CAPÍTULO V

PROGRESSIVE CONSTRUCTION OF A MARKET STUDY FOR INNOVATION PROJECTS

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Abstract

Research, development, and innovation projects (R&D+I) conducted by public universities or research centers in collaboration with small and medium-sized enterprises (SMEs) can be divided into a series of well-defined stages. In all these stages, technological prototypes that embody new knowledge are incrementally obtained, until they become new technological products ready for commercialization. The purpose of this paper is to propose a method for creating an incremental market study profile based on different types of information obtained during each stage of the R&D+I project. The method results in a table that shows the market information that must be collected along the pre-competitive phases of the technological product development. The market study can contribute to a successful technology valuation process and simplify the technology transfer process from the university to the firm. In addition, we conclude that market information relative to the new technological product obtained throughout the process and awareness of total production costs represent elements for the project team to make sound decisions concerning the launch price. The incremental market profile described in the present article is a powerful tool to make decisions to accomplish successful R&D+I projects.

Keywords: market profile, R&D+I project, technology management.

CONSTRUCCION PROGRESIVA DE UN ESTUDIO DE MERCADO PARA LA INNOVACIÓN

Resumen

Los proyectos de investigación, desarrollo e innovación (I+D+i) realizados por universidades públicas o centros de investigación en colaboración con pequeñas y medianas empresas (PYME) pueden dividirse en una serie de etapas bien definidas. En todas estas etapas, los prototipos tecnológicos que incorporan nuevos conocimientos se obtienen progresivamente, hasta que se convierten en nuevos productos tecnológicos listos para su comercialización. El objetivo de este documento es proponer un método para crear un perfil de estudio de mercado incremental basado en diferentes tipos de información obtenida durante cada etapa del proyecto de I+D+i. El método da como resultado una tabla que muestra la información del mercado que debe recopilarse a lo largo de las fases precompetitivas del desarrollo de productos tecnológicos. El estudio de mercado puede contribuir a un proceso de valoración tecnológica exitoso y simplificar el proceso de transferencia de tecnología de la universidad a la empresa. Además, llegamos a la conclusión de que la información del mercado relativa al nuevo producto tecnológico obtenida a lo largo del proceso y la conciencia de los costes totales de producción, representan elementos para que el equipo del proyecto tome decisiones acertadas sobre el precio de lanzamiento. El perfil de mercado incremental descrito en el presente artículo es una poderosa herramienta para tomar decisiones para llevar a cabo proyectos exitosos de I+D+.

Palabras clave: gestión tecnológica, perfil de mercado, proyecto de I+D+i.

This chapter is the result of a finished research project.

Introduction

Global economic crisis, particularly in Latin America, seems to be the permanent context in which new firms are born and survive. Naidoo (2010), points out that firms must be strongly market-oriented: their marketing strategies must be innovative, and their business strategies well defined. Boer (1999, pp.169) points out that, to create value, technological products must be geared to the market, and in order to guarantee their commercial success, important marketing efforts must be undertaken. According to Kottler, Armstrong, Saunders & Wong (1999), marketing innovation depends on the selection of an appropriate mix of four main variables: product, price, promotion, and place, known as the four Ps. According to Naidoo (Op. cit.), solid marketing decisions can help the firm to withstand the challenges of conducting business under the current economic conditions.

The present paper discusses two marketing variables in the context of Small and Medium-Sized enterprises (SMEs): the development and embodiment of new technological products resulting from the execution of applied research and technological development and the timely use of market information to define launch prices.

The diversification of existing products and the modification or upgrading of existing ones are well-known strategies to overcome the intense competition faced by contemporary firms are the development of new products. Nevertheless, launching new products represents a considerable risk, and the failure to commercialize a new product will certainly have a negative impact on the organization's profits (Tsafarakis, Grigoroudis & Matsatsinis, 2011). To minimize the risks associated with this process, project analysts must make estimations concerning the penetration of the new product into the market before the industrial production stage.

Many methodologies have been developed to determine the market segment in which the product will be successful (Fildes, Nikolopoulos, Crone & Syntetos, 2008). In this regard, accurate market information is essential for any business venture, and adequate market study should provide strategic and fundamental commercial information that can be used by the firm to define the type, shape, appearance, features, and launch price of the product according to the market segment.

