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SUPPORT FOR INNOVATION AND TECHNOLOGICAL ENTREPRENEURSHIP: ASPECTS OF LNCC TECHNOLOGY-BASED BUSINESS INCUBATOR MANAGEMENT

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Abstract: Business incubators bring together in their work environment a special type of firms that are characterized by innovation and entrepreneurship. During the incubation period, entrepreneurs are protected and the environmental effects of the market are minimized. The work highlights the importance observed in the last years of the incubator movement in the country and starts from the premise that survival in a complex and uncertain environment requires strategic interventions that enable the advancement of the incubated businesses. This research has an explanatory character and is based on bibliographic, documentary and field sources. The assessment takes as a theoretical basis the Balanced Scorecard methodology and the Technological Base Incubator of the National Laboratory for Scientific Computing - LNCC constitutes the sample that was defined by the accessibility criterion. The result shows that more adequate management models offer better conditions for the success of this enterprise.

Keywords: Incubator; management; entrepreneurship.

1. INTRODUCTION

The root of the word entrepreneur sends us, 800 years ago, to the French verb entreprendre, which means “to do something”. One of the first definitions of the word “entrepreneur” was elaborated in the early 19th century by the French economist JB Say, as one who “transfers economic resources from a sector of lower productivity to a sector of higher productivity and higher income” (1983 , p. 54). The term “entrepreneur” was incorporated into the English language in the early 19th century. Among contemporary economists, it was Joseph Schumpeter who was most concerned with the topic, who had a great influence on the development of the theory and practice of entrepreneurship. He describes it as the “engine driving the development of the economy. The innovation brought about by entrepreneurship allows the economic system to constantly renew and progress ”(1988, p. 67).

Currently, entrepreneurship is a global phenomenon in view of the marked changes in international relations between countries and companies, in the way of production, in the

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labor markets and in professional training. Investing in the organized dissemination of entrepreneurship will be a fundamental factor of social and economic progress and also a source of generating new jobs for nations.

Several public and private institutions have invested to research and encourage the entrepreneurship. There is an explicit correlation between entrepreneurship and economic growth. The clearest results are manifested in the form of innovation, technological development and job creation.

To make it possible to create a systemfavorable to socioeconomic development, it is important to encourage such points: local entrepreneurial culture, management of intellectual capacity and knowledge as the main intangible asset, and creation of adequate mechanisms for successful entrepreneurial attitudes. These points build the main pillars for social development with high added value and, consequently, wealth. Thus, the desire of Governments to transform social action must always count on the participation of public and private research and teaching institutions.

Against this background, the Institutes of Science and Technology (ICT's) have an important role in the development of science and technologyand encourage entrepreneurship, taking into account their excellence in research. In addition to research and teaching, it is imperative that ICT's build an integrated agenda of actions focused on solving problems and meeting the desires of Brazilian society.

The new function, deposited in ICT's, has been demanding the expansion of the promotion of an entrepreneurial culture that allows to recognize and take advantage of the opportunities generated by the research activities. By taking on such a task, the Research Institute can increase its importance in decision-making regarding, for example, the regional promotion of technological innovation in companies.

Attentive to these issues, the National Laboratory for Scientific Computing (LNCC) develops initiatives aimed at stimulating innovation and entrepreneurship. One of the great contributions of LNCC to the local productive arrangement was the creation of its Technological Based Business Incubator, the LNCC Incubator. Created by Ordinance LNCC No. 001, of March 15, 2001, the LNCC Incubator aims to house and encourage the creation of companies that transform knowledge into competitive commercial products, based on research carried out by the Research Institute of the Ministry of Science , Technology, Innovations and Communications.

The LNCC Incubator selects and supports incubated companies, enabling them technologically and managerially, contributing to the strengthening of the Regional System of Innovation. With the support of the incubator, companies enter the market with a high degree of specialization and great chances of remaining in the increasingly competitive market.

The aim of this study is to describe the improvement of the management model of the LNCC Technological Based Business Incubator. Understanding how a technology-based incubator is structured and how it performs process management can be of great importance for future entrepreneurs and managers, whose goal is entrepreneurship based on science, technology and innovation.

