A SYNTHESIS ON THE INNOVATION CONCEPT

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Abstract: Various definitions of innovation are presented, in view to highlight the state of the art of innovation concept. Some most common indicators employed to measure innovation are referred. The scope of this paper is to present the multiple approaches of the innovation concept, as this is reflected in the recent literature on innovation; also, is intended to discuss in short the methods of innovation measuring.
Key words*:* innovation, product innovation, process innovation, input indicator, output indicator

1. INTRODUCTION

Innovation presents a significant importance because it may offer better products, with improved quality characteristics, higher quality services, new production processes, and more efficient and clean (ecological) improved models of business management, modern methods of human resource management, such as empowerment of employees and so on. Innovation is an explanatory factor behind differences in performance between firms, regions and countries.

The scope of this paper is to present the multiple approaches of the innovation concept, as this is reflected in the recent literature on innovation; also, is intended to discuss in short the methods of innovation measuring.

2. DEFINITIONS OF INNOVATION

According to *The Explanatory Dictionary of the Romanian Language (DEX Online)* (*DEX Online*, 2001-2009), innovation is: "1) a newness, a change, an alteration; 2) a solution of a technical problem or of work organization, in view of productivity improvement, technical perfecting or rationalization of applied solutions."

In *The Compact Oxford English Dictionary of Current English* (1991) innovation is: "1) action or process of innovating; 2) a new method, idea, product."

There are various fields in which an innovation may be performed:

- introduction of a new product;
- a new process of production;
- the substitution of a cheaper material, newly developed for a given task, in an essentially unaltered product;
- a reorganization of production processes, or distribution arrangements leading to increased efficiency, better support for a given product, or lower costs;
-an improvement in equipment, instruments or methods of doing innovation.

The Austrian economist Joseph Alois Schumpeter (1883-1950) has classified innovations in five different "types": 1) new products; 2) new methods of production; 3) new sources of supply; 4) exploitation of new markets and 5) new ways to organize business. (Schumpeter, 1934). According to Schumpeter's opinions *product innovations* include "…creation of a new good that satisfy more adequate existent or former needs." *Process innovations* substitute a method or production process with another that produces cheaper products.

In the document "*Green Paper on Innovation"* (European Commission, (1995)) of UE is stated that "Innovation is the successful production, assimilation, and exploitation of novelty in the economic and social spheres." According to the dictionary, the opposite of innovation is "archaism and routine".

"Oslo Manual" version 3 (OECD/European Communities, 2005) proposed a classification of innovations in four types:

-*product innovations;*
-*process innovations;*
-*marketing innovations* and
-*organizational innovations.*

A *product innovation* "is the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics." The term "product" is used here to cover both goods and services.

A *process innovation* "is the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software".

Process innovations can be intended to decrease unit costs of production or delivery, to increase quality, or to produce or deliver new or significantly improved products through improved production processes. Examples of successful process innovations include: JIT (Just In Time) manufacturing, to reduce costs, flexible manufacturing that quickly adapts to changing demands, and Lean Manufacturing techniques to reduce waste and increase efficiency of production.

A *marketing innovation* is the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing. Marketing innovation is centered around the channels within which a firm markets its offerings including the marketing messages used, the market research methods adopted, as well as the innovation techniques that can be applied in these areas. Examples of marketing innovations are new sales channels and methods, entering new markets, new positioning a firm's product on the market etc.

An *organizational innovation* "is the implementation of a new organizational method in the firm's business practices, workplace organization or external relations." This type of innovations can be intended to increase a firm's performance by reducing administrative costs or transaction costs, improving workplace satisfaction, gaining access to non-tradable assets (such as non-codified external knowledge) or reducing costs of supplies. Organizational innovation also includes arrangements across firms such as reorganization of entire industries. Many of the most important organizational innovations there took place in distribution, with great consequences for a whole range of industries.

Francis and Bessant (2005) propose four categories of innovation "targeting": a) P_1 – innovation in product; b) P_2 – innovation in process; c) $P_{3;}$ .. innovation in positioning; P_4 – innovation in paradigm. These are called the four "P_s" of innovation.