Ingenbleek, Frambach, & Verhallen (2013), have indicated that new product development research should be understood as a compromise between market scheme and product penetration (price). A good market study should include information concerning demand, commercial viability, and competition, among many other variables that can help the firm to determine, for instance, the best time to launch the product or when to increase or decrease its price. The study should also help the team to decide when a product's flavor, presentation, or packaging characteristics should be changed or when to make major modifications or end its production (Rojas, 2012).

The main premise of the present study is that market studies must focus not only on competitive finished products. We intend to show how developing an incremental market profile is highly recommended, and even necessary, when firms establish agreements with public R&D institutions for the development of new technological prototypes whose technology will be transferred and scaled in the firm's facilities. The objective of the present article is to propose a method to obtain an incremental market profile using information occurring along the technology products development, constantly verifying market needs and the relevance and commercial feasibility of the new technological product. Finally, this valuable market information can be used to complement the last stages of market research, which define the product launch strategy.

Theoretical framework

Economic innovation: introducing new technological products into the market

Markets are geographical spaces where the interchange of products between producers and consumers takes place. Throughout human history, emergent and mature markets have existed all over the world. Mature markets are *socially built* as a result of the interaction between producers and consumers. Cooper (1993), cited by Boer (1999), asserts that the fundamental cause of commercial failure (45% of cases) is an inadequate market study; for comparison, disregarding marketing efforts is the cause of 25% of failure, while product defects or problems represent only 30%.

Marinova & Phillipmore (2003), point out that studies on innovation success factors carried out during the 1960s and 1970s describe the first linear innovation models to explain

success or failure concerning the introduction of new technologies into the market. It has often been stated that innovation takes place in connection with technological pull and market pull. Another frequent assertion is that commercially successful cases occur when technological development is oriented toward the market because firms understand the client's needs and new business processes. The technological push provides firms with knowledge concerning new manufacturing and production processes, some of which are based on applications of new scientific knowledge. Kohli & Jaworski (1990), point out that new product R&D processes require all involved organizations to be aware of and responsive to the information provided by the market. The general realization of market orientation as an essential element of innovative organizations was promptly acknowledged (Jaworski & Kohli, 1996). Hurley & Hult (1998), stress that market orientation can be critical during the initial stages of innovation processes. Utterback (1994), cited by Teichert, Von Wartburg & Russell Braterman (2006), reports that, during the initial stages of the development of new processes, producers seem not to know what products to develop, and consumers seem unaware of the purpose, operation, and application of new products. Therefore, design and development teams must understand when to modify and improve different functional details in order to meet consumer preferences as closely as possible until the emergence of a final product design. Once again, market information is essential to determine exactly which aspect of the prototype should be modified.

Interactive, systemic, evolutionary, and other types of production models have been developed over the past decades, and all of these models have an undeniable market orientation. According to Wren, Souder, & Berkowitz (2000), market-oriented firms improve their performance systematically using market intelligence to better understand the needs and desires of consumers and develop product strategies accordingly. Chesbrough & Appleyard (2007), and Lichtenthaler (2011) observed that, in recent open innovation models, it is first necessary to select the type of innovation to pursue and its source, to identify which of its features can be outsourced, and devise a marketing strategy in complete alignment with the firm's business model (West & Bogers, 2014).

A past trend among SMEs in developing countries was to give more importance to the technology than to the market; today, entrepreneurs have realized that market information is needed for project development and fundamental to estimate the competition that the technological products under development will face (Demuner y Mercado, 2011).

Additionally, information on the costs of technological product development is known to be determinant to achieve the expected value of the final product. All of these market-based data, in addition to strategic data, are used to determine the price of the final product (Ingenbleek *et al.*, 2013). This is extremely important because launching a product at a higher or lower price than the adequate could result in different problems for producers and other stakeholders.

It should also be noted that companies can jeopardize their efforts and investment in the new product development process if their pricing practices are ineffective. To avoid this problem, price conditions in the market must be ascertained and the market segment relevant to the product defined so that the product can be promoted according to its advantages, production costs, and the intensity of the competition. In general, SMEs lack enough economic, human, or financial resources to develop new technological products on their own. To solve these problems and remain competitive, they sign collaboration agreements with public R&D institutions.

