

## Factors of Open Innovation

Miroslava Prváková<sup>2</sup>

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### **Abstract**

*The issue of open innovation has become a popular topic in recent years. The literature review revealed that within the Open Innovation theories and its aspects, some elements were differently defined which showed a space for further exploration. The main aim of the paper is to synthesize knowledge about open innovation and to create a basic model of the open innovation environment in terms of influencing factors and to identify relevant actors, that may be part of this process. The primary method was a secondary survey aimed at the analyze of 24 definitions and integrating scientific definitions of open innovation, its factors, barriers and relevant players. By synthesizing this knowledge, we have developed a basic model of open innovation factors and identified relevant players in this process. This paper is part of the author's dissertation thesis, which aims to design and test an open innovation model in the service sector. The model will include all factors contained in this article. Further model could be used as an effective tool for implementing open innovation and evaluating its usefulness for theories and praxis as well.*

### **Key words**

*Open innovation, Actors in open innovation, Factors of open innovation.*

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### **Introduction**

The world has changed over the last decade from an economy that was predominantly physical to software economy, where information technology is an integral part of society. The beginning of the twenty-first century belonged to innovation and transformation of the functioning of society. The Fourth Industrial Revolution offers many possibilities, and market leaders have already demonstrated what can be achieved by applying open innovation processes, largely linked to the use of new technologies. Open innovation processes are highly dependent on elements characterizing the 4th industrial revolution, such as digitization, new technologies or agility.

In the context of open innovation processes, collaboration and knowledge sharing are the most important aspects. The risks of this sharing are still perceived as very critical, especially those related to company's reputation and its know-how. The main aim of the paper is to synthesize knowledge about open innovation and to create a basic model of the open innovation environment in terms of factors that influence it. Reaching the main goal is connected to fulfilling the scientific and professional knowledge about open innovation by summarizing definitions, factors, barriers and relevant players in open innovation processes. The main practical benefit is to enable innovation managers

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<sup>2</sup> Ing. Miroslava Prváková, University of Economics in Bratislava, Slovak Republic, e-mail: miroslava.prvakova@euba.sk

and R&D staff to understand what factors open innovation has and what are the essentials needed to be enabled for making greater openness in innovation processes.

### 1 Methodology

Currently is a growing trend seeing in the use of open innovation processes. In the order to benefit from the use of open innovation, it is very important to correctly understand its aspects as well as its application. The main aim of the paper is to synthesize knowledge about open innovation and to create a simple model of the open innovation environment in terms of factors that influence it. By summarizing definitions, factors, barriers and relevant players in open innovation processes, we will contribute to broadening scientific and professional knowledge about open innovation. In the order to fulfil the main goal of this paper, we conducted secondary research of domestic and foreign professional literature. Through this survey, we identified 24 definitions of open innovation, which we then analyzed. We synthesized the data into a synoptic table that focused on each definition of open innovation, its factors, barriers and relevant players. Our findings about papers of different authors from were from free and licensed databases such as ResearchGate, ProQuest Central or Web of Science was used to create a theoretical basis and to collect secondary data.

### 2 Results and Discussion

The term open innovation is used to support an information approach to innovation that is contrary to the traditional thinking of research departments. According to Trott and Hartmann (2009), the benefits and drivers behind increased openness have been noted and discussed in early 1960s. In a more interconnected world, open innovation offers more options than reducing research costs, spreading risks and bringing faster innovation to the market. The definitions of open innovation are based on the belief that in a world of distributed knowledge, companies can no longer rely solely on internal research; they should focus more on the benefits of collaborative innovation. This approach has brought significant benefits in many areas, including healthcare, IT, business models, public policy, etc. A summary of the aspects of open innovation (definitions, factors, barriers, relevant actors) are given in Table 1. This summary was used in further analysis of open innovation in the order to define its most important factors.

