

Geanina S. BANU

Faculty of Entrepreneurship, Business Engineering and Management,  
University "Politehnica" of Bucharest, Romania

Andreea DUMITRESCU

Faculty of Entrepreneurship, Business Engineering and Management, University "  
Politehnica" of Bucharest, Romania

Anca A. PURCĂREA

Faculty of Entrepreneurship, Business Engineering and management, University "  
Politehnica" of Bucharest, Romania

# CONSIDERATIONS ABOUT THE ESSENTIAL FEATURES OF INNOVATION

Literature  
review

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## Keywords

Innovation  
Risk factors  
Innovation systems  
Measuring indicators

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## JEL Classification

031

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## Abstract

*Defining and classifying innovation represents a complex approach both theoretical and practical. While comprising various views, the innovation concept is permanently redefined according to various criteria. Nevertheless, approaching innovation generic features should be always considered as defining the core of innovation as a concept. The aim of the present paper is to perform a literature review identifying the essential features of innovation with the aim of providing a comprehensive and holistic view of the concept. Furthermore, the present article aims at delivering a theoretical guide on innovation. To this end, the review comprises definition of concept, classification, risk factors, innovation systems and measuring indicators.*

### 1. Introduction

Innovation is a driver having profound implications in the economic development, while representing a concept under study both from a micro and macroeconomics perspective. Innovation has become an instrument of defining the development policies, while the relation between innovation and economic development is well established and recognized. As in the case of European Union, innovation has become the focus strategy to “pull” the nations out of the economic crisis still unfolding at the international level. Innovation provides a mechanism able to turn a crisis into an opportunity, especially during the periods of recession. In order to insure its proper understanding and use, innovation should be first explored as a concept with the aim of indentifying its essential features.

### 2. Method

The method comprises a literature review of both theoretical and practical studies, aiming at identifying the essential features of innovation which are well-established among authors. Moreover, a comparative analysis of various views is performed in order to highlight the concept of innovation and its classification, risk factors, innovation systems and measuring indicators.

### 3. Results

In defining innovation, experts such as Malerba and Orsenigo (1997) or Lundvall (2007) recommend to first differentiate innovation from invention. Therefore, while invention refers to a new idea, a new scientific discovery or a new technology or product, innovation represents the effective introduction and commercial use of an invention in the economy. Furthermore, innovation should be understood as the result of a development process which starts with a new idea/invention and concludes with the market uptake of that idea/invention. Schumpeter (1934) which is considered the father of modern innovation views the technical knowledge as representing the result of both invention and innovation. While proposing a holistic view of the two concepts, Urabe (1988) defines innovation as representing the creation of a new idea and its implementation into a product, process or service; that is, the innovation comprises both an invention and its commercialization. Although a unanimous definition does not exist, the innovation concept is permanently redefined according to various criteria specific to each field of application, while the impact of innovation on the organization varies in regards with the productivity, sustainable development and growth and organization performance. Nevertheless, defining the core of innovation concept uses interdependent criteria regardless of the field (Gopalakrishnan & Damanpour, 1997).

In view of understanding and providing core knowledge on innovation, there are numerous attempts worldwide to create an unique reference system on innovation and its features. To this end, various manuals have been created, e.g. Frascati, Oslo, comprising unique definitions unanimously accepted within the O.E.C.D. (Organization for Economic Cooperation and Development) countries, the EU and other participating countries. The Frascati Manual (O.E.C.D., 2002) considers innovation as being only of technological nature and comprising new or significantly improved products and processes which are being developed up to the implementation phase through a series of innovation specific activities, e.g. scientific, technological, organizational, financial, commercial activities. Unlike Frascati Manual, the Oslo Manual (O.E.C.D., 2005) broadens the view on innovation and proposes that it should be regarded as representing the implementation of a product, i.e. goods or services, or process presenting novelty or significant improvement or of a new marketing method or organizational method for improving business practice, the organizing of the work place or the external relations. Furthermore, innovation does not necessarily imply novelty for the entire world, but novelty for the adopting organization; that is, innovation should be new or significantly improved for the organization (Rogers, 1983; O.E.C.D, 2005) and not necessarily for everyone else. Currently, the Oslo Manual represents one of the most relevant sources for standard guidelines on innovation.

