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The role and importance of open innovation

Abstract: *The paper analyzes open innovation as a modern model of innovation, which is becoming increasingly important due to the limiting factors of closed innovation and the impossibility of the closed innovation model giving results in solving current problems. Open innovation represents a model of innovation, where the boundary between the organization and the environment is no longer so pronounced.*

Open innovations provide wider opportunities for the application of innovations, both their own and those coming from the environment. This suggests a business model that boils down to the approach that cooperation is better than competition. Open innovation is a more profitable way to innovate: it can reduce costs, accelerate time to market, increase market differentiation and create new value streams for the company. Transitioning to an open innovation model is not an easy task and certainly implies a good understanding of the advantages and disadvantages of open innovation on the part of the management, as well as the awareness that open innovation takes a long time to become successful in their organization.

The subject of this paper is in the form of a question: what is the role of the concept of open innovation in introducing new processes, achieving competitiveness and

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representation in modern industries? By establishing a model of open innovation, organizations promote their own innovative activities, cooperation with other organizations, exchange of ideas, resources and technologies, and in the end better satisfaction of consumer needs is achieved. The goal of the paper is to research how, through which factors and mechanisms the open innovation paradigm contributes to the introduction of new processes, in which way open innovation is key in achieving competitive advantage, as well as the impact of absorptive capacity and the representation of open innovation in various industries.

The contribution of this paper is reflected in the overview of theoretical facts specific to open innovation and drawing conclusions about the contribution of open innovation to the introduction of new processes and gaining competitiveness on the market as well as the representation of open innovation in various industries.

It can be concluded that open innovation is an important element of the spread and development of new technologies, considering that knowledge becomes widely available, that due to the incorporation of external knowledge, the costs of research and development are reduced, and that cooperation and collaboration are the basic characteristics of the environment in which organizations function.

***Keywords**: Open innovation, absorptive capacity, competitiveness*

Introduction

As innovation is advanced through open innovation, the transformation from closed to open innovation is inevitable. By establishing internal R&D activities, the absorptive capacities of organizations are developed, which will enable the appropriation of benefits from ideas and innovation activities that are the result of the action of external innovation sources. Organizations by establishing a new open model, i.e. models of *open innovation* using both their internal and external ideas contribute to the unification of creative potential.

In processing the topic, it is necessary to consider the impact of open innovation on the introduction of new processes in organizations and on the creation of a competitive advantage on the market. In the model of open innovation, there is a wide possibility of applying both own innovations and innovations that come from the environment. The model of open innovation, considering that it unites more talents,

creativity and more new ideas, certainly contributes to the better development of all organizational processes.

In this paper, the concept of open innovation is defined, a comparative view of open versus closed innovation is given, including the benefits, but also the disadvantages of open innovation, open innovation is presented through the prism of the introduction of new processes, competitiveness on the market and the intensity of representation in various industries. The paper is divided into 4 sections and is based on an analysis of the literature that defines the concept of open innovation, states the theoretical framework of the advantages of open over closed innovation, the benefits of open innovation in the domain of introducing new processes, achieving competitive advantage and implementation in various industries.

Literature review

It has been confirmed in the literature that the *model of open innovation* is increasingly important, precisely because of the benefits it provides, given that organizations can use external knowledge in an almost identical way, as well as internally, but according to clearly defined rules.

The term and definition of open innovation

In today's global competition, companies have realized that they can not innovate alone by focusing on their own skills, resources and expertise. The term open innovation was promoted by Professor Henry Chesbrough, Executive Director of the Center for Open Innovation at Berkeley University. Open innovation is a paradigm that assumes that organizations can / should use internal and external ideas, internal and external knowledge in order to improve technology and also market ideas externally. „Open innovation is the alternating use of purposeful inputs and outputs of knowledge, in order to accelerate the internal process of innovation and increase the market for the external use of innovation.” (Chesbrough, 2003:1).

The main idea behind OI (open innovation)[2] was that firms can and should apply external ideas and resources, as well as internal ones when they want to improve their innovation process. „Valuable ideas can come from inside or outside the company and can go to market from inside or outside the company. This approach places external ideas and external routes to market on the same level of importance as that reserved for internal ideas and routes. ” (Chesbrough, 2003:43). A number of analysts goes a step further by arguing that this model represents much more than simply using other people's ideas and technology. „ It represents a change in the way of use, management, employment, and creation of intellectual property in the knowledge economy.” (West i Gallagher, 2006:351). According to the model of open innovation, internal and external knowledge have equal value and equal usability.

Open innovation emphasizes the importance of business models and the following definition of OI is based on the business model concept: „Open innovation is a distributed innovation process based on purposefully managed flows across organizational boundaries, using monetary and non-monetary mechanisms consistent with a business organizational model. ” (Chesbrough i Bogers, 2014:27).

To benefit from an open innovation model, it must create additional value for customers, but companies must also be able to absorb most of that value. This is a direct result of the important link between companies' efforts to implement open innovation models and their strategies through the business model concept. The connection between people and organizations has allowed people and organizations to share ideas and knowledge to turn them into something new.

