

The definition and classification of innovation

Timur, KOGABAYEV,
Aleksandras Stulginskis University, Studentu g.11, Kaunas, LT-53361, Lithuania,
timurkoga@gmail.com
Antanas, MAZILIAUSKAS,
Aleksandras Stulginskis University, Studentu g.11, Kaunas, LT-53361, Lithuania,

Abstract

The paper presents the different definitions of innovation; the objective of the research being that of creating a theoretical model building on the previous work of several authors. The aim of the research is to define the different models, classifications and definitions of innovation. In this article we made use of a wide range of bibliographical sources on innovation, efficiency and also used comparative analysis of innovation definitions. Theoretical concepts were studied as well. The approach was constructed based on theoretical models of innovation definitions and used the technology and market perspectives. The main methods employed were comparative analysis of definitions of innovation and the creation of a model of innovation. It has been emphasized in the literature that the role of innovation is very important for making decisions regarding investment projects or investments for production. Innovation can bring benefits such as saving time, costs, and products and use them more effectively. Nowadays in the world, innovation is one of the most important factors of economic development, production, creation of a variety of products and in making management decisions. Innovation activity stimulates and has a positive effect also in investment activity.

Innovation is the core action for the development and productivity of any economic activity. Investment activity and its results are directly dependent on the type of innovation that has been used. An important range of literature sources refer to innovation efficiency measurement criteria, which are in most cases related to product, technology (process) and market. The use of a number of different measurement indicators is leading to the need for further examination of the innovation-business performance relationship. Our findings have let us distinguish five major groups of criteria where various factors could be allocated. To the three groups (product, market and process) we allocate two additional groups: finance and management. Innovation plays an important role in the efficiency of investments in an organization, forms of business activity and state policy in the field of business and design.

Keywords: Innovation; economic efficiency; investments

JEL Classification: O1, O3.

1. Introduction

Nowadays all economic processes are closely related to new technologies and innovations.

The most important thing for scientists and developers to understand what kind of innovation should be used in the production, scientific discoveries, in project activity and the creation of new high-tech products, the provision of services and execution of works.

In this publication the authors examined the various interpretations of innovation. Materials have been collected by many authors. Methodological approach of innovation was compiled to the definition of innovation and their typology and classification of innovation has been considered.

Many authors as (Rowe and Boise 1974), (Dewar & Dutton 1986), (Rogers, 1995), (Utterback 1994), (Afuah 1998), (Fischer, 2001), (Garcia & Calantone, 2002), (McDermott & O'Connor, 2002), (Pedersen & Dalum, 2004), (Frascati Manual, 2004) have combined technology and market perspectives in their development of theoretical models of innovation.

Some authors are saying that innovation consists of the generation of a new idea and its implementation into a new product, process or service, leading to the dynamic growth of the national economy and the increase of employment as well as to a creation of pure profit for the innovative business enterprise (Urabe, 1988).

In general, the concept of "innovation" - a rather complex and multifaceted, his study of the subject of many studies, but, despite this, the generally accepted definition of innovation in science does not exist. There are three main approaches to the consideration of the term (Siauliai, 2013).

Schumpeter, which may be called the founder of the theory of innovation in the economy generally, regarded innovation as the economic impact of technological change, as the use of new combinations of existing productive forces to solve the problems of business (Schumpeter, 1982).

According to Twiss, innovation - a process that combines science, technology, economics and management, as it is to achieve novelty and extends from the emergence of the idea to its commercialization in the form of production, exchange, consumption (Twiss, 1989).

(Afuah, 1998) refers to innovation as new knowledge incorporated in products, processes, and services. He classifies innovations according to technological, market, and administrative/organizational characteristics

A *problem* is how to measure of innovation and classify them, because in current sources and many authors identify innovation differently and classification of them has a huge criteria's and indicators.

The *aim* of this paper is to analyse current concepts and models of innovation and classification of them.

The main objectives of this paper are: a) to analyse the concept and theoretical models of innovation, and b) to analyse the classification of innovation.

Materials and Methods

The methodology of research is based on theoretical analysis of literature sources related to the innovation and classification of innovations. It was explored the definitions of innovation by many authors, created the models of innovation definition and model of classification of innovation as well.

For the assessment of innovation a number of literature sources have been analysed.

The model "Innovation path for efficiency of innovation to benefits" was suggested to identify the main aim of innovation.

