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**INNOVATION  
MANAGEMENT MODELS  
AND THEIR RELEVANCE  
WITH COLOMBIAN  
COMPANIES**

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**Abstract:** This document exposes the management innovation system's relevance for the Colombian companies. At first, this article describes some management innovation models and its contributions. Then it shows the Colombian companies' features and finally the considerations about relevance are presented and mentioned.

**Keywords:** Management model, innovation, companies, Colombians.

## INTRODUCTION

According to the Organization for Economic Cooperation and Development, OECD, innovation is the introduction of a new or significantly improved product, process, marketing model or organizational method, in internal practices of the company or in the market. (2015).

The Administrative Department of Science, Technology and Innovation, Colciencias, in its project typology document Version 5 adopts the OECD definition. (2018). Another definition says that innovation is creating and capturing new value, but it involves doing different things throughout the value chain. That is, new ways of producing, establishing new networks and alliances, new experiences for customers, among others. (Global Innovation Management Institute, 2013).

Innovation management must understand that the innovation process is not isolated from the other processes of the company, but on the contrary, it must be articulated and directed by strategic direction. Innovation management must take into account aspects such as leadership, organizational culture, structure, measurement, monitoring of results, technological surveillance, competitive intelligence, alliances with other entities, as well as the necessary resources for the implementation of innovations. the innovation strategy (Robayo Acuña, 2016).

There is no definitive model that explains

the process from the invention to its introduction to the market, even the OECD does not present a specific model for an invention that reaches the market. (Chavez, 2017).

Chávez mentions that, according to the OECD, innovation management models present serious questions, in addition to the fact that some authors state that a generalizable management model has not been developed and that others question the development of a universal model of the innovation process. (2017).

After having carried out a qualitative research with documentary design, where more than 15 innovation management models were analyzed, Colombian companies were characterized, an analysis was made of the dimensions of the different models, their interrelationships, as well as the relevance with Colombian companies.

In section 2, he presents excerpts from the review carried out on more than 15 innovation management models, where relevant aspects of some of them are indicated. Section 3 presents characteristics of Colombian companies. Section 4 shows the relevance of various innovation management models in the context of Colombian companies.

## METHODOLOGY

The research that is developed in this work, is part of a qualitative research, because this type of Research focuses on the understanding of phenomena, where it explores them from the perspective of the participants, studies them in their natural environment and in relation to their context. (Hernández Sampieri, Fernández Collado, & Baptista Lucio, Research Methodology, 2014)

The work carried out largely followed the documentary design, where information was systematically collected and analyzed from documents related to the object of study,

in this search sources that can be consulted permanently are investigated, among which can be find books, specialized magazines, scientific articles, business databases, among others. In this search, it was intended to know the innovation management models, as well as the characteristics of Colombian companies.

## RESULTS

This section of the document shows the results of the documentary review of the innovation management models and the characterization of Colombian companies. In the case of the innovation management models, a search was made not only of recent documents, this in order to find the most reliable descriptions of the model.

### CHARACTERIZATION OF INNOVATION MANAGEMENT MODELS

An analysis of different models of innovation management was carried out through a documentary review, below is a list of the models studied:

- Technology Push Model – Linear Model
- Demand Pull Model (Market Pull)
- Model by stages, areas or departments
- Marquis models
- Kline models
- Mixed Model – Rothwell and Zegveld
- Integrated Technological Innovation Model
- Concomitance Model – Schmidt – Tiedemann
- Network Model
- London School Model
- CIDEM ModelModel: TEMAGUIDE
- Model NTC 5801:2018

- Model R&D&i Units- COLCIENCIAS
- Block Model
- Integrated Management Model UNE, Family 166000, 16555-1, Spanish Association for Standardization and Certification (AENOR)

A continuación, se presenta una tabla con las descripciones y aportes de algunos de los modelos revisados.

### CHARACTERISTICS OF COLOMBIAN COMPANIES

This section presents a description of the characteristics of Colombian companies, as well as some relationships or relevance of the different innovation management models reviewed.

According to the Ministry of Commerce, Industry and Tourism -MINCOMERCIO- in Colombia, companies are classified into four types or sizes of companies: micro, small, medium and large companies (2007). This classification is currently made according to the number of workers and the level of assets measured in current legal monthly minimum wages (SMMLV), however, for the year 2020 a new criterion would be included, which is the total gross sales of the previous year (MINCOMERCIO, 2019).

According to data taken from Compite360, in Colombia, according to their economic activity, 2.6% of companies according to the primary sector, 15.5% to the secondary sector, and 81.9% to the tertiary sector; According to the size of the company, 95.3% are micro, 3.7% small, 0.8% medium and 0.2% large. (2019).

