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Sixth generation innovation model: description of a success model

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Abstract

this article describes an innovation model based on concepts of continuous improvement, a key component of quality management, an internal innovative milieu and a work environment that encourages all company personnel to engage in innovation of all kinds and continuously. The features of this model identify it as a sixth-generation innovation model. First of all the article describes the different generations and highlights their main characteristics. Despite the differences between them, all emphasize radical innovations and ignore incremental innovations. This model serves for both types, but focuses its efforts on incremental innovations for creating a continuous flow of innovations, which is a means of understanding the concept of continuous improvement applied to the company as a whole. Thus, this model builds a bridge between innovation management and quality management.
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Keywords: Innovation models; Incremental innovations; Continuous improvement; Innovative milieu; Idea generation; Suggestion systems

Introduction

The purpose of this paper is to present an innovation model to enable implementation of a policy of innovation on a continuous basis. Literature has presented a range of innovation models that reflects its growing importance to countries and organizations, especially business enterprises. An innovation model comprises a group of principles, regulations, routines and practices that guide innovation processes. In specialist literature, the models refer to technological product and process innovations; using the Oslo Manual classifications organizational and marketing innovations are disregarded.

Initially a review of innovation models will be presented in line with the different generations created over time. The first use of the expression "innovation generation models" has been lost over time, it is always possible to find precursors. This topic has been dealt with by a number of authors in the innovation area, so much so that today, what is an already vast volume of literature is continuing to grow. Despite this, there is a missing element, or at least one that is barely represented in these models. Incremental innovations, which involve few resources and risks, not received full attention in specialist innovation literature. This paper seeks to retrieve the importance of these innovations and describe a model based on this type of innovation, but without ignoring radical innovations. Before describing this model based on the widely acknowledged adaptation of the funnel, as developed by Clark and Wheelwright (1993), a discussion of incremental innovation and continual improvement will be presented according to the two concepts or branches of understanding. In addition to the basic operational characteristics of the model, the results achieved in recent times will be presented. As will be seen, the model presented is part of the sixth generation of models, according to the literature reviewed.

This article was prepared on the basis of primary data collected from the company that created the model and data gathered from a study conducted by the EAESP/FGV Innovation Forum. In this regard, company documents were consulted relating to these practices and the model's *modus operandi*. The focus of the Forum is the study of innovative organizations,

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and is made up of three phases: (1) the study of the timeline to understand the current status, based on an historical perspective of the organization; (2) identification of the manageable elements inside and outside the organization, which can predict its capacity to innovate; and (3) a study of exemplary innovation cases achieved in the organization to understand how these elements arose, which simplify or complicate the accomplishment of innovation processes in a concrete way. The Forum's studies require the joint participation of academic researchers and professionals from the company studied and directly involved in innovation in an effort to align theoretical studies on innovation and the its practical application.

Generations of innovation models

As expected, there is no consensus among scholars in this area as to the number of generations and their names, as shown in Chart 1, because different views on the innovation process result in different explanations of the origins and processes. Despite these differences, we can see that a certain sequence and certain titles recur, which is explained by the Rothwell (1994) article that has become a mandatory reference on the subject. For instance, Tidd (2006) repeats the Rothwell classification (1994) differing only in the last generation.

Rothwell (1994) presents five generations using the US environment as a reference. The linear model, or technology push, is regarded as the first by most authors who study this subject. Its origin is the report from scientist Vannevar Bush, entitled *Science: the endless frontier*, in which basic scientific research is given as the fundamental source for industrial development, which could stagnate if neglected for a long period (Bush, 1945). This model focuses on intensive innovations based on the scientific knowledge produced in public and private R&D centers or units. This supports the very common belief in the scientific community that scientific progress will be used in practice based on a continual flow from science to technology and this for the markets (Fig. 1). The popularity of this model ended up adding to specialized literature an emphasis on innovation in new products and processes with a high degree of technological novelties.

The second generation of models was developed in the mid-1960s and 1970s, a period in which an intensification of competition in the US economy can be seen and investments began to migrate to new products and related technologies. This is diametrically opposed to the first generation, which is why it was called reverse linear, as shown in Fig. 2. The market is the source of ideas that drive R&D operations, thus the expression "market pull" or "demand pull".

The push vs pull debate has excited authors on the topic for decades but several empirical studies showed that the *technology push* and *need-pull* models were extreme or atypical cases of a more general model of interaction between technological capabilities on the one hand and market needs on the other. This interaction model would be the third generation, the origin of which can be attributed to Rothwell and Zegveld (1985), who called it the *coupling model*, or combined model (Fig. 4). According to Rothwell (1994), the third generation began early in the 1970s but as from the mid-1980s began to be regarded as best practice by the majority of large western companies.

The third generation in the Bochm and Frederick (2010) design, called portfolio management (Chart 1), is just a different name for the coupled model, since one of its basic distinctions is the convergence of technological capacity and market needs. As in prior model generations, innovation is also conceived as a linear process, the operations sequence of which is similar to the second generation model, although including some interactions and feedback between them, as represented by the two-way arrows. This fact was widely exploited after the Kline (1978) and Kline & Rosenberg (1986) articles, in which a chain linked

Generation	Rothwell (1994)	Marinova and Phillimore (2003)	Tidd (2006)	Berkhout ; Duin; Ortt (2006)	Bochm; Frederick (2010)
1st	Technology push	The black box model	The linear models – need pull and technology push	Technology push	Technology push
2nd	Market pull or need pull	Linear Models (including technology push and need pull)		Market pull	Demand pull
3rd	Coupling model	Interactive model (including coupling and integrated models)	The coupling model	Combination of technology push and market pull	Portfolio management
4th	Integrated model	Systems model (including networking and national systems of innovation)	The parallel lines model	Cyclic innovation model	Integrated management
5th	Parallel and integrated model	Evolutionary model	Systems integrations an extensive networking		Systems integrations
6th		Innovative milieu			Integration in network

Chart 1. Innovation generation models – selected authors.

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