SEVEN publicações acadêmicas & HOME PUBLISHING BRAZIL

PIT method: a proposed management methodology for technology transfer

Crossref doi 10.56238/homeinternationalanais-051

Suyane da Silva Castro
Instituto Federal do Ceará

Maria do Socorro de Assis Braun
Instituto Federal do Ceará

Keywords: Planning, Innovation, Technology Transfer.

1 INTRODUCTION

Innovation has been gaining space in the competitive market, because the concern of companies is not only focused on the quality of the solutions made available, but also on the differential that it presents. Therefore, innovating has become the key process to ensure this differentiation, where the priority is to meet needs and deliver value to the consumer, while ensuring competitive advantage and lasting and sustainable results.

From this perspective, the use of innovative practices in companies is closely linked to the valorization of the technology factor, demonstrating the need for investment in RD&I (Research, Development, and Innovation) to improve knowledge and transform ideas into innovative products, processes, and services.

However, this investment demands time and high costs, leading to the formation of a relationship between Company, University, and Government, known as the Triple Helix, developed by Henry Etzkowitz and Loet Leydesdorff, where each one has its role, demanding, producing, and facilitating/encouraging innovation, respectively.

This interaction in the Triple Helix provides an approximation of the Scientific and Technological Institutions (ICT), name given by the Law of Technological Innovation nº 10.973/2004 to the Universities and PD&I Centers, with the productive sector, providing the opportunity for knowledge generation, research development, partnerships, and technology transfer, besides the financial gains through royalties.

In this sense, technology transfer can be understood as a process, involving both public and private sectors, through which an intellectual property can be licensed, assigned, or provided. This process aims at the development and exploitation of technologies created by researchers, while guaranteeing that they will reach society, allowing the country's technological growth and academic-scientific progress.

The ICT-Company relationship can be considered a strategic form of win-win, in which companies gain access to specialized human capital, laboratory infrastructure and know-how, and, the

ICTs guarantee access to production infrastructure, research support resources, dissemination of knowledge and technologies to society, and market proximity.

However, for this relationship to work and be beneficial to both parties, it needs to be done properly, and the ICTs, more specifically the NITs (Technological Innovation Centers), must develop studies and strategies for the transfer of innovation generated by the ICT, as determined in Law No. 10,973/2004.

From the perspective that the management of NITs is mostly carried out by professors-researchers, often without management experience, planning is necessary to ensure the gains of the ICT with innovation, this research aims to present a management system for technology transfers for ICTs through the connection of the Business Model Weaving Networks developed by Braun (2017) and the Practical Method of Technology Transfer, called TIRA (ARAÚJO et al.,2017) developed by a group of professors from the Graduate Program in Intellectual Property and Technology Transfer for Innovation (PROFNIT). Specifically aiming to analyze the feasibility of integrating the two models and examine whether the proposed application will benefit and facilitate management.

The Tecendo Redes is intended to guide micro and medium enterprises in the development of strategic planning, facilitating the structuring of processes, organization of activities and strategy definition in a holistic, systemic and visual way, providing a better understanding and execution. This diagram can contribute to the TT since it allows strategic planning and the holistic view of the negotiation, enabling to understand its claimant, the market in which it is inserted, the costs involved, the gains to be obtained and who can collaborate in the development of technology and its transfer.

The TIRA method was built from the professional practice of the authors, being named TIRA, abbreviation of the terms Technology, Insertion, Recipient, Appreciation, whose goal of the method "is to promote the structuring and consolidation of technology transfer activities through the offer of facilitating tools for partnerships with demanding entities of the society. (ARAÚJO et al. , 2017, p. 251). In TIRA, with the definition of what will be transferred (Technology), the method has the following basic principles, namely: how the technology will be inserted in the market (Insertion); who will benefit, which market (Recipient) and; what values will be perceived by the parties involved, that is, the valuation of the technology (Appreciation). Thus, companies can have access to innovative technologies, taking advantage of the skills of the human talents of the ICTs.

