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A Case Study of Marketing Research for Academic Spin-Offs: Challenges and Future Prospects

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Abstract. Academic spin-offs usually develop products and services that can be applied for different markets. This peculiarity makes it difficult to carry out marketing research, considering the diversity of segments, channels and segments to be prioritized. This article describes the problem based on the experience of an academic and medical device industry spin-off. Applying an observer-participant research method, the paper describes the development of a marketing research plan for this case and the team's solutions for the problem. Finally, the paper identifies practices that should be investigated to improve the interface between marketing, technology management and product development.

Keywords. Academic spin-off; market research of spin-off; entrepreneurial university.

Introduction

The knowledge transfer between universities and the market is extremely important factor for development. O'Shea et al. [1] mention the spin-offs generated by universities as important aspects by enabling the development of products through the creation of new industries that will contribute to new jobs and wealth creation.

According to Pavani [2], the spin-off companies are also called start-ups or technological basic seed or university spin-offs. The product or service success of these companies in the market, like in other spin-offs, depends on appropriate marketing study, including identification of potential customers, competitive advantages, strengths, weaknesses, gaps and other known issues.

In the case of academic spin-offs, however, there are uncertainties that make it difficult obtaining a focus and a plan to "attack" the market. Technological innovation means a new know-how, new feature or attribute and this new know-how translates into lots of solutions or classes of potential products that can be targeted to different markets and industries.

The amount of application options of technology and the high number of possible directions is a challenge for this task. This question is not dealt frequently in market research literature. The traditional view is the established companies and mature markets. In this case the first activity is the market segmentation.

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The problem therefore is how to target the academic spin-offs case in which possibilities of products and markets can be so wide? This article investigates the issue through a case study of an academic spin-off the area of medical equipment. It describes the adopted model and discusses the challenges and future prospects.

1. Literature Review

1.1. Support to Academic Spin-Offs

The current focus on academic entrepreneurship based on patents, licenses and creation of spin-offs, needs to be expanded to cover other commercial and noncommercial activity.

There are two complementary roles in the university that promote academic entrepreneurship [3]: the direct academic entrepreneurship, in which world-class research plays an important role in creating innovations that lead to competitive advantage, which can be through the spin- offs creation encompassing academic scientists; and second, the indirect academic entrepreneurship in the education and experience in university research may lead indirectly to entrepreneurial initiatives through corporate spin-offs and start-ups created by students and alumni.

Direct entrepreneurship depends on the creation of knowledge that can support teachers in academic spin-off creation and one way to do it is by creating methodologies and best practices to specifically support such companies.

According to Shane et al. [4], there are several factors that affect the spin-offs creation such as the nature of technology, the industry that the technology will be explored, the university where the technology was developed and the characteristics of the new technology inventors. O'Shea et al. [1] asserts that there are influences of academic individuals involved and environments and university settings.

There are many specific models that describe an academic spin-off setting in stages or steps. Araújo et al. [5] divides the process into four main stages: Stage 1: Ideas and opportunities identification with business potential and its protection; Stage 2: Technical assessment and economic feasibility and idea's market potential; Stage 3: The company creation and Stage 4: The company's consolidation and economic value.

Market research is a key tool for the first stage. Therefore, the university should be prepared to support start-ups regarding this issue.

1.2. Market Research for Academic Spin-Offs

Market research is the business function that connects the company and customer, through information to support decisions related to the product target, being a functional tool that guides the organization's strategies regarding the consumer behavior and possible segment trends in question and the current scenario.

Market research techniques can be applied to solve these problems such as positioning, branding, consumption potential, customer satisfaction, media and point of sale choice, among others. According to Aaker, Kumar & Day [6], all market research approaches can be classified into one of three general research categories of: Exploratory, Descriptive, and Causal.

However, Faria et al. [7], cites that academic spin-offs have some barriers to bring the technology emerged from research results to the market, either in the form of product or process innovation, which are widely accepted by the market. It appears that this difficulty is natural for academic spin-offs, considering that a good portion of university researchers commence their projects without market approach.

