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Proposal of a theoretical model for the implementation and scalability of science parks: a case study

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Abstract

The general aim was to propose a theoretical model for the implementation and scalability of science parks. For this purpose, an in-depth study was conducted at the Santos Science Park (SSP), as this is the only implementation and scalability program for science parks in the country whose central focus is on energy (oil and natural gas). The study was qualitative and exploratory in nature and the methodology used was the case study, with data collected from multiple sources. These sources included bibliographic research, document analysis, a workshop and meetings with members of the Board of Directors of the SSP. Information on other consolidated science parks in the country (Tecnopuc in Porto Alegre and Porto Digital in Recife), which was important to the structuring of the theoretical model for the implementation and scalability of the SSP, was obtained from semi-structured interviews with their managers. The results showed that the implementation of the SSP will require not only a legal format and an adequate real estate project, but will also involve the articulation of political, economic and social activities that precede the implementation of the venture. These activities will define the criteria for the concession and use of the park's infrastructure and services. They also include the mechanisms for economic and financial support and social rules that will affect the interface of the park with its resident and non-resident companies and society. The conclusions of the study led to the proposal of a theoretical model for the implementation and scalability of a science park through the development of dynamic, ambidextrous and relational capabilities that together result in a scalable innovation cycle.

Keywords: Implementation; Scalability; Theoretical model; Science park

Introduction

Science parks emerged in the United States in the 1950s and became more commonplace in the 1970s, when they rapidly spread around the world and adapted to the different conditions of each region and country. In Brazil, they have mostly been implemented since the 1990s (Vedovello, Judice, & Maculan, 2006). According to Zouain (2003), Brazil could be considered a latecomer to the field.

Science parks are important because they offer space and services to support the establishment and maintenance of technology-based companies, i.e., companies whose goods or services are characterized by adding value through the knowledge incorporated into their products or processes. The presence of academic research centers, an innovative management style, highly qualified professionals and an excellent communications infrastructure and high quality environment are the common characteristics of science parks (Instituto de Pesquisas Tecnológicas do Estado de São Paulo, 2007; Instituto Prointer, 2002).

The purpose of science parks is to increase the wealth and improve the well-being of the region where they are located

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by promoting a culture of innovation and competitiveness in the technological and scientific institutions associated with them. As these ventures are related to incentives for the production and development of new technological products and processes, these parks are normally managed by highly specialized professionals with close ties to the business and academic communities (Associação Nacional de Entidades Promotoras de Empreendimentos Inovadores, 2008). Because of their importance to the promotion of Science, Technology and Innovation (ST&I), these organizations are emerging as an element of technology policies all over the world (Centro de Apoio ao Desenvolvimento Tecnológico, 2013; International Association Science Park, 2002; Lai & Shyu, 2005).

In specific terms, the United Nations Industrial Development Organization (2005) highlights a basic difference between a traditional science park (implemented up to the late 1990s) and a third generation science park (established after the late 1990s). While the former has high-level strategic management and an operational management policy (management of daily activities), the latter is directly involved in local issues, processes, relationships and results. Furthermore, it manages this entire set of activities efficiently.

In the particular case of Brazil, data from the Ministry of Science, Technology and Innovation (Ministro da Ciência, Tecnologia e Inovação, 2013) reveal that in 2000 the country had around ten science park projects. By 2008, this number had risen to seventy-four. In 2013, 94 parks were being implemented. Thirty-eight of these were at the project stage and twenty-eight at the operational stage. In 2013, there was a greater concentration of parks in the Southeast region (41.5%) and the South (37.2%). In other words, practically four out of five initiatives for science parks were located in these regions. The study by the Ministry of Science and Technology (2013) also showed that in 2013 the science parks in Brazil created 32,237 jobs and housed 939 companies. Many of these were operating in the field of Information Technology (36), the Energy Sector (27) and the Biotechnology Sector (26), and were concentrated in the South (40%), Northeast (32%) and Southeast (25%).

It should be highlighted that a science park offers space to interested entrepreneurs with clear rules for participation, attractive costs and opportunities for partnerships and knowledge sharing. Not only does this require a systematized implementation model for new parks, but also scalability, understood as organizational efficiency linked to the continuous creation of value (Fiates, Chierighini, & Ueno, 2007; Jabbour & Fonseca, 2005; Osterwalder & Pigneur, 2011).

Santos (1997) highlights that the implementation model for a science park should also involve patterns of articulation and cooperation among social and political actors and institutional arrangements that coordinate and regulate transactions from the frontiers of the economic system. This includes not only traditional mechanisms of aggregation and articulation of interests, such as political parties and pressure groups, but also informal social networks (of suppliers and distributors), hierarchies and various types of associations.

Thus, the systematized implementation of a science park also opens up a discussion on the management of resources and organizational processes as a way of achieving the future scalability of the venture. To this end, the principles of dynamic capabilities, ambidextrous capabilities and relational capabilities may be highlighted. These involve, respectively: (a) the processes of creation, extension or modification of the resource base (Helfat et al., 2007); (b) the functions of identifying opportunities (that enable adaptability) and rationalization of resources and processes (that determine alignment), seeking to create more value (Birkinshaw & Gibson, 2004); and (c) inclusion in technological cooperation networks for the creation and collaborative appropriation of value by using funds for cooperation and strategic alliances (Hutabarat & Pandin, 2014; Zott, Amit, & Massa, 2010).

In this situation, the current problem for new third generation science parks, such as the Santos Science Park (SSP), does not involve only systematizing an implementation model. It also requires a study of the possibilities for creating value for resident companies, involvement in local issues and a drive for efficiency in processes, relationships and operational and strategic results. This leads to a reflection on dynamic, ambidextrous and relational capabilities to aid the scalability of the venture. In this context, the following research question emerges: How can the implementation and scalability model of a science park be aligned through the development of dynamic, ambidextrous and relational capabilities?

Specifically regarding São Paulo State, the São Paulo Science Park System (SPPT), officially established in 2006, has a number of projects for the implementation of parks, one of the major ones being the Santos Park. Thus, the intention is to propose a theoretical model for the implementation and scalability of science parks. For this purpose, an in-depth study of the SSP was conducted, as it is the only implementation and scalability program for a science park in the country focusing on the field of energy (oil and natural gas).

It should be stressed that recent academic discussions have revealed challenges regarding the organizational arrangements established by actors interested in innovation and technology. These include agility (Doz & Kosonen, 2008), response capability (Kanter, 2009), balancing innovation and efficiency (Brown & Eisenhardt, 1997; Tushman & O'Reilly, 1997), environmental sensitivity (Henderson & Newell, 2011) and, specifically, a sharp increase in collaborations (Reuer, 2004). This signals a tendency for involvement among actors with unique knowledge, shifting the locus of work that was previously defined as the nucleus of the company or research institute and applying it beyond its frontiers (Baldwin & Von Hippel, 2011).

Therefore, there is a latent theoretical gap in the development of scientific discussions and the proposal of theoretical models regarding the importance of coordination and scalability beyond the frontiers of the company or institute (Gulati & Singh, 1998; Reuer, 2004), given that the theories of organizational structure tend to emphasize the intrafirm and formal authority dimensions (Gulati, Puranam, & Tushman, 2012). In other words, these dimensions are discreet or totally absent in contexts of close collaboration between companies and STIs, which are often formally independent, as in the case of science parks.

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