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ECOLOGICAL INNOVATION AS AN INSTRUMENT FOR IMPROVING THE COMPETITIVE POSITION OF MANUFACTURING ENTERPRISES

4.1 INTRODUCTION

At present manufacturing enterprises are characterized by the Speer of implemented changes, increase of customer expectations and strong competition at the international level. All these processes exert enormous influence on creating efficiency and image of enterprises, and sometime lead to achieving advantage over competition. Contemporary production companies must face the awareness of changing economic conditions, hence implementation of innovation and environmental innovation become a key factor for them. Operational of the requirements of the concept of sustainable development at the micro-economic level, which requires identification of new instruments for improving relations between contemporary enterprises and the environment, is the reason which encourages companies to consider the issue of innovation and eco-innovation. Contemporary firms, which compete with one another by means of the reduction of the costs of operation, and new solutions improving the environmental aspects of operation may lead to such reduction by e.g. reduction of costs of environmental fees, energy and materials saving, constitute another important factor. Background literature describes ecological innovations as one of the instruments for improving relations between enterprises and the environment. That is why the hereby paper discusses the issue of ecological innovation as instrument for improving the competitive position of manufacturing enterprises.

4.2 THE ORIGINS OF INNOVATION AND ECOLOGICAL INNOVATION

While discussing the issue of ecological innovation as an instrument exerting influence on the competitive position of manufacturing enterprises, at first the concepts of innovation and ecological or environmental innovation need to be defined. Joseph Shumpter was the first author who defined the concept of innovation. He understood innovation, which constitutes an important element of business activity, as a technological change in production of goods already used, opening new markets and new sources of supply, introduction of Taylorism, improvement of materials management, opening new enterprises, briefly speaking: doing something in a different way [16]. The origins of the

concept, as well as various ways in which it has defined in background literature over the last several dozen years are presented in Tab. 4.1.

Ecological innovation is innovation, whose basic goal is to reduce negative impact of an enterprise on the environment. The concept was first defined in 1996 by Claude Fusler and Peter James in the book Driving Eco-innovation. The authors can be described as the fathers of the concept of ecological innovation. They presented eco-innovation as new products and processes, which add value to customers and business and at the same time contribute to the reduction of negative impact on the environment [4].

Tab. 4.1 Definitions of the concept „innovation"

Authors	Definition of the concept „innovation"
J.A. Schumpeter (1960)	Innovation is a significant change of the function of production, which consists on a different than previously, combination of factors of production. Introduction of new, or improvement of existing products, methods of manufacturing, development of new markets, use of new raw materials of semi-products, introduction of new organization of processes.
P.F. Drucker (1968)	Change of products, marketing, offered price, services provided to customers, changes in organization and management methods.
S. Mayers, D.G. Marquis (1969)	Innovation is understood as commercial application of an invention. Innovation constitutes an element of the process of innovation.
W. Spruch (1976)	Something absolutely new -new at the global level, which does not have its prototype and which is the result of research and development work.
Ch. Freeman (1982)	First commercial application of an invention, New product, process or appliance.
T. Machiba, K. Olsen Frascati OECD (1993)	Innovation in science and technology is a process of transformation of a given concept into a new or improved product introduced into the market; into a new or improved operational process used in industry or trade or a New approach to service provision for the society.
Ph. Kotler (1994)	Innovation applied to any foods, services or ideas, which are perceived by somebody as new. The idea may be old, but is an innovation for somebody who sees it as new.
Oslo Manual (1997)	Introduction of new or significantly changed (improved, modernized) foods (material products or services), processes or solutions in organization and management.
T. Sztucki (1998)	Innovation is any idea, procedure or thing, which is new since it is different from the previous ones. Transformation of innovation into products or market actions means starting something completely new, undertaking complex activity or high risk and uncertainty.
A. Hargadon, R.I. Sutton (2000)	The result of exchange of knowledge from areas, which is then integrated in a new, different way, in result of which new products appear.
A. Aftach (2003)	Any change, which is new, relative to the solutions accepted in a given company.
P. Hildreth, C. Kimble (2004)	The result of exchange of knowledge from areas, which is then integrated in a new, different way, in result of which new products appear.
P. Trott (2005)	Innovation consists of a theoretical concept and technological invention, which is subsequently introduced into the market.
Oslo Manual (2005)	Innovation means implementation of a new or significantly improved product or process, a new marketing or organizational method in economic practice, organization of the workplace or relations with the environment.
A. Lamparska (2005)	Conscious modification or change of a product, process, organization or form of management, which is new in a given company.
W. Janasz (2007)	Sensu largo innovation means any change in production which consists in the adoptions of the acquired knowledge. Sensu stricto innovation is a change in manufacturing methods based on knew, or so far unused knowledge.

