

# Use of Management Tools for the Development of Technological Innovation Processes in Organizations

Edwar Jacinto G<sup>1</sup>., Holman Montiel A.<sup>2</sup> and Fernando Martínez S.<sup>3</sup>

*Assistant Professors Technological Faculty, District University Francisco José de Caldas  
Calle 68 D Bis A Sur No. 49F – 70, Bogotá D.C., Colombia.*

<sup>1</sup>ORCID ID: 0000-0003-4038-8137,<sup>2</sup>ORCID ID: 0000-0002-6077-3510  
<sup>3</sup>ORCID ID: 0000-0003-2895-3084

## Abstract

Starting a process of technological innovation allows organizations to respond more efficiently to market changes and to be at the forefront in order to face the diverse and complex technological scenarios. The purpose of this paper is to present some of the most important management tools to implement and successfully carry out each of the stages that make up an innovation process, allowing the continuity of this rigorous process to be assessed and determined in each phase. as is innovation.

**Keywords:** Innovation, Technology, Innovative process, Management tools.

## INTRODUCTION

For many the word innovation is just a common word that over time has become popular, being used in any type of conversation or environment regardless of its true meaning and the wide and continuous process that this entails by being defined and implemented in an organization [1]. Since innovation is not a fad, it goes beyond just showing an improvement to something already existing, since it is about revolutionizing the market, generating value and economic growth based on a process that starts with the identification of opportunities allowing to generate diversity of ideas to the point of evaluating, developing and implementing them, that is, launching them to the market.

According to the Oslo Manual: "An innovation is the introduction of a new, or significantly improved, product (good or service), a process, a new marketing method or a new organizational method, in internal practices of the company, the organization of the workplace or external relations." [1]. On the other hand, it distinguishes four types of innovations: product, process, marketing and organization.

Therefore, innovation is a challenge that many organizations have not yet decided to bet or assume, this action leads to companies losing competitiveness and becoming obsolete in the market to the point of disappearing. According to Morales & León [2], most companies that choose to start an innovation process, "do it for one of the following reasons:

1. The need to differentiate from the competition.
2. The pressure or ambition to grow your business.

3. The need to generate radical ideas with greater impact.
4. The need to survive or to reinvent the business model.
5. The desire to manage or systematize innovation. "[2]

These reasons not only have to be managed taking into account a methodology or steps to follow, but also involves a fundamental actor such as human capital [3], that is, having well-prepared, qualified and competent personnel capable of applying correct techniques and tools necessary to execute the innovation. As Steve Jobs said a few years ago, "Innovation is not a question of money, but of people"; since, if you have money, but you do not have clear ideas that are a source of value creation, innovation will be a failure.

## MATERIALS AND METHODS

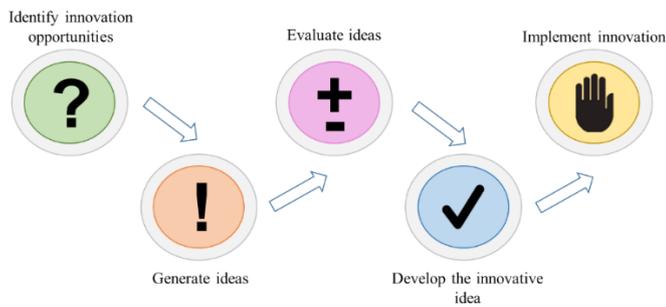
The development of this paper begins with the description of the stages that make up a process of technological innovation, then an analysis is made of some of the most important tools and management techniques used for the development and achievement of this process. Therefore, what is sought with the use of these tools, is to be able to define those that best suit each stage of the innovation process, thus facilitating the implementation process based on the correct choice and application of said tools, thus achieving the ideal identification of the type of innovation that will be developed. [4]

### Innovation process

Currently there are several proposals to carry out an innovation process, [5] which allows guiding from the generation of the idea to the start-up; however, in general terms the following stages should be considered, see Fig. 1. Next, each of the stages is described:

#### Identification of innovation opportunities

The success of innovation is in providing novel solutions to problems or needs that are detected in society and the market; allowing to dedicate efforts with the purpose of transforming those needs into products or services that create value and increase the life quality of the people. [6]



**Figure 1:** Stages of innovation process

### Generation of ideas

The fact of generating and having many ideas does not mean that they all mean innovation, therefore, innovative ideas can be generated in the following ways:

- ❖ **Internal:** consists of the contribution of ideas by employees, which can be presented freely or in response to campaigns and activities led by the company itself, allowing the participation of employees as they are those who have direct greater knowledge of the possible shortcomings that may be occurring in the processes that are developed.
- ❖ **External:** in some cases when internal innovation does not work, it usually has other options such as: open innovation, purchase of innovation, innovation with customers and suppliers.

For example, innovation with customers and suppliers, refers to creating ideas programs that involve other relevant actors to the organization, such as stakeholders, since these together with clients can express dissatisfaction, needs or improvement actions for the processes developed by the company.