The analysis and examination of this connection of models will be guided by the studies of Kaplan and Norton (2018), creators of the Balanced Scorecard and Strategy Maps, in Osterwalder and Pigneur (2011) creators of the Canvas Business Model, Tidd and Bessant (2015) on the topic of innovation management, and in emphasis, Braun (2017) creator of the business model Tecendo Redes and Araújo, et al (2017) developers of the TIRA Method.

Furthermore, it was used the structure of applied research with exploratory objective of qualitative approach. And because it is characterized as a type of analysis that correlates and substantiates the form of

management, we adopted the procedures of bibliographic survey based on books and published articles, in order to explain the themes involved and endorse the understanding of what is being proposed.

At this conjuncture, to help and facilitate technology transfers carried out by ICTs, the PIT Method (Plan, Innovate, Transfer) is presented, as a result of the adaptation of the Weaving Networks models and the TIRA method, a tool to plan, manage and execute transfers in a more didactic and applicable way for all managers. As Bernard Meyerson, leader of the IBM Academy of Technology, said, "The new generation of scientists is not limited to traditional tasks. They also draw up business plans, attend executive meetings, and make presentations to directors and customers." (Steinbeck et al., p. 44, 2015).

2 METHODOLOGY

This article presents a research of applied nature, since "it aims to generate knowledge for practical application, directed to the solution of specific problems" (GERHARDT and SILVEIRA, 2009, p. 35). This approach reinforces the research objectives as exploratory and descriptive, since it seeks, through the development of a new technology transfer management method, to describe, understand and explain the model being proposed. In this context, we have the qualitative and descriptive category, for characterizing a type of analysis that correlates and substantiates the suggested management method.

At the time of the research, the bibliographical survey was utilized as a procedure that, by means of the selection of authors and the search in electronic databases, books and published articles were chosen so as to explain the themes involved and endorse the understanding of what is being proposed. In this perspective, in the electronic search it was used the database: Google Scholar, with the following descriptors in Portuguese: "gestão da inovação tecnológica", "gestão de transferência de tecnologia", "transferência de tecnologia", "tecendo redes", "método TIRA". And in English: "Balanced Scorecard", "Canvas", "Business Model Canvas". The research was restricted to the period 2011 to 2021, with the aim of understanding the themes in the last 10 years, obtaining the results shown below, from which those that correlated with the PIT method were selected.

Given the literature selection, the Tecendo Redes business model and the TIRA Method were chosen for this adaptation due to their characteristics of comprehensibility and practicality, applicability and visual presentation, resembling what the PIT method proposes, an applicable and dynamic methodology.

Seeking the same predicates of the model and method used, the PIT method offers an accessible and uncomplicated form of technology transfer management. It is believed that the replicability of the research is evident, since it provides the opportunity for studies through the application of the proposed method and comparison of the results and their effectiveness.

3 CONCLUSION

Knowledge is a differential in the market; from it, it is possible to recreate processes, update production forms, and create new products, allowing companies to stand out from their competitors in the

fierce competitive market. And, as a consequence of these characteristics, knowledge started to be acquired like any other asset, being traded in society.

Considering this "commercialization of knowledge", the ICTs, the largest producers of knowledge and transformers of knowledge into solutions for the market, began to compose the innovation ecosystem and have a prominent role in technology transfers. The ICT, through the NIT, makes the company-university cooperation happen and the innovations reach the society.

However, for this cooperation to take place, some skills are required that are commonly obtained in the business field, and not in the academic field. For this reason, the PIT Method, an acronym for Plan, Innovate, and Transfer, has the purpose of assisting the planning and management focused on technology transfers between the university and the company.

The PIT Method, in an easy and collaborative way, allows for planning, managing, and carrying out technology transfers within ICTs. The method was structured by adapting the Weaving Networks business model created by Braun (2017) and the TIRA Method, devised by Araújo, et al. (2017). Facilitating, for those who do not have this knowledge, the management of technology transfer from the customer, financial, process, and knowledge perspectives.

The union of the two models originated from the analysis of the four blocks of Tecendo Redes, namely: Customer Perspective, subdivided into relationship, value added and channels. Financial Perspective, subdivided into revenues, risk management, costs/expenses. Processes Perspective, subdivided into resources, main activities, and partnerships, and Learning and Growth Perspective, subdivided into intangible knowledge, people, and leadership. And the correspondence of the principles (insertion, benefited, and valorization) and stages of TIRA's implementation, according to the defined technology, namely: prospective study on the supply side, prospective study on the demand side, structuring, planning, and execution.