**Table 1** Aspects of open innovation

Author	Definition	Factors	Barriers	Relevant actors
<b>Chesbrough (2003, 2011)</b>	Utilizing purposive gaining and losing knowledge to accelerate internal innovation	- Knowledge flow (open borders of company)	- Absorption capacity - Multiplication ability - Relationship ability	- Companies: suppliers, customers, general partners, competitors

	and expand markets for the external use of innovation. Collaboration between companies where knowledge flows in both directions (inside and out) to improve the internal innovation process.	<ul style="list-style-type: none"> <li>- Business model (oriented to openness)</li> <li>- Cooperation</li> <li>- Availability and mobility of specialists</li> </ul>	<ul style="list-style-type: none"> <li>- ICT</li> <li>- IP (Intellectual Property)</li> </ul>	<ul style="list-style-type: none"> <li>- Other organizations: universities, research laboratories, government and other non-profit organizations</li> <li>- Individual: customer, user, inventor, citizen</li> </ul>
<b>Kearney (2008)</b>	A process that involves a wide range of partners to support the process of generating new ideas. Open innovation is getting ideas from countless sources and understanding that each contributor brings a different perspective.	<ul style="list-style-type: none"> <li>- Cooperation</li> <li>- Wide range of partners</li> <li>- Internet and online environment</li> <li>- Sharing rewards from innovation</li> <li>- Change in organizational structure</li> </ul>	<ul style="list-style-type: none"> <li>- Risk of cooperation (non-compliance, concealment, etc.)</li> <li>- Lack of human resources for such cooperation</li> </ul>	<ul style="list-style-type: none"> <li>- Customers</li> <li>- Consumers and the public</li> <li>- Suppliers</li> <li>- Employees</li> <li>- Strategic partners and knowledge networks (universities, research organizations)</li> </ul>
<b>Lazzarotti &amp; Manzini (2009)</b>	Cooperation with different types of partners (diversity) and with a high number of partners.	<ul style="list-style-type: none"> <li>- Cooperation</li> <li>- Number of partners</li> <li>- Diversity of partners</li> </ul>	<ul style="list-style-type: none"> <li>- Small number of partners</li> <li>- Little diversity of partners</li> </ul>	<ul style="list-style-type: none"> <li>- Partners</li> </ul>
<b>Tuomi (2009)</b>	The process of combining internal and external ideas into the architectures and systems of the organization itself.	<ul style="list-style-type: none"> <li>- Exchange of knowledge (continuous interaction)</li> <li>- Cooperation and openness (technical and social)</li> </ul>	<ul style="list-style-type: none"> <li>- Corporate culture</li> <li>- Strategy and perceived risk</li> </ul>	<ul style="list-style-type: none"> <li>- The organization itself</li> <li>- Contractors</li> <li>- Customers</li> <li>- University</li> <li>- The government</li> <li>- Local communities</li> <li>- Competitors</li> </ul>
<b>Dahllander &amp; Gann (2010)</b>	A process that includes one of the following options: <ul style="list-style-type: none"> <li>-Outgoing non-financial innovations</li> <li>-Outgoing financial innovations</li> <li>-Incoming non-financial innovations</li> </ul>	<ul style="list-style-type: none"> <li>- Cooperation</li> <li>- Multiple partners</li> <li>- Flow and use of knowledge</li> <li>- Business model reflecting openness</li> </ul>	<ul style="list-style-type: none"> <li>- The relative impact of technology on industry innovation</li> <li>- Length and complexity of the innovation cycle in the sector</li> <li>- Regulations in the sector</li> <li>- IP access</li> </ul>	<ul style="list-style-type: none"> <li>- Partners</li> </ul>

