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The definition and categorization of innovation

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Research Article

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Abstract

The goal of the study is to develop a theoretical model that builds on the earlier work of several authors. The article discusses the various definitions of innovation. Determining the many models, categories, and definitions of innovation is the goal of the study. We utilized a variety of bibliographical sources on efficiency and innovation in this essay, as well as a comparative study of definitions of innovation. Additionally, theoretical ideas were examined. The method was developed using market and technological perspectives and theoretical models of innovation definitions. The development of an innovation model and a comparative examination of concepts of innovation were the primary techniques used. The importance of innovation in making choices about investment projects or manufacturing investments has been highlighted in the literature. Benefits from innovation include time, money, and product savings as well as more efficient use of them. These days, one of the most crucial elements in economic growth, manufacturing, the development of a wide range of goods, and management decision-making is innovation. Investment activity is also stimulated and positively impacted by innovation activity.

The foundation of every economic activity's growth and productivity is innovation. The kind of innovation that has been used directly affects investment activity and its outcomes. Innovation efficiency measuring criteria, which are often associated with product, technology (process), and market, are mentioned in a significant number of literary works. The link between innovation and company performance has to be further investigated as a result of the usage of various measuring metrics. Our results have allowed us to identify five main categories of criteria to which different aspects might be assigned. We assign two more categories—finance and management—to the three groupings (product, market, and process). In the fields of business and design, innovation is crucial to the effectiveness of investments made in organizations, corporate activities, and governmental policies.

Keywords*:* Investments, economic efficiency, and innovation

Introduction

These days, new discoveries and technology are directly linked to all economic operations. Understanding what sort of innovation should be employed in production, scientific discoveries, project activity, the development of new high-tech items, the supply of services, and the execution of tasks is crucial for scientists and developers.

The writers of this paper looked at how innovation is interpreted. Numerous writers have gathered materials. The definition of innovation was compiled using a methodological approach, and their typology and classification of innovation were taken into consideration.

Theoretical models of innovation have been developed by numerous authors, including 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), and Frascati Manual (2004).

According to some authors, innovation is the creation of a new idea and its application into a new product, process, or service, which results in the creation of pure profit for the innovative business enterprise as well as the dynamic growth of the national economy and employment (Urabe, 1988). Although the idea of "innovation" has been the topic of several research and is often rather complicated and varied, there is currently no widely recognized definition of innovation in science. The phrase may be considered in three ways (Siauliai, 2013).

Schumpeter, who is credited with developing the notion of innovation in the economy as a whole, defined innovation as the economic effects of technical advancement and the application of novel combinations of already-existing productive forces to address business challenges (Schumpeter, 1982). Twiss defines innovation as a process that integrates science, technology, economics, and management in order to produce originality. This process spans from the idea's conception to its commercialization via production, trade, and consumption (Twiss, 1989).

According to (Afuah, 1998), innovation is the integration of new information into goods, procedures, and services. He categorizes innovations based on market, administrative/organizational, and technical aspects.

How to quantify and categorize innovation is a challenge since various authors and contemporary sources define innovation in different ways, and there are a lot of criteria and indicators involved in the categorization process.

This study aims to analyze and categorize existing innovation ideas and models. This paper's primary goals are to: a) analyze the notion and theoretical models of innovation; and b) analyze how innovation is classified.

Materials and Methods

The theoretical study of literature sources pertaining to innovation and innovation categorization forms the basis of the research technique. Numerous writers have examined concepts of innovation and developed models for both definition and categorization. Numerous literary sources have been examined in order to evaluate innovation. To determine the primary goal of innovation, the "Innovation path for efficiency of innovation to benefits" model was proposed.