Open innovation is a modern model of innovation. The phenomenon of open innovation has become increasingly significant in recent years. „The open innovation model allows companies to transform their hard boundaries into semi-permeable ones membrane that allows innovations to move more easily between the external environment and the company's internal innovative processes. ” (Stanković, 2014:199).

[2] In the rest of the text, we will use the abbreviation (acronym) for open innovation - OI, which is normally used in the literature.

From closed to open innovation

It is characteristic of the closed innovation model that (enterprises that create innovations must do everything themselves: to come up with an idea, produce, distribute and service). Control, which does not allow competitors to use ideas for their own profit, is of great importance for the success of closed innovations. The model of closed innovation is a paradigm that suggests companies to be independent, because they can never be sure enough about the quality, availability and reliability of other people's ideas. Under the closed innovation model, companies invest in innovation, and innovation leads to discoveries that help firms achieve higher levels of sales. The profit made is used to reinvest in research and development. The disadvantage of this model is that companies invest in the knowledge and skills of their employees, and if employees leave the company, the company is at a great loss. Companies, because of that lose a qualified employee and there is a greater chance that the competition will use their information.

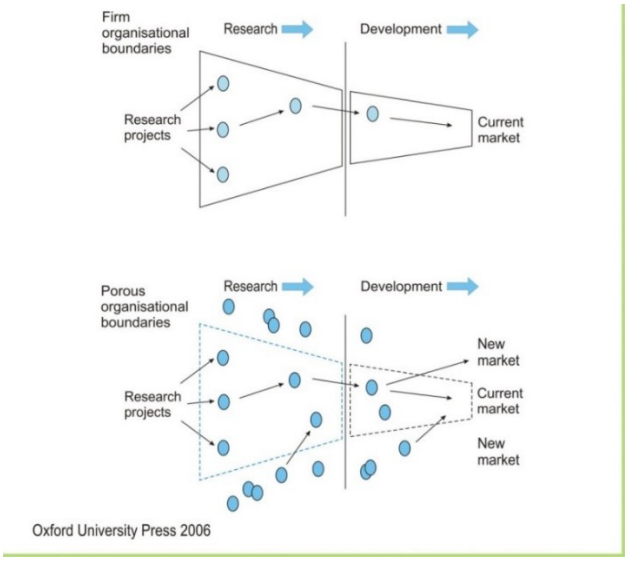
Over time, the intensity of production increased, so that even companies that had developed R & D could not rely on their own R & D, which led to the fact that solving complex problems requires an interdisciplinary approach. Organizations in order to reduce costs engage in open innovation to find more efficient ways of doing things through the acquisition of new process technology. Companies entrust other organizations areas for which they are not sufficiently competent, and develop technological knowledge in the most important areas by their own efforts.

Unlike closed innovation, open innovation implies that organizations can and should use external ideas, knowledge and technologies, in an almost identical way as internal ideas, knowledge and technologies. Henry Chesbrough believes that the business model of closed innovation has faced declining efficiency due to two facts: a) growing costs of technological development and b) shorter and shorter shelf life of new products.

According to Chesbrough, several significant factors have led to the erosion of closed innovation:

- The mobility and availability of highly educated people has increased over the years. As a result, large amounts of knowledge exist outside the research laboratories of large companies. In addition, when employees change jobs, they take their knowledge with them, resulting in knowledge flows between firms.
- The availability of venture capital has increased significantly recently, which allows good and promising ideas and technologies to be further developed outside the firm, for example in the form of entrepreneurial firms.
- Opportunities for further development of ideas and technologies outside the company, for example in the form of spin-offs or through licensing agreements, are growing. Finally, other companies in the supply chain, for example suppliers, play an increasingly important role in the innovation process. (Chesbrough, 2003.) Figure 1. shows a graphic view of closed and open innovation.

Fig. 1. Closed Innovation versus Open Innovation, Chesbrough, Oxford University Press (2006)



Source :https://medium.com/alan-advantage/open-innovation-models-and-best-practices-e2e732a38155

Also, we provide an overview (table1) that indicates the key differences between open and closed innovation.

Table 1: closed/open principles of innovation

Principles of closed innovation	Principles of open innovation
Competent people from the field work for us	Not all competent people in the field work for us. We have to find to work with competent people inside and outside the company
To profit from IR, (research and development) we must discover, develop and launch ourselves	External IR (research and development) can create significant value: Internal IR (research and development) is needed to participate in creating part of that value
If we discover something ourselves, we will be the first to market	We don't have to start research to profit
The company that brings the innovation to market first will win	Building better business models is better than a ″first to market″ approach
If we create the highest and best ideas in the industry, we will win	If we make the best use of internal and external ideas, we will win
We should control our intellectual property so that competitors do not profit from our ideas	We should profit from other people's use of our IP (intellectual property) and buy other people's IP whenever it improves our business model

Source: https://openinnovation.eu/open-innovation

From the previous points, we can summarize, with the help of Le Merle and Campbell, what are the advantages of open innovation:

•a huge space of innovators working on technologies, products and services of importance to the company

• reduced costs associated with an increased portfolio of innovations;

• risk is reduced because others invest their human capital to work on risky proposals;

• accelerated time to market as innovation is freed from the shackles of cumbersome financial, planning and manufacturing processes of large companies. (Le Merle i Campbell, 2011.).