2 - THEORETICAL FRAMEWORK:

The growing competitiveness where organizations are currently found is leading to the emergence of new organizational arrangements. These arrangements seek to deal with an enormous complexity of variables generated by environmental changes, requiring the establishment of practices and actions associated with strategic planning. Public and private organizations are suffering the impacts of these changes and, respecting the management peculiarities of each one, it is evident the need to implement tools that enable the management of the new variables perceived in the business environment.

In the nineties, Robert Kaplan and David P. Norton participated in a research project involving several companies, which aimed to find new ways to measure performance in organizations. The researchers argued that knowledge-based assets (especially employees and information technology) became increasingly important for the competitive success of organizations (KAPLAN & NORTON, 1997).

From this research project, the authors came across a new concept of a balanced measurement system: the *Balanced Scorecard*(BSC), which is a measurement system based on the company's objectives and helps in the communication and implementation of the strategy. This measurement model appears with the objective of solving the problems that exist in having a single perspective in the conduct of decision making in a company. It is a counterpoint to traditional accounting that uses an exclusively financial line.

The BSC model seeks to balance different perspectives for an evaluation of business performance. Its purpose is to transform the company's strategy into effective actions for the business, based on financial aspects, processes, customers, learning and growth. The BSC

development process asserts itself in the premise of strategy as a hypothesis, because according to the authors*strategy denotes the movement of the organization from its current position to a desirable but uncertain future position* (KAPLAN; NORTON, 2001, p.88).

According to Herrero (2015), the management of the BSC-based strategy can be defined as the construction of a truly competitive strategy, creating value greater than the large number of stakeholders involved in the incubator project.

Without the use of the BSC methodology, the management control process is usually carried out through topics focused on financial control, through the budget that has a short-term view. With this line of thought, the main reference is the financial one and the company's strategic vision will always be contained in the financial decisions. Thus, any change in direction or strategy will imply a budget review, since the company's strategy is executed from the financial resource.

The management system centered on the BSC is linked to the execution of its strategy and, in this way, the budget starts to live with this methodology and remains a management tool, but not the only one (FIGURE 1).

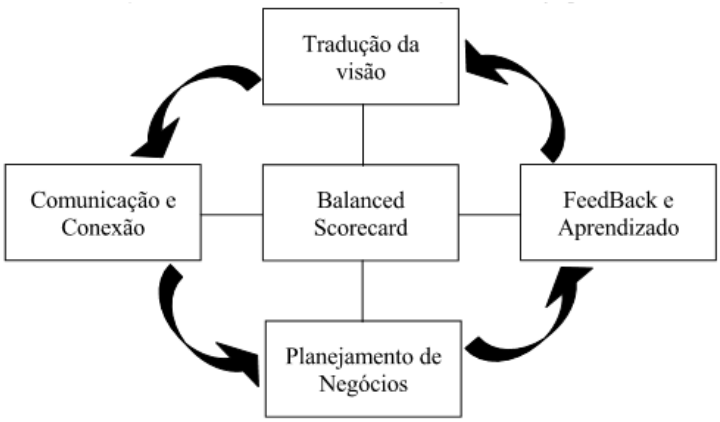

Figure 1: Strategic Management System.
Source: Kaplan and Norton (2001). Adapted by the author

According to Kaplan and Norton *the scorecard empowers successful organizations to build a new type of management system - designed to manage strategy* (2001, p. 17). Thus, with the new management system formatted with the BSC, the organization is now focused on its established strategy.

The authors point out that there are principles of organizations focused on strategy, which aremobilizing for change through executive leadership; converting the strategy into a

continuous process; transforming strategy into everyone's task; the organization's alignment with the strategy; and, translating the strategy into operational terms.

The use of the BSC methodology, indicated as an instrument of management and control of the organization for a business incubator, is recent in the management of management processes. It is a flexible and adaptable methodology, mainly because it efficiently meets the requirements of a behavioral control system, as defined by modern organization theory. The BSC uses a set of performance indicators, organized and logically articulated, in order to harmonize measures that portray past performance and indicate future performance.

