Acta logistica - International Scientific Journal about Logistics
Volume: 8 2021 Issue: 3 Pages: 199-207 ISSN 1339-5629

doi:10.22306/al.v8i3.216 *Received: 08 Feb. 2021; Revised: 15 Apr. 2021; Accepted: 21 May 2021*

PROPOSAL OF A MODEL FOR THE ECO-INNOVATION INTEGRATION INTO THE INNOVATION PROCESS OF COMPANIES IN SLOVAKIA TO INCREASE THEIR PERFORMANCE

Erika Loučanová
Technical University in Zvolen, T.G. Masaryka 24, Zvolen 96001, Slovak Republic, EU,
loucanova@tuzvo.sk (corresponding author)
Miriam Olšiaková
Technical University in Zvolen, T.G. Masaryka 24, Zvolen 96001, Slovak Republic, EU,
olsiakova@tuzvo.sk

Keywords: innovation, eco-innovation, logistics model
Abstract: The issue of innovations, as well as ecological innovations, is a concept in Slovakia, to which considerable attention is paid because they affect all spheres of society. They relate to production, logistics, sales, and the consumers, who decide on their acceptance on the market. However, the success of innovation in the market depends on several factors that influence the innovation process. They are not just determinants that act pro-innovation and thus support innovation and innovation process. In the innovation process, some factors have the opposite effect and result in forces that suppress the creation of innovation. Therefore, in this article, we focus on mapping the state of pros and cons of innovation forces acting on companies' innovation process in Slovakia. Based on the above findings, we have identified a large interest in implementing innovations, using an open innovation system to implement innovations and implementing eco-innovation. On the other hand, we have also identified negative factors influencing companies' innovation process such as lack of financial resources, high bureaucracy, lack of relevant information for creating innovations, low awareness of eco-innovation, etc. Subsequently, based on the findings, we proposed a model for eco-innovation integration into companies' innovation process in Slovakia, which was the paper's aim. The proposed model eliminates mainly the negative influencing factors of the innovation process in companies, and at the same time, it should support them for the innovation direction. Implementing the proposed model should lead to an innovation increase in companies, but their positive impact also applies to environmental support and an overall increase in the company´s efficiency in Slovakia.

1 Introduction

Innovation is considered an important tool to succeed in an environment characterized by strong competition in the market. It is important to manage the innovation process and its implementation and seek inventions, financial resources, and many other aspects that are the incentives for successful acceptation of innovation in the market when innovation is implemented. They present input in the innovation process as a source when beginning but also implementing the innovation. Internal as well as external sources reimburse the sources representing the innovation capacity of the company.

As it is presented by Straka et al. [1], distribution logistics provides the physical, organizational and information link between resources and the innovation process. It plays an important role in ensuring the most appropriate way to select, analyze, and transport these resources during the innovation process.

However, it is not sufficient just to innovate. The attention is focused when innovations are created and implemented on the principle of sustainable development, thus representing ecological innovation. The EU [2] states, it is important to implement ecological innovations that increase the protection of the environment and the competitiveness of EU industry. It should be realized by introducing technologies, processes, business models, and logistic system models that use resources more effectively [3,4].

Activities of logistics entities, creation of document flows, implementation of logistics operations and functions are influences by developing supply chains regulation methods in logistics, including the regulatory framework. It has a direct and indirect impact on them. Logistic activities are subject to existing laws and by-laws. Methods of centralized, unified regulation of logistics chains as a set of subjects, objects, and logistics activities are significant to promote material, information, financial, and other flows from the starting point to the destination. The logistic approach to economic processes managing is based on the operation of information standards, business and other regulatory acts in the field of logistics. Nowadays, all countries in the world have to comply with international and national laws and regulations. This task is currently the most urgent for all companies to timely react and meet all legislative and market requirements. They have to develop environmental programs and

collaborate with the government to improve the environmental guidelines and standards [5].

Companies' self-regulation of social and environmental impacts is promoted to solve the regulatory problems that developing countries solve. Since globalization brings many potential opportunities for businesses in developing countries, governments of developing countries consider the international legal norms to be helpful [6]. At the same time, it creates an important regulatory problem. In recent years, private companies have been under increasing pressure to take responsibility for social and environmental issues. The critical attitude towards private companies and their impact on society dominates. To solve this ambiguity, integrating social responsibility into governance processes is recommended. This can improve accountability, promote and guide corporate responsibility, provide companies with ways how to systematically develop innovation processes and environmental parameters. New economy approaches (such as the information economy and network economics, logistics) have provided new knowledge [7]. With changes in logistics management and a wide range of logistics tools and instruments, the environmental impact of the logistics system is becoming more serious with the increase in the volume of logistics. Logistics is now playing an important role in economic and social development because of the rapid growth of science and technology and the growth of the global economy. The development of logistics is also very essential for quality and efficiency improvements within the national economy, optimizing the distribution of resources, improving investment conditions, promoting industrial restructuring and increasing economic power, the importance for economic growth and increasing the employment potential, as well as the ecological situation of the country [5,8-10].