Benefits of open innovation through the prism of new processes, competitiveness and representation in industries

„Open innovation is the use of dedicated inflows and outflows knowledge to accelerate internal innovation and expand markets for external use of

innovation, respectively. This paradigm assumes that companies can and should use external ideas as well as internal ideas as well as internal and external pathways towards the market, while they want to improve their technology. ” (Chesbrough, 2006:1). Process innovation, as one of the four basic types of innovation, is defined as follows: „ Process innovation is the implementation of a new or significantly improved way of production or delivery. This includes significant changes in technique, equipment and/or software. ” (OECD, Oslo Manual, III ed. 2005). „The main factor in the process phase of open innovation is finding innovative ideas and establishing access to the network with the external environment. ” (Wibisono, 2021:145). „ Innovations do not refer exclusively to the development of new and improvement of existing products and processes, but also include innovations in the field of marketing management, and especially innovations in the organizational sense.” (Ilić i Marković, 2014:195).

Application of innovative technologies is a key factor of competitive advantage. „The phenomenon of openness becomes a key factor for building a competitive advantage in the network economy. In the model of open innovation, the role of external partners grows; this happens in all phases, i.e. generation, selection of ideas, transformation into innovative solutions, commercialization and diffusion of innovations.” (Skrzypek i Sagan, 2018:104). According to research from 2021, innovation is recognized as an essential part for the growth of companies and maintaining competitiveness and achieving high profitability. To this goal, companies must constantly improve their innovation efforts and explore new opportunities for commercialization. Furthermore, innovation plays a significant role in ensuring high productivity of organizational processes and it becomes an ongoing process as it evolves. However, there are many complexities and uncertainties in innovation management. This has led to various models that systematize the innovation process in order to drive successful and sustainable innovations. (Werasinghe, 2021.).

Managers may choose open innovation for a variety of reasons. It is important to set clear rules for open innovation. The rules help to know exactly what to expect from the process. It is necessary to have clear information about the problem to be solved, a reward system so that people give their maximum contribution, it is

necessary to know who owns the intellectual property, if the organization decides to adopt an innovation as a result of open innovation, how and when people should submit ideas.

Some studies have shown that open innovation has become a basic condition for the long-term survival of high-tech companies. Despite the fact that OI originally appeared in the high-tech sector, there has been an increase in articles investigating innovation processes in the low-tech sector. The most researched industry in the low-tech sector is the food industry. „The proclivity towards open innovation in the agri-food sector in the researched sample of companies in the agri-food sector in Serbia is 27.62%. This result supports the view in the literature that the propensity to open innovation is also shown in companies that are not in high-tech industries, as well as in small and medium enterprises. ” (Zakić, Bugarčić i Milovanović, 2017:70)

Processes of open innovation

According to Purificat, open innovation is a more profitable way to innovate: it can reduce costs, accelerate time to market, increase market differentiation and create new value streams for the company. (Purificato, 2014.) There are three different models of open innovation. These are „ acquisition of external technology in open research processes (inbound innovation - Inside-out process); external transfer of technology in open processes of exploitation (outside innovation - outside in process); and coupled innovation.” (Bigliardi, Ferraro, Filippelli and Galati, 2020:1). Below we will consider each of these three innovations.

Outside-In process innovation is the exploitation and integration of external knowledge as a way to exploit, use and improve technology. Through this combination of internal ideas and external knowledge, company is able to create value for customers and compete in the market. Input OI activities include cooperation with other companies or universities, participation of research and development institutions for product development, involvement of clients or end users in activities related to

product development and acquisition of intellectual property rights from external organizations (Bigliardi, Ferraro, Filippelli i Galati, 2020.).

Inside-Out process of innovation implies that ideas and technological knowledge move from the company in which they are located to external companies as a way to obtain economic income. In other words, there is an exploitation of internal knowledge by stakeholders. These activities include the company's participation in new initiatives arising from previously of developed products or from the development of technologies and products through external input. It „includes licensing, selling patents, or duplicating technology by channeling ideas or knowledge into an external technology market. ” (Bigliardi, Ferraro, Filippelli i Galati, 2020:2).

Coupled innovation implies the joint application of both input and output activities of OI. In other words, to bring new ideas to the market, companies develop and commercialize the innovation at the same time. In general, companies carry out coupled OI activities when they are involved in various interactions with other companies. These relations can refer, for example, to a cooperative model of research and development aimed at acquiring and providing complementary knowledge. (Bigliardi, Ferraro, Filippelli i Galati, 2020.).