	-Incoming financial innovations		- Preferred source of innovation - Overall disruption and turbulence in society	
<b>Hilgers &amp; Ihl (2010)</b>	The process of transferring knowledge about customers' requirements (needs) to a possible solution using only the knowledge (technologies, materials, methods, processes, etc.) that belong to the company possibilities.	<ul style="list-style-type: none"> <li>- Flexibility</li> <li>- Cooperation</li> <li>- Gaining knowledge and resources through online tools or platforms (such as crowdsourcing)</li> </ul>	<ul style="list-style-type: none"> <li>- Context (sector in which the company operates)</li> <li>- Company limits (technological, material, methodological, process, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>- Consumers</li> <li>- Users</li> <li>- Specialized communities</li> </ul>
<b>Wallin &amp; Krogh (2010)</b>	A process that involves creating and using knowledge to develop and implement something new and useful.	<ul style="list-style-type: none"> <li>- Corporate culture</li> <li>- Processes</li> <li>- Findings</li> <li>- Motivation</li> </ul>	<ul style="list-style-type: none"> <li>- Absence of strategy for open innovation</li> <li>- Mismatch between open innovation and company strategy</li> </ul>	<ul style="list-style-type: none"> <li>- Customers</li> <li>- Contractors</li> <li>- University</li> </ul>
<b>Schweisfurth et al. (2011)</b>	Integrating and exploiting ideas created outside and inside the organization for innovation.	<ul style="list-style-type: none"> <li>- Motivation to contribute (individual and organization motivation)</li> <li>- Contractual framework (transparency, accessibility, intellectual property)</li> <li>- Allocation of decision-making rights (centralized, decentralized)</li> <li>- Innovation process (which part of the process is open)</li> </ul>	<ul style="list-style-type: none"> <li>- Motivation barriers (barriers for further implementation)</li> </ul>	<ul style="list-style-type: none"> <li>- Users</li> <li>- Not-users</li> <li>- Individuals</li> <li>- Enterprises</li> </ul>

<p><b>Galati et al. (2012)</b></p>	<p>A system that continually examines a wide range of internal and external innovation resources integrates this survey with the company's capacities and resources and takes great advantage of these opportunities across multiple channels.</p>	<ul style="list-style-type: none"> <li>- Internal and external resources of the company</li> <li>- Company capacities</li> <li>- Multiple information and communication channels</li> </ul>	<ul style="list-style-type: none"> <li>- Organizational culture</li> <li>- Specifics of the sector in which the company operates</li> </ul>	
<p><b>Lidegaard (2012)</b></p>	<p>A philosophy or way of thinking that should enable an organization to work with external inputs to the innovation process as naturally as with internal input. It is the bridging of internal and external resources and the impact on those opportunities that bring better innovation to the market faster.</p>	<ul style="list-style-type: none"> <li>- Different types of external sources</li> <li>- Collaboration (Intersection of the Three Circles: Innovation Community, Innovation Ecosystem, Customers and Users)</li> </ul>	<ul style="list-style-type: none"> <li>- Limiting the development of internal skills and key technological competences</li> <li>- Increase dependence on external technology providers</li> <li>- Increasing the complexity of processes resulting from cooperation with external parties.</li> </ul>	<ul style="list-style-type: none"> <li>- Suppliers</li> <li>- Partners</li> <li>- Innovation intermediaries</li> <li>- Competitors</li> <li>- Users</li> <li>- Consumers</li> <li>- Customers</li> <li>- Universities and research institutions</li> </ul>
<p><b>Piller (2012)</b></p>	<p>Open Innovation offers a set of different methods and practices that support innovative companies in identifying and integrating relevant external knowledge. The intention is to allow new forms of distributed crowdsourcing solutions beyond conventional measures such</p>	<ul style="list-style-type: none"> <li>- Types of shared knowledge</li> <li>- Stakeholders: number and diversity of partners</li> <li>- Use of technology, the Internet and different platforms</li> <li>- Collaborate in different parts of the innovation process</li> </ul>	<ul style="list-style-type: none"> <li>- Work process rigidity</li> <li>- Accepting external ideas</li> <li>- Insufficient resources</li> <li>- Insufficient support of top management</li> <li>- Unrealistic expectations</li> <li>- Legal barriers</li> <li>- Organizational / administrative barriers</li> <li>- Communication barriers</li> </ul>	