Logistics understands and deals with parts of the real world, such as logistics systems. The logistics system is a system that manages, secures, and implements logistics flows and chains. Its active elements are machines, equipment, people, activities, processes, and they realize the "movement" of passive elements materials such as products, information, money, people creating flows. There are other logistics systems around the logistics system because we perceive each object of the process as a logistics system. Logistics systems consist of a finite number of active elements forming the chains and networks in which logistics flows take place [11].

It is more advantageous from a cybernetic perspective to apply a feed-forward management system in these systems [12,13]. Their structure implies the use of several types of models. Through logistics models, we can simulate changes in the parameters of input variables, network models to determine the critical path in project management, simulation of production and distribution plan through public service systems, simulation models, Gantt diagrams showing the implementation of processes, etc. In general, it can be said that simulation is a method to find out the state or behaviour of a real system using a model. Simulation is a method in which we imitate (replace) a real system with its simulation model, on which we perform experiments. The results are retrospectively applied to the real system [11,14].

Logical and business models, as it is mentioned above, involve many aspects and incentives that affect economic processes and innovation. Moreover, the innovation incentives at all levels can differ. Therefore, this manuscript aims to monitor and propose an eco-innovation integration model applied to companies' innovation process in Slovakia aimed to increase their performance.

2 Methodology

The primary method of the survey is "Methodology of knowledge mapping industrial clusters" by Lodl [15], which consists of three basic steps:

The first step is the identification of key processes of companies or industry. Internal resources (organizational manuals or quality management system documentation) are used for this identification. In this step, it is necessary to get a picture of a recognized or established industry process system. Using the analytical-synthetic method, we analyzed the issue of innovations, ecological innovation, innovation process, financing, their support, innovation system and other contexts, focusing on the links between them.

The second step is identifying knowledge, where a survey is applied with people from the individual processes, only if they are experts in the field [16]. In this step of the methodology, the questioning of knowledge is carried out by means of a questionnaire consisting of questions concerning individual processes and the identification of knowledge about the researched issue - innovations, ecological innovation, innovation process, financing, their support, innovation system and other contexts. The online survey method is used to study the attitude of stakeholders [5]. The survey was carried out in electronic form and was attended by 327 companies from all over Slovakia.

After collecting the data, it is possible to move to the third step, namely the proposal of a knowledge map representing "The proposal of a model for the eco-innovation integration into the innovation process of companies in Slovakia in to increase their performance". It presents a logistic model of the system of planning, synchronization, management, implementation, and control of internal and external flows for the highest flexibility, accuracy, economy, and innovations support within the innovation system in Slovakia within the integration of ecological innovations into the innovation process of companies. The analytical-synthetic and inductive-deductive method were used when creating the model. They drowned basic logical procedures found by previous methods. Then they were proceeded in creating the model from general laws and facts towards individual

phenomena and relationships and from general principles to specific ones.

3 Result and discussion

To process the proposal of a model for the eco-innovation integration into the innovation process of companies in Slovakia to increase their performance, the first step had to be to identify key processes within the innovation process as the first step. Then as the follow-up step, there was identified knowledge on the implementation of ecological innovations and innovations into the innovation process within Slovak business entities.

Identifying key processes within the innovation process is based on the available literature on models of the innovation process because it is necessary to create a picture of a recognized or established system of processes of the researched issue - the innovation process.

Identifying key processes within the innovation process is to systematically influence the reproduction of business in accordance with the growing needs and requirements of the consumer and the market, considering 3 C (Customers, Competitions and Change). The synergy of innovation process management regarding market aspects increases the efficiency of investments in new processes and products [17,18].

Therefore, the most effective implementation of innovation processes must be analyzed in terms of its forms or models of use in the company, which can eliminate risks during its implementation in such a way that to meet the most important attributes.

Analysis of innovation processes shows that the first model used to implement innovations by organizations is a linear sequence of certain functional activities. We either talk about "technology-driven" innovations representing the opportunities that have emerged from research and development within the innovation process or "demand-driven" innovations. It means that the market signalized the need for something new, which subsequently led to an innovation process whose output is an innovation.