2. Definitions of innovation

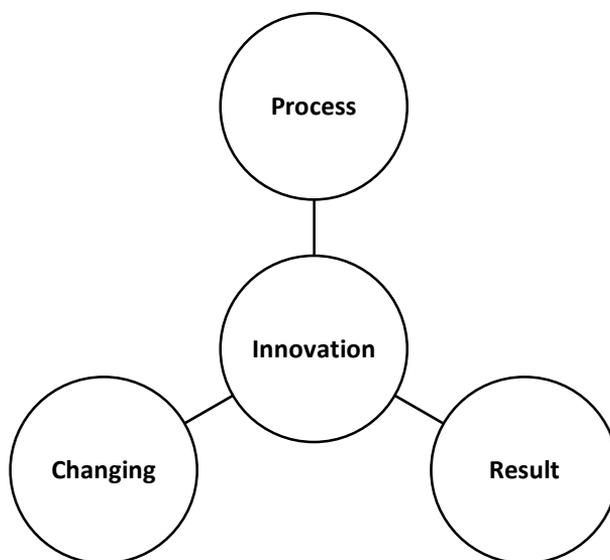
The approaches to the typology of diverse innovations, there are representations of various authors. In the institutional science also has its own approach to the typology of innovation as the good and the typology of the subjects of innovation, the relationship between the first and second disclose the advantages of using certain types of innovation actor's specific innovation. Thus, the theme of this work is relevant enough.

Definitions of innovation can be found in (Rowe & Boise, 1974), (Dewar & Dutton, 1986), (Rogers, 1983), (Utterback, 1994), (Afuah, 1998), (Fischer, 2001), (Garcia & Calantone, 2002), (McDermott & O'Connor, 2002), (Pedersen & Dalum, 2004), (Frascati Manual, 2004) as well.

“Innovation consists of the generation of a new idea and its implementation into a new product, process or service, leading to the dynamic growth of the national economy and the increase of employment as well as to a creation of pure profit for the innovative business enterprise. Innovation is never a one-time phenomenon, but a long and cumulative process of a great number of organizational decision-making processes, ranging from the phase of generation of a new idea to its implementation phase. New idea refers to the perception of a new customer need or a new way to produce. It is generated in the cumulative process of information-gathering, coupled with an ever-challenging entrepreneurial vision. Through the implementation process the new idea is developed and commercialized into a new marketable product or a new process with attendant cost reduction and increased productivity” (Urabe, 1988).

In general, the concept of "innovation" - a rather complex and multifaceted, his study of the subject of many studies, but, despite this, the generally accepted definition of innovation in science does not exist. There are three main approaches to the consideration of the term. This classification is presented in the (Fig. 1) below.