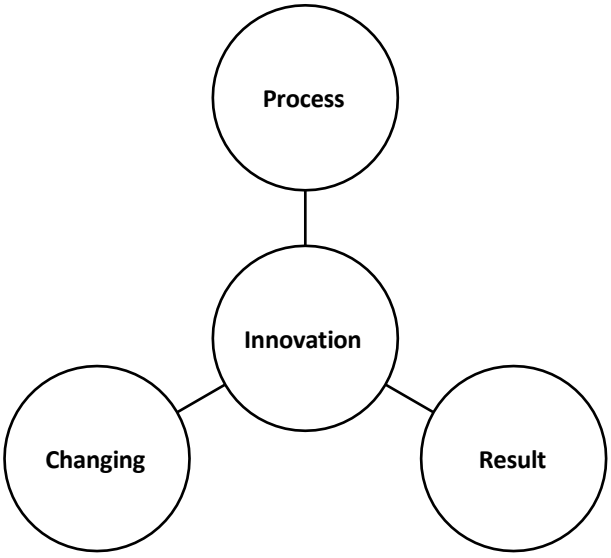
Definitions of innovation

There are representations of different writers in the approaches to the typology of distinct inventions. Institutional science also takes a unique approach to the typology of innovation as the good and the typology of the subjects of innovation; the interaction between the two reveals the benefits of using the particular innovation of certain kinds of innovation actors. The topic of this piece is thus sufficiently pertinent.

(Rowe & Boise, 1974), (Dewar & Dutton, 1986), (Rogers, 1983), (Utterback, 1994), (Afuah, 1998), (Fischer, 2001), (Garcia & Calantone, 2002), (McDermott & O'Connor, 2002), (Pedersen & Dalum, 2004), and (Frascati Manual, 2004) provide definitions of innovation.

"Innovation is the creation of a new idea and its application into a new product, process, or service, which results in the creation of pure profit for the innovative business enterprise as well as the dynamic growth of the national economy and employment." Innovation is never a one-time event; rather, it is a lengthy and cumulative process involving several organizational decision-making processes, from the creation of a new concept to its execution. The term "new idea" describes the impression of a new consumer demand or a new method of production. It is produced by combining an ever-challenging entrepreneurial vision with a cumulative process of information collection. The new concept is developed and marketed via the implementation phase, resulting in a new process or marketable product with associated cost savings and higher productivity (Urabe, 1988). Although the idea of "innovation" has been the topic of several research and is often rather complicated and varied, there is currently no widely recognized definition of innovation in science. There are three primary methods for analyzing the phrase. The categorization is shown in the following figure (Fig. 1).

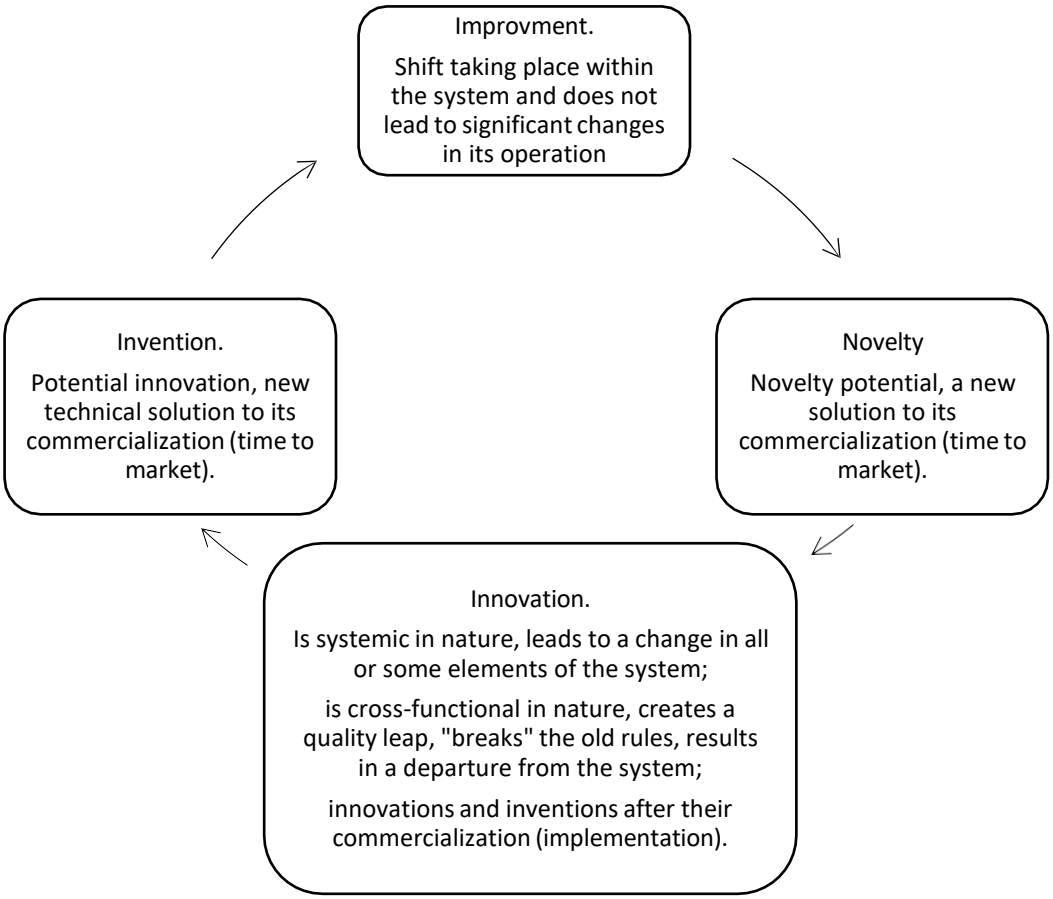
Figure 1. Approaches to the definition of innovation