Research method

The research method applied in this paper is a systematic analysis and synthesis of views from the selected literature on the topic of defining open innovation, the principles and benefits of open innovation through appropriate explanations and examples of open innovation implementation, as well as the impact on the introduction of new processes in organizations, increasing competitiveness and adoption in the industry. Numerous topics were reviewed, data was analyzed, data extraction and integration were performed in order to process the topic of *the role and importance of open innovation*.

Hypotheses

Bearing in mind above mentioned the analysis of the model of open innovation and the possibility of its application, we set the following hypotheses:

H1-Open innovation increases the probability of introducing new processes in organizations

H2-Open innovation contributes to the creation of a competitive advantage in the market

H3-Open innovation is not equally adopted in all industries

Analysis and proof of hypotheses

In the analysis of the first hypothesis (*H1-Open innovation increases the probability of introducing new processes in the organization*), we start from the position that *the model of open innovation* implies a process of intensive exchange of ideas, knowledge, resources and technology between organizations, considering the boundaries between organizations and the environment are no longer so pronounced. Generally speaking, considering organizations can use both external and internal ideas, share knowledge, resources and technologies, organizations are more likely to improve their processes and introduce new processes. The probability that an organization will introduce a new process will be higher if the organization is more capable of open innovation.

According to Chesbrough, open innovation is a more distributed, more participatory and decentralized approach to innovation. (Chesbrough, 2003.) This approach is a great way to access external knowledge and find new ways of doing things. Collaboration is necessary to develop open innovation, because open innovation is a complex process. Cooperation in innovation enables the organization to acquire the necessary skills, technologies, funs and other resources from the partner. Sharing resources increases the ability and flexibility of the company in implementing its innovative projects, especially considering that some organizations do not have enough resources. „ Individual organizations do not have enough resources to conduct research independently, but they can cooperate, buy, rent or license processes or

inventions (patents, intellectual property, etc.) with other companies, organizations or institutions." (Nikolić, 2014: 80).

Horizontal cooperation with similar companies is an important element of open innovation, but it also includes "vertical" cooperation with customers, suppliers, universities, research institutes, etc. (WIPO, 2011.). Open innovation is a paradigm that assumes that firms can and should use external and internal ideas to improve their technology. In order to analyze the influence of ideas from the external environment, it is necessary to keep in mind that open innovation can be viewed through three dimensions:

- cooperation with external partners,
- information obtained from an external source i
- procurement of external research and development

Each of these dimensions of open innovation affects / contributes to the introduction of new processes in organizations and is therefore explained in more detail below.

Cooperation with external partners. Open innovation through the dimension of cooperation with external partners (suppliers, users, competitors, research organizations and universities) enables easier access to additional resources and external knowledge that can be used to increase the probability of introducing a new process. Consumers are also of great importance for the development of the concept of open innovation. Many consumers are innovation-oriented, tend to improve the existing products and services of companies and thus become innovators themselves. (Bogers, Afuah, Bastion, 2010.). Many organizations and companies have implemented open innovation initiatives, and the results have confirmed positive effects. The Coca-Cola Company, for example, one of the most prominent food companies, used an open innovation initiative for a "freestyle dispensing machine." This machine had the ability to allow customers to mix their own flavors and suggest a new taste for Coca-Cola products. Today, the company involves customers by allowing them to suggest and mix their own flavors in a free dispensing machine. With the mobile app, customers can record their favorite new flavors and get them from other machines in different locations.

For small companies, a simple customer idea portal represents the best form of open innovation. This type of *crowdsourcing* tool is a low-cost and low-risk way for users to contribute ideas for products and services. For larger companies, there is access to more resources necessary to manage a formal open innovation process, such as an innovation competition, a dedicated client co-creation project, or public joint ventures. Open organizations maintain good relations with universities because academics have knowledge about specific aspects of organizations.

Information obtained from an external source. The most important thing is that firms have sufficient absorptive capacity to identify valuable external information, to integrate it into internal innovation processes and to commercialize it. The absorptive capacity view emphasizes the importance of firms being able to acquire and effectively incorporate new information (external knowledge).

Procurement of external research and development. Research and development is heart of the innovation system. With closed innovation, it is understood that the organization invests in its own R&D activities, such a company must employ the best and most intelligent experts who deal with innovation activities. Research and development (R&D) includes activities that companies undertake to innovate and introduce new products and services. It is often the first stage in the development process. The goal is usually to bring new products and services to market and add to the company's bottom line.

The results of research and development of other organizations can create value that can be profited from, and it is very important to develop absorptive capacities through internal R&D activities that will enable the appropriation of benefits from ideas and those innovative activities that are the result of the action of external innovation sources.

Open innovation has reduced costs, and it also enables the reduction of direct investments in internal research and development, while a part of that investment must be set aside for surveillance systems and cooperation with external agents. In open innovation, cooperation with universities, research institutions, cooperation with other companies and engagement of numerous external resources through an open call is expected. Outside the company, there are many high-quality

experts with excellent ideas, cooperation with them leads to the development of innovative systems, and therefore to the probability of introducing new processes. An example of open innovation is in the biopharmaceutical industry, through the collaboration of universities, companies and other participants in the production of the Astra Zeneca vaccine.