The linear model of the innovation process represents a complex system divided into three basic parts:

- creation of invention - impulse, idea, the proposal of a possible solution, which after assessment turns into an innovation opportunity and after processing results in innovation.
- creation of innovation - scientific, research and development, organizational or experimental activity, the aim of which is to start the innovation process or keep it at the necessary pace.
- penetration of innovation, diffusion of innovation on the market - expansion of new or already adopted and used innovation in new conditions, new markets, or new application places [19].

These parts, activities and phases express a complex view of the innovation process, which in the case of partial innovation changes is purposefully minimized only to those parts, phases, and activities necessary to ensure the innovation.

Also, the specific conditions in which the innovation process takes place may influence the participation or non-participation of a particular phase. Alternatively, they can lead to a reduction or, conversely, to an expansion of the content of any of them. In terms of time sequence, consistent placement and adherence to the individual phases in a row are practically unbearable. The need to accelerate the innovation process (for example, by exploiting the potential of current information technology and technique) makes it increasingly urgent to shorten each phase and ensure that the process is organized, allowing maximum overlap of the individual phases over time.

For these reasons, it is important to analyze innovation processes, which can take various forms, in addition to the already mentioned innovation process, in the form of a simple linear model, chain-linear model, nonlinear innovation model of open innovation, innovation process model by Tidd, Bessant and Pavitt, innovation models by Schumpeter, innovation model by Schmookler, innovation model by Rothwell, Klin's model of innovation, Beije's innovation model, model of the innovation process by business to customer and business to business. Models of the nonlinear innovation process represent an open approach to the innovation process, which facilitates the information penetration to support the creation of innovation within organizations but also countries, which is currently supported by innovative platforms of information and communication technologies stimulating innovation [20]. The output is an open innovation system, which is also open to other opportunities to innovate the business in the form of start-up or spin-off companies.

The second step is knowledge identification. In this step of the methodology, the inquiry of knowledge is realized. It consists of questions concerning individual processes and the identification of knowledge about the researched issue - the innovation process. Based on the survey, we came to the following findings in the implementation of the innovation process. 53.20% of the total number of addressed companies believed that the innovations implemented by them are ecological and 46.80% do not consider them ecological.

In implementing the innovation process, most companies (59.60%) also cooperated with other subjects. It means they use a nonlinear innovation process to implement innovations based on an open innovation system. Linear innovation process was used by 40.40% of companies that implemented the innovation process without the participation of other subjects. The key entities with which companies cooperated on innovations include suppliers (55.10%) and other subjects (25.80%). Cooperation with customers (10.70%) and the Ministry (5.80%) was less implemented. Only a few companies collaborated on innovations with business angels (1.30%) and clusters (1.30%). None of the companies cooperated on innovations with the Slovak Business Agency. They

also did not mention other institutions that would participate with them in the innovation process.

The factors that, in respondents´ opinion, negatively influence the development of innovations. Thus, eco-innovations include the company´s high costs associated with introducing innovations and the time-consuming return on investment. They also consider the high level of risk and, interestingly, the lack of professional and qualified human resources to be a crucial negative factor. The process that is associated with obtaining and implementing innovations in practice is quite lengthy. It is also perceived this way by the respondents of our survey, who identified bureaucracy as the next negative factor. They also negatively perceive the impact of a pandemic, which threatens the innovation process, so businesses cannot invest as much money in the innovation process as they would be if the pandemic did not occur. Also, in connection with subsidies at the time of the pandemic, they began to consider the black passenger effect as a problem.

Moreover, frequently changing pandemic, but also other measures and legislation are often unclear. Many companies are discouraged from introducing innovations by a lack of financial resources and insufficient experience and know-how in the company. Insufficient consumer readiness, on whom the acceptance of eco-innovation depends, and too traditionalist thinking among producers and a lack of knowledge on sustainability issues can be considered a significant problem. Respondents perceive the lack of information on the possibilities of financing innovations and subsequently other factors to be less significant negative factors.

Researched companies consider that these areas would contribute to the support of ecological as well as innovations as a whole:

- financial support from the state (stated by 12.50% of companies),
- less bureaucracy (10.30%),
- sufficient financial resources to implement innovation (9.40%),
- better information – e.g., easier access to obtain information on the possibilities of introducing innovations into practice (8.50%),
- more public awareness of eco-innovation and its importance (8.10%).

After collecting these data, it is possible to proceed to the third step - the proposal of a knowledge map presenting the proposal of a model for the eco-innovation integration into the innovation process of companies in Slovakia to increase their performance.