	as innovative alliances or contract research.			
<b>Durmaz (2013)</b>	Collaborative system in which knowledge from customers, employees and other stakeholders (partners, suppliers) is openly reflected.	<ul style="list-style-type: none"> <li>- Cooperation</li> <li>- Exchange of knowledge</li> <li>- Business model</li> </ul>	<ul style="list-style-type: none"> <li>- Industry regulatory requirements</li> <li>- Conservative approach to IP (difference)</li> <li>- Focus on internal development and research only</li> <li>- The difficulty of ensuring a balance between an open and a closed system</li> </ul>	<ul style="list-style-type: none"> <li>- Customers</li> <li>- Employees</li> <li>- Other stakeholders (partners, suppliers)</li> </ul>
<b>Brant &amp; Lohse (2014)</b>	The process of integrating external and expertise into the innovation process.	<ul style="list-style-type: none"> <li>- Knowledge from multiple sources (optimal use of internal and external thoughts)</li> <li>- Intellectual property management</li> <li>- Knowledge management</li> <li>- Flexibility</li> <li>- Change in organizational structure</li> </ul>	<ul style="list-style-type: none"> <li>- Intellectual property management</li> <li>- Management of knowledge management</li> </ul>	<ul style="list-style-type: none"> <li>- Suppliers</li> <li>- Research centers</li> <li>- University</li> <li>- Customers</li> <li>- Competitors</li> <li>- Companies with an additional offer of products or services</li> </ul>
<b>Tidd (2014)</b>	Acquire valuable resources from outside companies and share internal resources to develop new products / services.	<ul style="list-style-type: none"> <li>- Resources: in an open innovation process, resources can be shared, not just knowledge.</li> </ul>		<ul style="list-style-type: none"> <li>- Companies</li> </ul>
<b>Bengtsson et al. (2015)</b>	Managing knowledge flows beyond company boundaries.	<ul style="list-style-type: none"> <li>- Flow of knowledges</li> </ul>	<ul style="list-style-type: none"> <li>- Knowledge flow management</li> <li>- The difficulty of achieving balance</li> </ul>	
<b>Chachoua (2015)</b>	The collaborative process between	<ul style="list-style-type: none"> <li>- Cooperation</li> <li>- Multiple partners</li> </ul>	<ul style="list-style-type: none"> <li>- IP management strategy</li> </ul>	<ul style="list-style-type: none"> <li>- Companies</li> <li>- Individuals</li> <li>- Public agencies</li> </ul>

	companies, individuals and public agencies to create innovative products and share their risk and reward.	<ul style="list-style-type: none"> <li>- Risk sharing and rewards</li> </ul>		
<b>Oberhaus (2015)</b>	Engaging external workers in new ideas or products by sharing knowledge and intellectual property.	<ul style="list-style-type: none"> <li>- Equivalence of internal and external ideas</li> <li>- Engaging the external workforce to disseminate knowledge</li> <li>- Use of external research and development</li> <li>- Purchase and sale of IP in connection with the business model</li> </ul>	<ul style="list-style-type: none"> <li>- Internal staff barriers with the acceptance of external ideas and technologies</li> </ul>	
<b>Dabic et al. (2016)</b>	The company looks outside its research and development to look for new solutions created by external players and conduct profitable collaborations and partnerships.	<ul style="list-style-type: none"> <li>- Cooperation and partnerships</li> <li>- Openness type (4 types: revealing, sale, sourcing, acquisition)</li> </ul>		<ul style="list-style-type: none"> <li>- R&amp;D</li> <li>- Customers</li> <li>- Universities and research institutions</li> <li>- Suppliers</li> <li>- Competition</li> </ul>
<b>Greco et al. (2016)</b>	Company innovation capacity resulting from interaction with another company.	<ul style="list-style-type: none"> <li>- Innovative capacity</li> <li>- Companies interaction</li> </ul>		<ul style="list-style-type: none"> <li>- Companies</li> </ul>
<b>Osorio et al. (2016)</b>	The collaborative process of government, research organizations, clients, consumers, suppliers, dealers that aim to connect human, financial, material and knowledge	<ul style="list-style-type: none"> <li>- Multiplayer cooperation</li> <li>- Exchange of knowledge as well as other resources (human, financial, material)</li> </ul>	<ul style="list-style-type: none"> <li>- Inability to develop inter-company relations</li> <li>- Inability to use external knowledge</li> <li>- Limited knowledge of open innovation</li> </ul>	<ul style="list-style-type: none"> <li>- Government</li> <li>- Research organizations</li> <li>- Clients</li> <li>- Consumers</li> <li>- Suppliers</li> <li>- Dealers</li> </ul>