Innovation in product is aimed at improving the existing products (incremental product innovation) or introducing entirely new products (radical product innovation) Criteria that differentiate products include number, timing and rate of change of product platforms, whether they are variations or derivatives, the frequency of improvement rate, relationship with strategy and degree of modularity. A firm may be able to plan for several generations of products over a life cycle with derivatives in between.

Innovation in process has the scope to offer faster, cheaper and safer processes. There is considerable scope in improving the operation of existing processes, through taking out waste of various forms and optimizing them for high performance. Also, there is considerable scope for identifying new process routes, which offer better performance parameters – e.g. cost reduction, quality enhancement, time reduction, etc. Major processes can be improved or re-engineered perhaps incorporating new technologies.

Innovation in positioning is a change in the context in which products are delivered. For example, the introduction of an actual well-defined product into a new market represents a positioning innovation. Repositioning to open up market segments means an innovation in positioning. This category of innovation is partially equivalent to the marketing innovation, defined in the "Oslo Manual".

Innovation in paradigm. The term "paradigm" has found its way into the vocabulary of organizational management, in such terms as " paradigm switch" or "paradigm breakthrough". The expressions are taken to imply that a traditional belief system –the old paradigm –has been replaced by a new way of understanding, a new paradigm. Paradigmatic innovation is a change in the underlying mental models of problem-solving associated with a particular product or service. This innovation may produce "technological revolutions" (consisting of a cluster of innovations) or may create new technological systems. An example of a transformational innovation in paradigm is the development of Internet solutions to many business areas like banking, insurance, travel, etc.

Another common classification of innovations is that which differentiate between "*technology push*-" and "*demand pull*"-innovations. In the first case, technological innovations emerge from technological inventions. In the decade 1960-1970 was modeled an innovation process in which demand forces from within the market pull inventions and innovations –this is the *demand-pull* (or *market pull*) innovation process. There is a tendency for technology push-innovations in the domain of complex technologies and a tendency for demand pull-innovations when radical innovations have been implemented

Kline and Rosenberg (1986) proposed an innovation model called the "c*hain-linked model*", according to which innovation occurs from an interaction between market opportunities and technological opportunities of firms. The authors of this model consider that "innovation is inherently uncertain, somewhat disorderly, and subject to changes of many sorts at many different places within the innovating organization." The complexity of innovation process results from the implication in this process of many "actors": firms, customers, networks, universities, public power, etc. The "chain-linked model of innovation" stresses three basic aspects of innovation:

- innovation is not a sequential (linear) process but one involving many interactions and feedback in knowledge creation;
- innovation is a learning process involving multiple inputs;

- innovation does not depend on invention processes, and such processes (involving formal R&D) tend to be undertaken as problem-solving within an ongoing innovation process rather than an initiating factor of innovation.

In the "chain-linked model" of innovation R&D is not confined exclusively to the origin of the innovation process, but is performed in relation to questions and problems at all stages of the innovation process, from market analyses through design and testing, full-scale production, distribution and marketing.

The work of Kline and Rosenberg (1986) has an important implication for innovation indicator development – the importance of non-R&D inputs to innovation: design activities, engineering developments and experimentation, training, exploration of markets for new products, etc. Therefore, the input innovation indicators must reflect this input variety and its diverse distributions across activities.

The concept of *Open Innovation* states that companies cannot rely on their own R&D resources, but should look to source ideas and technologies from other companies via licensing or buying patents.

Business innovation, which changes the firm's business practices, is the creation of substantial new value for customers and the firm by changing one or more dimensions of the business system. Business innovation is systemic. Successful business innovation requires the careful consideration of all aspects of a business. When innovates a firm must consider all dimensions of its business system.

The key dimensions of business innovation through which a firm can consider for opportunities to innovate are: 1) the offerings a company creates; 2) the customers it serves; 3) the processes it employs; 4) the points of presence it uses to take its offerings to market.

Innovation along the dimension "offerings" requires the creation of new products and/or services that are valued by customers.

To innovate along the dimension "customers" means to discover new customer segments or uncover unmet needs.

Processes are the configurations of business activities used to manage internal operations. To innovate along the dimension of business processes a firm. can redesign its processes for greater efficiency, or faster cycle time.

Points of presence are the channels of distribution that a firm employs to take offerings to market. Innovation in this dimension involves creating new points of presence or using existing ones in creative ways.

As can be seen, there is no an universally accepted definition of innovation concept.