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

1. Classification of innovation

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

Table 2. Classification of innovation by application

№	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

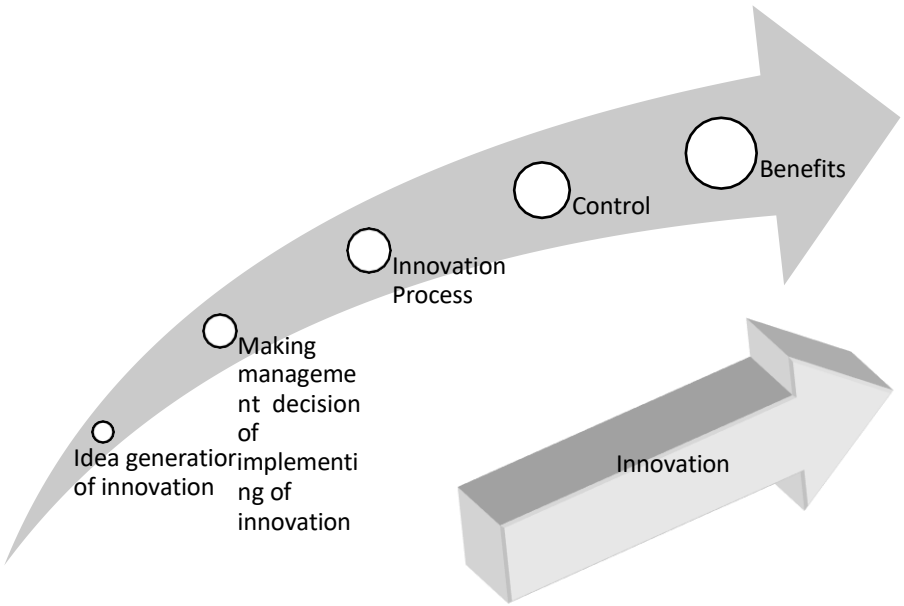
Source: Davydenko, 2011

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 paten 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;

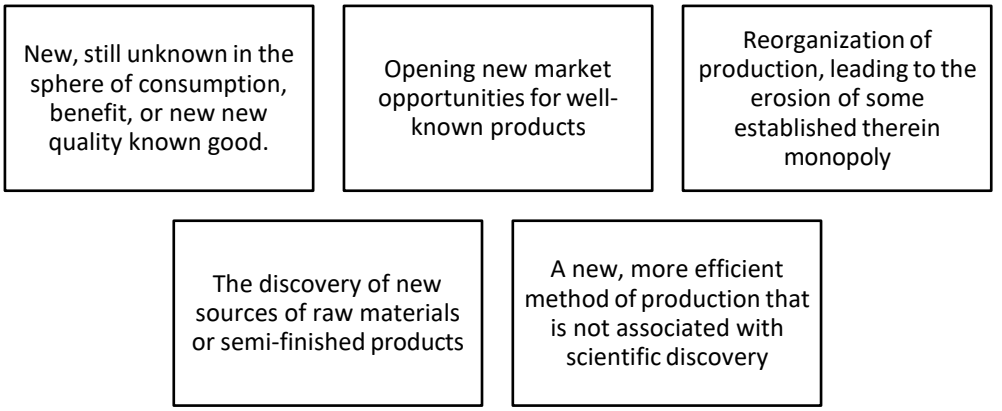
Economic results, the consequence of which is the growth of labor productivity, increase profits, increase in output;

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.