Dornelas (2013) reinforces the importance of obtaining performance in processes, as they are the patterns of interaction, coordination, communication and decision making by which companies transform the inputs of resources (people, technology, equipment, product designs, brands, energy and capital) into higher value products and services. Finally, the four perspectives of the BSC are built based on external and internal indicators, which guide the organization to have a structured view of its objectives in each perspective.

3- RESEARCH METHODOLOGY

In this case study, foThe interview and the form applied to the partners of the incubated companies were used as a questioning tool. According to Gil (2002), this method consists in the deep and exhaustive study of one or a few objects of analysis, in a way that allows its broad and detailed knowledge.

The work has an exploratory character and aims to present the phenomenon in such a way that it can help in understanding various situations where it may occur. The methodology also used bibliographic and documentary research to support the study.

4 - INCUBATORS CONTEXT

Business incubators are a worldwide phenomenon supporting the consolidation of the development of micro and small companies in the market. According to world literature, they were conceived as an environment to support entrepreneurs and new ventures, and to stimulate the creation of innovative companies with a high technological degree of their products and services. The Technological Innovation Law (BRASIL, 2004), highlights that incubation is also used to assist the transfer of knowledge produced in the Institutes of

Science and Technology to companies; to increase the technological level of companies and the development of local productive arrangements.

The dedication required from incubators, such as the LNCC, which work with emerging technology-based companies, is not simple. Companies, based on the search for innovation, need specific care, as they involve greater risk and greater unpredictability for the development of products and services.

Comparing with traditional industry, technology-based products are more complex and elaborate and require longer maturation periods and, often, tests require large volumes of resources (material, human and financial) and have a shorter life cycle. In addition, technology-based companies do, in general,part of a new industry and propose some kind of innovation to the market, that's why they undergo the “liability of newness” process. That is, there is still no solid knowledge base on the market for the type of product or action that the new company is proposing. As a result, the process of creating and legitimizing the new company becomes more difficult. More than just creating a company, technology entrepreneurs often need to create a market.

This situation, by itself, makes technological-based ventures risky, which becomes even more reckless when entrepreneurs have no experience in business management. The manager's lack of experience in the administrative area contributes to the fact that a considerable portion of companies do not succeed in the first years of life[2]

Possible causes for the collapse may be related, not to the product's failure, but to the lack of planning, management failures and the entrepreneur's behavior. Thus, the strategic requirements for business success (knowledge, entrepreneurship, management and financial capital) may not be sufficient or inappropriate for the nature of the enterprise. Sometimes, in the product / service development process (Figure 2), these pre-operational investments receive little relevance or are made available inappropriately, underestimating the effort to innovate.

[2] According to SEBRAE data, more than 24% of companies created close their doors before completing two years of life (SEBRAE, 2017).

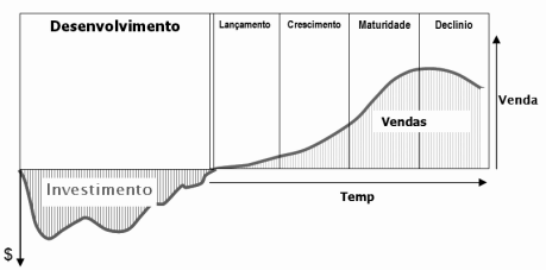

Figure 2: Technology-based product development process

Source: StratPlan, 2007

In this context, it is important that during the companies' residency phase, the incubator also trains managers for market challenges. As the partners of the enterprise, in general, do not have a degree in Administration, issues related to this area should be worked on during the incubation period. Support should not be limited to infrastructure services (24 hour security, meeting room, maintenance and cleaning), expanding the entrepreneur's knowledge through consultancies, encouraging him to transform his product / service into a business. Thus, the managerial question of the incubator becomes an extremely important factor for the success of new ventures.

For Miziara and Carvalho (2016), one of the great differentials that leads an incubator to success is the formation of a network of partnerships that stimulates synergy and the development of new business opportunities. For these authors, the incubators called “networked incubators” are the ones that most have chances of success because they have competitive advantages. Cooper et al (2012) also highlights as a critical success factor the partnership with universities and research centers, whether for the formation of entrepreneurship networks or the transfer of technology to the market.