„ It should be noted that the Covid-19 pandemic has become a challenge for research and development cooperation between companies, universities and other entities in the entire biopharmaceutical research and development, as well as an opportunity to join the research and development potential in the new biopharma-university alliance. Biopharma-university inter-industry alliances and public-private partnerships significantly increase the chances of creating better medical therapies for patients because they enable greater synergistic effects, as well as speed and agility. ” (Runiewicz-Wordyn, Eliashvili, 2022:38).

The results of research and development of other organizations can create value that can be profited from, so it is very important to develop absorptive capacities through internal research and development activity that will enable the appropriation of benefits from ideas and innovative activity resulting from the action of external sources of innovation. A high level of cooperation with external parties (external partners, information obtained from an external source, as well as procurement of external research and development) increases the ability of the organization to introduce new processes.

The above statements and examples allow us to state that our first hypothesis („ open innovation increases the probability of introducing new processes in the organization”) has been confirmed.

In the analysis of the material for the second hypothesis (*H2: Open innovations contribute to the creation of a competitive advantage in the market*), we start from the position that with new products and new services of organizations and companies gain a competitive advantage. Competitive advantage on the market is achieved by the speed of introducing new, advanced products/services that meet the needs and demands of consumers as an essential link in modern business. Competitive

advantage can be characterized as a set of factors that distinguish a company from its competitors, which is why it gets a unique position on the market.

As Daničić emphasizes, competitiveness represents the ability of a company, organization, society, and even a nation to offer products and/or services that meet the quality standards of local and world markets at prices that are competitive, but that enable business profitability. In the long run, such capabilities are exclusively realized through innovation. (Daničić, 2013.).

Lajović and Vulić point out that „Schumpeter was the first scientist who noticed the importance of the development of a new product for economic development, considering that the competitiveness of a company that is achieved by introducing a new product is far more significant than that which is based on marginal changes in the prices of already existing products. Innovations are, according to Schumpeter, new products, new methods of production, new sources of supply, new markets and new ways of organizing work. Schumpeter defined innovation as „ a new combination of existing resources . ” (Lajović and Vulić, 2010:59).

Absorptive capacity is widely recognized as an effective tool for gaining and maintaining competitive advantage. Absorptive capacity (ACAP) is the potential of a business entity to „ identify the value of new, external information, assimilate it and apply it for commercial purposes.” (Cohen and Levinthal, 1990:128).

According to the OECD (Organization for Economic Cooperation and Development), innovation is the implementation of a new or significantly improved product (good or service) or process, a new marketing method or a new organizational method in business practice, workplace organization or external relations.

The open innovation model brings together more talent, creativity and more new ideas. Successful innovation is often created in a cooperative manner with external actors. By applying open innovation methods, an organization can overcome its local partiality in the search and obtain precise information about needs and therefore innovate more successfully and cost-effectively. A successful strategy of the open innovation model means that the organization should find creative ways to use internal innovations and available external innovations that contribute to the development of the organization and enhance the competitive advantage of the

business entity. Having an innovation does not mean that companies immediately have a sustainable competitive advantage. In order to use innovation to gain competitive advantage, companies and other business entities, „ must have appropriate strategies to use these innovations in a proper way. ” Shkipe, Gadaf i drugi, 2013:11).

Innovation strategy is a key factor for sustainable competitiveness for the following reasons:

- open innovation is a successful way to create user-driven innovation by involving customers in the product development process;
- open innovation directly involves the customer in the process of product development and co-design, while in some cases the customers in return receive fees or some benefits related to the product;
- open innovation processes enable companies and their collaborative partners to reach new and targeted markets;
- access to new technological solutions/opportunities;
- reduction of costs of the innovation process and faster placement on the market;
- based on technology platforms, companies with external participants can risk sharing and large investments in infrastructure and research equipment, as opposed to individual investments that are very expensive and risky;

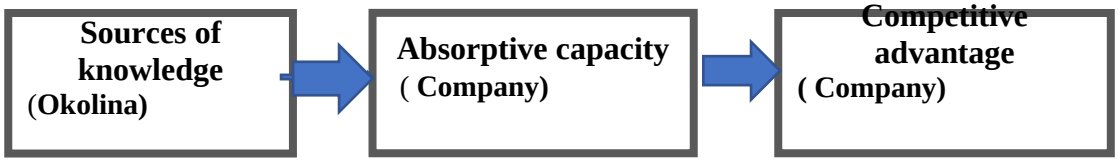
All these benefits from the implementation of an innovative strategy ultimately lead to the sustainable competitiveness of the company. „ To be competitive, an individual organization can not innovate in isolation; with valuable external knowledge, the company must be able to increase its own strengths and speed during the implementation of innovations, as well as complement internal knowledge.” (Ibrahimov, 2018:701).

