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THE NATURE OF INNOVATION AND ITS INTERNAL AND EXTERNAL DETERMINANTS. THE FUNCTION OF NETWORK CONNECTIONS

Introduction

The notion of innovation may be classified among fuzzy and imprecise categories. It is generally agreed that the innovation is always related to progress. According to the literature, two main approaches to the subject may be proposed. In the first one, which may be described as the narrower one, the innovation is defined as the change in products and production methods. The basis for this change is new or as yet unused knowledge. In the other approach, which by contrast to the former may be called the broader one, the innovation is associated with any kind of change in production based on acquiring new knowledge. The hypothesis is innovation encompasses a variety of cooperative activities centered in the development of new products and processes. As a relational process, innovation involves a diversified group of actors connected by linkages with different degrees of intensity. The present article is focused in the cooperation determinants of innovation networks.

Into economics, the theory of innovation has been introduced by Joseph Alois Schumpeter (1883-1950), who is perceived the father of the theory. According to his definition, the innovation is "the discontinuous run of new combinations existing in five instances" (Schumpeter, 1960), which are as follows:

- the introduction of a new product which has yet to be made familiar to customers;
- the introduction of a new production method which still needs to be tested in the particular branch of industry;
- opening a new market for that branch of industry regardless of its previous existence;
- acquiring new resource of materials or semi-finished products;
- reorganizing industry, *e.g.* creating or abolishing the monopolistic situation.

As presented by J. A. Schumpeter, the nature of innovative activity amounts to the concept of so-called creative destruction, which consists of continuous destroying old structures, and an unceasing process of creating new, more effective ones.

Schumpeter suggests that, if new and utilized, the object of innovation may be one of the following:

- the product;
- the production process;
- the organization.

The cases mentioned above make it possible to identify the very nature of innovation, which falls into three categories that may be named as follows: technical, organizational, and economic.

In the last years, the impact of innovation itself on increasing efficiency of managing processes is observed. The phenomenon may be attributed to the growing needs of the society, meeting of which is possible only by proper and successful use of science and its achievements. The contributory factors behind the possible effect of innovation on the social and economic growth may be the following:

- a strong connection between science, production, the domestic and international market resulting in aiming the scientific research for meeting the needs of the market;
- allotting considerable financial resources to scientific development, with the result that modern, highly-efficient equipment and personnel is produced;
- confronting innovation as a separate process requiring proper management on each and every level of organization: from a company, region, country, to European Union as well.

Innovation leads in turn to the reduction of prices, creation of demand, increase in pace at which a particular organization develops. Additionally, innovation may be attributable to more profitable investments and the increase in capabilities. Moreover, innovation appears to be related with efficacy, competitiveness, and trade exchange. Therefore, it seems reasonable to assume that the creation and absorption of innovation is the biggest challenge in the 20^{th} century.

1. The nature of innovation within an organization

An organization may be defined in various ways. Probably the most widely acknowledged definition is the following: ‘An organization is a group of people who work together in an arranged and coordinated manner, in order to achieve some goals’ (Griffin, 2008).

To introduce innovation, it is vital for an organization to have access to any sources of innovation, and to create a system of information on existing solutions and methods of using them. If, however, those solutions are absent, or it is impossible to use them under any license, the organization is compelled to seek for new idea on the outside, or to create one by itself. For those ideas to be beneficial, it is necessary that they be formulated, analysed, and adapted to their realization capabilities.

'Anything, only if it generates certain ideas, thoughts, or projects, may be the source of innovation, and lead to seeking or discovering the new, undertaking new enterprises, realizing and improving those projects' (Penc, 1999).

Innovations have their origins in creative ideas which, eventually, turn into inventions, products, services, processes, and methods. Being vital for innovation, creativity is based on building connections. It is impossible for experiencing and managing individuals to be innovative if they fail to have passion (Rózga-Luter, 2004). One also needs to be of great vision in order to develop one's imagination. It is widely supposed that success in innovation depends on the following conditions:

- the use of new ideas;
- feasibility;
- economic justification;
- client-orientedness;
- atmosphere for innovation in the organization.