Addressing a little more operational management, Maletz and Siedenberg (2007) point out that a dynamic and qualified management team, and a well-defined structure enabling internal and external articulations that lead to success. Silva et al (2016), when carrying out studies with Rede Mineira incubators, also characterized the qualification of managers and administrative staff of the entities as a differential. Anyway, theThe incubator team must have adequate training to manage the incubator and guide the incubated companies in a professional manner. The greater the quantity and quality of consultancy services and networking services, the greater the chance of business success.

In this context, the incubation process is a challenge for both the incubated, as for the incubator. New entrepreneurs need to understand consumer behavior, estimate price and cost

of products and services associated with their business, define market strategy, among other tasks. The great challenge to be faced by the incubator's managers is to offer the structures and tools for all of this to be accomplished.

4.1 - MANAGEMENT MODEL FOR INCUBATORS

As required by candidate ventures incubation, an incubator must prepare its business plan. In preparing the plan, the main aspect to be considered must be the objective of the incubator that will serve as a guide for all its actions. Among the main goals of a technology-based incubator we can highlight: to reduce the mortality rate of nascent companies, to stimulate the creation of innovative companies, to encourage entrepreneurship and to encourage regional development.

In order for the idealized objectives to be met, it is important to identify the areas in which the incubator can operate, taking into account factors such as: the socioeconomic vocation of the region in which it operates, the potential for innovation, the possibility of partnership with universities and research and evaluation centers the potential for entering into agreements with established companies.

According Caulliraux (2001), the main function of business incubators is the shelter, that is, the transformation of entrepreneurs into a company during their incubation period. At the same time, the author points out that the incubator's activities are aimed at stimulating innovation and entrepreneurship, as they strengthen and prepare small companies to remain in the competitive market. In general, incubators seek to increase the efficiency of their macroprocess by improving the quality of candidates and increasing the efficiency of the incubation period. Thus, the processes of business incubators must be defined in order to achieve greater efficiency in the execution of their main product (Figure 3).

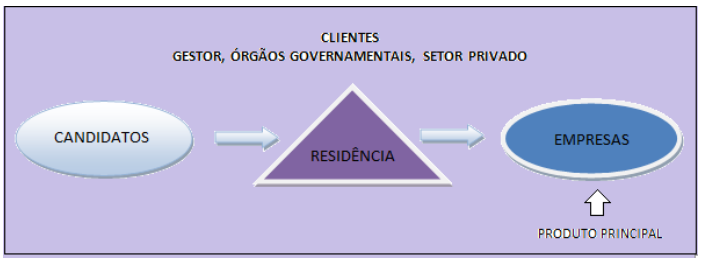

Figure 3: Main macroprocess of incubation programs
Source: Caulliraux (2001). Prepared by the author.

Another category of activity flow in an incubator is related to the support that supports the entire structure necessary for its execution. According to (Caulliraux, 2001) this category encompasses the activities of accounting and finance, planning and marketing, legal advice, among others.

4.2 - LNCC INCUBATOR PERFORMANCE INDICATORS

The assessment and monitoring of companies are becoming increasingly important for their management due to the constant changes in the globalized market. This management tool allows companies to improve their performance in a competitive environment.

The management of an efficient company in a competitive environment requires skills, information and great commitment on the part of its managers. In accordance withIn such a scenario, it becomes clear that managers need indicators that measure organizational performance to achieve the organization's efficiency and effectiveness.

The company's strategy, in order to contribute effectively to the organization's success, it must be translated into results that are then monitored throughout the management process, which depends on the establishment of a performance evaluation system. For Beuren (2000) "the definition and translation of the strategy, in a feasible and understandable way to the members of the organization, involves the need to provide adequate information to those responsible for the elaboration of the business strategy".

Kaplan and Norton (1997) ratify this position by claimingrem that measuring is important: “what is not measured is not managed. If there is no data to support the measurement, the management process for the strategic objective is probably inadequate or does not exist ”.

According to Meyer (2014), there are two types of indicators: results and processes. The result indicators show the organization its effective situation in the effort to achieve its objectives, but do not demonstrate how it achieved its goals.