Research, Development and Innovation (R&D+I) Projects

Innovation represents the successful exploitation of new ideas by organizations of any size who leverage these ideas in the development of profitable products, processes, or services (Damanpour, 1992; Johannessen, Olsen & Lumpkin, 2001). Vega-Jurado, Gutiérrez-Gracia, Fernández-de-Lucio (2009), point out that innovation strategies seem to be associated with a firm's ability to incorporate new knowledge (absorptive capacity), as described by Cohen & Levinthal (1990). Large enterprises often have enough economic and human resources to satisfy their own research and development needs. Nevertheless, as a result of the growing complexity of our contemporary world, organizations are unable to accomplish its fundamental goals relying only on themselves: they all require help from other organizations, which is established by means of networks, technological alliances, or strategic societies.

In this context, innovation becomes hard to achieve for SMEs, which must therefore seek external knowledge sources to increase their capacity to develop new products. Furthermore, innovation involves a certain degree of uncertainty and risk, but organizations need to develop these skills if they intend to survive and be competitive.

Firms can obtain new knowledge from other firms, which involves less risk and higher costs; however, this solution is usually available to large companies only. By contrast, SMEs collaborate with public universities or R&D institutions to develop their innovation projects. In this way, internal development and the acquisition of external knowledge via R&D+I projects become complementary strategies (Vega-Jurado Op. Cit, pp.75). This complementarity can be observed in different stages of R&D+I projects developed by universities and firms. Figure 1. Units in vertical axis are USD.

Time units on the horizontal axis can be set in years. Project development requires economic investment throughout the process. No additional external income is expected; therefore, the curve is below the horizontal axis. Sales are expected to increase rapidly after the product is launched; these sales eventually increase income and become profits, which will take the curve above the horizontal axis.

Multidisciplinary teams created in universities with the purpose of developing technological knowledge are composed of basic and applied scientists, engineers, designers, teams of technicians, administrators, entrepreneurial strategists, and technology management specialists, in addition to lawyers, whose role is to develop and manage legal consensual instruments. The market launching phase requires marketing specialists to pursue the rapid dissemination of the product into the market by promoting sales, in addition to sales specialists and different types of specialized consultants, among other actors. Sometimes, R&D+I projects become trans-disciplinary.

As pointed out by Kaats & Opheij (2012, 2014), another reason why learning to collaborate is beneficial for small organizations is the series of benefits in the following fields: (a) development of new markets, (b) decreased production costs, (c) access to new technology, (d) development of new knowledge, and (e) external management of organizational pressure. Figure 1, shows that the first stage of R&D projects involving universities or public R&D institutions and SMEs is usually undertaken by the research party.

Once the technological prototype is completed and tested in the laboratory, technology is transferred from the academic institution to the firm, which can now further test the

Figure 1. Lineal model of R&D+I Project Stages.

Source: Authors own elaboration (2019).

prototype and develop the first pre-competitive industrial prototype. Afterward, the firm initiates the industrial scaling process to produce the commercial prototype for the market. Thus, the process involves at least the pre-competitive, bench, concept, and laboratory prototypes, in addition to the first industrially scaled version and final modifications before the product is ready for commercialization. For its part, the technological product acquires value from scientific and technical knowledge derived at each stage.

Technology valuation of technology transfer

Accurate estimations of the value of the technology become indispensable during the fourth stage of the technology transfer process. Normally, the first estimation of the minimum value is based on the total production costs of the previous stages. To estimate the development costs of the ensuing stages, cost analysts need to consider expected sales and the size of the production line or plant that will be required to meet the sales targets. Analysts often use different market size scenarios to estimate costs (Bonoma, Crittenden & Dolan, 1988).

An adequate technology valuation process requires accurate market information in terms of competition and sales potential, as well as optimistic, normal, and pessimistic sales scenarios. In some cases, the value of durable goods depends on the possibility of using them over time or in the future, for example smartphone applications, tablets, internet service subscriptions, coffee capsules and machines, printers, ink cartridges, automobiles, or maintenance and repair services, among many others (Laussel & Resende, 2014).

Figure 2. Market profile construction for technological R&D+I projects.

Source: Authors own elaboration (2019).