Source: [6]

In later publication, many other definitions of the concept can be fund. According to M. Carley and P. Spapens ecological innovation is intentional action characterized by resourcefulness, including the stage of product design and integrated management within its life-cycle, which contributes to pro-ecological modernization of the societies of the industrial age, while taking into account ecological problems in the process of developing products and related processes. Eco-innovation leads to integrated solutions whose goal is to reduce outlay on resources and energy, and at the same time improve the quality of products or services [1].

According to M. Dąbrowska eco-innovation means any forms of innovative action whose aim is to improve environment protection in a significant way. Eco-innovation include new production processes, new products or services, new business and management methods, whose implementation contributes to environment protection or significantly reduces the threat to the environment and negative results of the use of raw materials [2]. A similar definition was suggested by K. Rennings, who observed the concept of ecological innovation includes all actions of significant subjects (enterprises, politicians, associations, churches, households), responsible for initiation, application and implementation of new ideas and forms of behavior, production processes and products, whereas the environment is protected or the ecological dimension of sustainable development is supported.

4.3 TYPOLOGY OF ECOLOGICAL INNOVATION IN MANUFACTURING ENTERPRISE

The Oslo handbook suggests the following definition of innovation: implementation of a new or significantly improved product (material product or services) or process, a new marketing or organizational method in economic practice, organization of the workplace or relations with the environment [18]. The concept can be also described as „the result of creative activity aimed at introduction of changes in the system of functioning of an organization, applying to products, processes or management, which meets its needs and brings benefits in the form development, profit or prestige" [12]. Ecological innovation can be defined as innovation aimed at sustainable development achieved by reduction of the negative impact on the environment or improvement of efficiency. It happens by more effective use of available resources. The goal of ecological innovation is to control ecological problems and threats, and reduce resulting effects. The concept evolves, which means that it responds to changes [20].

Ecological innovation was subject of research already at the end of 1970s. It is considered to be the factor, which puts emphasis on pro-ecological economy. Eco-innovation contributes to the reduction of negative impact of enterprises on the environment, and supports their dynamic development [24]. Furthermore, the Oslo handbook distinguishes four types of innovation:

- product innovation,
- process innovation,
- marketing innovation,
- organizational innovation.

The first type, product innovation, is defined as introduction of a product or service, which is New or significantly improved in respect of its features or applications. This includes significant improvement in respect of technical specifications, components, materials, embedded software, operation or other functional features [18]. Products and services may be described as products. Product innovation includes not only implementation of new services or products, but also modernization of the existing ones. The following are examples of product innovations: first microprocessors, digital cameras, introduction of the GPS system, ABS breaking systems, but also: cameras in mobile phones, new and more effective medicines, self-service banks, Internet services such as banking or payment systems.

Process innovation is understood as: innovation within the process means implementation of a New or significantly improved method of production or delivery. The category includes significant changes in technology, facilities and/or software [18]. Within the framework of this kind of innovation companies may introduce new machines or facilities, which reduce the costs of production, new form of delivery, improve the quality of products or offered services. Enterprises may also improve or introduce completely new products. Process innovation, among others, includes: laser cutting tools, automatic packing of products, introduction of bar codes or RFID chips, new or better computer networks, and the GPS system in transport, introduction of better or new software, and introduction of IT systems in companies.