Based on the above findings, a force field for the implementation of the innovation process of innovation and eco-innovation in Slovakia was developed (Table 1). It represents the pros and cons of innovation forces. It means pro-innovation forces that support the innovation process of implementing innovations and vice versa. These innovative forces prevent the implementation of the innovation process in companies in Slovakia, as Slovak companies perceive it based on a survey conducted by us. The force field points to innovative forces that support innovation and the innovation process and the interest in its development in Slovakia, such as interest in implementing innovations, using an open innovation system to implement innovations, and companies trying to implement innovations eco-innovation to a greater extent.

On the contrary, companies in Slovakia feel the anti-innovative forces as the facts that prevent them from developing innovations and the innovation process in Slovakia. They include lack of financial resources, high bureaucracy, lack of relevant information for creating innovations, low awareness of eco-innovation, cooperation in implementing the innovation process, increased costs for implementing innovations, lack of qualified workforce, high level of risk and now a pandemic situation. It operates more or less only at the sectoral level (suppliers and customers).

Table 1 The force field of the implementation of the innovation process of ecological innovations in Slovakia

Pro-innovation forces	Anti-innovation forces
Interest in implementing innovations	Lack of financial resources
Using an open innovation system to implement innovations	High bureaucracy
Companies try to implement eco-innovation to a greater extent	Lack of relevant information for creating innovations
	Low awareness of eco-innovation
	Cooperation in the implementation of the innovation process
	High costs for the implementation of innovations
	Lack of qualified workforce
	High level of risk
	Pandemic

After collecting the data, it is possible to proceed to the third step, namely the proposal of a knowledge map presenting the proposal of a model for the eco-innovation integration into the innovation process of companies in Slovakia to increase their performance (Figure 1). The model itself is based on the analysis process related to the implementation of the innovation process. As we found out through the analysis, it is based on the principle of 3C - Consumers - Eco-innovation adopters, Competitions - stakeholders and Change - an innovation process leading to innovations as well as eco-innovations.

It represents the system management of external and internal material flows and related information flows, representing the modelling of these processes to increase the performance of business entities through the implementation of innovations with a focus on eco-innovation. The proposal of a knowledge map representing a model of integrating eco-innovation into companies' innovation process in Slovakia to increase their performance by designing a system of planning, synchronization, management, implementation, and control of internal and external flows, which is the basic role of logistics. The proposed model of the knowledge map presents a model for the eco-innovation integration into the innovation process of companies in Slovakia to increase their performance, presenting the proposal of the system of planning, synchronization, management, implementation**,** and control of internal and external flows. The direction of the arrows in Figure 1 shows the direction of flows within the internal as well as external environment of companies. This is the basic task of logistics. The proposed model of the knowledge map as a logistic model aims to achieve the highest flexibility, accuracy, economy, and innovations support within the innovation system in Slovakia to integrate eco-innovation into the innovation process of companies.

In addition to the collected data, the proposal of the model is also based on motivational factors for the eco-innovations introduction, which are necessary for the implementation and introduction of innovations into the innovation process of business subjects and practice. Díaz-García et al. [21], who summarized the motivational factors for the introduction of eco-innovations, characterized their determinants in general. We divide them into three categories:

1. Macro–level. It includes the already mentioned regulations that are part of the so-called Porter's hypothesis that states that regulations concerning the environment stimulate innovation and lead to a "win-win" situation at the end of which the negative impact on the environment decreases and the competitiveness of companies increases. Businesses respond to environmental policy interventions, through which governments must use the internal power of private companies, which are also motivated by customer interest and voluntary codes of conduct.

2. Meso-level. The motivating factors that fall into this category are characterized especially by changing market conditions caused mainly by changes in consumer behaviour of customers (increasing awareness of the need to protect the environment, modern trends, etc.). The theory represents the mezzo-level mainly by dominant subjects and their behaviour in the range of micro and macro-level [22]. In this case, the meso-level is characterized by organizations, institutions, groups, and public policy [23].

3. Micro-level. It includes mainly internal incentives and the state of small and medium enterprises. The authors refer to the structural characteristics of companies (e.g., size, age), their strategy and business logic (e.g., cost savings, expansion in the market) or their technological competencies (e.g., research and development), the qualifications of staff and management, cooperation, and networking with other sectoral partners). [21], figure 1, on the right - Motivational factors for the implementation of eco-innovation. Subsequently, based on the data collected from the previous steps, the model is designed to reflect the needs of businesses, their opportunities for the development of eco-innovation and to eliminate anti-innovative forces within the force field. To eliminate them within the force field and the motivating factors that include the tools to support innovation from the individual levels, it was also elaborated other subjects, such as government, scientific and technological organizations, research and development, universities, investors, and investors organization support.