According to Harnecker (1976), the value-generating 'substance' is human labor, and value manifests itself as the exchange of goods. For Dong-Hyun, Wonsik, Kil-Pyo (2007), what is negotiated in technology transfer agreements is the knowledge embodied in prototypes, the intellectual property titles or certificates, such as patents, and the industrial models, trademarks, industrial secrets, software, products, services, industrial designs, and the know-how or the organization's technological capacity.

The method of discounted cash flow (DCF) is based on an estimation of expected sales; this procedure is frequently used to make estimations based on market information. As with any business decision, the starting point is the identification or estimation of cash flows (Drury, 2004, chapter 9). DCF is also used to determine the value of the technology.

Method for the incremental construction of the Market Study

Proposed construction of the market study (MS) by stages

The final MS should be conducted on the basis of two complementary sources of information, and the market profile must be created incrementally during each of the R&D phases described in the previous section. Subsequently, once the technological product is ready and scaled for industrial production, a final comprehensive complementary MS should be carried out by an independent consultant using data from interviews, focus groups, surveys, and visits to clients. The newly obtained information must be refined and added to the market profile (in its current form up to this stage) and integrated into an overall market research report. This information should provide the entrepreneur with grounds for making important decisions concerning the launch of the new technology product into the market.

Figure 3 shows the proposed process for the incremental construction of the market profile at each stage, leading to the final market study. The first advantage of this method is that the team is constantly oriented toward the market. Therefore, the R&D team at the university will be able to answer a series of questions about the technology being developed using both research data and market information. For that purpose, the team must keep a record of how the technological specifications, product improvements, and changes to the manufacturing process are associated with expected market conditions, competitors, and sales expectations.

In such a way, in addition to their insights based on the evolution of the design, the project team will have a better idea of the intellectual property strategy that should be followed; the team should also be aware of the development costs and the minimum expected value of the technology. Similarly, the market profile of the laboratory prototype will provide the firm with important information to determine the additional value that the technology will acquire once it be scaled for industrial production and be transformed into a competitive new product.

Figure 3. Method to develop an incremental market study in parallel to the process of technology development.

Source: Authors own elaboration (2019).

Development costs, the value of the technology, and transaction costs are included in the final MS carried out by the external consultant during the marketing stage. Other costs to include are those required to enable industrial production, such as new machinery, pilot or industrial plants to be acquired, qualified personnel, governmental permits and licenses, and normalization and quality control costs. When these data be contrasted with different sales scenarios and expected production volumes transforms in valuable information that in addition to pricing information from competitors, will enable company officers to determine the price of the new product.

Fundamental questions for the market profile

For Pedroza y Ortiz (2008), the first step in developing the product and the market profile is to create a “technological map” of market-technology interactions in selected target segments. These segments are clearly defined by the different stages of the innovation project. The product and market profiles are used to organize the necessary information to answer a series fundamental questions that stakeholders from both the university and the firm need to ask in order to have a clear picture of the whole project. Some of these questions are:

- What is the product, and what are its specifications?
- Is its production feasible? What is the most complex part of the production process?
- Does the product meet security and quality standards?
- Which are its total costs?
- What is its fundamental technological value?
- Who are its probable buyers? Why are they important?
- Which characteristics of the product affect purchase and use decisions?
- What are the client's values?
- What do clients value and why?

All of these questions and other relevant ones should be answered gradually as the different stages of the R&D+I unfold, and the technological product is improved. The accumulated market information obtained at each stage of the project is what we refer to as an incremental market profile. The profile will be gradually improved using the different types of information collected at each stage and finally combined with the data obtained by the consulting company during the marketing stage (i.e., surveys, interviews). This incremental market study will be complete when all the information is analyzed, and conclusions are drawn.

Specific information included in the progressive Market Study

To answer the fundamental questions for the market profile, the integrated market study must include at least the following information:

Product information

Technological product specifications

The university project team establishes basic product specifications at the time of developing the concept prototype. A basic functional test of the concept prototype should clearly establish what the technological product is and what it can do, as well as its limitations. Most specifications will change as the prototype is further developed.

The laboratory prototype will require additional specifications; it should be noted whether optional features are possible, if it requires special equipment or supplies, and a maintenance manual must be drafted indicating whether special tools or consumables are required for the normal operation of the product. Warnings concerning operational risks should also be indicated. Quality, security, and other applicable norms and certifications must be noted, and a special section must establish the costs of the laboratory prototype.