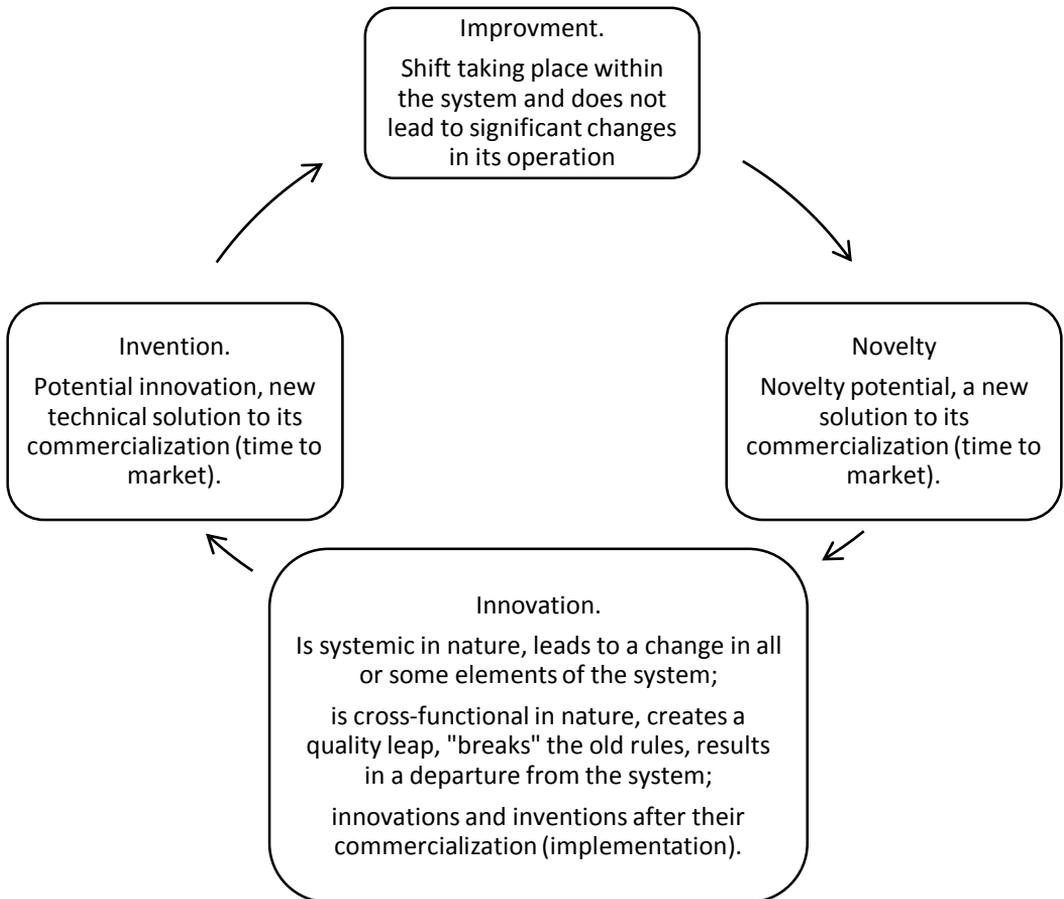
Figure 1. Approaches to the definition of innovation



Source: Siauliai, 2013

Innovation interprets as "improved", "innovation", to some extent, even the "invention". However, for use in scientific, legislative practice should clearly grasp the difference between these words. (Fig. 2) Explains the difference between these definitions and presented below.

Figure 2. The concepts of "improvement", "novelty", "invention", "innovation"



Source: provided by the author

Schumpeter, which may be called the founder of the theory of innovation in the economy generally, regarded innovation as the economic impact of technological change, as the use of new combinations of existing productive forces to solve the problems of business. (Schumpeter, 1982).

According to Twiss, innovation - a process that combines science, technology, economics and management, as it is to achieve novelty and extends from the emergence of the idea to its commercialization in the form of production, exchange, consumption. (Twiss, 1989).

According to the interpretation of Molchanov, innovation is the result of scientific work aimed at improving the social activities and intended for the implementation of social production. (Siauliai, 2013).

(Afuah, 1998) refers to innovation as new knowledge incorporated in products, processes, and services. He classifies innovations according to technological, market, and administrative/organizational characteristics, as shown in Table 1 below.

Table 1. Generic classification of innovation

Generic classification of innovation			
	Technological	Market	Administrative
	Product	Product	Strategy
	Process	Price	Structure
	Service	Place	Systems
		Promotion	People

Source: adopted from Afuah, 1998

3. Classification of innovation

Classification of innovation by application is presented on Table 2 below.

Table 2. Classification of innovation by application

No	Classification sign	The classification categories (types) of innovation
1.	Applications Innovation	The managerial, organizational, social, industrial, agricultural, etc.
2.	STP stages, which resulted in innovation	Scientific, technical, technological, engineering, manufacturing, information
3.	The intensity of innovation	"Boom", uniform, weak, mass
4.	The pace of implementation of innovations	Fast, slow, decaying, growing, uniform, abrupt
5.	The scope of innovation	Transcontinental, transnational, regional, large, medium, small
6.	The effectiveness of innovation	High, stable, low
7.	Efficiency innovation	Economic, social, ecological, integrated