3.ANALYSIS AND MEASUREMENT OF THE INNOVATION PROCESS

Innovation is a concept that is not easily quantified. The methods used to measure innovation are less precise.

Measuring innovation is based on the use of indicators. There are *input indicators, by-put indicators*, and *output indicators.* (Grupp, 1997).

The major *input indicator* is R&D expenditure. R&D are conceived as covering three different kinds of activities: basic research, applied research, and experimental development.

R&D are often classified according to multiple criteria, and data is collected in highly detailed forms. Beyond the distinction between basic research, applied research and development the data is classified into sector of performance: business enterprise, government, higher education, and private non-profit. In a firm, the expenditure on R&D may be classified into intramural and extramural (*cf. "Oslo Manual").* The intramural R&D expenditure is intended to contribute to the introduction of technologically new or improved products or processes. Extramural R&D expenditure comprises the acquisition of R&D services. R&D data has fundamental advantages. These include the long period over which it has been collected, the detailed subclassifications that are available in many countries, and the relatively good harmonization across countries.

But the indicator of R&D expenditure has major disadvantages: money spent on R&D does not always equal successful innovation.

As *byput indicator* is used data on patents which measure the output of R&D activities. The equivalent scientific indicator comprises *bibliometric data* (that is data on scientific publication and citation). Bibliometric analysis relates primarily to the dynamics of science rather than innovation. Both patents and scientific publications do generate R&D output, but does not necessarily lead to successful innovations. Several advantages of patents as an innovation indicator are:

- patents are granted for inventive technologies with commercial promise (i.e. innovation);
-the patent-system systematically records important information about these inventions;
- the patent-system collates these technologies according to a detailed slow-to-change classification system;
- the patent-system systematically relates the invention to relevant technologies.

But using patents as a measure has some disadvantages. The first, being that many innovations, especially process innovations, do not use new patentable technologies. Patents can only be granted for new technological inventions.

Innovation measurement through patents fails to capture the new innovations that are not patented by the developer. The inventor of a process or technology is not necessarily the innovator.

Output indicators do not refer to single R&D activities, but measure the overall innovation output. A common output indicator is the share of a company's turnover that was realized with new or improved products.

For the majority of innovation raters the methods of *European Innovation Scoreboard – EIS* (Pro Inno Europe, 2009) are an useful instrument of analysis and evaluation of different innovation dimensions in Europe. The EIS 2008 includes innovation indicators and trend analysis for the EU27 Member States. The 29 indicators of Innovation Performance captured in the EIS 2008 are grouped into 3 main blocks:

a) *enablers* – captures the main drivers of innovation that are external to the firm (9 indicators);
b) *firm activities* – captures innovation efforts that firms undertake, recognizing the fundamental importance of firms' activities in the innovation process (11 indicators);
c) *outputs* – captures the outputs of firm activities (9 indicators).

The Summary *Innovation Index (SII)* gives an overview of aggregate national innovation performance and is calculated as a composite of the 29 EIS indicators.

The document "*European Trend Chart on Innovation in Europe"* (European Commission, 2000) is a practical tool for policy-makers and managers in Europe, with summarized information and statistics on innovation policies, performance and trends in the EU.

Community Innovation Survey (CIS) is a statistical analysis coordinated by the statistical office of the European Commission, EUROSTAT. The "Oslo Manual" provides the methodological basis of this survey. CIS is a survey conducted every 4 years by EU member states that allows the monitoring of Europe's progress in the area of innovation. The survey is conducted at the enterprise level. Data from CIS is used for the annual *European Innovation Scoreboard*. The CIS questionnaire is aimed at enterprises and focuses on product and process innovation, looking mainly at the effects of innovation, sources of information for innovation patents, innovation expenditure, innovation co-operation, public funding of innovation, etc.

Inno-Barometer is an opinion poll carried out by the European Commission to explore the opinions of European managers on their companies' needs and investment in innovation as well as the output achieved.

4. CONCLUSIONS

The existence of many different definitions and models of innovation highlights that this is difficult to define, because it is rather an art than a science. Being intangible, measuring or analysis of innovation is difficult. Innovation is a multidimensional process, with nothing clearly measurable about aspects of the underlying process. Future conceptual and applied research will be focused on how innovation occurs and on the systemic character of innovation process.

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