Feasibility and production requirements

The first industrial scaling strategy should consider low production volume, leaving the door open to rapid escalation; alternative types, manufacturers, and specifications for production equipment must be identified. It should also be noted whether specific manufacturing equipment, parts, or subsystems can be acquired from national firms. Production and maintenance costs must also be considered. It is important to mention whether specialized personnel will be required for any part of the process.

Production process

Once pilot industrial production is enabled, the next step is to perfectly define each of the technical aspects of the projected industrial manufacturing and production processes. This information is a key determinant of product quality, can be used to secure important cost reductions, and represents a decisive market advantage. Basic and detailed product engineering should include the following variables: (a) raw materials, (b) sustainable supply of energy and water, (c) mass and energy balances, (d) major equipment specifications, (e) number of operators required to run the process and procedures to be followed for startup, normal operation, and shutdown, (f) software and automation philosophy, (g) technical solutions for regulatory requirements, (h) aspects of environmental control and waste disposal, (i) approved plant testing, and (j) normal plant operation availability and reliability indexes.

Market information

A. Potential client specifications

The product development team must be well aware of the potential buyers of the technological product under development and why their satisfaction is important. Detailed planning of actual and potential market segments will be time well spent.

During the concept testing stage, the team may have an initial idea of who the potential clients are. For example, they could be an internal group in the company to whom the university is transferring knowledge. Having a list of primary and secondary clients, including their purpose as a business, their products, and their clients is also important. If possible, the list should include estimations of product sales for each potential client. This procedure will make it possible to steer the strategy if alternative development paths or products are found to be profitable.

Competitors

The product development team, namely university scientists, technicians, and company officials, should have a clear idea of the companies and organizations that will become their competitors when the product is launched. The market profile should include a data sheet on each competitor, including information on the size of the company, its number of

employees, and its economic capacity, in addition to its market share, distribution channels, sales points, and if available, its financial statement, among other data sources. Whether the product will represent actual competition for other firms should also be borne in mind since large firms could deploy protective maneuvers, including aggressive pricing or blocking the entry of the product into the market.

Technological value

Technology valuation methods are necessary to accurately determine the value of the technology.

Fundamental aspects of market behavior

The characteristics of the product that will motivate potential clients to purchase the product should be determined for each targeted market segment. These are simply the factors due to which the customer will choose to buy or use the product over competing alternatives. Moreover, the team must identify a market niche where the product will be successful, and a reasonable market share can be expected.

Estimated product price

The firm's management should estimate product launch price and launch strategy based on MS information, payback period, and market size and sales estimations restricted to specific incomes and interest rates. The following section will describe this topic in more detail.

Results

Using the product and the market information indicated in the previous points, we built Table I, which shows a summary of the types of information obtained at the different stages to include in the integrated MS.

Table I. Integrated product/market information.

Project Stage/ Responsible organization	Product Specifications		Required market profile information			Value of the technology
	Work in progress	Technology	Manufacturing Process	Competitors	Costs	
1. Concept prototype/ University	Basic functional feasibility test, prototype not necessarily integrated, tested in modules.	Pre-competitive, immature technology under development. Basic prototype specifications, scope, capacity, energy consumption, sustainability, fundamental design technologies.	Not available, manual manufacturing. Fabrication of structural parts for testing	List of similar products and manufacturers, including datasheets, competitor products and, if available, prices.	(C1) total man- hours required for design and manufacturing, materials, parts, and required plant equipment.	Base value (V1); prototype design and development (man-hours, including costs of required equipment and infrastructure.
					(M1) Project manager and technology transfer office must have clear idea of the market segment and characteristics of the customers that will benefit from the new technology.	
2. Integrated prototype/ University	Functionality of concept prototype and operability improvements.	More robust and integrated technology, including communications, processing, software, and improvements to increase availability and reliability.	Improvements to manufacturing, improved technology.	Competing manufacturers and producers are added according to the new features of the technology.	(C2) Additional design and manufacturing costs to pass from concept to integrated prototype must be included.	Intermediate value V2 is calculated by adding the costs associated with design improvements for the integrated prototype to the previous costs.
					(M2) Information about new market segments potentially interested in the new features of the improved prototype is added.	