In this scenario, the combination of the Tecendo Redes and TIRA models resulted in the creation of the PIT Method, which proposes to collaborate in the improvement of administrative practices focused on innovation, seeking to professionalize the performance of the ICTs' NITs in the generation and commercialization of technologies for transfer.

The PIT Method is illustrated in the form of a diagram, drawn up by the authors, which shows which blocks of activities correspond to each stage (plan, innovate, and transfer), based on Weaving Networks and TIRA principles.

Like the Weaving Networks formatted by Braun (2017), the PIT diagram uses colors for each stage, in order to facilitate visualization and provide a dynamic process. The colors chosen were based on the colors of Braun's Weaving Networks, in which we have: red in the Planning stage, for representing stimulus and power, necessary attributes for leadership and target audience, elements that subdivide this stage.

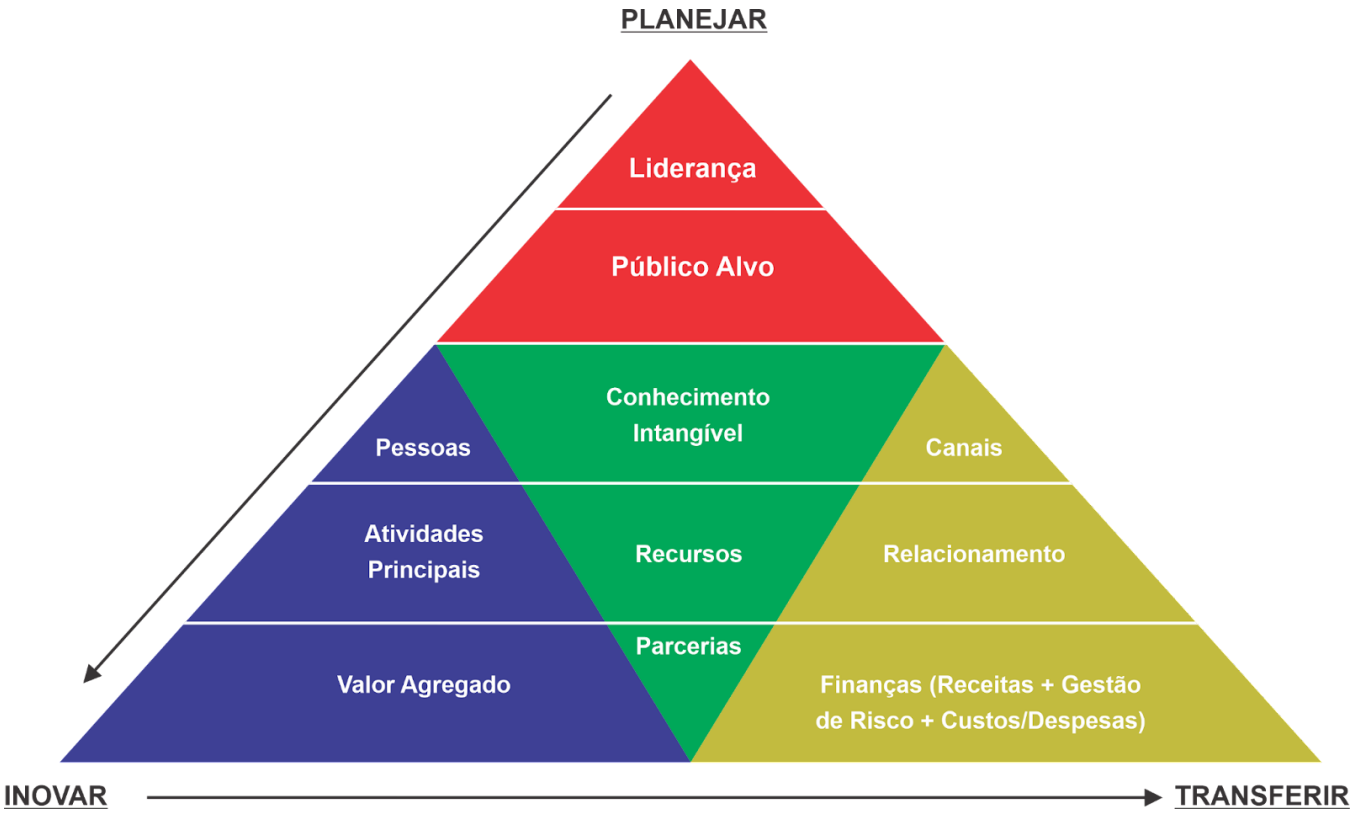
In sequence, the Innovate stage was colored blue, to represent the stimulus to creativity and intellectuality, essential characteristics for the innovation activity, in this stage are the elements people, main activities, and added value.