There were no specific articles on market research for companies using this model. This phenomenon can be explained by the authors Oliveira et al. [8], which identify such companies have great difficulty regarding the marketing plan implementation due to lack of understanding of the concept and its enfoldments by researchers / entrepreneurs, showing themselves extremely involved with the technological innovation process. When we analyze the reality of these companies, we realize that there is pressing irregularities between their marketing skills, which tend to affect competitiveness, assertiveness and market permanence.

Still, there are shortages of probing studies that address the issue of marketing challenges to this business model and there are authors such as Oliveira et al. [8] who claim that companies require different marketing tools:

- Marketing plans are made with short-term view and, in general, without prospects for medium and long term;
- Entrepreneurs find it difficult to create a mission for the company and focus sharply on technological development;
- The entrepreneur's values are confused with the new company's value;
- Difficulties emerge regarding assessment and business weaknesses;
- Entrepreneurs focus on the relationship with the target market entrepreneur;
- Entrepreneurs focus on the technology design process without getting solid information from the market.

Therefore, the lack of implementation reports may be related to the high complexity of new technology; cultural focus to the product / technology, arising from the academic environment; and even the lack of these techniques. Another challenge, not least, is the lack of work plans / implementation specific to these cases. In the following sections describe a specific case research plan for an academic spin-off

2. Methodology

This work was carried out from the monitoring of an academic spin-off created by the Department of Robotics, a branch of the Mechanical Engineering Department of in a Brazilian university. The company chosen for this work implementation was an academic spin-off that emerged through research results developed within the University.

3. Case description

3.1. Project team formation

The team assembled for this project was constituted by five (5) persons, two (2) professors, one (1) business consultant and one (1) professor advisor in the product development segment.

The project carried out by the spin-off research team generated technology, knowhow, which has great potential to be incorporated into a given set of products. They managed technical issues and were the stakeholders and decision makers.

The business consultant and expert in product development conducted a support type consulting, offering guidelines for market research as problems emerged.

3.2. Project opening meeting and PC elaboration

A first meeting occurred to clarify the technology and its characteristics to those involved in the project. It was given the authorization for the Project Charter and the data gathering deadline was set.

As a result, one of the team members prepared a PC - Project Charter - from a document template as Appendix 1 - TAP.

The main concern was the identification of deliverables. They were defined as follows: 1) Business Model; 2) Project Deadline; 3) Members activities; and 4) The next team meeting date.

3.3. Meetings and in Loco Technology Observation

The Market Research Theory proposes a set of information sources, suggesting the distinction between secondary and primary sources. In this sense, the marketing researcher should start its work seeking to exhaust the secondary sources usually being a cheaper thesis, and then go for more accurate surveys, observations, etc., their primary sources.

Thus, it was possible to see that professors and researchers in academic environment establishing contacts with clients and companies throughout technology development. In this activity they accumulate a quantity of information. An important decision of the business consultant was the use of observation methods, at first, focused on the research team.

The business consultant visited the lab where the technology was developed, and in addition to gather information related to the process, the ongoing activities progress and the functions organization was observed as well. This was important in many aspects, since:

- a) Allowed greater technology knowledge, laboratory operation and contact with other developing technologies;
- b) the research team activities have been described;
- c) There was an approximation of the business reality.
- d) There was a prototype physical contact and testing
- e) partnerships and agreements signed for prototype testing between universities have been reported;
- f) A high degree contact with a partner in a company born from an academic *spin*off in the United States that develops similar technology was mentioned;
- g) There was a greater commitment concerning the developer team;
- h) One of the professors in the development team entrepreneurial vision was noticed.

It was possible to identify some internal communication gaps, the high focus on technology development, the average market knowledge t and the absence of time control delivery. Arguably this step brought more analytical data and the production process understanding, but there was a need for exploring information related to companies developing similar technologies, which is reported in the following topic.

3.4. Market information search

The second stage was characterized by the search for additional information. So one of the limitations found consisted of the time and investment needed to carry out extensive market and segmentation research. The given solution was to use simple and synthetic data sources. In this case, we used the DATAVIVA [9] database to search for information and open data.