Within the internal flows of the proposed model in companies, the innovation process should be based on inventions developed into innovation opportunities in Research&Development (R&D) as well as technological research, which would result in the testing of R&D outputs representing product or process innovations. Subsequently, these outputs of the innovation process need to be tested on the market. For the correct proposal of a marketing plan to place the innovation on the market because due to increasing innovation pressure from competitors, tendentious saturation of many markets and hastened technological development, product success is becoming increasingly difficult to achieve. Figure 1 - middle part of the model - innovation process, which is based on nonlinear models of the innovation process representing an open approach to the innovation process, which facilitates the penetration of information to support innovation in organizations but also countries, which currently support innovative ICT platforms stimulating innovation [20]. The result of the innovation process is consequently Figure 1 - middle part of the model - innovation process, which is based on nonlinear models of the innovation process representing an open approach to the innovation process, which facilitates the penetration of information to support innovation in organizations but also countries, which currently support innovative ICT platforms stimulating innovation [20]. The result of the innovation process is consequently innovation and ecological innovation.

PROPOSAL OF A MODEL FOR THE ECO-INNOVATION INTEGRATION INTO THE INNOVATION PROCESS OF COMPANIES IN SLOVAKIA TO INCREASE THEIR PERFORMANCE

Erika Loučanová; Miriam Olšiaková

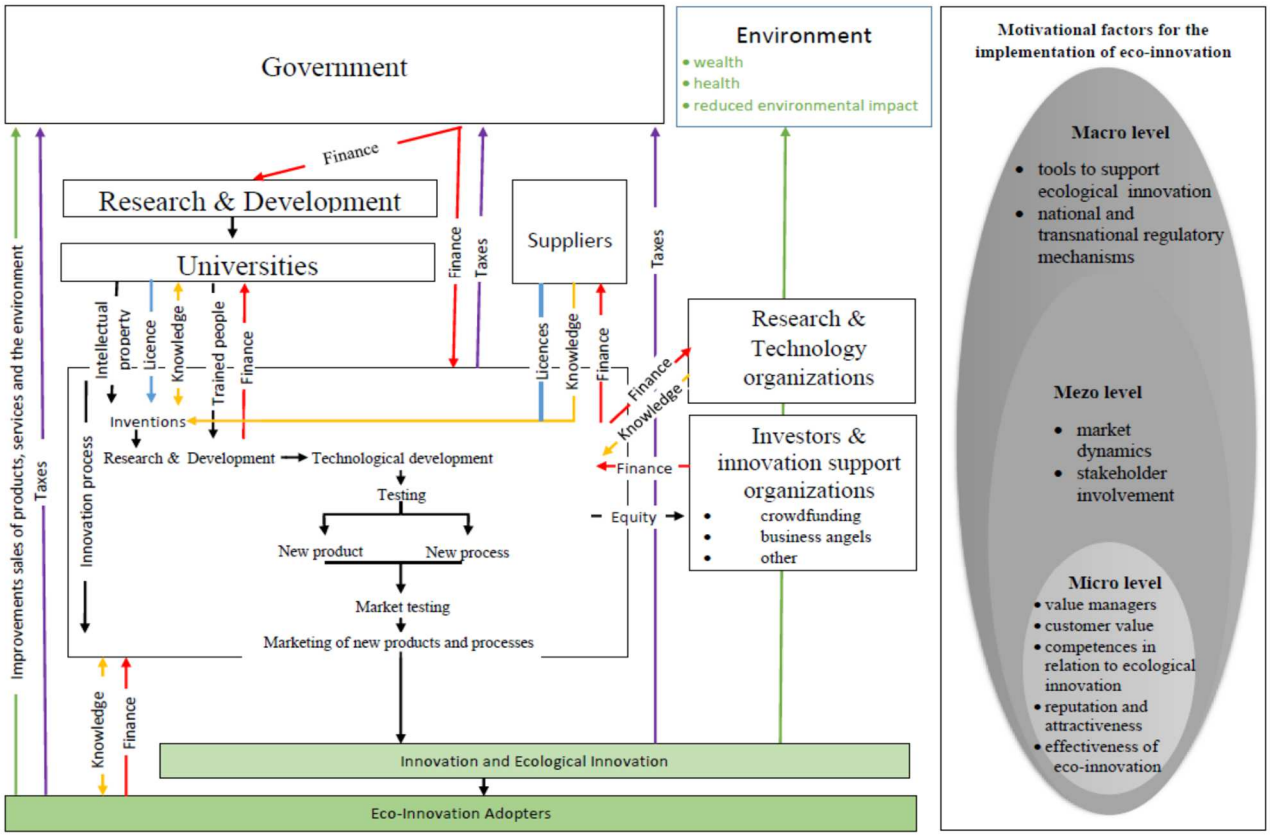

Figure 1 The proposal of a model for the eco-innovation integration into the innovation process of companies in Slovakia in to increase their performance