Examining the innovation as a process resulting in higher competitiveness, it may be reasonably argued that the innovation process utilizes every management strategy, namely the technical management (information, technology, human resource, and economic management), social subsystem's management (political, status, authority, personnel, awards, and culture management), creating and maintaining a set of commonly shared values, views, and assumptions that affect the behaviour of employees in particular organization. Among inspirations of the current research, there is the newly developed EU's strategy called the 'Europe 2020', which includes the following interrelated priorities (Janasz & Kozioł-Nadolna, 2011, pp. 123-160):

1. Intelligent growth: the development of economy based on knowledge and innovation.
2. Balanced growth consisting of supporting an effective economy, which, being friendly and competitive, utilizes resources.

3. Growth facilitating social inclusion: supporting high-employment level economy, which ensures social and territorial cohesion.

In the New Strategy for Advancement of the Economy of the European Countries (Europe 2020), we can see the sustained, albeit not yet met, Lisbon Strategy demand for the expenditure on RD (*i.e.* research and development) to amount to 3% of GDP by 2020. As for the New Strategy introduced in the Nordic Co-operation Programme for Innovation and Business Policy, five operational plans may be distinguished, which are as follows (Janasz & Kozioł-Nadolna, 2011, pp. 1-2):

- Access to innovation and cross-border trade.
- Development and sharing new qualifications, as well as innovations.
- Creating grounds for co-operation.
- Improving conditions for innovation and trade exchange outside the Nordic countries.
- Supporting and implementing political initiatives.

It can be seen from the previous discussion that indices, typically used in studies on business activity, imply that the innovation of Polish entrepreneurs differs significantly from the majority of the EU countries, which concerns not only product and process innovations, but also organizational and marketing novelties. The significance of the latter is increasing in the modern world.

2. Innovation determinants

Growth of the economy, and the standard of living in a country depends on the increase in the value of goods and services being produced in that country. To reach a certain level of economic growth, it is necessary to reconstruct those economy sectors where the higher efficacy of work, and the higher productivity of other factors are achieved. In many of developed countries, the driving force behind the structural transformations is the manufacturing sector. This is due to the unprecedented scale of innovativeness that may be found within this branch of economy.

Every human accomplishment, as well as their innovative activity may be related to developmental factors. If, for instance, restructuring is aimed at enhancing the production of goods for the export, its physical potential itself should be the basis of how the process of restructuring is perceived. To be able to manage the innovation determinants, first we must refer to the environment and its processes, energy of which is utilised as stimuli for

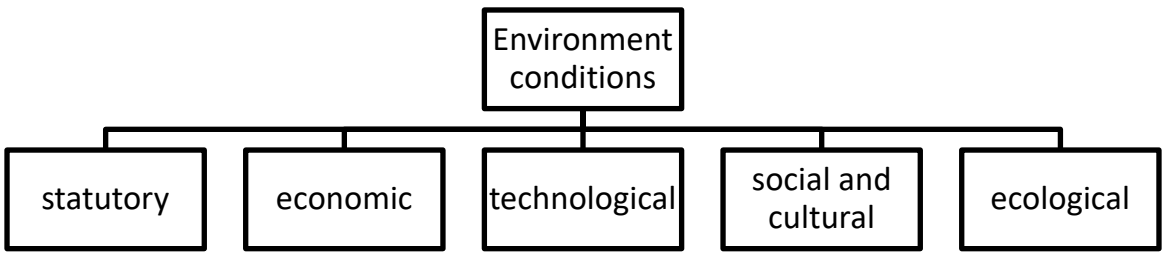
innovation. The environment's potential is contributory to innovation. However, the structure of the environment is complex. Among the innovation determinants, the following factors may be listed (Wiszniewski, 1999; Janasz *et al.*, 2001):

- general aspects, *i.e.* the institutions and general conditions that limit the scope of innovation;
- the science and technical base, *i.e.* the science and technical institutions supporting innovations;
- technological transfer determinants, *i.e.* human, social, and cultural factors affecting the learning process and the transmission of information to companies;
- the innovation driving force, *i.e.* the dynamic conditions influencing the innovative process within organizations.

One of the characteristics of the above-mentioned classification is that its first element refers to innovation determinants whereas the last relates to the innovation driving force placed within the organization. While absorbing energy from its environment, this 'driving force' is capable of releasing the innovative force of the firm.

Having acknowledged its possibilities, risks, and limitations within both macro- and microenvironment, the organization may then adopt an appropriate strategy.