Another type of innovation, that is marketing innovation, is defined as implementation of a new marketing method connected with significant changes in the design/ construction of the product, packaging, distribution, promotion or price strategy [18]. The aspiration to satisfy customer needs in consideration of environmental needs may lead to the introduction of the following changes [15]:

- design and packaging (new and attractive design, form),
- promotion and advertising of services (e.g. product placement),
- sales methods (licensing products, new forms of product presentation),
- pricing strategy for products and services.

Marketing innovation may contribute to opening new markets or change the image of products offered by a given firm. The last of the above mentioned type of innovation, organizational innovation, is defined as implementation of a new organizational method in the principles of actions accepted by a company, organization of the workplace or relations with the environment [18]. Enterprises, while wishing to improve their efficiency, introduce changes in the organization of internal process in companies. They may result in the improvement of working conditions of the employees (which results in higher staff satisfaction) or lowering costs (administrative, supply and transactional). It is, however, impossible to speak about organizational innovation if a firm introduces changes which were used previously in other departments of the company. Instances of organizational innovation include cooperation with universities or other research institutions, introduction of quality control standards for contractors or sub-contractors, or introduction of training programmers.

At present ecological innovation plays a significant role. This is the result of the processes of globalization, with which ecological innovation is strictly related. Two significant roles can be ascribed to ecological innovation. At first innovation supports economic development. Lower production costs, development of markets, improvement of the company's image, development of the job market, reduction of unemployment etc. the second role of ecological innovation consists in its positive influence on the environment, reduction of pollution and more conscious use of resources [20].

4.4 ECOLOGICAL INNOVATION AS AN INSTRUMENT FOR IMPROVING COMPETITIVE POSITION

At present entrepreneurs increasingly more often implant ecological innovation in their branches. In order to show how eco-innovation contributes to the development of firms, increase in their attractiveness and credibility, and they help to achieve desired results, several concepts have to be clarified. First of all: what is competitive position? Various definitions of the concept of competitive position can be found in background literature. In the „Compendium of Knowledge about Competitiveness", the authors state that „Competitive position should be understood as the result of the process of competition, i.e. competition in the sense of its result. Competitive position is the result of application of a specific competition strategy directed at a specific competitive potential." [5]. Thus, generally speaking, competitive position applies to the placement of a given enterprise, its products and services on the market in such a way so that it could compete with other firms by means of certain measures. Among others, these measures include:

- business profitability;
- costs;
- market share;
- product or service characteristics relative to the competition;
- the extent to which the company is recognized on the market, and the way it is perceived;
- trust, loyalty to the company and brand;
- possibility of appearance of fake or substitute products.

These are only some of the measures of the position of the enterprise on the market. The measures change depending how big the market is, whether it is a local, international or global market. The total concept of the competitive position refers to a much wider idea, which is competition.

There are numerous definitions of competition. Even according to E. Skawińska, the concept of competition cannot be defined accurately [23]. In colloquial language it is often described as the ability to compete. It has to be remembered however, that completion has existed from the beginnings of trade. It is one of the basic elements of the market. There are many instrument of competition such as: product quality, price, product variety, frequent introduction of new products, the extent of adjustment to customer needs, availability of products or services, advertising, information etc. What is important when we talk about competition? At present we view competition in the perspe-

ctive of the international market, especially in the EU countries [16]. There is a conviction that before achieving success on the international market, companies should win with the completion on their local markets [23]. So at first enterprises must win competitive advantage locally.

There are other approaches to defining competition. D. Hübner understands „international competitiveness of the national economy as its price and non-price competitiveness" [8]. U. Płowiec shares such views, however adds that „competitiveness of an enterprise means profitability of its production higher from current interest rates and significant chances of long-term development in result of the company's inclination to technological and organizational innovation, which enable achievement of appropriate rents, and in consequence leadership in a given branch of production" [19].

Can ecological innovation be also treated as instruments for improving competitive position? SONY is one of the pioneers in introducing eco-innovation in manufacturing their products. It runs active policy on the basis of the „Road to zero" plan, whose final outcome is to reduce interference in the environment to zero. According to Kazuo Hirai, the President and CEO of Sony Corporation, „[…] in order to accelerate actions related to the environment, we developed goals Green Management 2020. While approaching the accomplishment of these goals, the entire group, including branches dealing with entertainment and electronic, will use all efforts to take advantage of their strong points and carry out planned tasks" [7].