As it is reported by Trommsdorff and Steihoff [24], although the individual success factors or better methodologies supporting the marketing of innovation are known, the failure to succeed with a product is from 4 to 90%, depending on the business area and measurement methodology. Therefore, from a time point of view, it is very important to correctly estimate the success of innovation in terms of both qualitative and quantitative point of view. It means to evaluate the effectiveness of the implemented project for innovation. A bad estimate can cause the project team large losses and damage to goodwill. Therefore, it is appropriate to implement a two-way flow of knowledge to meet the needs of eco-innovation adopters, which are then transformed for the company into a flow of finance - income from sales of innovation, taxes for the government from these sales and the overall impact of improvements sales of products, services and the environment.

Successful innovations and eco-innovations then present "any quantitative or qualitative purposeful change representing a positive effect" [19] for companies as well as eco-innovation adopters, or innovation adopters for which they are intended, Figure 1– low part of figuring – eco-innovation adopters.

One interesting idea regarding "innovativeness" explains the degree to which an individual or another unit of adoption accepts earlier new ideas compared to other members of a system. Following this idea, Rogers and Mitsufuji [25] divided consumers into six adopter categories: Innovators, Early Adopters, Early Majorities, Late Majorities, and Laggards. Consumers in each category share general unique characteristics specific to their category. Early Adopters accept innovation and also become opinion leaders. Moore [26] supposes that Innovators and Early Adaptors are consumers who buy innovative products even if no one around them owns such a product. Early Majorities are rather market pragmatists and conservatives. They do not try an innovation until others do so. Understanding both Early Adopters and Early Majorities is important to find the best ways to encourage wide use of innovations on the market.

Rogers and Mitsufiji [25] states that socioeconomic status is related to innovativeness. Early Adopters have more years of education and higher social status than Late Majorities. Status is deduced from variables such as income, lifestyle, and wealth. Regarding the idea, Early Adopters and Early Majorities share an appreciation for new technology, while Late Majorities tend to dislike using sophisticated technology. Early Adopters are more likely to try new technology if it addresses issues they are interested in, while Early Majorities are more pragmatic and traditional than Early Adopters [27].

Inventions for innovation processes in companies should be based on licenses, knowledge or incentives also from the external environment, directed from research and development, universities, suppliers, research technology organizations, investors and innovation support organizations such as crowdfunding, not forgetting also on adopters. This flow of inventions, knowledge, licenses, and incentives for the innovation process also represents a flow of funds, which either supports the research and development of innovation or subjects providing these incentives or supports implementing the innovation process from investors and other stakeholders. The exchange of information, inventions, but also material flows also represents funds directed to the state budget in the form of various types of taxes, which the government should use through the tools of the innovation system to support the development of innovation and thus the eco-innovation process in companies, figure 1 – upper part of the Figure – Government, Research and Development, Universities, Suppliers, Research and Technology organizations, Investors & innovation support organizations and Environment.

This presents a method how to obtain money and finance to capitalize on various projects. Considering possibilities provided by the innovation system of the model supporting innovation, subjects who seek funds for project financing reach a potentially varied audience, which can support their innovation projects. Experts, lawyers, and policymakers usually describe these alternatives for financing as "disruptive", and "democratizing" characteristics. These features also result from the concept of monetary and financial ecologies, which assumes that the processes of capitalizing are variegated, intermediated and uneven. Thus, it is a new, rendered economic space that could challenge established funding practices. To reach critical progress in the economy, it is necessary to develop the idea of "ecologies", which is elaborated in the literature dealing with money and finances. The financial and monetary ecological issues were initially developed to consider the endurance of "relic" forms of financial issues during the 1990s. In this case, the ecology idea applies an approach to money and finance geographies without considering monetary and financial systems operations to be singular and defined by space and time logic of a global capital circuit. Money and finance geographies include discrete and dynamic constitutive ecologies. In turn, the ecologies above consist of specific configurations. They are more or less reproducible over time. These relational processes, which entail distinctive combinations of financial knowledge, institutional and intermediary techniques and expert and popular subjectivities, unfold across the model. Therefore, distinctive ecologies emerge in various places [28-30]. The direction of the arrows in Figure 1 shows the direction of flows among individual parts of the model.