Although dating from 1934, the complex and still modern view of J. Schumpeter proposes innovation as a function of entrepreneurship generating “new combinations” of existing resources in order to produce new products and services and also new production, marketing and organizational processes.

While further exploring the essential features of innovation, the classification of innovation reveals various classes based on multiple criteria, the most relevant being: the degree of change it causes, type, impact, ownership and competence (Narvekar & Jain, 2006). Such criteria are being interpreted and combined by authors expressing their view on the matter.

Schumpeter (1934) considers innovation as able to generate radical effects or to support the change. Thus, radical innovations determine major disruptive changes, while incremental innovation continuously facilitates the process of change. This is a first and exhaustive classification of innovation according to the degree of change it produces, allowing for highlighting the impact on the current state of the art through either minor (i.e. incremental innovation) or major changes (i.e. radical innovation) (Urabe, 1988).

The Oslo Manual (O.E.C.D., 2005) proposes a classification according to the degree of novelty, i.e. new to the firm, new to the market, and new to the world. This allows the identification of the initial developers and the adopters of innovation and the market leaders and the followers, while emphasizing the pattern of diffusion.

Classifying innovation according to the degree of change it produces refers always to the incremental or radical attributes of innovation. That is, innovation covers the complete spectrum of change from sustainable or incremental innovation (e.g. functional remodelling) to disruptive or radical innovation (e.g. breakthrough, paradigm shift) (Assink, 2006). Regardless of the proposed classification, innovation takes place on the axis from incremental to radical. While incremental change can be measured using same performance indicators, radical change commences a completely new S-curve, requiring new indicators to measure the performance (Drejer, 2002). Nieto's study (2004) highlights the fact that the impact of incremental innovation through continuous improvements is bigger than that of radical innovation. Furthermore, organizations concentrate approximately 80% of their innovation activities into existing product development and only 20% for the creation of new products. Other studies (Tidd et al., 2005) also emphasize that the benefits of incremental innovation are more often bigger than those of radical innovation occurring occasionally. Radical innovation, that is new to the world or disruptive innovation, represents only 6%-20% of total innovation. While radical innovation is important and takes place more frequently in the initial development stages of a new industry, incremental innovation and its cumulative effects coming from minor changes made to well-established products bring bigger competitive advantage and have a bigger economic impact.

Another well-established and accepted more intricate classification further establishes product, process, marketing and organizational innovation (Nieto, 2004; O.E.C.D, 2005, Tidd et al., 2005). Product innovation represents the products and services offered by an organization (Tidd et al., 2005). That is, product innovation allows for improving offers which are already existing and established on the market in order to increase their performance, utility or other features and to reduce costs (Moore, 2004). The Oslo Manual (O.E.C.D., 2005) proposes an exhaustive definition of product innovation in the sense of representing the introduction of a new or significantly improved good or service in terms of characteristics and intended uses (e.g. improvements in technical specifications, components and materials, incorporated software).

Unlike product innovation, process innovation represents a change in the way products or services are created or delivered (Tidd, Bessant & Pavitt, 2005). Moore (2004) underlines that process innovation allows creating more efficient and productive processes for well-established offers which already exist on the market. The Oslo Manual (O.E.C.D, 2005) views process innovation as representing the implementation of new or significantly improved production or delivery methods, including significant changes in respect to technologies, equipments and/or software. In terms of marketing innovation, same Oslo Manual defines it as "the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing" such as changing product form without altering functionality, the first introduction of a franchising system, the first use of significantly different media or techniques, new branding, price differentiation strategies, etc. Furthermore, organizational innovation is viewed as representing "the implementation of a new organizational method in the firm's business practices, workplace organization or external relations", such as new methods for organizing work procedures, new practices for learning, knowledge sharing and knowledge codifying within the firm, new types of collaboration with research organizations or customers, first time outsourcing or subcontracting of business activities, etc.