According to the website, DATAVIVA is a tool created through the Strategic Priorities Office of Minas Gerais government and an international consultancy, with the initial target to assist the government's economic development policy of Minas Gerais state. In result, platform potential as Big Data tool was noticed: the platform has data from all over the country, which helps not only Minas Gerais state. The databases are composed of data provided by the Labor and Employment (MTE) and by Development, Industry and Foreign Trade (MDIC) Ministries. DATAVIVA presents the export data on 1,256 products of Foreign Trade Secretary and the 865 occupations among 427 economic activities, from the Annual Social Information Report. Other statistics within this platform are the School Census and Higher School Census database which include gathering information from primary to higher education and United Nations Commodity Trade Statistics Database (UN Comtrade) containing detailed statistics on imports and exports reported by the statistical authorities of nearly 200 countries.

The information, though rich, its content was general and depended on a market segment or group choice in order to be more accurate.

3.5. Target market choice

The initial survey conducted in the previous step, as well as data obtained from observation, indicated the existence of a significant number of products to be offered to a range of potential consumers.

This aspect, initially positive, generates, however, a focus problem: it is not possible to accurately analyze all these markets and segments, for all product possibilities.

The given solution was a creation of general and alternative business models dynamic. The idea was to probe several options that would allow the team to prioritize a smaller set of markets and segments to explore.

The meeting was prepared with the assistance of graduate students in Industrial Engineering. They were driven to propose different solutions and generate new ideas and capabilities that could be presented to the project team. With these researchers assistance, four scenarios were generated and described in the Canvas Business models type that served as a starting point for the project team work

Initially there was a presentation of an executive summary containing the data collected performed by the business consultant to assist the project understanding. The executive summary was constituted of market data: context, target group and the final consumer; technology description; possible products to be developed using the same technology; similar and future competing technologies presentation; presumable distribution channels.

So, four BMG models - Business Model Canvas were provided to fulfill the criteria and gather all the information that encompassed every possible product. The choice of this method can be justified by the use of visual features such as picture and adhesive stickers contributing to the participation of members and autonomy during the activity.

Sebrae's booklet on Canvas [10] presented as a tool created by Alex Osterwalder and Yves Pigneur through trials and studies. It's called Business Model, where can be displayed the description of the business and its component parts, so that the idea is understood by people who see it in the same way who developed it. It consists of nine sections: value proposition, customer relationships, customer segment channel, major partnerships, key activities, key resources, cost structures and revenue streams.

In this process, there was brainstorming considering all the students' ideas and opinions of unrestricted possibilities in completing the Business Models. Upon completion of this dynamic another meeting was carried out with the project members for the presentation concerning the business models analysis results and settles the proposals.

Developers analyzed the business models and selected two of them that met in focus and group perspective. This process of funneling ideas and proposals is shown in the figure below.

3.6. Market research conclusion

The business consultant conducted a new stage for further research on the two business models specific markets. The form chosen to complement the information was interviews with distributors. In this case, a company interested in knowing the technology has been identified. A meeting for experiences exchange between researchers and the commercial representative was arranged. Besides knowing and testing the prototype, the commercial representative reported factors and important information for business plan detailing as:

- a) Segment peculiarity / entry barriers (standardizations, legislation and taxation);
- b) Technology recipiency;
- c) Segment trends;
- d) Possible technology versions to reach other consumers;
- e) Guidance on critical issues concerning the technology insertion context;
- f) The brand significance;
- g) Import and export trade markets;
- h) Probing the competition actions;
- i) Possible partnerships.

The interview did not change significantly the developers' focus, but contributed positively to guidance and clarification of market positioning doubts, entry barriers, norms and segment trends. Market research was oriented in order to complete the business plan prior to the deadline given by the project team.



Figure1. Ideas development funnel and business model.

3.7. Future academic spinoff market research applications

In order to gather all the activities involved in this study and to guide possible spin-offs in the market research development, follows a sequence of steps that can facilitate implementation.

