future, the company will not devise the strategy before it creates conditions so that new strategies can emerge and evolve. In the business market, Barney and Hersterly (2007) demonstrate the condition in which two or more independent organizations contribute to each other in the development, production, or sale of goods or services.

Kullmann (2003) understands that a strategic union is a trading partnership that enhances the efficacy of the competitive strategies of organizations. Another strategy is the marketing, which should be based on good relationships with external customers of the company. According to Rook (2006), it means to sustain the infrastructure of relationships between organizations. In other words, it is a business strategy to build lasting relationships between the organization and its external customers. For Ryans (2010), the sales strategy of a company working with top standard products can suffer high competitiveness of a company that works with low-cost products; the customer understand that this inexpensive product can have quality features and consistent reliability with higher standard.

Another possibility is the technological strategy. The technological strategy is one of the bases for the innovative process in organizations; therefore, companies should develop implementation strategies of technological strategies according to their available resources (Liao, 2005).

The formulation of a technology strategy, directed to a competitive performance, should follow a sequence of analytical steps in order to transform technology into a competitive tool rather than a scientific curiosity (Delatoura et al., 2014).

The acquisition of technologies can be seen as a necessary component for technology strategy (Beltrán and Boscan, 2011). To acquire technologies, it should occur a careful and effective selection, considering objectives and priorities of the company. Investment strategies in pioneering technology are seen as potential for competitive advantage (Cetindamar et al., 2009). Another advantage is that acquire technologies need less time as to develop them. In this sense, buying new technologies can cut time of a uncertain success in R & D and costs.

Investments in technology allow companies to increase their capacities in volume and variety of products, satisfying the need of the market (Brown, 2001). The method of acquiring technology should be chosen considering all the possibilities available. One of the possibilities adopted by companies is the technology transfer (Brown, 2001).

4. Technology Transfer

Technology transfer is a strategy that involves the acquisition of knowledge aimed at improving the performance of the company (Hung and Tang, 2008). It is understood as the movement of a specific set of technological resources, directed from one entity to another (Lundquist, 2003). It is defined as a planned, selective and focused process in advanced technology import that the company does not have neither dominate, making it an effective tool for acquiring new technologies and business development (Braga Jr et al., 2009).

Thus, technology transfer of a company that already owns to another that needs it becomes an effective tool for the acquisition of new technologies and business development. Increasing productivity, making the company more profitable, is an action that involves new ideas, knowledge, cutting-edge devices, and academic R&D of organizations that can be absorbed through technology transfer processes (Jakubavičius and Vilys, 2008).

As well as support activities, technology transfer is available to all companies. Micro and small enterprises also transfer technology in order to improve the quality of their processes/services, adding value to their product (Kremic, 2003). Researches confirm that the micro and small companies are concerned about the value chain that integrates their products (Sima, 2009).

Micro and small companies do not have big financial resources that give them the possibility to buy new technologies and business development. Normally, they can develop new technologies, but they have to sale them after to bigger companies in order to survey in the competitive market. A second way is to use credits to complete the financial resources for the development and, then after the development, to sale the products to bigger companies or to the customers to get the money back. A third option is to sale the whole company.

5. Methodology

The scope of the research is composed by companies of electronic segment that identified themselves as micro and small enterprises, serving as the basis of analysis criteria of annual revenue, company rating, technology governance, and market share.

We preserve identities of companies, due to a pre-established confidentiality agreement with the interviewees, so, we adopted an alphanumeric coding for each company, like: C1 - Company 1. We selected, in companies, people with knowledge that could contribute to research. Those selected people occupy positions of engineers, managers, and specialists responsible for strategic-level sectors in companies.

The interviews were recorded and transcribed. Later, the authors analysed them in order to identify significant excerpt to our subject. To better organize the interviews, questions were separated by blocks (constructs) in order to contemplate the theoretical framework. The period of data collection was between January and December of 2014.

The interviews for data collection were done in person, with an average duration of 60 minutes. Data were transcribed and dialogues recorded using a portable voice recorder, while interviews were interpreted through content analysis technique.

6. Analysis and Discussion

Technology transfer, in companies we researched, is taken as a stimulus tool for competitiveness, considering acquisition, installation, training, and operation of new technology to then achieve the expected results.