While moving forward with present exploratory view on innovation, the innovation process is briefly analyzed. That is because in the opinion of authors, the innovation process always requires a separate study due to its complexity and importance. Considering that the innovation process does not comprise a single event, but an interconnected series of activities, Rogers (1983) defines it as comprising all decisions, activities and their impact taking place at the moment of recognising a need or problem, during research, development and commercialisation of an innovation, during the diffusion and adoption of an innovation by users, up to the consequences it generates. That is, the innovation process must supervise how *innovative ideas* are being developed and implemented by *people*, which are engaged in *transactions or relations* with other people, while making the necessary adjustments to obtain the desired results and working in continuously changing institutional and organisational *contexts* (Van de Ven, 1995). Although innovations vary due to criteria such as size, degree of novelty and nature, the innovation processes are essentially similar to all organisations. It is this feature that allows the modelling of the innovation process (Tidd et al., 2005).

In order to facilitate the market uptake of innovation by modelling the innovation process, it is crucial to identify and control the factors affecting the success of innovation. Tidd et al., 2005, emphasize that the effectiveness in managing innovation depends on establishing and continuously improving efficient routine processes and activities. To this end, the innovative organisations must be capable of recognising and understanding efficient routine processes and activities and of facilitating their implementation within the organisation. Various factors having impact on the success or failure of innovation have been identified in the literature, as presented in Table 1. Regardless of various existing classifications, it can be observed that these factors are having effects beyond the innovation process, moving up to the organisation itself and also to the external business environment.

When exploring the innovation concept, the innovation system should be underlined. The notions of innovations system and national innovation system were first introduced and developed by Freeman (1982) based on Friedrich List's idea proposing "the national system of political economy" in 1841. The innovation system emphasizes that the technology and information flux between individuals, enterprises and institutions represents the key of the innovation process. The innovation system comprises the main entities involved in various innovation activities, starting with universities and private companies to public agencies. These entities are affected by complex factors determining the success or failure of the innovation process, respectively financial markets, institutional factors, social and organisational factors, educational factors, organisation's strategies, competitiveness on the national and international market. The innovation system is based on the necessity for interaction between the various entities needing to transform an idea into a new product, process or service. These entities play distinct roles yet are working together in the effort of achieving common objectives, thus triggering the need for a common vision on innovation between industries, research communities and governments. Schrempf, Kaplan and Schroeder (2013) identify four categories of innovation systems: national systems of innovation, regional systems of innovation, sectoral system of innovation and technological innovation systems. The Oslo Manual (O.E.C.D., 2005) establishes the national system of innovation, the regional system of innovation and the international system of innovation.

The national system of innovation represents the set of institutions and knowledge flows playing a crucial role in economic progress. It allows for placing innovation at the heart of policy making.

As innovation is usually not homogenous at national level, complementary approaches have been developed based either on a geographical dimension (i.e. regional innovation systems focusing on and exploring in more detail the relationship between technology, innovation and localised industry, research entities and institutions) or concentrating on a specific technology spanning multiple industrial sectors (i.e. technological innovation systems) or on an industrial sector entirety comprising various technologies (i.e. sectoral innovation systems) (Schrempf, Kaplan and Schroeder, 2013). When exploring the key features of innovation, the measuring instruments are also reviewed. They allow for assessing the innovation both at the level of the organisation and at political level. Currently, there is no unique mechanism or indicator for measuring the innovation performance at organisation level. The classic indirect indicators employed are the research and development (R&D) expenditure, i.e. input of the innovation process, and patents, i.e. output of the innovation process (Falvey, Foster & Memedovic, 2006). Above indicators are not efficient if used alone because of various disadvantages, e.g. R&D expenditure does not always relate to successful innovation, while patents are not always employed to protect innovations. Direct indicators are also used to measure innovation at organisation level, such as the number of innovations and/or innovative activities within the organisation. As in the case of indirect indicators, direct indicators are not efficient if employed alone, e.g. number of innovations does not cover failed innovation. A study by McKinsey & Company (2008) assessing the innovation metrics identifies a portfolio of thirteen most used indicators for measuring innovation at organisation level. While concluding that indicators measuring the outputs of the innovation process are being mostly utilized by companies, the study also highlights that it is the use and combination of multiple indicators (as depicted in figure 1) that allows for strategically guide the innovation activities and the resources distribution in order to insure the success of innovation. Unlike metrics used at organisation level, measuring innovation at political level concentrates on the competitive advantage of a country or a region. Grupta (2009) synthesises the indicators utilized to measure innovation at political level and indentifies the following categories:

-Aggregate Innovative Indices. This approach focuses on understanding the innovation process and on assessing the critical factors of innovation. It presents advantages such as the use of numerous innovation factors for collecting data, and disadvantages such as limited collection of

financial data, the use of mostly qualitative data, limited production of scorecards.

-Contribution of Intangibles to Growth. This approach measures the total investment in intangible assets and its contribution to growth. It correlates the GDP (Gross Domestic Product) and consumption based on the estimation of investment in intangible assets. The method has advantages such as showing the impact of not considering intangibles as investment, and disadvantages such as obtaining only estimations. Table 2 lists some of the most employed indicators for measuring the innovation at political level, respectively at regional, national and international level, allowing for evaluating and comparing the performance of the innovative activities.

#### 4. Discussion

The importance of innovation demands for a comprehensive and holistic understanding of the essential features of innovation.

J. Schumpeter's (1934) still up-to-date and comprehensive definition of innovation is applicable in terms of identifying the four dimensions of innovation, i.e. new product, process, organizational method and marketing method. The innovation should be differentiated from invention; that is, innovation represents the development path followed to achieve the market uptake of an invention. Furthermore, unlike invention, innovation can bring novelty for the organization and not necessarily for the world.

Although the literature presents numerous classifications of innovation, the well-established features of innovation from this perspective are incremental and radical and technological and non-technological. Regardless of type, all innovation takes place on the axis of change from incremental to radical, while being under the influence of the business environment, i.e. radical innovation is being influenced by more factors than incremental innovation, thus having more profound and bigger effects. In terms of development and progress, both minor and major changes determined by innovation are just as important. While minor change can generate improvements of functional, operational or safety nature in products, services or processes, a major change can determine a paradigm shift and further innovation due to its revolutionary nature. The impact of innovation can determine changes in the market structure, it can create new markets or it can replace existing products.

While incremental and radical innovation represents a „superclassification” of innovation, a more intricate classification reveals the following types: product, process, marketing and organisational innovation, all of them taking place on the axis from incremental to radical.

As it represents a very important and complex feature of innovation comprising all stages and

activities aiming at facilitating the delivery of an idea to the market, the innovation process should be explored as a separate study highlighting the models of innovation.

Due to its nature, innovation inevitably involves high risk activities. In order to be successful, management must strongly guide the innovation process, while mitigating the related risk factors. That is, successful innovation process requires the identification and understanding of all factors acting from within and mostly from outside the process itself and determining the success or failure of innovation.

The innovation is also approached through innovation systems which are based on the flow of information and technology between individuals, industry, research organisations and institutions at national, regional, industrial and sectoral level. This approach allows for establishing a political and organisational framework for understanding, analyzing and improving the innovation process.

Innovation performance requires measuring both at organisation and political level (i.e. regional, national and international). Although there is no unique measuring indicator either at organisation or political level, several indicators are being employed for evaluating innovation with the aim of improving the performance. Further development is needed in order to create more precise instruments.

The identified features of innovation allow for creating a map in exploring the essence of innovation with the aim of understanding the concept and its applicability for maximizing innovator's growth.