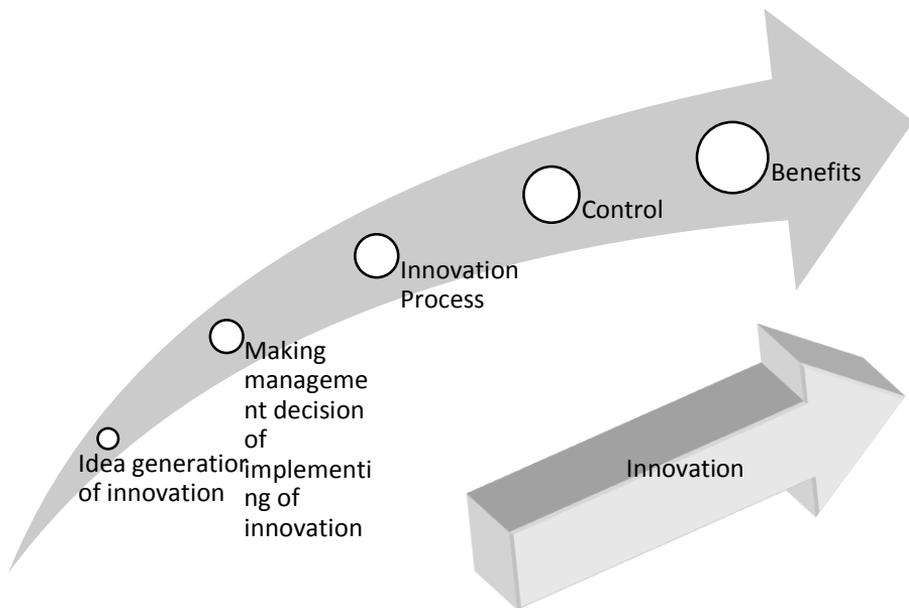
Source: Davydenko, 2011

Technological innovation is the knowledge of components, linkages between components, methods, processes and techniques that go into a product or service. It may or may not require administrative innovation. It can be a product, a process, or a service. Product or service innovations should be new products or services aiming at satisfying some market needs. Process innovation is concerned with introducing new elements into an organization's operations such as input

materials, task specifications, work and information flow mechanisms, and equipment used to produce a product or render a service (Afuah, 1998).

The main idea of innovation to speed up the processes and include the innovation to the production circles as well to reach the goals: (maximize the profit, social projects efficiency, sustainable economic growth and etc). The description of making management decisions to implement innovation ideas to the final stage of getting benefits is presented on the Fig. 3 below.

Figure 3. Innovation path for efficiency of innovation to benefits



Source: Provided by the author

There are many discussions about how the innovation at every stage should be measured and assessed. Some authors as (Li 2000), (Elenkov & Manev, 2009) suggest to measure new and improved products as direct output of innovation associated with new product development. (West et al., 2003), (Akgün et al., 2009) are suggesting to measure improvements in process and methods, while (Czarnitzki & Kraft, 2004) are speaking about the market success of innovation, suggesting “ratio of innovative product sold in the market to total sales”. Speaking about market aspects (Elenkov & Manev, 2009) are defining an indicator of the success of new products on a market, making a point that a rate of success of new products on a market may be very vulnerable and is never 100%. Some authors refer to patent application for innovation (Jung et al., 2008), (Zahra

& Nielsen, 2002), but (Makri & Scandura, 2010) are suggesting measuring the importance of patents in terms of patent citations.

Several other useful papers can be identified, including (Barczak, 1995), (Linton, Walsh & Morabito, 2002), (Montoya-Weiss & Calantone, 1994). We can mention also the papers (Cooper, 1990; Cooper & Kleinschmidt, 1996; Boston Consulting Group, 2006; Chapman et al., 2001; Cooper, 1998; Cooper & Edgett, 1996; Cooper & Kleinschmidt, 1986) which develop the concept of output performance, including: financial, temporal, market and product related factors.

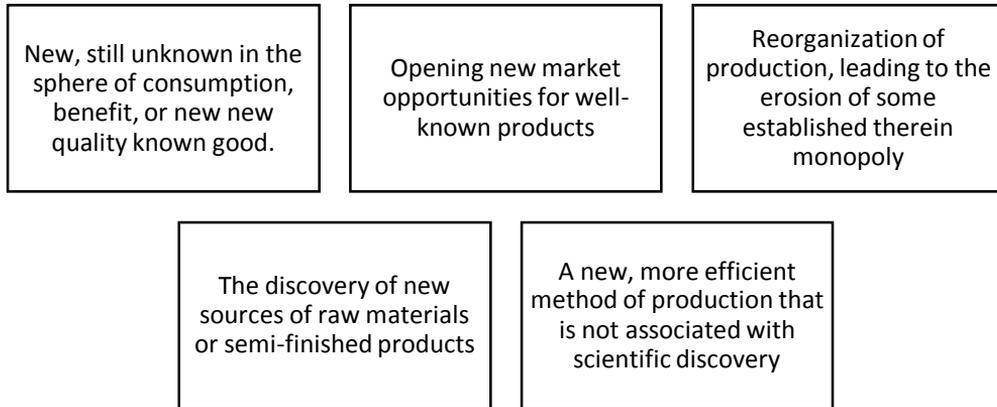
(Drucker, 1992) underlines the importance of social innovation in spite of - as he claims - general belief that innovations are based on subjects and exact sciences and technology. There are several examples of social innovation leading to significant changes in society. It is extremely important for today recognizes innovation in the field of occupational safety and health. The following sub-groups based on the results of innovation can be identified in this area:

- social effects, manifested, in particular, as an exception, heavy, unhealthy jobs, improve safety and health conditions, exclusion of occupational diseases and accidents at work;
- Economic results, the consequence of which is the growth of labor productivity, increase profits, increase in output;
- Technical results in the form of improving the technical parameters of machines, equipment, products, or improving the organization of work and the flow of the process.

4. Typology of innovation

Schumpeter identified the five types of innovation. The description of this model is presented on (Fig. 4) below.

Figure 4. Types of Innovation



Source: Schumpeter, 1982

German scientist Mensch offered his classification of innovation in order of importance. He identified three main types of innovation. The model is presented on Fig. 5 below.

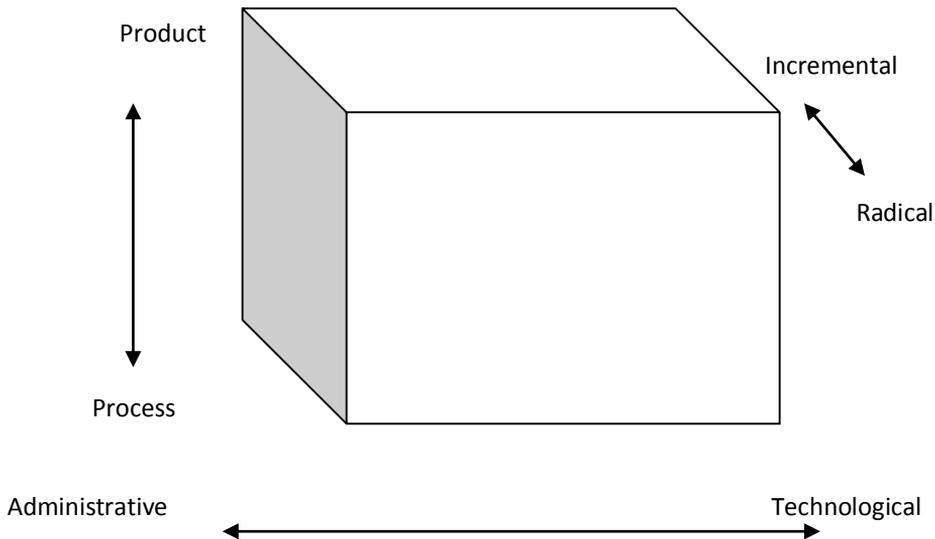
Figure 5. Types of innovation by Mensch

Basic innovations	Improving innovation	Fake Innovations
<ul style="list-style-type: none"> • arise on the basis of major inventions, mark the beginning of a new, previously unknown products or processes based on new scientific principles. • require the most investment, the process of their development is a long and commercialization of their results in the emergence of new technological structures 	<ul style="list-style-type: none"> • small but important improvement of products, processes, services • grow - continued technical improvement and innovation applied to the basic application. 	<ul style="list-style-type: none"> • External modify products or processes that do not lead to a change in their consumer characteristics.

Source: Siauliai, 2013

A multidimensional model of innovation is presented on (Fig. 6) below.