Phase 1: Design team selection for market research. In this first phase it is essential to choose those responsible for drawing up the search. Typically, non-academic spin-offs undermine the market studies for the target segment knowledge. Within these business models there is a strong concern with the product and the development team, lacking of management skills. With this initial difficulty, the spin-off should select members who have skills and management expertise to direct the market research and even be appointed a project manager. It is very important the experts help, related area researchers and technological entrepreneurship support agencies.

Phase 2: Meeting to align the design and integration team. If the spin-off insert external support agents to market study, their integration to project goal alignment that will be developed is needed and the team members and stakeholders expectations understood. It is suggested in this stage a Project Opening Statement elaboration containing the activities descriptions and approval of all members before starting the market research project. If necessary, considering the project safety, this step could also create a confidentiality term for all the participants. Academic spin-offs can be oriented by innovation agencies regarding the use of confidentiality agreements within the university.

Phase 3: Knowing the technology or product to be developed. This step is extremely important to present the product or the idea of it to all the external agents or experts who will conduct the market research. If the product or prototype has already been developed at this stage you can insert a target customer to test the functionality or perform tests with costumers' focal groups. The project manager along with the specialist should measure and evaluate customer needs and register, forwarding the possible changes to the product.

Phase 4: Knowing the customer and target market. Search on the customer and the market that the new product will be inserted is a survival factor for the companies. You need to map all possible customers with their specific needs and through these results, decide which types of customers are part of the company's strategy and its stakeholders. Big Data and specific research tools will provide useful information for understanding the public. After prospecting possible costumers in a generalist way you need to select the target. At this stage, the use of business model (Canvas) can provide important general guidelines to be considered in this market decision. In case of similar products scenario it is necessary to identify its market position and its competitive differentials.

Phase 5: Wrapping up the market research and creating a business plan. After the conclusion of the phase above, a detailed study concerning production capacity, distribution channels, resources and initial investments required for the company's inception is essential. It is important to be aware of the entry barriers, specific legislation, market trends and economic fluctuations. A complete business plan and all the data resulting from the above phases can be a crucial tool for the beginning company, the inclusion of new investors and the possibility of initial funding to encourage entrepreneurship.

4. Conclusion

The work fulfilled its objective regarding to the exclusivity of the model adopted for market research. The market research theory is emphatic about the importance of understanding the needs, perceptions and customer emotion, however, this case shows that the observation of the development team, especially those called to assist the Marketing Planning is fundamentally important since they contributed significantly to the project outcome as it allowed better research adjustments. This is a hypothesis for future research.

A practice that was proved interesting was the web database use that synthesizes market information, such as DATAVIVA, facilitating the search for data and optimizing time and project resources.

The case suggests that one of the research markets challenges in academic spinoffs is the great flexibility in terms of market performance. Unlike an established company, which already has a target market, this group of individuals would have to create their own distribution channels. This means they can opt for different segments and product types. The challenge is to find methods of market identification and prioritization, even considering the limited information. The goal was achieved with the use of BMG tool - Business Model Canvas, or simply, Canvas, but the team's perception is that a set of enhanced techniques can be developed and applied.



Figure 2. Flowchart market research process for a academic spin-off.

The graduate student's participation that was not considered as a part of the initial project was a positive factor in the assembly of possible marketing scenarios, both project management and product development researches, and its collaborations have increased the development of alternative and supplemented with data on the project context interpretation.

The information exchange between commercial representative and the researchers' team in this particular study case brought the involvement of researchers into market research. This shows that in the project integration, there is no parallel development of the steps, including developers throughout the stages, facilitating the decision making of the project steps and guiding possible changes in the course of it.

To the future research references, it would be possible to work with scripts for teams of developers observation; studies and proposals of *Data Mining* and *Big Data* tools for specialized analysis in technological innovation markets; techniques proposed for prioritizing markets for academic *spin-offs*; and also with the use of visual tools

such as *Canvas* and *Design Thinking* in development stage ideas to support decision making.

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