Going forward, the color yellow was chosen for the Transfer stage, as it represents the need for alertness and focus on what is being performed, which is indispensable at the moment of negotiation and in the channels, relationship, and finance (revenues, risk management, and costs/expenses) components.

And, finally, the center of the triangle was colored green, for being the color obtained from the unification of blue and yellow, demonstrating that the elements intangible knowledge, resources, and partnerships correspond simultaneously to the stages of Innovate and Transfer, each one with its respective particularity, besides representing balance and growth, desirable factors for these elements.

In this sequence, Figure 1 below presents the diagram of the PIT Method, formatted in the form of a triangle, where at each of its ends are the stages: Plan, Innovate and Transfer. On the outside there is the direction of the process flow, represented by the arrows, starting from the Planning stage, where it is understood that, before any activity is performed, including technology transfer, planning must be done; from there on to the Innovate stage, where what was planned will be executed, generating the innovation; and finally, the Transfer stage, where, with the innovation in hand, the technology transfer process can be carried out.

Figure 1 - PIT Method



Source: Created by the authors.

Step: Plan

Law 10,973/2004, allowed ICTs to enter into technology transfer and licensing contracts to grant the right to use or exploit a creation developed by them alone or through a partnership. However, we know that to negotiate it is necessary to plan, to establish "a useful framework for obtaining and sharing data, debating interpretations, elaborating hypotheses, and making risks and challenges explicit." (TIDD and BESSANT, p..34, 2015)

In this perspective, the Planning stage of the PIT Method has the elements; target audience, which is where you define who will benefit from the technology, establishing whether it will be ICT or company, what is the market segment, if the sector is internal or external and what are the expectations and preferences of this audience. Next we have the leadership element, which consists in indicating the person responsible for motivating, inspiring and gathering the specialized team, listing the physical and technological resources, making the check list of actions for the development and negotiation of the technology.

Step: Innovate

Then, after the planning stage, where the leader was designated and the beneficiary was identified, the Innovate stage begins, in which it is necessary to verify the people element, indicating who are the professors and student researchers that can contribute to the developments, researches, and projects within the ICT, listing them by area of knowledge and/or activity.

At this stage, together with the people element, we have the main activities, an element in which the best form of technology transfer is indicated, the ICT's specialty in terms of transfer is identified, and the types of business that the ICT can offer its target audience are listed. With the identification of the main activities it is possible to define the method of market insertion, that is, through licensing or assignment of intellectual property rights, partnership agreement for RD&I, know how contract, sharing contract or use of laboratories and equipment, among others.

Once the main activities have been established, we move on to the added value element, in which the ICT's differential must be defined, what makes it better than the others, that is, what makes the ICT be remembered when the subject is technology transfer.

Once the elements exclusive to the demarcation of innovation are finalized, we move on to the first element that corresponds to two stages, firstly the intangible knowledge, which for the Innovation stage, represents the identification of what needs to be developed, created, recreated, which is not yet in the ICT portfolio, according to market demand, and may be products, processes, or services.

In continuity, the resources element also corresponds to two stages, and in innovation, it corresponds to the moment of listing the resources of infrastructure, materials, technology, and specialized personnel with knowledge and skills, for the new planned developments.

In this direction, we have partnerships, the last element concomitant to the two stages, where in innovation, it corresponds to relating who can collaborate with the ICT in the development of the asset, which can be a government agency, a company, or another ICT.