2. 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.

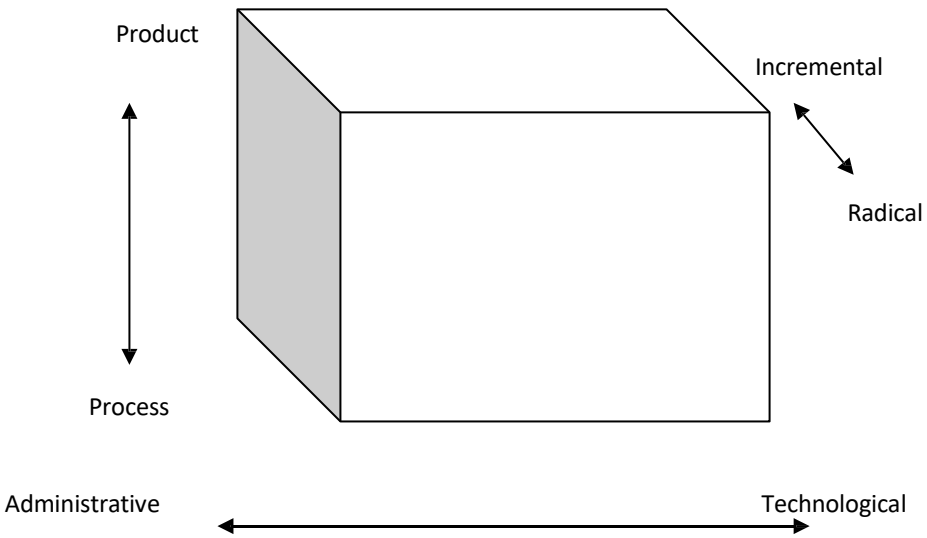
Figure 5. Types of innovation by Mensch

Basic innovations	Improving innovation	Fake Innovations
• 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 andcommercialization of their results in the emergence of new technological structures	• small but important improvement of products, processes, services • grow - continued technical improvement and innovation applied to the basic application.	• 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