As a second option is open innovation, a type of innovation increasingly common that consists of the sum of synergies between different actors to do things collaboratively, where each actor plays a key role in the value chain of innovation.[4]

Finally, the purchase of innovation, meaning, ideas can be bought directly, such as the cases of start-ups and small companies that develop ideas that can be adapted and applicable to our business.

### Evaluation of ideas

In this stage, we seek to analyze and prioritize all the ideas that have been generated in the previous stage, since the resources that the company can count on may become limited or scarce to carry out the implementation of all the ideas and not all they can become innovation projects; therefore, it is necessary to evaluate them taking into account certain criteria in order to be able to select which ideas pass, that is to say, to choose those that greater indicators present and better profitability can produce in the company.

### Development of the idea

After carrying out the previous stages and once the ideas have been evaluated and prioritized, the next stage of the innovation process will be to develop them. [2] During this stage of development, it is advisable to design prototypes or pilot projects in order to be able to validate functionalities and debugging errors with customers or small-scale users, at low risk and cost to the company, before launching them to the market.

### Implementation of the idea

At this stage, ideas cease to be proposals and become innovation projects; This is the most important since it seeks to implement and realize the project, meaning launch it to the market to reach the target audience using communication strategies; It is necessary to consider the measurement of the results of the innovation and establish points of comparison in order to analyze the success or failure of the project.

## **RESULTS AND DISCUSSION**

Once each of the stages of the technological innovation process has been addressed and explained, a description of some of the fundamental and most appropriate tools to use in each of these stages will be made in this section: [2,7]

### ***Identification of Innovation Opportunities***

There are a variety of tools and techniques that can work for this first stage:

**Customer complaints mailbox:** it is a general email box, where customers anonymously send their ideas, complaints and claims to the company; this tool can be a source of ideas to create or substantially improve the product or service.

**Focus group:** it is considered as a qualitative research technique, it consists of bringing together a small number of people (clients, suppliers, and workers in both cases) between 6-12 usually, who are guided by a moderator. The development of the activity consists of asking questions, discussions or debates to get valuable information about needs or opportunities about a specific topic.

**Analysis of trends:** it is usually carried out by external teams or consultants or by internal teams depending on the size of the company, since what is sought is to analyze technological trends, their assessment and adaptation to the company.

**Analysis of the competition:** also known as benchmarking; with this tool it seeks to collect information and compare the most relevant indicators that refer to products, processes or services of the organization regarding those of other organizations with good accredited practices, in order to implement new practices in the process that facilitates a continuous improvement for the organization.

**Generation of ideas**

Contest or ideas campaign: this is the main source of ideas and from which more valuable results can be obtained. The most optimal way to use this tool is that the organization's management proposes a specific need, opportunity or problem to resolve, and from this, an internal competition is created for employees to participate in the definition of creative solutions, innovative and feasible, through the use of practical and simple forms to fill out, see Table 1.

**Table 1:** Form for innovative ideas

Form for presentation of innovative idea	
Participants:	
Phone:	
Email:	
Name of the idea:	
¿ Why is it innovative the idea?	

Brainstorming of an internal team: it is one of the most used tools by companies, is to gather a group of people in order to generate the largest number of ideas regardless of whether they are viable, robust or appropriate about a given particular issue and of interest to the organization, in this brainstorming session there is a moderator who will be responsible for writing down all the ideas, later the participants are divided into groups with the aim of classifying and organizing the ideas according to the previously established criteria, then the teams evaluate the organization and classification of the ideas, contributing suggestions for improvement and finally the group will come to consider the ideas with the greatest possibility of implementation. [8]

**Evaluation of ideas**

In this phase of the innovation process it is advisable to set indicators and criteria for the evaluation of ideas [9], based on the interests of the organization and thus be able to select the ideas that have the greatest potential to become innovation. Some of the indicators and criteria may be oriented to:

- Alignment of the business strategy with the innovation strategy.
- Feasibility of implementing the project successfully.
- Satisfying new customer needs.
- The project will help the development of the brand image.
- It is a project that offers an advantage over our competitors.
- How unique and different is this project.

A very practical and easy to apply technique is label it, in which the viability of the idea is evaluated, labeling each idea with different values:

- Excellent (it's almost certain to be successful)

- Likely (needs future profiling)
- Possible opportunity (needs improvement)
- 50/50 (could go anyway)
- Risky bet (remote possibility of success)

On the other hand, there is also the PNI technique (Positive, Negative, Interesting) by Edward de Bono [10], which seeks to analyze and identify:

\* *Positive aspects (P)*, potential and reasons that indicate that the idea can work successfully.

\* *Negative aspects (N)*, weaknesses and reasons that indicate that the idea may not work or have little viability.

\* *Interesting aspects (I)*, those issues that are important to take into account, but that are neither positive nor negative.