As A. Pomykalski concludes: 'The microenvironment may be, to some extent, modified to fulfil the needs of organizations taking this action' (Pomykalski, 2001).



Based on Kreikebaum, 1997.

The microenvironment includes more unique factors related directly or indirectly to the particular organization. To identify and analyse the company's environment, the so-called 'business line structure model' by M. E. Porter is usually adopted. According to this concept, the microenvironment involves the following elements:

- a supplier,
- a purchaser or recipient,

- existing or potential rivals,
- surrogates,
- obstacles to entering and leaving the market.

The externality concept, pertaining to both domestic and international effects, has contributed to the identification of external innovation determinants. The concept explains how the innovative activity of one company, although unintentional and non-profitmaking, influence other firms. This impact, and therefore external effects, may be positive (the so-called 'spillover'), which occurs when the innovative activity of some companies proves to have a stimulating effect on others, leading to innovations. If the influence is negative, it causes the companies to be 'driven out' of the market (this is the negative external effects of knowledge). Moreover, the effects may be of price or non-price nature. In the former case, the innovation introduced by some company leads to significant fall in production costs, enabling prices to be lowered, and to surpass competitors in the market. In the latter case, the innovation results in a new product which makes the rivals' ones obsolete. The research on externality has led to the concept of National Innovation System, which has been more and more often utilised in innovation politics of developed countries. According to this concept, the creation and diffusion of knowledge is heavily influenced by the interaction of different entities and institutions, particularly the research institutions, economic and market entities, as they provide goods and services.

The last of the relations listed above is being referred to as the innovative market relation. The concept of the National Innovation Systems emphasizes the significance of external innovation determinants. Introducing this concept into the innovation policy of the European countries has resulted, among others, in acknowledging the demand connections between companies generating the flow of innovation among them (demand-driven innovation). The previous models of innovation were centred on supply determinants, *i.e.* innovation recourses of companies (Wziątek-Kubiak & Balcerowicz, 2009).

Analysing the RD work as a particular activity of firms requires a broader perspective on its determinants. A determinant itself (from the Latin "determino" meaning "I define", "I set") is a factor which functions as an indicator (indicating something) (Tokarski, 1980). In other words, it is an index, a characteristic of something (Kopaliński, 1989, p. 117). A stimulus, on the other hand, is defined as a reason to act, an impulse or an incentive (Tokarski, 1980, p. 708).

The RD activity of companies and whole country economy depends on various factors pertaining to the scope and level of this activity, among which the following may be listed (Pawłowski, 2005, p. 29):

1) The invention capacity to create and introduce innovation in different RD sections indicating constructive creation and transformation into realistic designs, which in turn may be utilised in RD sections of a company to maintain or increase its competitiveness. The intellectual potential of employers, and the effectiveness of managers are the main areas to shape this factor.
2) The ability to absorb innovation, *i.e.* the pro-innovation attitude of employers and managers as a part of RD policy of the company (the so-called internal absorbency). Among factors influencing this feature, there are, above all, employee participation, intellectual potential, and efficiency of managers.
3) Structural capacity to improve the competitiveness, *i.e.* the virtual possibilities to increase the share of the market. Those possibilities are a part of the technical and organizational infrastructure, the main element of which being the structural capital.
4) The product innovation development competency (*i.e.* the ability to improve the particular product or entire range of goods) based on the acquired technical and technological, as well as economic potential.
5) The technical and technological capability relating to the attractiveness of the owned technique and technology in RD sectors. The main areas to affect this factor are the following: the technical and technological potential, economic potential, and company's intelligence.
6) The ability to fund the RD activities and actions supporting the company's competitiveness. This capacity is based on current surplus and feasible funding, both from internal and external sources. Among the main problems pertaining to this factor, there are property and capital structure, anticipated cash flow, and funding possibilities.