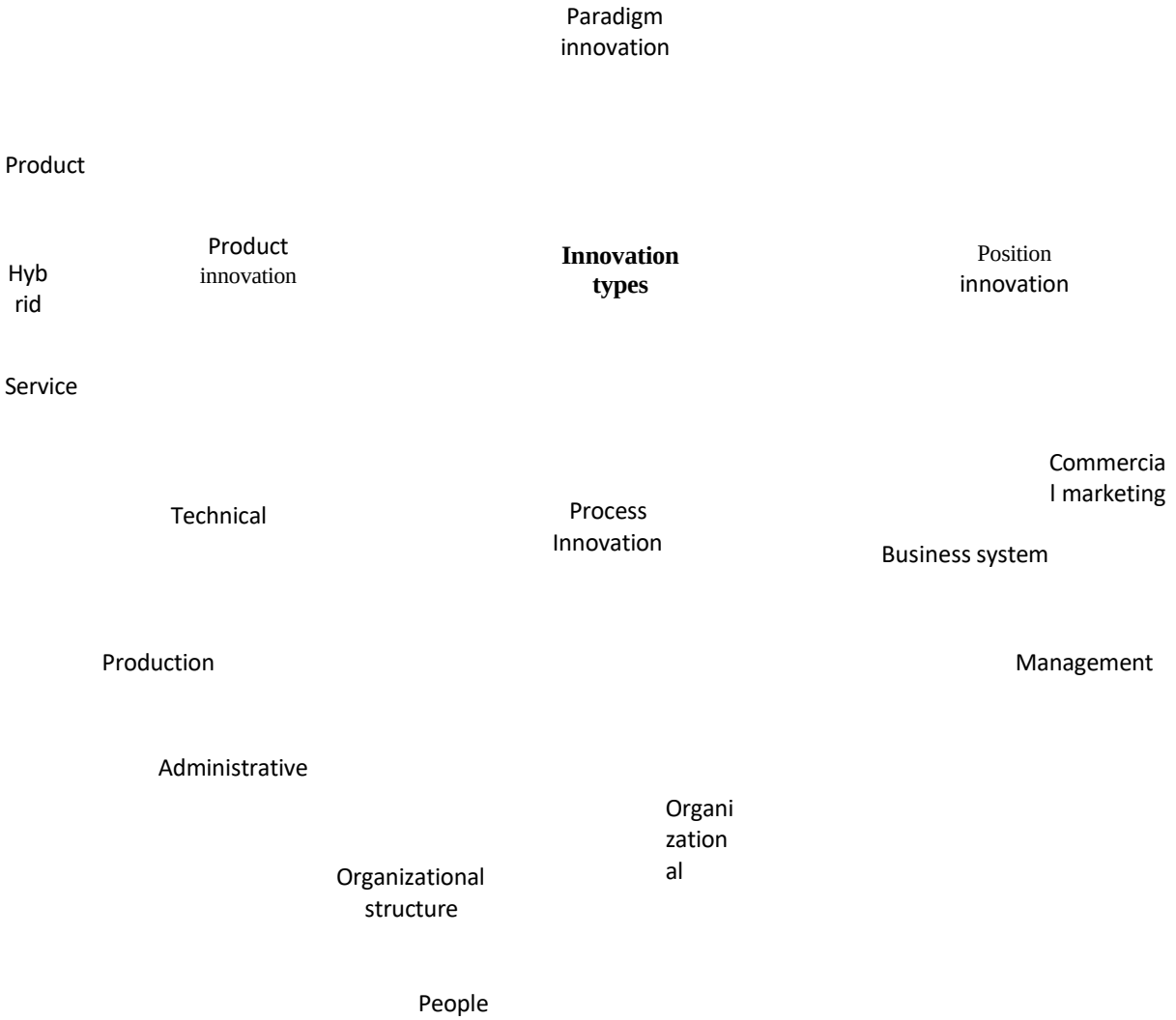


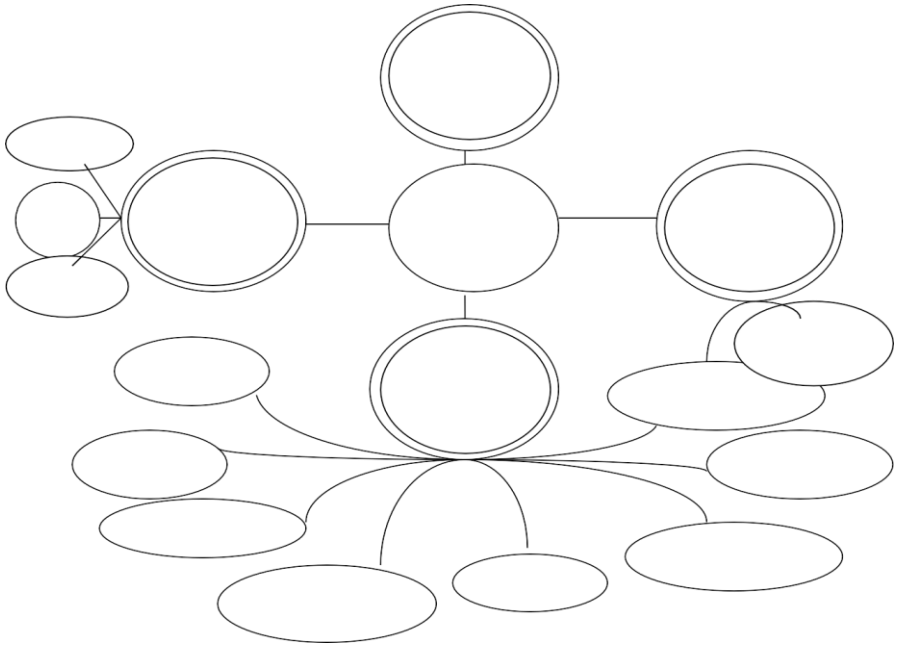
Source: adopted by Rowley J., Baregheh A., Smabrock S. 2011 from Cooper, 1998

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





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.

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