Step: Transfer

Subsequent to the Innovate stage, the Transfer stage begins. These contain three elements in common, but with different execution. The first concomitant element is intangible knowledge, which in the transfer stage corresponds to the preparation of the ICT's portfolio of intellectual property assets, that is, its patents, industrial designs, trademarks, computer programs, integrated circuit topographies, cultivars and its literary, artistic or scientific works. It is important to include in the portfolio the stage protection of each asset, the level of technological maturity and (Technology Readiness Level - TRL) and also the success cases, the relevant partnerships and transfers.

Likewise the intangible knowledge, the resources is also a concomitant element that corresponds to the elaboration of an inventory of the resources available in the ICT, specifically, the quantity of laboratories, specifying the specific area of use, list of equipment, describing functionality and quantity, professional researchers and developers, listed by area of performance and the knowledge and key skills of each one, quantity of computers, with the technical specifications, list of software used, with the description of its functionality, among others. This inventory allows a better visualization by the requester, and can be inserted in the insertion methods.

In the same perspective of resources, there are the partnerships, the last concomitant element, in which all the partnerships made by the ICT are catalogued and disclosed, regardless of their current status, or rather, all ongoing and finalized partnerships, observing the confidentiality criteria of each partnership.

Once the simultaneous elements are finalized, the elements pertaining exclusively to the transfer stage begin, the first of which are the channels, corresponding to how and which IP assets will be presented to the technological offer statement, it is the display of what the ICT proposes and/or has to negotiate. That is, how to satisfy my customer's needs.

After the definition of the channels, the other element of this stage is the relationship, which also corresponds to the method of market insertion, that is, how the ICT will interact with the client, how the technologies will be presented and reach the market, in other words, what means will be used to disseminate and transfer this technology, whether by partnership, project, agreement, collaboration, cooperation, co-participation, licensing, or assignment.

And, finalizing the Transfer step, the finance element, which consists of a junction of the elements revenues, risk management and costs/expenses, this is the moment when the valuation takes place, since it is on this occasion that the support foundation that will support the ICT will be defined, the forms of financing made available, or rather, how the technology will be transferred will be paid for, what returns and financial gains the transfer will bring. In this opportunity valuation techniques are used to define what

is the value of the technology that is being negotiated given the courses involved, what is the economic viability and profitability of the projects. The business viability study, the SWOT Matrix of the negotiation, and the financial control of the involved values are done together.

One realizes that the act of managing requires study, planning, and dynamism, so it is necessary to analyze the situation, foresee scenarios for each decision, and adapt quickly to changes. In this context, innovation management encompasses all these characteristics and also adds creativity and novelty as key factors for success. For this reason, it is necessary that innovation managers, especially managers of NITs, have a working knowledge of planning and management mechanisms.

It is in this logic that the PIT management method focuses on contributing to those responsible for the NITs in the management of technology transfers between the university and companies, so that, in a usual and collaborative way, it is possible to prospect technologies, establish directives, define goals and take the innovations and knowledge produced in the ICT to the market, guaranteeing the gains from this transaction and continuously improving the NIT's activities.

In this perspective, the PIT Method, created by adapting the Tecendo Redes business model and the TIRA Method, aims to collaborate in the development of administrative management practices, seeking to qualify managers for the generation and commercialization of intellectual property assets.

The PIT Method is illustrated in the form of a triangle, with 3 steps, namely: plan, innovate, and transfer. Inside of which are the planning elements that must be executed. The arrows, on the outside, are a directional, identifying where the process begins and where it ends. The colors are representations of the essential characteristics of each stage.

It is important to emphasize that the PIT method is not a recipe with a determined final product, but rather a synthetic and innovative way to guide the management and production of innovation. All more robust planning methods and tools remain available, the PIT Method does not seek to replace these, only to collaborate, in a succinct and practical way, for the management of technology transfer.

Finally, it is necessary to emphasize the low number of publications about the models used in this proposal, a factor that is considered limiting, due to the fact that they are recent and little explored methods. All the methods presented, including the theme of this article, have a practical proposal, which differs from the existing ones, which have a conceptual characteristic.

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