On the other hand, it is believed that in the world 80% of businesses are family-owned, in the United States this figure represents 96% and in Colombia it can range between 70-75% (Sandoval & Guerrero, 2010). To this can be added the problem of informality in

Name	Description	Contributions	Source
Technology Push Model – Linear Model (First Generation)	<p>This model is presented as a sequence of stages, which begin with basic research and end with the commercialization or marketing of the innovation. Its phases are:</p> <ul style="list-style-type: none"> <li>Basic investigation</li> <li>Applied research</li> <li>Developing</li> <li>Production</li> <li>Commercialization</li> <li>Market</li> </ul> <p>Some variations take applied research and development as the Design and Engineering phase.</p>	<p>It allows to understand the innovation process in a simple way.</p> <p>The beginning of the innovation process from basic research and then its passage through applied research.</p> <p>It highlights the preponderant role of science and/or technology for innovation.</p>	<p>Kline &amp; Rosenberg (1986)</p> <p>Velasco, Zamanillo &amp; Gurutze; 2007</p> <p>Barreto &amp; Petit, 2017</p> <p>Chávez, 2017</p> <p>Velasco &amp; Zamanillo, 2008</p>
Demand Pull Model (Market Pull) (Second Generation)	<p>This model is presented as a sequence of stages that start with the needs of the market, and then go through the development, production and sale of the innovation.</p>	<p>Permite entender el proceso de innovación de una manera sencilla.</p> <p>The needs of consumers or customers are the main source of ideas</p>	<p>Kline &amp; Rosenberg (1986)</p> <p>Velasco, Zamanillo &amp; Gurutze; 2007</p> <p>Barreto &amp; Petit, 2017</p> <p>Chávez, 2017</p> <p>Velasco &amp; Zamanillo, 2008</p>
Model by stages, areas or departments (Second Generation)	<p>This model presents a series of activities or departments or areas that are involved in the development of innovation.</p> <p>The input input for the first area of the model is ideas and the end result, after the sequence, is new products.</p> <p>The main stages included in the model are:</p> <ul style="list-style-type: none"> <li>Ideas</li> <li>R&amp;D</li> <li>Design</li> <li>Engineering</li> <li>Production</li> <li>Marketing</li> <li>New products</li> </ul>	<p>Includes elements of the two previous models (Technology Push &amp; Market Pull).</p> <p>It shows an interaction between the different stages, an output of one department becomes the input of the other.</p> <p>Keeps in mind the interaction between technological capacity and the needs of the demand</p>	<p>Velasco, Zamanillo &amp; Gurutze; 2007</p> <p>Barreto &amp; Petit, 2017</p> <p>Chávez, 2017</p> <p>Velasco &amp; Zamanillo, 2008</p>
Interactive Models – Marquis (Third Generation)	<p>This model shows a beginning of innovation management in the analysis or recognition of the technical capabilities of the organization and the needs of the demand.</p> <p>In addition, the main source of ideas is not necessarily the R&amp;D department or the needs of the demand, but can come from any department or area of the organization.</p>	<p>Marketing is presented as a means of disseminating innovation.</p> <p>Ideas can come from different areas of the organization</p>	<p>Barreto &amp; Petit, 2017</p> <p>Chávez, 2017</p>

Name	Description	Contributions	Source
Interactive Models – Kline (Third Generation)	This is a model that shows a greater number of interactions than linear or staged models, it has a main path that goes from the potential market to the commercialization of the innovation. This main road is shown as linear.	The concepts of science (scientists) and technology are considered in each of the stages.  Feedback is presented at each of the stages.  It allows to involve the innovative process of technology, knowledge and the central chain of innovation.	Kline & Rosenberg (1986)  Velasco, Zamanillo & Gurutze; 2007  Barreto & Petit, 2017  Chávez, 2017  Velasco & Zamanillo, 2008
Mixed Model – Rothwell and Zegveld (Third Generation)	This model presents a series of logical steps. Which are not necessarily consecutive, but they can be independent and interactive.  It seeks to combine the Marquis model and the Kline model	Interactive communication between the different stages.  Innovation is generated through a logical sequence of phases, although not necessarily consecutive.	Barreto & Petit, 2017
Integrated Technological Innovation Model (Fourth Generation)	This model shows non-sequential phases, which can be simultaneous and overlap each other in time.	Consider the phases of innovation as non-sequential processes.  There is greater integration and interrelation between the phases of the innovation process.  Removes barriers from functional areas.  Reduces the time for innovation to enter the market.  Greater integration with suppliers, customers and other organizations external context.	Barreto & Petit, 2017  Velasco & Zamanillo, 2008
Modelo London School	This model is based on four main processes, which are considered as the necessary business skills to manage innovation efficiently, these four processes or skills are the generation of new concepts, product development, process innovation and innovation. technology acquisition.	Inclusion of innovation audits.  Innovation is not a sequential process.  Innovation can come from different parts of the organization.	Escorsa, Valls, 2003 Barreto & Petit, 2017
Modelo NTC 5801:2018	This model presents a modification to the Kline model, it seeks to present the different interactions of the process and its relationship with the external context.	Seeks a systemic implementation of innovation management.  Facilitates integration with other innovation management systems.  It presents different generalities with the purpose of its application to companies of different sizes and sectors.  Mention the tools that the innovation management unit must use in its process.	NTC 5801:2018 (ICONTEC, 2018)