What form of Eco-innovation was used in production? One of the most important ones was SORPLAS – plastic, whose composition in 99% consists of recycled materials. The material, developed by SONY scientists does not include any petroleum compounds, whereas the 1% is non-combustible compounds. This is a success, since in the production of such materials, among others, chlorine, bromine, phosphorus and sometimes paraffin are used [11]. According to Sony Corporation, what follows is that in the process of combustion of SORPLAS the emission of carbon dioxide is reduced by as much as 80% [3], and additionally its construction facilitates multiple recycling with no loss and the process of recycling is much cheaper. And what is used in the production of this type of plastic? For instance: plastic bottles, waste CDs or DVDs, photo sheets etc. The material is used in almost all products, and in 2015, for the first time in eight years, thanks to the sale of consoles or cameras, the company was successful [21].

Other companies also take advantage of Eco-innovation. For instance Siemens modernized buildings, which contributes to the reduction of costs of maintenance and heating. During a debate on June 25th, 2012 in the office of Responsible Business Forum, M. Guttman said that „if it had not paid, the firm probably would not have survived" [9]. Available data indicates that after one year of operation of the building, the emission of the carbon dioxide fell by 34 kg per square meter.

The Heat and Power Plant in Częstochowa increased the amount of bio-mass in the combustion process. Thanks to the implementation of this technology, Fortnum expected economic profit at the amount € 298 900 [15]. Combustion with the use of bio-mass is practically free of carbon dioxide emission. This is one of the most modern heat and

power plants in Central in Eastern Europe. Between 2010 and 2015 its power output increased from 64 to 68.4 MW and from 120 to 129.1 MW respectively.

During the 17th International Environment Protection Fair in Kielce in 2016, LSA was awarded with a medal for innovative and ecological process of production of Certyd, lightweight aggregate. The aggregate is produced in Poland and production process was patented in Poland [13]. It is manufactured in result of „high temperature agglomeration of previously prepared anthropogenic materials in controlled conditions […], ash from the combustion of hard coal in fine coal boilers of the Białystok Heat and Power Plant" [14]. Thus, a Polish company became a highly recognizable enterprise offering innovative and ecological solutions, and hence proved that Polish firms may become world market leaders in respect of introducing eco-innovation in production processes.

CONCLUSIONS

Pro-ecological approach exerts pressure on the change of previous views and update of current knowledge in view of changing environment. The concepts of innovation and eco-innovation evolved over the years. Particular approaches and views changed. New types or groups were identified.

In the context of competitiveness of enterprises, Eco-innovation undoubtedly improves the competitive position of firms on the market. They trigger the development of new, environment-friendly technologies, whose diffusion is desired. Enterprises investing in eco-innovation are more attractive and credible to customers, which supports the achievement of assumed results.

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Abstract: *The paper discusses the question of ecological innovation in manufacturing enterprises as an instrument for improving their competitive position. On the basis of the analysis of background literature, the origins of the concept of innovation and eco-innovation are presented, as well as typology of its forms used in practical operation of contemporary production firms.*

Key words: *ecological innovation, manufacturing enterprises*

INNOWACJE EKOLOGICZNE, JAKO INSTRUMENT POPRAWY POZYCJI KONKURENCYJNEJ PRZEDSIĘBIORSTW PRODUKCYJNYCH

Streszczenie: *Artykuł podejmuje zagadnienie innowacji ekologicznych (eko-innowacji) w przedsiębiorstwach produkcyjnych, jako instrumentów poprawy ich pozycji konkurencyjnej. Na podstawie analizy piśmiennictwa omówiono w nim genezę pojęcia innowacja i eko-innowacja, jednocześnie przedstawiający typologię ich form występującą w praktyce funkcjonowania współczesnych firm produkcyjnych.*

Słowa kluczowe: *innowacje ekologiczne, przedsiębiorstwo produkcyjne*

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