The whole proposal of the model for eco-innovation integration into companies' innovation process in Slovakia to increase their performance subsequently aims to support the environment and increase the efficiency of companies in Slovakia. Model is proposed to strengthen pro-innovation forces and eliminate anti-innovation forces of the force field identified for Slovak companies. It means eliminating lack of financial resources, lack of relevant information for creating innovations, low awareness of eco-innovation, cooperation in the implementation of the innovation process, high costs for the implementation of innovations.

The European Union has long been searching ways to promote innovation, from supporting research and industrial policies in the 1970s, through action plans in the 1990s and the Lisbon Strategy from 2000, to the Europe 2020 strategy from 2010, which is currently being updated by ten priorities of Jean-Claude Juncker who is the President of the European Commission. Regarding a recent study, innovation policy has evolved to be understood as an overall term that includes research, industry, and education policies and policies keys to the innovation process, such as funding, taxation, regulation, standards, and intellectual property rights. Efforts to promote innovation are also part of many EU programs, such as the Digital Single Market [31].

Innovation policies aim to improve and facilitate interactions among the innovation system actors to enhance the whole system's performance. Based on the proposed model mentioned above, it is obvious that more factors influence innovation and ecological innovation. When addressing innovation, policymakers should consider a wide range of aspects.

4 Conclusions

This paper describes the proposal of a model for the eco-innovation integration into the innovation process of companies in Slovakia with the aim to increase their performance. The creation of a model in which ecological innovation can contribute to increased performance of companies in Slovakia and sustainable development requires a logistic model of the system of planning, synchronization, management, implementation and control of internal and external flows for the highest flexibility, accuracy, economy and innovation support within the innovation system in Slovakia in the integration of ecological innovations into the innovation process of companies. The model is based on determinants influencing the development of eco-innovation. Attention was paid not only to determinants that positively impact the creation and implementation of eco-innovation, but we mainly focused on determinants that negatively impact their creation. The application of the proposed model was constructed to increase the efficiency of the innovation process of companies for the implementation of ecological innovations in Slovakia. If companies want to succeed in a market that is often characterized by strong competition, they should focus on creating innovations implemented on the principle of sustainable development. It means they

should think ecologically during the production, distribution or sales, and of course, to offer customers products that meet environmental standards. This effort also affects the activities of the European Union, which is also interested in the issue of environmental protection and the sustainability of economic development, resulting in specific programs that are directly related to the green economy and the sustainable environment. Despite the above mentioned, when applying the model, it is necessary to consider certain limitations that their using is difficult in the conditions of the Slovak Republic. At present, these are mainly restrictions associated with the Covid-19 pandemic, which significantly affects the Slovak economy, so the possibilities of the state support for innovation are changing very dynamically. Therefore, the model should respond correctly and flexibly to the macroeconomic and microeconomic environment, legislative factors, and other country factors. The state sets the conditions that the company must respect in its business activities and related innovative activities. These factors represent the design limits of this model.

Acknowledgement
This research was funded by the Scientific Grant Agency of the Ministry of Education, Science, Research and Sport of the Slovak Republic and the Slovak Academy of Sciences, grant number 1/0674/19, *"Proposal of a model for the eco-innovation integration into the innovation process of companies in Slovakia in order to increase their performance"*.