The study highlighted some information related to experiences on transfer processes and business strategies that could contribute to the efficiency and effectiveness of new similar projects, to be applied in other micro and small companies.

This assessment can be structured formally and reach a greater number of benefits if it uses technological audit, because it considers many variables not attended by subjective analysis. Table 1 shows the summary of the results found in our research.

Table 1: The determination of technological strategies and technology transfer to add value through innovation in the studied industries of electronic segment

Technology Management	Studied electro-electronic industries
Technological Strategies	Determined by the economic and financial sustainability in order to meet the R & D needs through economies of scale markets. There are partnerships established with other companies with strong brand in attractive markets, positioning their products with innovative technology, differentiated and high reliability.
Technology transfer	Used by managers to incorporate new technologies in the product by purchasing patents. Technology transfer is used as a technology strategy to increase competitiveness.
Technology transfer in the determination of technology strategy	The results of technology transfer processes effected are already used to guide the determination of new technology strategies for value addition in products and innovative solutions.
Technology and innovation value chain	The technology gaps in the market are identified by analyzing the characteristics and benefits that clients request in cutting-edge products and whose needs are not met, aiming to suggest incremental changes that add value to the user of this technology.

It is observable that technology transfer has a major importance in determining new technology strategies in the industries studied. The absorption of new technologies follows the formal precepts of a transfer process, so that this can be fully exploited without the occurrence of anomalies.

However, it is noteworthy that there are always risks, that are measured between the parties, and that they consider when starting a new partnership. The effects achieved with technology transfers are confirmed to guide decision-making and the determination of new technology strategies.

7. Conclusions

This study aimed to understand, in the electro-electronics industry, how technology transfer contributes to plan technology strategies seeking to add value through innovation. We have done a literature research in order to theoretically assimilate the technology transfer concepts, technology strategies, and innovation value chain.

We attempted to observe the performance of these practices and relate the results applied to these concepts, focusing on the internal and external environment of organizations, their difficulties and opportunities.

The understanding of the literature review helped us to identify the gaps in business practice, allowing a pragmatic and realistic way in the planning of improving projects considering the industrial processes researched.

It was observed, through the interviews, that small companies determine their technological strategies based on the needs of gaps missed by the market, seeking to develop technological artifacts in line with their low budgets for research and development.

Thus, they establish strategic partnerships with complementary and more competitive companies, creating a variety of products considered as technological solutions for their customers, therefore helping in business.

We concluded that small companies that have a higher investment in R & D achieve a high diversity of products and cutting-edge technology solutions, seeking to add value through innovation, so, they also benefit and require global markets absorbing their innovative products on a larger scale in order to support their research.

However, these companies continue establishing partnerships with large companies known in the international market and aligning their products and solutions to established brand in the economic centres, which greatly helps in winning new slices of the market and, therefore, having more economical results.

The acquisition, development, and dissemination of technology on the market have demanded high risk for organizations, so, many companies import more competitive technology embedded products and distribute under their own brand, reducing the likelihood of economic losses for the failure in commercial operations.

The limited human capital, when the subject is technology development in this industry, weakens the consolidation of this practice, requiring that small companies that participate in the innovation value chain seek competitive strategies to maintain their competitive position on this adverse scenario.

The results of our research reinforce Betz (2011). From the studied companies, we can conclude that R & D is a long-term investment. Even the shortest development of products from applied research may take two to three years. The further development of basic research usually takes ten years. Thus, R & D must have a long-term strategic planning horizon. In contrast, the business units are always in quarterly profit accounting system, focusing mainly in the current year practice of business.

This is the challenge, combining properly strategic planning of R & D with the tactical planning of the business unit. For SMC this means they have to create financial resources to do R & D. In other words, quarterly profits will mostly go down.

The results presented in our study are consistent with the reality presented in small companies of electro-electronic sector in Southern Brazil and this should be considered in order to avoid generalizations. This is the main limitation of this research and we suggest that a sequence using the same constructs could be applied in large companies to compare the results.

Acknowledgment

The authors would like to thank the support of CNPq and FAPERJ.

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