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Table No. 1  
*Factors determining the success or failure of innovation*

<b>Authors</b>	<b>Factors</b>
<b>Kimberly &amp; Evanisko (1981)</b>	<i>Individual factors; Organisational factors and Contextual (business environment) factors.</i>
<b>Freeman (1982)</b>	<i>Financial markets; Institutional factors; Social factors; Organisational factors; Educational factors; Organisation's strategies; Competitiveness on the national and international market</i>
<b>Yin (1985)</b>	<i>Internal factors: Characteristics of the academic areas; Personnel structure; Managerial strategy; Internal policy; Organisational form; Scale of unit (size). External factors: Environmental conditions (i.e. technological climate, national policy, industry characteristics); Market incentives (i.e. demand-pull innovation, technology-push innovation, users as innovators); Internal and external communication (i.e. channels of communication, necessity of communication, possibility of communication); Government role.</i>
<b>Kwon &amp; Zmud (1987)</b>	<i>Individual factors; Task-related factors; Innovation-related factors; Organisational factors and Environmental factors.</i>
<b>Cooper (1999)</b>	<i>Solid up-front homework – to define the product and justify the project; Voice of the customer – a slave-like dedication to the market and customer inputs throughout the project; Product advantage – differentiated, unique benefits, superior value for the customer; Sharp, stable and early product definition – before development begins; A well-planned, adequately-resourced and proficiently-executed launch; Tough go/kill decision points or gates – funnels not tunnels; Accountable, dedicated, supported cross-functional teams with strong leaders; An international orientation– international teams, multi-country market research and global or “glocal” products.</i>
<b>O.E.C.D – Oslo Manual (2005)</b>	<i>Economic factors (e.g. costs and demand); Enterprise specific factors (e.g. skilled personnel and knowledge); Legal factors (e.g. regulations and tax rules); Enterprise's ability to appropriate the gains of their innovation activities (e.g. protection of innovation from imitation by competitors).</i>
<b>Keizer &amp; Halman (2007)</b>	<i>New product performance according to specification; Reliability of suppliers; New product adaptation by consumers; Internal organisation; Knowledge; Project management.</i>

Table No. 2  
*Innovation measuring indicators employed at political level*

<b>Indicator</b>	<b>Description</b>
<b>Trend Chart on Innovation in Europe (TCI)</b>	<i>It was developed by the European Commission (EC) in 1998 with the aim of monitoring the policies on innovation and their changes within Member States. It represents a statistical analysis made by Eurostat using the methodology of the Oslo Manual.</i>
<b>Indicators created by O.E.C.D. which are complementary to Oslo Manual</b>	<p><i>While the Oslo Manual is measuring innovation at firm's level, other indicators, manuals and guidelines have been conceived by O.E.C.D. for measuring the innovation at political level:</i></p> <ul style="list-style-type: none"> <li>- <i>Proposed Standard Practice for Surveys of Research and Experimental Development – Frascati Manual, 2002</i></li> <li>- <i>Handbook on Economic Globalisation Indicators, 2005</i></li> <li>- <i>Measuring Productivity Manual, 2001</i></li> <li>- <i>Guide for Information Society Measurements and Analysis, 2005</i></li> <li>- <i>Framework for Biotechnology Statistics, 2005</i></li> </ul>
<b>European Innovation Scoreboard (EIS)</b>	<i>It was developed at the initiative of the EC starting with 2000 with the aim of evaluating by comparison the level of innovation performance of the Member States and of the European Union (EU) in comparison with various zones and countries beyond EU. This aggregate indicator synthesises the level of innovation with the help of 29 innovation indicators categorized in three main blocks, i.e. enablers, firm activities and outputs indicators (Grupta, 2009; Hollanders &amp; Tarantola, 2011).</i>
<b>Innovation Union Scoreboard (IUS)</b>	<i>It was developed at the initiative of the EC, being employed within the EU and in other states. It allows for performing a comparative evaluation of the research and development level of performance and of the strengths and weaknesses of the innovation systems of nations. This aggregate indicator comprises 25 innovation indicators grouped in three main blocks, i.e. enablers, firm activities outputs</i>

indicators (Hollanders & Tarantola, 2011).

**Inno-Barometer**

It was developed at the initiative of the EC in 2001 and it represents a system of opinion polls aiming at identifying the opinions of the European managers about their company needs, the investments in innovation and the obtained results (outputs). The indicator has a different research topic every year and presents the results accordingly by issuing a report.