The process indicators monitor the tasks and activities that produce results in the organization. These indicators privilege the organization's intermediate activities and not just its result.Performance indicators are basic tools for managing the organizational system and the information that these indicators provide is important for the decision-making process.

Gallon *et all* (2011) highlight that the environment in which the incubators are inserted requires a management model that is sensitive to the expectations existing in the agents

involved in the general environment of the organization, in addition, of course, to an efficient monitoring of changes.

For the National Quality Foundation (2008), the performance indicators comprise the data that measure the inputs (resources or inputs), the process, the outputs (products), the performance of suppliers and the satisfaction of the interested parties. According to Nunes (2008), "an indicator is a performance measurement instrument being used to measure and analyze the results obtained in certain periods".

The various definitions of performance indication, in the view of the authors and the National Quality Foundation, demonstrate a common denominator among them: the quantification of information that is collected through a performance measurement system during the process and that generates data. This information is translated into numbers called performance indicators. Through these indicators it is possible to evaluate the role of organizations with their customers and also to know what the real situation is, what improvements can be implemented, what preventive and corrective actions can be adopted in the process and in the product, and the planning and defining its strategies.

Table 1 shows some indicators used in the LNCC Incubator that allow periodic monitoring of incubated companies in a formal manner and following standards established by the Model CERNE (Reference Center for Support to New Enterprises). This model was designed to meet the demands of the market focused on quality and competitiveness standards. The methodology, developed by the Brazilian Micro and Small Business Support Service (SEBRAE) and the National Association of Entities Promoting Innovative Enterprises (ANPROTEC), aims to expand the incubator's capacity to generate successful innovative ventures.

CERNE was inspired by the support models for micro and small companies in the United States called Small Business Development Center (SBDC) and Business Innovation Center (BIC's), and follows the BSC methodology.

The implementation of the methodology involves a gradual and continuous process that evolves as the requirements are met and is designed on four levels. CERNE 1, object of our study, represents the first level of maturity in the incubator certification process. At this first level, the concern is to implement all systems that are directly related to the development of the projects. Upon reaching this level, the incubator demonstrates that it has the capacity to prospect and select good ideas and to transform them into innovative businesses, systematically and repeatedly.

Table 1: Performance Indicators - LNCC Incubator

	Empreendedor	Mercado	Financeiro	Tecnológico	Gestão
ANÁLISE TRIMESTRAL	• Participações em eventos	• Evolução das vendas • Número de clientes • Evolução do banco de dados dos potenciais clientes	• Faturamento • Receitas e despesas recorrentes • Capital de giro	• Desenvolvimento do produto	• Postos de trabalho
ANÁLISE SEMESTRAL	• Cursos de capacitação empresarial	• Grau de dependência cliente	• Inadimplência • Planejamento e acompanhamento do fluxo de caixa	• Participação em grupos de pesquisa • Investimentos em P&D	• "Turn over" • Legalização da empresa/certidões
ANÁLISE ANUAL	• Premiações • Número de projetos incubação • Maturação de novos projetos • Certificações	• Abrangência de mercado • Força de vendas e capacitação • Gerenciamento da marca	• Grau de endividamento • Projetos apoiados por agências de fomento • Grau de dependência da incubadora	• Novos produtos • Certificações • Registro marcas/patentes	• Sugestões apresentadas e implementadas • Atualização do plano de negócios

Source: ANPROTEC (2012), with adaptations.

The entrepreneurial axis assesses the personal characteristics and qualities of the partners of the enterprise and whether they are in accordance with the entrepreneurial profile. Market share, indicators are used to measure sales growth, number and degree of dependence on customers and marketing planning.

In the financial area, the ability to plan and manage resources, degree of indebtedness and financial results are checked. The product is the focus of the technological axis where criteria are established to ascertain and evolution of the production process.

Regarding the management item, it is verified whether the company uses strategic planning for its actions and establishes goals and results to be achieved. It is also verified if the incubated company uses an adequate management of its processes and human resources.

4.3 - CONSULTING AS A LEARNING PROCESS

Organizational consulting is treated as a method of improving organizations' management practices. Its main feature is the advisory service, from the consultant to the client, so that the client can cooperate so that their organizational objectives are met.