Figure 6. A multidimensional model of innovation

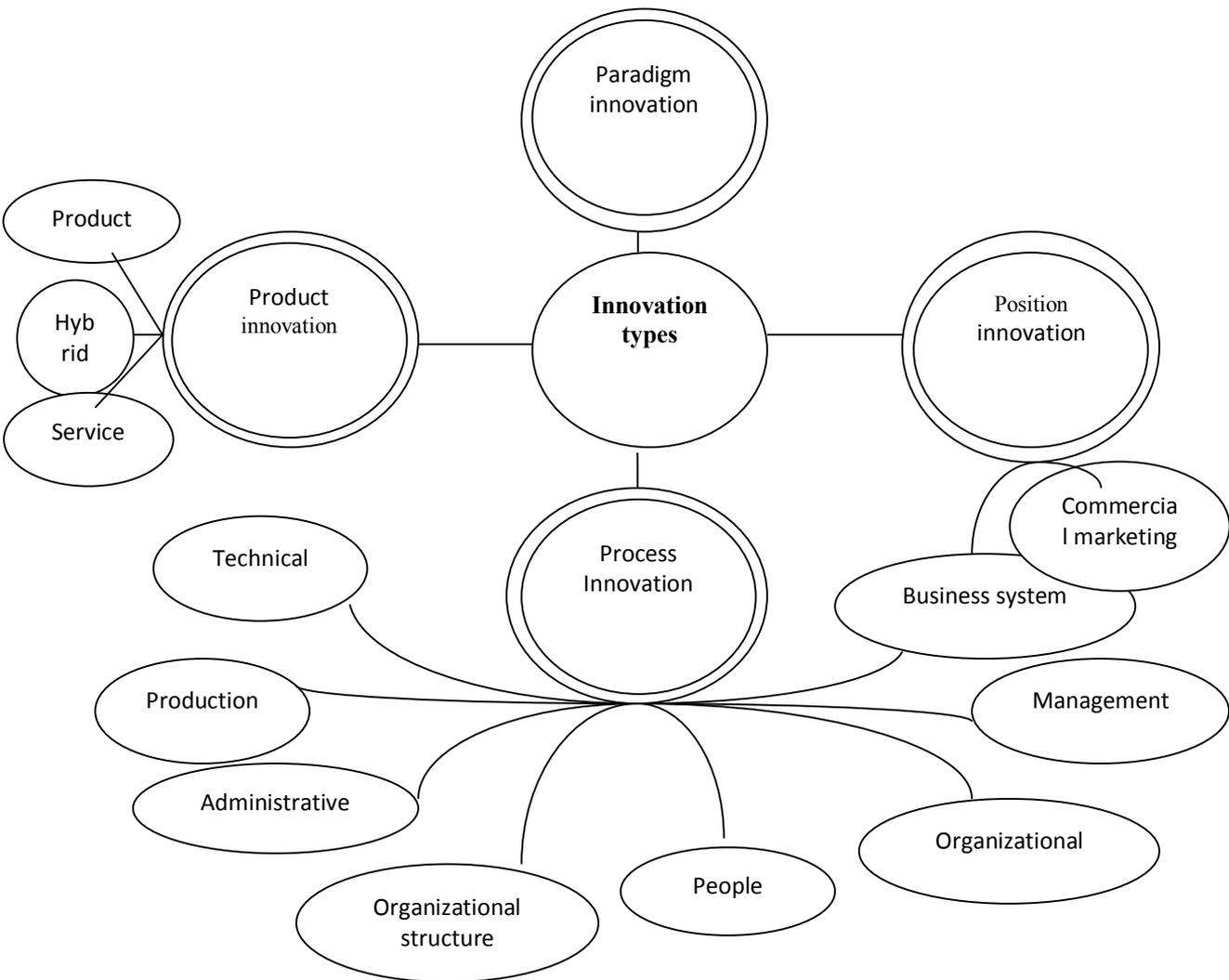


Source: adopted by Rowley J., Baregheh A., Smabrock S. 2011 from Cooper, 1998

Fig. 7 shows that the (Rowley J., Baregheh A., Smabrock S. 2011) proposed development of (Francis & Bessant 2005) classification of types of innovation. In

developing of innovation-type mapping tool the aim has been to distil and integrate the key types of innovation identified by previous scholars and researchers. Specifically the unique types of innovation identified in previous frameworks have been identified as: Product, service, hybrid, technical, administrative, organizational structure, organizational, management, production, and businesses system, commercial/marketing. Fig. 7 is presented below.

Figure 7. Innovation-type mapping tool



Source: adopted by Rowley J., Baregheh A., Smabrock S., 2011 from Francis & Bessant, 2005

As reflected in Fig. 7, there is not only an obvious overlap between different types of innovation such as administrative, organizational structure, and people,

there is also no clear distinction between the wider categories of innovation, e.g. product and process, as a product innovation may involve a number of process innovations, or a position innovation might lead into product innovations (Rowley J., Baregheh A., & Sambrock S., 2011).