**Global Innovation Index**

It was developed by INSEAD (The Business School of the World) in collaboration with the Confederation of Indian Industry. It is a composite indicator that employs over 90 innovation indicators to rank the nations in terms of their innovation systems and outputs. Cornell University and WIPO have joined INSEAD starting with 2014. The yearly results of this composite indicator are audited by the Joint Research Centre of the EC starting from 2011.

**Other international indicators**

Innovation Index (developed by Indiana Business Research Centre); State Technology and Science Index (developed by US Milken Institute); The Bogota Manual (developed by The UNESCO Institute for Statistics); Global Innovation Index (developed jointly by the Boston Consulting Group and the National Association of Manufactures); Innovation Efficacy Index (developed by INSEAD), etc.

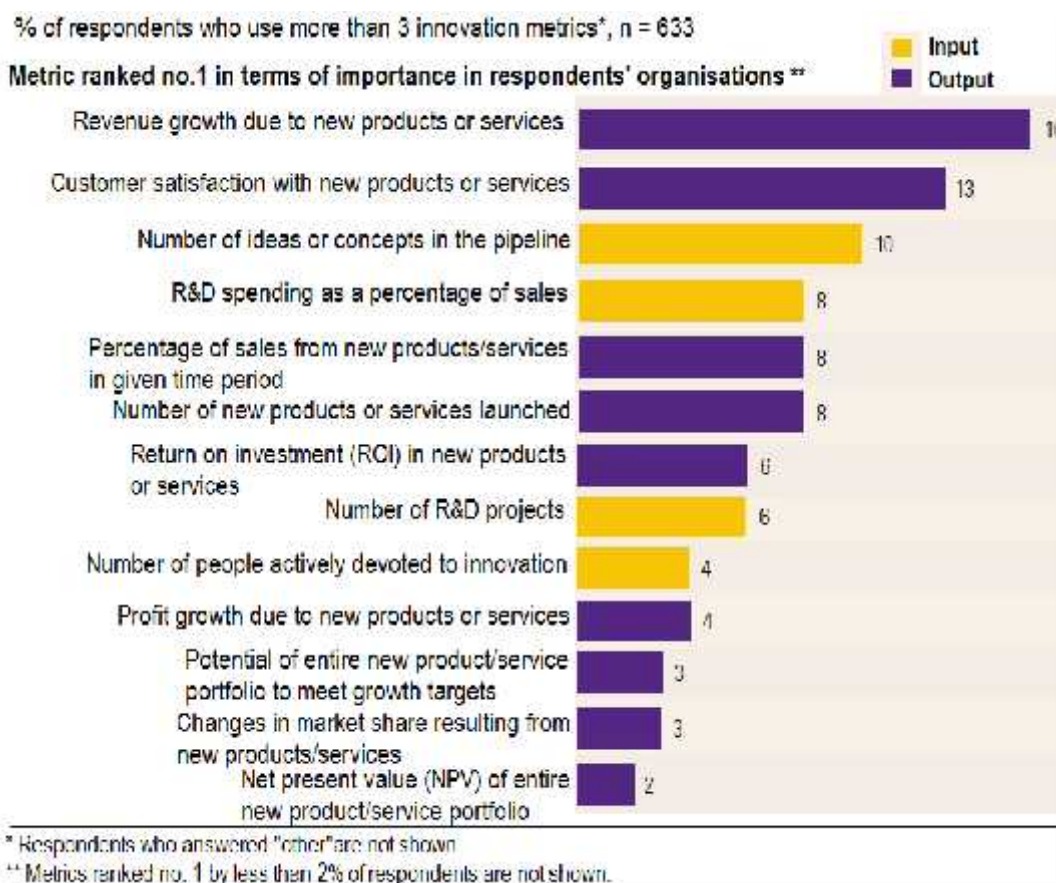


Figure 1. The indicators (metrics) most utilized for measuring the innovation performance at organisational level (% of respondents utilizing more than three measuring indicators). Source: McKinsey & Company (2008)