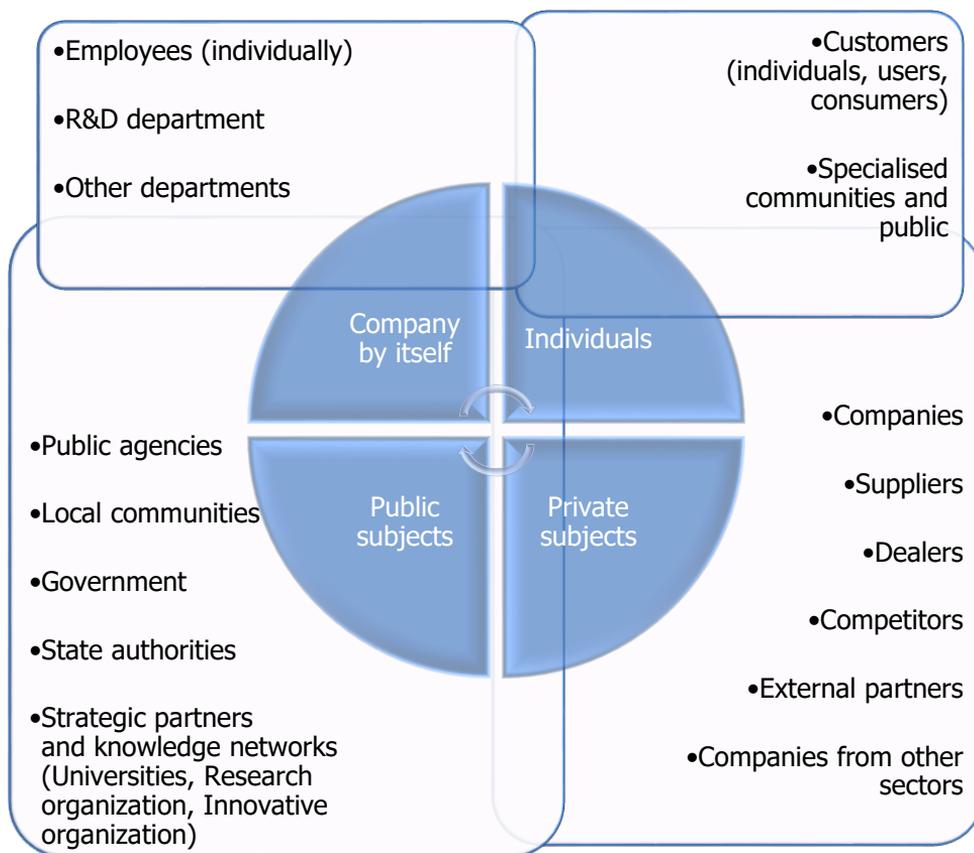
	to gain shared value innovations.			
<b>Hossain &amp; Aneesur-Rehman (2016)</b>	Effective acquisition of external knowledge for internal innovation and offering internal innovation for external markets.			
<b>Zobel et al. (2016)</b>	Greater use of external knowledge and increasing cooperation with various external partners.	<ul style="list-style-type: none"> <li>- External knowledge</li> <li>- Cooperation</li> </ul>	<ul style="list-style-type: none"> <li>- Organizational culture</li> </ul>	
<b>Hvizdová &amp; Máchal (2017)</b>	Through open innovation, companies apply external ideas as well as internal ideas. These ideas are then incorporated into architectures and systems that are characterized by business models.	<ul style="list-style-type: none"> <li>- Collaboration throughout the innovation lifecycle</li> <li>- Corporate culture (human resources management, top management support, inter-departmental communication)</li> <li>- Agile management methods</li> </ul>	<ul style="list-style-type: none"> <li>- Employee's fear of change - changing organizational structure, reallocation of powers and incomes can cause a negative atmosphere.</li> </ul>	<ul style="list-style-type: none"> <li>- Suppliers</li> <li>- Partners</li> <li>- Competitors</li> <li>- Users</li> <li>- Customers</li> <li>- Employees</li> <li>- Departments</li> <li>- External partners</li> <li>- University</li> <li>- Research institutions</li> <li>- Private companies</li> <li>- State authorities</li> </ul>
<b>Zapfl (2018)</b>	Opening an innovation process outside the company's boundaries to increase its own innovation potential through active strategic use of the environment.	<ul style="list-style-type: none"> <li>- Innovation potential of the company</li> <li>- Open borders of society</li> <li>- Interaction of knowledge, technology and processes</li> <li>- The customer's role (active innovator)</li> <li>- Qualified workforce</li> <li>- IP</li> </ul>	<ul style="list-style-type: none"> <li>- IP protection</li> <li>- High cost of using licenses and other IPs</li> <li>- Comprehensive innovation</li> <li>- Unique innovation</li> <li>- High competition</li> </ul>	<ul style="list-style-type: none"> <li>- Employees</li> <li>- Customers</li> <li>- Suppliers</li> <li>- Users</li> <li>- University</li> <li>- Competitors</li> <li>- Companies from other sectors</li> </ul>