In their paper (Birchall & Armstrong, 2001, pp. 37–45; Niedzielski & Rychlik, 2006, pp. 94–96), D.W. Birchal and M.S. Armstrong presented all factors relating to the RD activity of the companies, grouping them into four main categories. Their model consists of the following elements:

- external environment, *i.e.* all the factors within the economic, legal, and technological environment of the company, especially those determinants

connected with the line of business, in which the company operates; it is this environment from which all new knowledge and information on new technologies originate;

- internal environment, *i.e.* factors which themselves may be managed by the company; it includes the strategy of the company, owned and used technologies, and complex social relations within organizational and research units of the firm;
- RD process, relating to factors that are closely connected with research processes such as RD process administration, RD process supervision and management;
- development management, *i.e.* determinants related to people in the company; it includes the organization capability to learn based on intellectual capital gathered within the company.

Additionally, the following determinants of RD activity within companies may be listed:

- internal processes running in human psyche, involving motivational predisposition and creative activity;
- service processes consisting of scientific research system, scientific, technical, economic, and organizational information system, as well as educational system;
- extra-economic regulators involving legal norms, and administrative regulations.

It is worth mentioning that some of the above-mentioned external determinants are interventionist in nature. For those companies which invest in new technologies, it is possible for the country to interfere in order to increase their share of the market using legal instruments of influence. The function of the government, the social and political climate, and the RD policy of the country are thus evident.

Another group of factors relating to innovation are internal (also called endogenous) elements. Their source may be traced back to financial and non-financial components of companies running RD work. In this group, *inter alia*, there are the following elements (Kolarz, 2006, p. 57):

- the company's expense on RD work;
- the number of staff and its qualification, as well as research experience, and information systems' efficiency;
- communication within the company, and motivation of the employers.

Among the internal determinants of innovation, the following may be listed:

- factors directly influencing innovation, called the innovation resources;

- factors indirectly influencing innovation, determining whether the innovation activity is commenced by the company.

The innovation resources, which, as it was stressed above, have direct influence on innovation, include:

- Hidden resources of human capital (including education and qualification), *i.e.* knowledge and skills of the employed, being the result of formal training, both general and specialist, and acquired experience. It is worth mentioning that the nature of human capital, as well as scientific research, may be perceived as twofold: as a source of new knowledge, and, at the same time, as the main factor behind the adaptation and absorption of external knowledge. Similarly to the scientific research, the human capital has a dual role in the innovatory process.
- Resources of accumulated knowledge which may be measured in expenses on scientific research, and the number of RD staff. Those resources involve scientific research led within the company, and in cooperation with other entities, both domestic and international ones.
- The resources of physical knowledge in the form of purchased equipment and buildings.
- The resources of non-physical knowledge, *i.e.* the purchased licences and patents.
- The resources of external knowledge, purchased in the process of absorbing the positive external effects of knowledge from the environment, other entities in the market, and the cooperation with those entities (*e.g.* production, commercial, or financial connections).
- Commercial resources.
- Organizational resources.

3. The function of network connections

The notion of a network involves different kinds of formal and informal connections between units and organizations. The network structure allows companies to access knowledge, economizing on time and money. Defining the network, it may be stated that it consists of clients, rivals, suppliers, research institutions, schools, non-profit organizations, all of which are connected, and produce innovations (De Jong *et al.*, 2008, p. 17). The network is a set of actors linked together by a set of relations. According to another definition, the

network relates to a particular type of connections between given set of persons, objects, or phenomena (Plawgo & Klimczuk, 2014 pp. 305–307).

Innovative networks consist of the following elements (Markowski, ROK, p. 22):

1) scientific pole (*e.g.* universities, scientific institutions);
2) technological and industrial pole (*e.g.* technological centres, implementation facilities);
3) market pole (*i.e.* distribution networks).

The network-like nature of connections within innovative process denotes that new technological and organizational solutions are created to be transferred and utilised in economy. This process is feasible due to the knowledge produced within the network as a result of interaction and cooperation between those within the network. According to A. Koźmiński (2005, p. 40), it is this essential function of the network that is to share knowledge, leading to variability of networks which, therefore, are unpredictable and generate uncertainty.

The type of the network is determined by the relations between entities. The following kinds of networks may be listed:

1) social networks;
2) intra-organizational networks;
3) inter-organizational networks.

Social networks are based on informal, personal contacts, and provide information in initial stages of company's development. Later, the intra-organizational and inter-organizational networks (involving suppliers, recipients, science, or authorities) become more and more significant as it facilitates access to specific resources and information.