We can state that all of the above confirms our second hypothesis („ open innovation is very important and contributes to the creation of competitive advantages on the market ”).

Our third hypothesis *(H3: Open innovation is not equally adopted in all industries)* aims to examine and prove the representation of open innovation in different industries. We start from the fact that in an increasingly dynamic business environment, it is important for manufacturing organizations to open their borders and exchange technology and knowledge with other external partners. Also, it is important

that the organization has a good level of absorptive capacity. Absorptive capacity is key in explaining why some companies are much better than others at creating, developing and applying value, from acquiring externally developed technology to collaborating with partners who develop and continuously rely on innovation. As Wilkinson notes, absorptive capacity is an organization's ability to identify, assimilate, transform, and use valuable external knowledge, research, and practice. In other words, absorptive capacity is a measure of the rate at which an organization can learn and use scientific, technological or other knowledge that exists outside the organization and is actually a measure of the organization's ability to learn. (Wilkinson, 2018.).

Figure 2 - Linking knowledge sources, absorptive capacity and competitive advantage

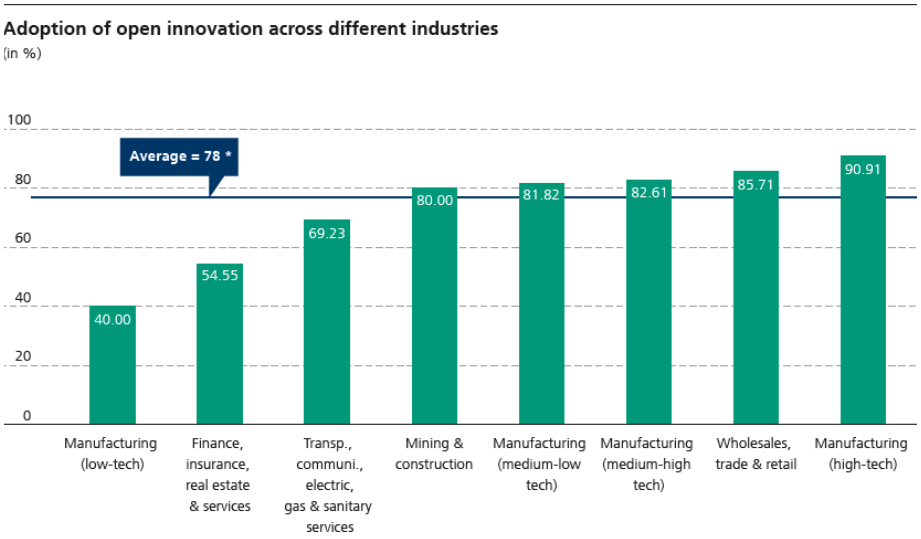


Source: personal account

Open innovation provides an overview of how absorptive capacity contributes to open innovation in an industry and contributes to competitive advantage and how companies can benefit from external sources of knowledge as we can see in Figure 2 - Linking knowledge sources, absorptive capacity and competitive advantage.

Industrial innovation is becoming more open, and changes in the way companies manage innovation are very important. Open innovation mainly started in the high-tech sector as shown in Figure 3. The adoption of open innovation has different dynamics in different industries, but there is a new trend for the low-tech sector to take advantage of the potential of opening up its innovation process. Drivers and barriers to open innovation can depend on the type of industry. Research conducted in the past period confirms that open innovations are most prevalent in high-tech production sectors and wholesale, trade and retail. Low-tech manufacturing sectors and financial services show the lowest rate of open innovation adoption.

Figure 3: Adoption of open innovation in different industries



Source: Managing open innovation ina large firms, Survey report / Executive survey in open innovation 2013, Henry Chesbrough hass school of business US Berckeley, Sabine Brunswicker, FraunhoferInstitute for Industrial engineering, Fraunhofer society.

One study, funded by the Workforce Information Council, found that the high-tech sector can be defined as an industry with a high concentration of workers in STEM (science, technology, engineering and mathematics) occupations and that it increasingly embraces open innovation. (Wolf i Ferrel, 2016.).

Based on the Statistical Classification of Economic Activities in the European Community (NACE), the industry is organized by technological intensity: low-tech, medium-low-tech, medium-high technology and high-tech manufacturing industry.

High technology includes the production of basic pharmaceutical products and pharmaceutical preparations, the production of computer, electronic and optical products, the production of air and space vehicles and accompanying machines.

Low technology is present in the production of food products, the production of beverages, the production of tobacco products, textiles and clothing, the production of leather and related products. Then there is the manufacture of wood and wood and cork products, except furniture, the manufacture of straw products and knitting

materials, the manufacture of paper and paper products, printing and reproduction of recorded media, the manufacture of furniture, as well as other manufacture excluding the manufacture of medical and dental instruments and accessories.

Despite the fact that OI originally appeared in the high-tech sector, there has been also an increase in papers (especially articles) investigating innovation processes in the low-tech sector. The most researched industry in the low-tech sector is the food industry.