Table I. Integrated product/market information. (Continuation)

Project Stage/ Responsible organization	Product Specifications			Required market profile information		
	Work in progress	Technology	Manufacturing Process	Competitors	Costs	Market
3. Laboratory prototype/ University	Second level pf improvement (integration, operability, functionality); aesthetical improvements; drawings, part manuals, part lists.	Prototype specifications: availability, reliability, and destructive testing, accurate repeatability, precision, usability, Process description, intellectual property titles or certificates: patents, utility models, industrial designs, software. Technologically mature laboratory prototype.	Quality testing of prototype modules or sub-assemblies. Special manufacturing processes required. Building drawings, list of materials, pilot plant specifications. Process logs	Identification of market segments and adjustment of technological product. Screening of lists of products, competitor product prices, and companies.	(C3) Costs of parts, materials, spare parts, special manufacturing tools, software, intellectual property, energy, waste disposal, manufacturing man-hours, packaging. Equipment foundations. Savings according to production scale.	(M3) Specific market definitions for laboratory prototype by geographic region, by use, by new application. Characteristics and optional features of final prototype. In applicable cases, definition of product efficiency, type of fuel or energy supply, sustainability profile, etc.
						Laboratory prototype value (V3) = V2 plus intangible value of intellectual property plus value of the opportunity benefit in the market.
4. Technology Transfer (TT)/ University-Company	Negotiation of financial term definitions and signing of TT agreement.	Functional prototype, integrated technology, and training to be transferred from the university to the company.	Same information as in third stage.	Same information as in third stage.	(C4) Same information as in third stage (C3)	(M4) Same information as in third stage (M3)
						(V4) New TT valuation based on laboratory prototype.

Table I. Integrated product/market information. (Continuation)

Project Stage/ Responsible organization	Product Specifications			Required market profile information		
	Work in progress	Technology	Manufacturing Process	Competitors	Costs	Market
5. Industrial Feasibility/ Company This stage is equivalent to industrial concept testing.	Feasibility of industrial production is carried out jointly by the university and the company in their R&D laboratories.	Product technology assimilation, validation of functionality, and preparation of manufacturing manual for production line. Optimization of materials and parts based on availability in the local market.	Description of manufacturing processes, assembly lines, possible bottlenecks, equipment arrangement diagrams, Gantt chart, critical path, production contingencies, and manufacturing alternatives.	Company must identify products and manufacturers working with similar technologies and fill out data sheets with the characteristics of competing products and prices if data are available.	Costs of fifth phase (C5) represent the costs associated with the assimilation of technology by the R&D group in the company, including man-hours for design and manufacturing and parts, materials, and equipment used in small production lots.	(M5) Entrepreneur must have an idea of the target market, which should be clearly identified and geographically segmented by type of user. A brand or sub-brand must be defined for the product and expected sales volumes calculated by market segment.
						Value (V5): Costs of assimilation, testing, and industrial adaptation of laboratory prototype are added to the value of the TT stage (V4).
6. Industrial Scaling/ Company	New product development and activities to expand capabilities of existing production lines or assembly of a new one as required.	Robust final technological product, including the definition of its degree of maturity; intended applications; communication and processing capabilities; relevant software; reliability and availability.	Complete specifications of production line. Equipment, materials, and energy requirements; production efficiency; management of solid waste, liquids, and gases. Pilot plant. Special materials and processes required. Mass and energy balances.	Final list of competing manufacturers and producers. Information on competing products and prices.	Estimation of total cost for industrial production of new technological product for low, moderate, and high production volumes. First launch price proposals can be made based on this information and sales estimates.	Screen and define target market sectors. Increase of expected sales volume by market segment using trade association newsletters and government publications.
						Final Value (VF) is calculated by adding the costs of testing, sanitary permits, and safety and quality standards to the costs of the previous phase (V5).

Table I. Integrated product/market information. (Continuation)

Project Stage/ Responsible organization	Product Specifications			Required market profile information		
	Work in progress	Technology	Manufacturing Process	Competitors	Costs	Market
7.Marketing/ Company	Contract is assigned to a consultant to conduct market research (surveys, etc.) to measure actual sales volumes.	Product technological specifications same as in phase 6.	Technological specifications of manufacturing and transformation processes required by the new technological product same as in phase 6.	Information of progressive market profile is complemented with data from professional market study carried out by consultants or marketing firm.	Costs of market research by external agent are added to production costs, which are same as in phase 6.	Professional market research conducted by specialists in the field: surveys, interviews, visits, and focus groups based on marketing strategy selected for each target market segment.
		Degree of maturity of the fundamental technologies of the new product.				Launch value of New Technological Product (VNP) = Final Value (VF) plus cost value of Professional Market Study plus value of intellectual property titles.