According to C. Mesjasz (2008, p. 37), when international companies (or trans--national corporations) are considered, the most important are intra-organizational networks, although internal network companies are frequently a part of inter-organizational networks. Inter-organizational relations are usually defined as influence occurring between companies which participates in informational or financial exchange, provided that both sides display involvement (Czakon, 2005). Proposed in the paper by Brilman, the classification of company networks is of traditional nature.

The following types of relations between organizations may be listed as follows:

- integrated networks consisting of dispersed entities such as subsidiaries and agencies (*e.g.* banks, post offices).

- federated networks created in order to fulfil shared needs (*e.g.* associations, cooperatives).
- contractual networks joining independent partners under the terms of contracts or franchise;
- direct connection networks (or direct selling networks).

Different units of corporate groups, within which innovatory Polish companies operate, seems to be the most important source of information for those companies. This is proven by nearly half of Polish firms that introduces innovations.

What is distinctive for Polish innovatory companies is that, apart from clients, rivals, and companies within the same line of business, they derive information from conferences, as well as scientific, technological, and trade publications. The government policy of supporting companies at fairs and exhibitions proves itself to be effective. One of indirect determinants of company innovation is the accessibility of funds, which may be recognized as the decisive factor in the companies' capability to finance innovation and taking risk relating to development and implementation of innovation. The significance of this factor may be described with the use of innovation obstacle analysis, or, to be more exact, elements curbing the innovatory activities of companies.

In Poland, companies usually confront four types of obstacles:

- financial difficulties;
- knowledge-related hindrances;
- market-related obstacles;
- other difficulties, usually pertaining to costs.

In relation to innovatory activity, as much as 30% of Polish companies have stated that the lack of funds, even within corporal groups, is a major hindrance. The significance of this problem for Polish companies is also proven by PARP surveys. The inaccessibility of external funds that might be used by companies to finance innovation appears to be the obstacle to introduce new products for as much as 26% of Polish innovatory companies, while high costs of innovation were pointed at by not more than 32% of them.

Another, in regard of hindrance to innovatory activity of companies, noteworthy problematic issue is the unpredictability of the demand for new products. As much as 16.6% of Polish companies recognize the unpredictability of demand as very significant obstacle to innovation, whereas the same factor is acknowledged by 9.4% of Finnish innovatory companies. The same applies only to 12.8% of British companies while in Germany only to as

much as 4.7% of innovative firms. Most of the Polish innovatory companies, however, admits that their access to information on the market and technology is acceptable. On the other hand, not much than 5% of Polish firms report inaccessibility to information on the market and technology, which is similar to Finnish and British indices of the comparable phenomenon. However, for companies in Finland and Great Britain, the unpredictability of demand seems to be of less significance, which may lead to conclusion that Polish innovative firms lack the knowledge of market potential, and that they fail to be aware of this fact. A small fraction of companies (not more than 7.3%) experiencing the shortage of qualified employees indicates lower technological advancement and concentration of complementary innovation. It also suggests that the majority of Polish companies refuse not only to plan the transition to more advanced complementary innovation, but also to appreciate the quality of human capital in the process of introducing innovations. Even though organizational innovations have been introduced, most companies fail to recognize the significance of improvement, and how valuable a contribution qualified employers make to organizational changes (Wziątek-Kubiak & Balcerowicz, 2009).

Conclusion

The article assumes implicitly three basic elements that provide a territorial framework to the knowledge creation process: institutions, routines and cumulative knowledge. Institutions are the foundations for the innovation process, creating stability in uncertainty. Routines reflect embedded knowledge in organizations, which were created through experience. The systemic perspective of innovation is particularly relevant as it integrates complex interrelations among enterprise, science and technology, and governance spheres, infrastructure, and institutions. It is particularly important how innovation relates with different patterns of collaborative activities regarding production, exchange and knowledge transfer. In parallel, the study is interested in understanding the different behaviors of innovation actors and their likelihood to engage innovation.

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Abstract. *In this publication the author discusses the following place of innovations in development of organization, essence of innovation, essence of innovation management and role of workers and clients in innovations creating process. The aim of this article is to analyze and evaluate the role of innovation in the process of enterprise management. The results of the research indicate the existence of numerous ideas and innovations in companies. Employees are usually creative and engaged. The study and review of literature shows that the role of innovation in management is very important.*

Keywords: *innovation, innovation networks, innovation system, network connection*