Conclusions

As emphasized in the literature, innovation can bring benefit for the all economic activity, with implementing projects; produce the new products with the new quality and help to reduce costs of production circle. Also innovations can catalyze the processes and save the time.

System, the complex nature of innovation is reflected in the complexity and diversity of the concept of innovation. It includes a wide range of innovations with varying degrees of innovation embodied in their knowledge, used in various industries and fields of activity to be implemented in different markets, etc. Classification innovation plays an important role as it allows not only streamlining existing views, but also a means of finding and identifying poorly studied issues of innovation. The laws specific to certain types of innovation cannot be shown or even have an opposite character to other species, which often leads to contradictions in the conclusions of the various innovative management theories. Typology of innovations and their classification in various substantive grounds, the criteria parameters is important not only for the development of consistent innovation management theory, but in practice and should be in the management of innovation-based. Managers of innovation in its activities should proceed from the idea that different types of innovation have their own characteristics development, implementation and dissemination, require specific management approaches, the relevant structures of innovation, its techniques and styles.

On innovation management specialists note certain regularities in the dynamics, consistency, speed of implementation of the various types of innovation.

In the practical management activities commonly used features such as the dynamics of the innovation:

- The intensity of the innovation, degree of innovation is the number of innovations carried out over a certain period of time.
- Rate of Innovation - is the speed with which the innovations introduced after they were first implemented in some other place. This indicator describes the ability to respond quickly to innovation.

Innovation Managers should be aware that different types of innovation have their own characteristics development, implementation and dissemination, require specific management approaches.

References

- [1] Afuah, A. (1998). Responding To Structural Industry Changes: A Technological Evolution Perspective. *Oxford University Press, Usa*, Vol.6, Issue 1, pp. 183-202.
- [2] Akgün, A. E., Keskin, H., & Byrne, J. (2009). Organizational Emotional Capability, Product And Process Innovation, And Firm Performance: An Empirical Analysis. *Journal Of Engineering And Technology Management*, Vol. 26(3), pp. 103–130.
- [3] Barczak, G. (1995). New Product Strategy, Structure, Process And Performance In The Telecommunications Industry. *Journal Of Product Innovation Management*, Vol. 12, pp. 224–234.
- [4] Boston Consulting Group. (2006). *Measuring Innovation*. Boston, Ma: The Boston Consulting Group Inc.
- [5] Chapman, R. L., O'mara, C. E., Ronchi, S., & Corso, M. (2001). Continuous Product Innovation: A Comparison Of Key Elements Across Different Contingency Sets. *Measuring Business Excellence*, Vol. 5, No. 3, pp. 16–23.
- [6] Cooper, R. (1990). New Products: What Distinguishes The Winners. *Research And Technology Management Journal*, Vol. 33, pp. 27-31.
- [7] Cooper, R. (1998). Benchmarking New Product Performance: Results Of The Best Practices Study. *European Management Journal*, Vol. 16, No. 1, pp. 1– 17.
- [8] Cooper, R.G., & Edgett, S. J. (1996). Critical Success Factors For New Financial Services. *Marketing Management*, Vol. 5, No. 3, pp. 26–37.
- [9] Cooper, R. G., & Kleinschmidt, E. J. (1986). An Investigation Into The New Product Process: Steps, Deficiencies And Impact. *Journal Of Product Innovation Management*, Vol. 3, pp. 71–85.
- [10] Cooper, J. (1998). *A Multidimensional Approach To The Adoption Of Innovation*, Management Decision, Vol. 36 No. 8, pp. 493-502.
- [11] Czarnitzki, D., & Kraft, K. (2004). Innovation Indicators And Corporate Credit Ratings: Evidence From German Firms. *Economics Letters*, Vol. 82, Issue 3, pp. 377-384.
- [12] Davydenko, L. (2011). *Fundamentals Of Economic Theory: Principles, Problems, Politics Of Transformation. International Experience And Belarusian Vector Of Development*. Manual, Minsk.
- [13] Dewar, J. L., & Dutton, J. (1986). The Adoption Of Radical And Incremental Innovations: An Empirical Analysis. *Management Science*, Vol. 32, Issue 11, pp. 1422–1433. Available At <[http://Dx.Doi.Org/10.1287/Mnsc.32.11.1422](http://dx.doi.org/10.1287/mnsc.32.11.1422)>.
- [14] Drucker, P. (2014). *Innovation And Entrepreneurship*. Routledge, pp. 25-36.
- [15] Elenkov, D. S., & Manev, I. M. (2009). Senior Expatriates Leadership's Effects On Innovation And The Role Of Cultural Intelligence. *Journal Of World Business*, Vol. 44, pp. 357–369.
- [16] Fischer, M. (2001). Innovation, Knowledge Creation And Systems Of Innovation. *Annals Of Regional Science*, Vol. 35, pp. 199–216.
- [17] Frascati Manual. (2004). Main Definitions And Conventions For The Measurement Of Research And Experimental Development (R&D). A Summary Of The Frascati Manual. Ocde/Gd (94)84.