High-tech and medium-high-tech production is much more related to OI research than low- and medium-low-tech production. Key issues for open innovation are: maximizing the return of internal innovation, recognizing/incorporating external innovation, and motivating the ongoing flow of external innovation. To achieve this, companies need to explore the environment, develop the ability to absorb external knowledge, share or grant IP (Intellectual property), and provide rewards and structures for contributions. High-tech manufacturing industry is more suitable for these principles than low-tech manufacturing.

The high-tech manufacturing industry corresponds more to these principles than low-tech manufacturing, and therefore open innovation is more accepted in the high-tech sector, although there is a noticeable increase in the number of researches in the low-tech sector as well. This gives us arguments to state that our third initial hypothesis („Open innovations are not equally adopted in all industries") has been confirmed.

Discussion

Summarizing the role and importance of open innovation, and through the analysis of the available literature, it was confirmed that open innovation is a complex process that is achieved through cooperation with new partners, through the use of information from an external source, as well as through the procurement of external research. As not all good ideas are within one's own company, not all ideas should necessarily be further developed within the boundaries of one's own company. Companies can find vital knowledge from customers, suppliers, universities, national laboratories, consortia, consultants and even start-ups. With adequate absorption

capacity in companies, it is possible to introduce new processes. It is important that open innovation is embedded in the business strategy. Through the connection of scientific-theoretical facts specific to open innovation and examples from practice (Astra Zeneca, Coca Cola, etc.), the concept of open innovation is confirmed in this paper.

Also, absorptive capacity has a strategic role when introducing new processes, competitiveness and implementation in industries. Absorptive capacity can be considered an effective tool for gaining and maintaining competitive advantage. Thanks to innovations, companies stay ahead of their competitors and achieve a competitive advantage. In order to be competitive, companies must become aware of the increasing importance of open innovation.

„ Basically, competitiveness represents the ability to reach a higher level of profit compared to the average achieved by other organizations in a certain branch of industry, that is, the ability of a specific organization to be more successful than relevant organizations that deliver similar products or services." (Sajfert i Pavlović, 2009:9). Open innovation enables companies to implement business models that generate higher profits. Awareness of external knowledge and technology in order to achieve and maintain competitiveness is very important, and companies in order to be competitive need to use external knowledge.

Open innovation depends on the open character of the business model. Although open innovations in the initial period were more prevalent in the high-tech sector, in the previous period there are more and more open innovations in the low-tech sector, and research in that sector is also increasing.

The reason for the greater representation of open innovation in high-tech industries is in greater absorption capacity, in providing rewards, sharing knowledge, because the first factor in the process of open innovation is an innovative idea and access to the environment.

Restrictions

This paper represents an attempt to point out the importance of the implementation of open innovations through the prism of introducing new processes,

achieving competitive advantage, as well as the different representation of open innovations in various industries. Namely, through the clarification of the role and importance of the open innovation model, universal relations were identified. This paper can be greatly expanded by introducing additional research. Although it is generally established that the introduction of open innovation contributes to the introduction of new processes, increasing the competitive advantage, and that open innovation is not equally adopted in all industries, it is necessary to determine the relationship more precisely in the extended research through conducted surveys. Research would be conducted in an appropriate number of organizations (high and low technology organizations), through survey questionnaires with the following possible initial research questions:

- Are new processes/products introduced as a result of own work or in cooperation with other institutions and companies? (With which?)
- Does the organization have a general business strategy in which the strategy of open innovation is incorporated as a key factor of sustainable competitiveness?
- Bearing in mind the previous two questions, what is the motive in your organization for introducing open innovations?

Conclusion

Unlike the closed innovation model, the open innovation model is based on the use of external ideas, knowledge and technologies in an almost identical way as internal ideas, knowledge and technologies.

Because of the permeable boundaries, it is possible to easily transfer innovations internally and externally and therefore share the risk as well as the income.

The model of open innovation, by incorporating external knowledge, reduces research and development costs, faster time to market and better quality products, while connectivity and cooperation are the basic characteristics of the environment in which organizations operate.

Cooperation with external partners, information obtained from external sources and procurement of external research and development are of key importance in the context of open innovation. The success of open innovation within an organization depends, among other things, on the absorptive capacity of the organization.

By establishing an open innovation model, organizations increase:

- the probability of introducing new processes in organizations
- creating a competitive advantage on the market.

Open innovation has not been equally adopted in all industries because exploring the environment, developing the absorptive capacity of external knowledge, sharing or giving away intellectual property, providing rewards and contribution structures is more accepted in the high-tech sector.

Being innovative is a key issue in the process of value creation and growth of enterprises (business entities), and it is increasingly evident that companies must innovate in order to gain and/or maintain their competitive advantage.