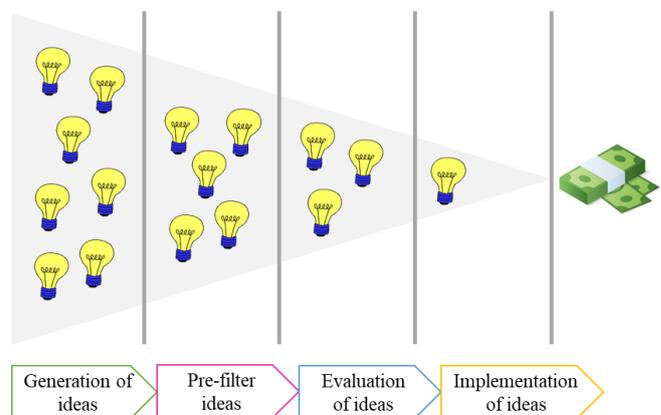
And so finally achieve select the idea that provides more positive and interesting aspects for the organization.

**Development of the idea**

During this phase it is advisable to develop prototypes that make ideas visible and test them on a small scale, to assess whether clients or users accept them, that is, receive feedback before investing resources in their total development.

**Implementation of the idea**

Once an idea has been developed, it is necessary to implement it, launch it on the market and market it, for which it is necessary to carry out a correct communication campaign that disseminates the solution to the target audience; for this final stage it is important to define indicators that allow measuring and evaluating the incursion of this new product or service in the market, being able to identify if the obtained results coincide with the planned ones.



**Figure 2:** Innovation process

Therefore, as shown in Fig.2, the application of tools means that a centralized team of people in charge of creating and managing the technological innovation process is defined, and

at the same time facilitating management in each of the stages [11], acting as a filter that allows to obtain something measurable or tangible that put in the market is new, supplants a need and generates profitability.

## CONCLUSIONS

Innovation must be a priority in organizations, if it is wanted to keep in the market and take advantage of opportunities in order to increase competitiveness. Therefore, this paper addressed and made reference to some of the most important tools and management techniques that can be used in order to obtain the maximum benefit possible by applying them to each of the stages (identification of innovation opportunities, generation of ideas, evaluation of ideas, development of the idea and implementation of the idea), and as progress is made in the process, they become evaluation points in which it is necessary to decide whether the innovation process continues or ends; this in order not to invest more resources and time in something that will not be able to complete in innovation.

## ACKNOWLEDGMENT

This work was supported by the District University Francisco José de Caldas Technological Faculty. The views expressed in this paper are not necessarily endorsed by District University. The authors thank the research group ARMOS for the evaluation carried out on prototypes of ideas and strategies.

## REFERENCES

- [1] OECD/Eurostat.: Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data, 3rd Edition, Paris, France, (2005)
- [2] Morales, M., León, A.: Adiós a los mitos de la innovación: una guía práctica para innovar en América Latina. México D.F.: Innovare. (2013)
- [3] Edgett, S., Jones, L.: Ten Tips for Successfully Implementing a StageGate® Product Innovation Process, In: Stage-Gate Inc. (2013)
- [4] Cooper, R., Edgett, S. & Kleinschmidt, E.: Optimizing the Stage-Gate Process: What Best-Practice Companies Do-I. In: Research-Technology Management, 45(5), pp. 21-27 (2016)
- [5] Chesbrough, H.: Open Innovation: The New Imperative for Creating and Profiting from Technology. In: Harvard Business School Press, Boston, Massachusetts. (2003)
- [6] Subic, A., Clifton, P. and Beneyto-Ferre, J.: Identification of innovation opportunities for snowboard design through benchmarking. In: Sports Technology, 1(1), pp. 65-75 (2008)
- [7] Bosch-Sijtsema, P., Bosch, J.: User involvement throughout the innovation process in high-tech industries. In: Journal of Product Innovation Management, 32(5), pp. 793-807 (2014)
- [8] Kalargiros, E., Manning, M.: Divergent Thinking and Brainstorming in Perspective: Implications for Organization Change and Innovation. In: Research in Organizational Change and Development, 23, pp.293 – 327 (2015)
- [9] Ferioli, M., Dekoninck, E., Culley, S., Roussel, B. and Renaud, J.: Understanding the rapid evaluation of innovative ideas in the early stages of design. In: International Journal of Product Development, 12(1) (2010)
- [10] Kivunja, C.: Using De Bono's Six Thinking Hats Model to Teach Critical Thinking and Problem Solving Skills Essential for Success in the 21st Century Economy. In: reative Education, 6(3), pp. 380-391 (2015)
- [11] Igartua, J., Markuerkiaga, L.: Application of Innovation Management Techniques in SMEs: A Process Based Method, In: Closing the Gap Between Practice and Research in Industrial Engineering. Lecture Notes in Management and Industrial Engineering. Springer, Cham, pp.67-74 (2017)