Source: Own processing.

*Summary definition of open innovation: the process of sharing knowledge and other resources beyond the organization as part of an open business model with number of different actors with whom the organization works. Open innovation is a mechanism enabling the use of synergy effects from the sharing of innovation capacities of the participating actors, thus increasing the innovation potential of the company.*

According to Table 1, the relevant players were divided into 4 categories: the company itself (enterprise / organization, internally), individuals (the public), private entities (other businesses) and public entities (the state) shown in Figure 1.

**Figure 1** Relevant actors in open innovation process



Source: Own processing

## 2.1 Factors of Open Innovation

In further analysis of Table 1 above, we focused on the factors that influence open innovation. Different authors had different views on these factors, but in most cases they agreed. After analyzing the knowledge, we identified a set of relevant factors influencing open innovation and other explanatory information:

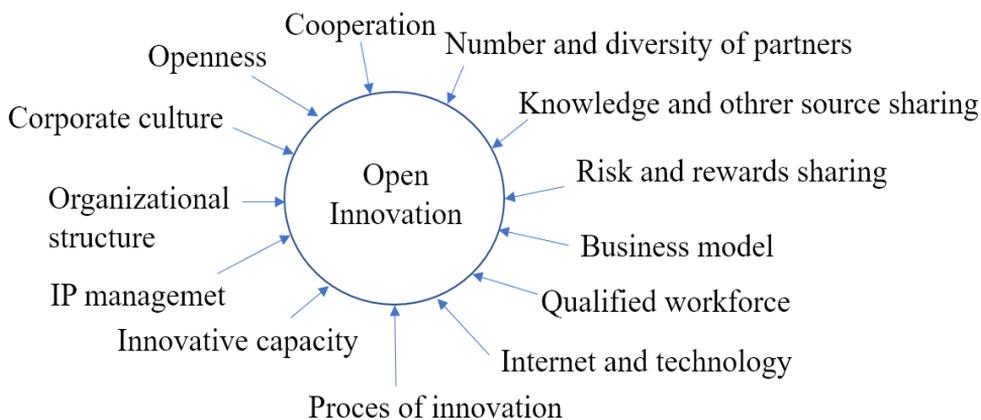
- Cooperation is one of the most important factors of open innovation. Through open innovation, numerous external and internal sources of ideas and knowledge can be used to bring innovation management to a new level. Cooperation can take place with a different number and diversity of partners. It can take place both within the company and between organizations. Outside the company, cooperation is aimed at a wide range of partners and co-workers, with the customer (an active innovator) playing an important role. We identify open innovation collaboration as the intersection of three circles: innovation community, innovation ecosystem, customers and users. This collaboration can occur in different parts of the innovation process or can persist throughout the innovation lifecycle (both within the company and across organizations).
- Openness means, first and foremost, the opening of company's borders. Forms of openness can be technical and social, with the most common types of openness being revealing, sales, sourcing and acquisition. Most authors agreed that a contractual framework that ensures the protection of the interests of the company as well as of other participants is essential for openness. Within the framework of openness, the focus is on transparency, accessibility and intellectual property. All stakeholders must determine in advance the procedure and form of risk-sharing and innovation rewards.
- Exchange of knowledge and other resources can be expressed in several ways as a constant interaction with the outside world, interaction of knowledge, technology, processes and sales channels. In open innovation processes, the exchange of knowledge has also been extended to the exchange of resources other than knowledge - human, financial, material resources.
- Business model adapted to openness in most authors' definitions occurred as a key element of open innovation processes. First and foremost, the company must be aware of and evaluate its opportunities in terms of openness and cooperation, ascertain its innovation capacity and innovation potential.