The nature of the consultancy is defined as a relationship of knowledge and cooperationthat is established between the consultant and the organization to renew itself. This renewal occurs due to the greater participation and satisfaction of its members and the continuous improvement of the quality and productivity of its goods and services.

Aware of the need to offer consultancy to entrepreneurs resident in the LNCC IncubatorIn 2013, an agreement was signed between the LNCC incubator and the Brazilian Micro and Small Business Support Service (SEBRAE). The agreement was executed through the project “Development and Improvement of Technological Products”, within the scope of the so-called Public SEBRAE / ANPROTEC 01/2011 - Application of the CERNE Model.

With the resources of the agreement, it was possible tohiring consultancy / accounting advice for the 4 (four) companies resident in the incubator, covering the following areas: tax, accounting, labor and social security and income tax. After the end of the consultancy, meetings were held with representatives of each company to provide feedback on the services provided. It was agreed that each company should pass on to the incubator an action plan related to its resource management for the next 12 months.

An incubator can have good results, especially if it structures its actions focused on the needs of the entrepreneur (production, quality, sales, costs, disclosure and marketing). In addition, it must consider the specificities of local technological development.

The service provided by the consultant also made it possible to reassess the Incubator's business plan model, with the aim of improving the incubator's selection process. This new model included strategic points of the enterprise such as: team, technology, market and action plan, and followed some formatting criteria that helped in the standardization of plans and consequently in the evaluation of the same by the examining board. Still in order to develop the Key Process “Selection”, the service of another company was hired to define which criteria should be evaluated by the examining board with different degrees and weights, covering all the axes described by CERNE: Entrepreneur, Technology, Capital, Management and Market. For each axis, indicators were proposed that could facilitate and standardize the criteria,

With the resources of the SEBRAE agreement, it was also possible to hire the services of a production company to create video in Stop Motion format, in order to publicize the services provided by the incubator. The video explains in a simple and fun way how the incubator can help future entrepreneurs. This activity is related to two Key Processes: Basic Management and Awareness and Prospecting, since the video is being used in a variety of ways such as awareness lectures, virally on social networks and on the incubator's website.

Another important point related to the key process “Sensitization”, was the hiring of communication consultants to build the communication plan and develop graphic material used in our prospecting campaigns.

5 - CONCLUSIONS

O The main objective of this article was to describe the construction and improvement of the LNCC incubator management, comparing this information with the hypotheses raised from the literature. The search for managerial improvement of company incubators is a strategy and should be encouraged, as the resources for its financing are disputed by a greater number of competitors. In addition, there is a greater concern with the effectiveness / efficiency of the resources applied by the development institutions.

ÇBased on the results obtained through the case study and the semi-structured interview, one can answer the research problem and confirm some guiding hypotheses. The differentiating elements that allow an incubator to achieve its management success are directly linked to the following items: punctual monitoring of each incubated company and critical analyzes to correct problems; preparing companies to face real market conditions and developing partnerships.

The proper selection of the consultants' profile is also important for the success of the Incubator. The typical resident entrepreneur accepted at the LNCC Incubator is a professional with a good academic background (at least with a degree) and good experience in the development of applied research projects. However, this professional has little or no experience with commercial clients and business management. Thus, the entrepreneur must acquire organizational and commercial knowledge in his collection of skills. Convincing you of this is an arduous task that can be reduced by offering free consultations in your work environment.

Regarding the LNCC Incubator's vision of the future, there are still obstacles to be overcome. Among them, the use of technological prospecting instruments, market research and*marketing*to facilitate the innovation cycle. There is also a need to intensify networking with partners and investors to accelerate the residents' graduation process.

It is suggested withthe future study the development of a satisfaction survey of the management model among entrepreneurs resident in the LNCC Incubator. Another suggestion would be to deepen the study with the managers of incubators in Rio de Janeiro associated with the Network of Incubators, Technology Parks and Poles of Rio de Janeiro - ReINC.

Per Finally, the author of this paper hopes that the results presented here can be useful both for the academic community and for managers of other incubators.

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