REFRENCES

- Bigliardi, B., Ferraro,G., Filippelli, S. i Galati, F. (2020). ″The influence of open innovation on firm performance". *International Journal of Engineering Business Management* vol.12.
- Bogers, M., Afuah, A. i Bastian, B. (2010). Users as innovators: A review, critique, and future research directions. *Journal of Management, 36*(4).
- Chesbrough, H. (2003). *Open innovation The New Imperative for creatng and Profiting from Technology.* Boston: Harvard business school
- Chesbrough, H. i Bogers, M. (2014). Explicating Open Innovation: Clarifying an Emerging Paradigm for Understanding Innovation. In H. Chesbrough & W. Vanhaverbeke (Eds.), *Open Innovation: New Frontiers and Applications* J. West, Oxford: Oxford University Press

- Cohen, W. M. i Levinthal, D. A. (1990). Innovation and learning: the two faces of R&D, *The Economic Journal*
- Daničić, R. (2013). Opstanak privatnih kompanija, available at https://www.slideshare.net/SLDProject/inovacije-i-konkurentnost-preduzeca-28035611 (accessed Januar 2023).
- Ibrahimov, B. (2018). Open Innovation and application to Petroleum Industry.*IFAC-Papers On Line*
- Ilić, D. i Marković, B. (2014). ″ Organizacione inovacije kao faktor jačanja konkurentske prednosti preduzeća u Republici Srbiji″ *Poslovna ekonomija* , vol.8., br.1
- Lajović, D. i Vulić, V.(2010). Tehnologija i inovacije, Ekonomski fakultet Podgorica available at http://www.preduzetnistvo.ef.ac.me/dokumenta/tehnologijaiinovacije-skripta.pdf (accessed Januar 2023).
- Le Merle, M. i Campbell, J. (2011). "Building an external innovation capability", Booz & Company
- Nikolić, M.(2014). Inovativnost malih i srednjih preduzeća kao faktor privrednog razvoja Srbije , doktorska disertacija, Ekonomski fakultet Niš
- Purificato, M. (2014). The Open Innovation Paradigm in Electric Vehicle Industry: A case study of Tesla Motors, *DI PARTIMENTO DI IMPRESA E MANAGEMENT CATTEDRA DI ECONOMIA E GESTIONE DELL'INNOVAZIONE AZIENDALE* available at https://tesi.luiss.it/13496/1/purificato-marco-tesi-2014.pdf (accessed December 2022).
- Runiewicz-Wordyn, M. and Eliashvili, T. (2022). "Open Innovation Practicies and open innovation Culture in the life -Sciences Clusters the case of Astra Zeneca". *European Journal of Business and Management Research* vol.7
- Sajfert, Z. i Pavlović, M. (2009). " Kvalitet kao činilac konkurentnosti" *Menadžment znanja* IV(3/4)
- Shqipe, G., Gadaf, R. i dr. (2013). Innovation strategies and competitive advantages , СОВРЕМЕННАЯ ЭКОНОМИКА: ПРОБЛЕМЫ, ТЕНДЕНЦИИ, ПЕРСПЕКТИВЫ, No 8, available at https://cyberleninka.ru/article/n/innovation-strategies-and-competitive-advantage/viewer (accessed Januar 2023).

- Skrzypek, A.i Sagen, S. (2018). "Open Innovation in Business models", *Annales Universitatis* MARIAE CURIE SKLODOWSKA LUBLIN POLOMIA SECHIOH vol. LII, 6.
- Stanković, M. (2014). The importance of innovation for Franchise development systems, available at _ https://pdfs.semanticscholar.org/dfdc/d4c6d44b47d37c4ccb7112c37b2e33b5a24e.pdf (accessed December 2022).
- OECD, (2005) OSLO Manual: Guidelines for Collecting and Interpreting Innovation Data, OECD and Eurostat, 3rd edition
- Weerasinghe, R.N., Jayawardane, A.K.W. i Yapa, U.A.S. (2021). "The Impact of Open Innovation Practices and Moderating Effect of Inter-Organizational Networks on Innovation Performance of Large Firms in Sri Lanka" *Annals of Spiru Haret University. Economic Series*, vol.3
- West, J. i Gallagher, S. (2006). ″Challenges of open innovation: the paradox of firm investment in open-source software″. *R&D Management*
- Wibisono, E., (2021). "A critical review of open innovation in SMEs: Implementation, success Factores and challenges" *STI policy and management journal* , vol.6.
- Wilkinson, D. (2018). Innovation capacity how to develop it in Your organisation available at https://oxford-review.com/developing-innovation-capacity/#ab (accessed Januar 2023).
- Wolf, M. i Ferell, D. (2016) .The high-tech industry, what is it and why it matters to our economic future, *EMPLOYMENT & UNEMPLOYMENT*, May 2016 | Vol. 5 / No. 8 available at https://www.bls.gov/opub/btn/volume-5/the-high-tech-industry-what-is-it-and-why-it-matters-to-our-economic-future.htm (accessed Januar 2023).
- World Intellectual Property Report 2011, The Changing Face of Innovation available at https://doi.org/10.34667/tind.28191 (accessed december 2022).
- Zakić, N., Bugarčić, M. i Milovanović, M. (2017). ″Proclivity for open innovation in the case of agricultural and food companies in Serbia″, *International review* No 3-4