- [18] Garcia, R., & Catalone, R. (2002). A Critical Look At Technological Innovation Typology And Innovativeness Terminology: A Literature Review. *The Journal Of Product Innovation Management*, Vol. 19, pp. 110–132.
- [19] Jung, D., Wu, A., & Chow, C. W. (2008). Towards Understanding The Direct And Indirect Effects Of Ceo's Transformational Leadership On Firm Innovation. *The Leadership Quarterly*, Vol. 19, pp. 582–594.
- [20] Li, L. X. (2000). An Analysis Of Sources Of Competitiveness And Performance Of Chinese Manufacturers. *International Journal Of Operational Production Management*, Vol. 20, pp. 299–315.
- [21] Linton, J. D., Walsh, S. T., & Morabito, J. (2002). Analysis, Ranking And Selection Of R&D Projects In A Portfolio. *R & D Management*, Vol. 32, No. 2, pp. 139–148.
- [22] Makri, M., & Scandura, T. A. (2010). Exploring The Effects Of Creative Ceo Leadership On Innovation In High-Technology Firms. *The Leadership Quarterly*, Vol. 21, pp. 75–88.
- [23] Mcdermott, C., & O'connor, G. (2002). Managing Radical Innovation: An Overview Of Emergent Strategy Issues. *Journal Of Product Innovation Management*, Vol. 19(6), pp. 424–438.
- [24] Montoya-Weiss, M., & Calantone, R. (1994). Determinants Of New Product Performance: A Review And Meta-Analysis. *Journal Of Product Innovation Marketing*, Vol. 11, pp. 397–417.
- [25] Pedersen, C. R., & Dalum, B. (2004). Incremental Versus Radical Change - The Case Of The Digital North Denmark Program. *10th International Schumpeter Society Conference, 2004*. Bocconi University, Milano, Italy.
- [26] Rogers, M. (1995). *Diffusion Of Innovation*. 4th Edition. New York: The Free Press.
- [27] Rowe A., & Boise, B. (1974). Organizational Innovation: Current Research And Evolving Concepts. *Public Administration Review*, Vol. 34, No. 3, pp. 284–293.
- [28] Rowley J., Baregheh A., & Sambrook, S. (2011). *Towards an Innovation-Type Mapping Tool, Management Decision*, Emerald Insight. Journal Vol. 49 Issue 1, pp. 73-86.
- [29] Siauliai A. (1979). The Essence Of The Concept Of "Innovation" As An Economic Category And Economic Systems Management, *Electronic Scientific Journal*. [Http://www.uecs.ru](http://www.uecs.ru), Date: 31.10.2013.
- [30] Mensh G. (1978). *Stalemate Ying Technology: Innovation Overcome Tae Depression*. Cambridge (Mass.).
- [31] Twiss, B. (1989). Goodridge M., *Managing Technology For Competitive Advantage: Integrating Technological And Organisational Development: From Strategy To Action*. Trans-Atlantic Publications.
- [32] Urabe, K. (1988). *Innovation and Management: International Comparison*. Berlin, New York: Walter De Gruyter.
- [33] West, M. A., Borril, C. S., Dawson, J. F., Brodbeck, F., Shapiro, D. A., & Haward, B. (2003). Leadership Clarity And Team Innovation In Health Care. *The Leadership Quarterly*, Vol. 14, pp. 393–410.
- [34] Zahra, S.A., & Nielsen, A. (2002). Sources of Capabilities, Integration And Technological Commercialization. *Strategic Management Journal*, No. 23, pp. 377–398.