- Corporate culture and organizational structure are important for open innovation processes, especially from the point of view of systematic establishment and functioning of open innovation processes. When organizational structure is changed, decision-making rights (centralized, decentralized) are redistributed and emphasis is placed on knowledge management and intellectual property management, which mainly deals with IP protection. Important is interdepartmental communication, human resources management, agile management methods and support about open innovation from top management. It is also necessary to pay attention to the motivation to contribute in company (individual motivation and organization motivation).
- Qualified workforce is essential for open innovation processes, since the open innovation is focused primarily on the use of knowledge and cooperation, which mean human resources / possibilities. The external workforce is also used to disseminate knowledge. The effective functioning of open innovation

processes is largely linked to the availability and mobility of specialists in the labor market.

- The use of technology, Internet and various platforms is mainly used to acquire and share knowledge and resources through online tools (e.g. crowdsourcing).

For the clarity of our findings, Picture 1 was created. This picture identifies basic model of open innovation from the perspective of the most important factors that affect it.

**Picture 1** Factors of open innovation



Source: Own processing

## Conclusion

Factors of open innovation point out what all subjects accept when they apply open innovation processes. Open innovation shows how a company can use its business model to identify a better research and development position in the world of knowledge, better manage and access intellectual property, develop its current and future business. It is a more distributed and cooperative, decentralized approach to innovation based that today's useful knowledge has wide distribution and the company does not use its resources to the full if it innovates alone. Innovation is open to business more advantageously as it can reduce costs, accelerate time to market, increase market differentiation and create new income streams for society.

The period of the Fourth Industrial Revolution is characterized by complete automation and digitization processes using electronics and information technology (IT) in both manufacturing and services. Companies that use digitization are innovating faster and more agile than their competitors that do not use digitization in their innovation processes. According to Baur (2017), open innovation to create new business models is not new but is currently gaining greater acceptance and importance because of digitization. According to Kubičková and Benešová (2011), increased pressure on service producers' performance is due to increased competition and increased trade in services.

The company's need to use external ideas and technologies more effectively in its innovative activities is becoming increasingly desirable. Working together today is not just sharing technology knowledge, but also sharing market, the customer and business model knowledge. Openness in cooperation and exchange of knowledge is an important part of the effective use of the facilities of the Fourth Industrial Revolution.

This paper is a part of the author's dissertation thesis, which aims to design and test an open innovation model in a service sector. The model will include all the open innovation factors contained in this article. The model will be applied and tested in the environment of selected companies in Slovakia.

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