Source: Authors own elaboration (2019).

Product price determination and market launch

Price is a key product attribute, and it must be established by the firm's upper management (Boer, Op. cit., pp.190). Product price determination, or pricing, is an extremely complex process. If the launch price is too high, clients could immediately reject it or accept it only gradually. If the price is too low, market performance perturbations or oscillations could endanger the investment.

As mentioned before, price is a key product attribute, and it must be determined by the firm's upper management (Boer, Op. cit., pp.190). This complex process must be accurate to avoid rejection due to immoderately high prices or market disruptions due to immoderately low prices. Low prices can stimulate adoption, but the payback period and expected profits will be delayed. In the long term, it may also result in a negative assessment of the product in the client's perception and decreased useful potential since new market segments accepting lower reference prices will need to be carved.

Myers (1997), described a positive correlation between the use of market information and management satisfaction concerning pricing decisions. These decisions depend on strategic factors. For example, if the product involves sales in a primary market (fore-market) and a secondary market (aftermarket), the management's strategic decision might be to launch the main product at a low price in order to obtain a more substantial margin in the consumables aftermarket, as is the case with printers and toner packs or razors and disposable blades, among many other examples (Cabral, 2014).

Finally, according to Frankel (1990, page 123), the price of the product tends to increase as it penetrates the market and becomes mature, and profits will peak before the product's life cycle ends. See figure 4.

Figure 4. Relationship between technological product dissemination and price
(Q = quantity; P = price).

Source: Frankel, (1990).

Boer (Op. cit., pp.203) noted that sales increase exponentially immediately after the product is launched, in an S-shaped curve pattern typical of product life cycles. However, this growth requires that an adequate product price be established considering data from the final marketing study, total costs of the innovation project (including all seven described stages) and expected payback period. This process must bear in mind competitor prices and the innovative characteristics of the new product.

Conclusions

Innovation projects are a lengthy adventure. A laboratory prototype can take more than half a decade to become a commercial product (Boer, Op. Cit; pp.175). The present paper sought to demonstrate the series of benefits of conducting an incremental market study using information from the different stages of an innovation project.

There are at least two possibilities of collaboration between university representatives and company officials, depending on the moment when they meet. The incremental market study is a low cost information tool that offers and makes available valuable market information at any time of project development to stakeholders to make decisions to carry on the collaboration.

In universities, R&D projects are usually carried out with the purpose of training human resources, but there is scarce interest in exploiting the technological product. In this first scenario, an incremental market study makes it possible to refocus and redesign the project with an eye on the satisfaction of a possible market. Therefore, both lead researchers and undergraduate students will be aware of the possible commercialization of the product in the future, and therefore, they will be able to redefine the project in an adequate direction. A market profile including information about competitors, costs, and the target market and its segments can support the decision to continue investing in the prototype or to improve it. Furthermore, once the technology is an actual laboratory prototype, market information becomes extremely important to facilitate technology transfer because it provides grounds and data to perform the technology valuation and negotiate the terms of the exchange.

In a second scenario, the R&D+I project is requested and funded by an external organization. If a company finances the project, the market profile can be created by both parties. Intellectual property is usually shared, and the company is granted priority rights over technology transfer. No initial or down payments for technology transfer are, and the negotiated terms of reference are usually established as a percentage of the royalties, based on either revenues or profits.

In both scenarios, the information gathered by the company concerning feasibility and scaling stages and costs of production, manufacturing plant extensions, and pilot plant costs, in addition to information on competitors, target market segments, technological valuation, and market research carried out by an external consultant, will represent a hoard of hard data to estimate the demand for the new technological product when launched into the market. These data will also support pricing decisions and allow for analyses or software-based simulations to determine expected interest rates and payback period. In this way, the firm will develop certainty concerning the project, and the university-company project team

will have greater probabilities to produce an authentically innovative technological product geared to economic or social impact.

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