References

[1] STRAKA, M.: *Distribution and Supply Logistics*, Cambridge Scholars Publishing, Newcastle upon Tyne, UK, 2019.
[2] ŽIVOTNÉ PROSTREDIE: *Využívanie inovácií*, [Online] Available: http://ec.europa.eu/environment/basics/green-economy/innovation/index_sk.htm [21 Dec 2018], 2018. (Original in Slovak)
[3] LOUČANOVÁ, E., OLŠIAKOVÁ, M.: Distribution flow identification in cooperation and support for ecological innovation introduction in Slovak enterprises, *Acta logistica*, Vol. 6, No. 1, pp. 5-8, 2019. doi:10.22306/al.v6i1.111
[4] TREBUŇA, P., SABADKA, D., PETRIKOVÁ, A.: Performance evaluation indicators of university spin - off companies, *Acta Simulatio*, Vol. 1, No. 4, pp. 17-23, 2015. doi:10.22306/al.v7i1.149
[5] GRABARA, J., DABYLOVA, M., ALIBEKOVA, G.: Impact of legal standards on logistics management in the context of sustainable development, *Acta logistica*, 2020, Vol. 7, No. 1, pp. 31-37. doi:10.22306/al.v7i1.155
[6] LOUCANOVA, E., OLŠIAKOVÁ, M.: Crowdfunding as a way of the monetary and financial ecologies, *Marketing and management of innovations*, Vol. 2021, No. 1, pp. 21-29, 2021.
[7] DAVID, G., NGAIRE W.: Making corporate selfregulation effective in developing countries, *World Development*, Vol. 34, No. 5, pp. 868-883, 2006.
[8] MIKOVÁ, Ľ., VIRGALA, I., KELEMEN, M.: Embedded systems, *Acta Mechatronica*, Vol. 3, No. 2, pp. 1-5, 2018. doi:10.22306/am.v3i2.32
[9] KOVÁCS, G., KOT, S.: New logistics and production trends as the effect of global economy changes, *Polish Journal of Management Studies*, Vol. 14, No. 2, pp. 115-126, 2016.
[10] SPERANZA, G.: Trends in transportation and logistics, *European Journal of Operational Research*, Vol. 264, No. 3, pp. 830-836, 2018.
[11] MALINDŽÁK, D.: Modely a simulácia v logistike, *Acta Montanistica Slovaca*, Vol. 15, No. 1, pp. 1-3, 2010. (Original in Slovak)
[12] MALINDŽÁK, D.: *Výrobná logistika 1*, Košice, Štroffek, 1997. (Original in Slovak)
[13] MALINDŽÁK, D., TAKALA, J.: *Projektovanie logistických systémov*, Košice, TU, 2005. (Original in Slovak)
[14] DAHL, O. J.: *Desepet avent Simulation Languages*, Oslo, Norah Regrresevitralen, 1966.
[15] LODL, P.: *Methodology of knowledge mapping in industrial clusters*, International conference Kognice 2005, University of Hradec Králové, pp. 65-73, 2005.
[16] JEŘÁBKOVÁ, S.: *Návrh systému generačního předávání know-how v ŠJS*, Katedra průmyslového inženýrství a managementu, ZČU, Diploma thesis, 2004. (Original in Czech)
[17] TUREKOVÁ, H., MIČIETA, B.*: Inovačný manažment – východiská, overené postupy a odporúčania*, Žilina, Vydavateľstvo Žilinská Univerzita, 2003. (Original in Slovak)
[18] ČIMO, J., MARIÁŠ, M.: *Riadenie marketingových aktivít*, Bratislava, GeoPARNAS, 2006.
[19] ZAUŠKOVÁ, A., LOUČANOVÁ, E.: *Inovačný manažment*, Zvolen, Vydavateľstvo TU, 2008.
[20] BAČIŠIN, V.: Modely inovačného procesu a súvislosť s financovaním, *Finančné trhy*, 2010. (Original in Slovak)
[21] DÍAZ-GARCÍA, C., GONZÁLEZ-MORENO, Á., SÁEZ-MARTÍNEZ, F. J.: Eco-innovation: insights from a literature review, *Innovation*, Vol. 17, No. 1, pp. 6-23, 2015.
[22] JUREČKA, V. et al.: *Makroekonomie 3*, Praha, Grada Publishing, 2017. (Original in Czech)
[23] HEJLOVÁ, D.: *Public relations*, Praha, Grada Publishing, 2015.
[24] TROMMSDORFF, V., STEINHOFF, F.: *Marketing inovací*, Praha, C. H. Beck, 2009. (Original in Czech)
[25] ROGERS, E. M., MITSUFUJI, T.: *Diffusion of innovations*, 5th ed., Shoeisha, Japan, 2003.
[26] MOORE, G. A.: *Crossing the Chasm: Marketing and selling high-tech goods to mainstream customers*, Harper Business, New York, 1991.

[27] SATO, T., SAIJO, M.: *How Can We Facilitate the Diffusion of Electric Vehicles in Japan?*, Proceedings of the International Joint Conference on Knowledge Discovery, Knowledge Engineering and Knowledge Management, pp. 70-81, 2016.
[28] LANGLEY, P., LEYSHON, A.: Capitalizing on the crowd: The monetary and financial ecologies of crowdfunding, *Environment and Planning A*, Vol. 49, No. 5, pp. 1019-1039, 2017.
[29] LOUCANOVA, E., NOSAĽOVA, M.: Eco-innovation Performance in Slovakia: Assessment Based on ABC Analysis of Ecoinnovation Indicators, *BioResourc*es, Vol. 15, No. 3, pp. 5355-5365, 2020.
[30] NGUYEN, H.V., TO, T.H., TRINH, V.X., DANG, D.Q.: The role of supply chain dynamic capabilities and sustainable supply chain management practices on sustainable development of export enterprises, *Acta Tecnología*, Vol. 7, No. 1, pp. 9-16, 2021.
[31] THE EU AND INNOVATION: *What Think Tanks are thinking | European Parliamentary Research Service Blog* [Online], Available: epthinktank.eu [20 Dec 2020], 2020.

Review process
Single-blind peer review process.