Table 1. Characterization of innovation management models

Colombian microenterprises, in the country 41.1% of microenterprises are informal, this measured in establishments that have or do not have a commercial registry (Mauricio & Sandra, 2018). On the other hand, there is a duality with formal companies, which are not entirely formal, because practices such as double accounting, tax evasion such as VAT (Value Added Tax) are presented and accepted (Mauricio & Sandra, 2018 )

In relation to business technological dynamics, studies carried out by the National Administrative Department of Statistics (DANE) and the national competitiveness report carried out by the Private Competitiveness Council can be counted on. For the 2015-2016 biennium, it can be counted that 21.5% of the companies in the manufacturing sector can be considered as innovative in the broad sense and 0.2% as innovative in the strict sense (National Administrative Department of Statistics (DANE), 2017 ), as for companies in the services and trade sector in the 2014-2015 biennium, the companies considered as innovative in a broad and strict sense is 22.7% (Competitiveness, 2019).

## **RELEVANCE**

Although the research was carried out with a characterization of more than 15 innovation management models, for the purpose of this study only five (5) were mentioned.

## **CONCLUSIONS**

The conclusions of the investigation are shown below:

Innovation management models have evolved over time, where more dimensions or elements have been included, as well as greater interactions. In addition, it is shown that there is not a single path that starts in basic research, as suggested by the linear model - Technology Push, but rather that there may be

different paths and interactions, as suggested by models such as Marquis or Kline.

Over time, the models included elements of the external environment, as important dimensions in the management of innovation in organizations.

Most of the management models analyzed present an application towards companies of an industrial type or from the manufacturing sector, as well as to product innovation.

In Colombia, less than 22% of manufacturing companies are considered innovative in the strict or broad sense; while for service companies this percentage does not exceed 23%.

It can be concluded that, although there are different models of innovation management to which Colombian companies can access, these are not necessarily relevant to the characteristics of the companies in the country, it is for this reason that the need to propose a model may arise. of gestión de la innovación cuyas dimensiones, elementos o componentes se adapten de mejor manera a las peculiarities of business organizations in Colombia.

Model	Sources	Reflection Relevance
Technology Push Model (Technology Push)– Modelo Lineal	Kline & Rosenberg (1986) Velasco, Zamanillo & Gurutze; 2007 Barreto & Petit, 2017 Chávez, 2017 Velasco & Zamanillo, 2007	This model shows a relationship from research to market placement. However, in Colombia, most companies do not do basic research. It is an applicable model for companies in the secondary sector.
Demand Pull Model (Market Pull)	Kline & Rosenberg (1986)	This model starts from the identification of market needs. It does not show the relationship with the knowledge generated from previous research. It is an applicable model for companies in the secondary sector.
Interactive Models – Marquis	Barreto & Petit, 2017 Chávez, 2017	It combines the economic and social environment with technical knowledge, shows different paths for innovation. It is a model that can be applied to companies from different sectors, but very little in micro companies that constitute the majority in Colombia.
Interactive Models – Kline	Kline & Rosenberg (1986) Velasco, Zamanillo & Gurutze; 2007 Barreto & Petit, 2017 Chávez, 2017 Velasco & Zamanillo, 2007	This model shows five (5) main paths for innovation, it has been taken as a basis for other models such as NTC 5801:2018. Its application can occur in companies from different sectors. Although easier for medium and large
Modelo Mixto – Rothwell y Zegveld	Barreto & Petit, 2017	It is a model that shows greater interactions between its dimensions, combines elements of other models, its application is more marked for medium and large companies in the secondary sector.

Table 2. Innovation management models and their relevance to the characteristics of Colombian companies.

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