

**Milica Jovanović Vujatović<sup>1</sup>**

*Innovation Center;*

*University of Niš*

**Jasmina Ognjanović<sup>2</sup>**

*Faculty of Hotel Management and Tourism in Vrnjačka Banja,*

*University of Kragujevac*

**Slavica Popović<sup>3</sup>**

*University Union Nikola Tesla Belgrade,*

*Faculty of Applied Sciences Niš*

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## THE ROLE OF ECO-INNOVATION IN SUSTAINABLE INTELLECTUAL CAPITAL OF THE COMPANY

### Abstract

*Due to the growing concern for the environment and the impact of new technologies on it, companies are asking how to make a profit while respecting the problems of the environment. In this sense, they develop eco-innovations that do not reduce economic performance, but ultimately affect the strengthening of sustainable intellectual capital, sustainable competitiveness of enterprises and greater business efficiency. The goal of this paper is to point out the importance of the development of sustainable intellectual capital in modern business conditions and the role of eco-innovation within this intangible asset of the company.*

**Keywords:** *eco-innovation, sustainable intellectual capital, environmental capital, green intellectual capital, sustainability*

**JEL classification:** *M21, O31, O34*

## УЛОГА ЕКО-ИНОВАЦИЈА У ОДРЖИВОМ ИНТЕЛЕКТУАЛНОМ КАПИТАЛУ ПРЕДУЗЕЋА

### Апстракт

*Због све веће забринутости за животну средину и утицаја нових технологија на њу, предузећа постављају питање како остварити профит уз уважавање проблема животног окружења. У том смислу развијају еко-иновације које не смањују економске перформансе, већ у крајњем утичу на јачање одрживог интелектуалног капитала, оживу конкурентност предузећа и већу ефикасност пословања. Циљ рада је да укаже на важност равоја одрживог интелектуалног капитала у савременим условима пословања и на улогу еко-*

<sup>1</sup> jovanovicmilicaa90@gmail.com, ORCID ID 0000-0002-6410-0938

<sup>2</sup> jasmina.lukic@kg.ac.rs, ORCID ID 0000-0002-6036-5269

<sup>3</sup> popovic.slavica@hotmail.com, ORCID ID 0000-0003-4985-929X

*иновација у овој нематеријалној имовини предузећа.*

**Кључне речи:** *еко-иновације, одрживи интелектуални капитал, зелени интелектуални капитал, еколошки капитал, одрживост*

## **Introduction**

Eco-innovations include new business and management methods, new production processes and new products or services that will contribute to environmental protection. In recent decades, with increasing environmental risks and declining natural resources, there has been growing public concern. Companies are required to become more environmentally conscious. What companies could do in this regard is to ensure a minimal impact of their products on the environment, through a change in the inputs and outputs used, especially product design.

In today's business environment, sustainable business and growth is becoming a key issue. In all of this, the development of sustainable intellectual capital and the development of eco-innovation as components of sustainable structural capital play an important role. Namely, the key aim is to achieve reduction in environmental harm. In order to make progress from environmentally responsible to sustainable development, the previously left out factor - the cost of environmental impact, must be integrated. Taking this cost into account when determining the price of a business activity/project would make many of the activities/projects undertaken today irresponsible.

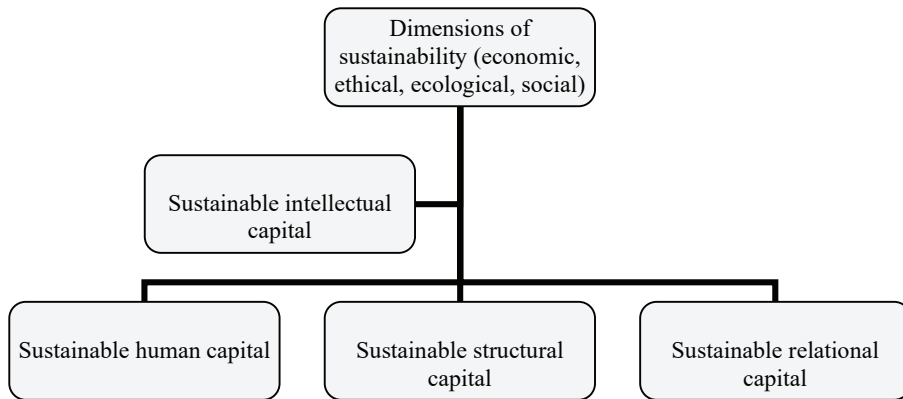
Many companies act as if human capital is still scarce and nature abundant, as was the case during the first industrial revolution. The rapid mechanization of the textile industry at the time caused explosive economic growth that led to a shortage of labor in the factories. However, the pattern of scarcity is changing. Today, labor is "not scarce", but nature is. This is primarily manifested in industries that directly depend on the quality of the environment, given that, unlike traditional factors of industrial production - capital and labor - biologically limiting factors cannot be replaced. Companies addresses these problems by reintegrating environmental and economic goals. The ones that are the first to take a step towards solving these problems will gain a competitive advantage.

## **The main determinants of sustainable intellectual capital of the company**

Different authors (Claver-Cortés et al., 2007; Chen, 2008; Lungu et al., 2013) use different terms to denote the intellectual capital of a company that is focused on solving environmental problems and environmental protection – sustainable intellectual capital, "green" intellectual capital, environmental capital.

Sustainable or green intellectual capital, in the knowledge economy, is becoming a key prerequisite of sustainable growth and development of modern enterprises. This is a consequential precondition for achieving a sustainable competitive advantage of an innovative company. The term is related to intellectual asset that includes knowledge resources aimed at satisfaction of environmental issues (Jovanović et al., 2021).

Figure 1: Integrating the sustainability dimension into intellectual capital



Source: Lungu et al. (2013)

Taking into account the concept of sustainable intellectual capital according to Lungu et al. (2013) - shown in Figure 1, it can be concluded that this is a comprehensive concept. Namely, it includes all dimensions of sustainability - economic, ethical, ecological and social. Sustainable human capital refers to the training of employees and the activities of employees in terms of solving sustainability problems. Sustainable structural capital includes culture, strategy, management process and R&D investment in sustainable business. Finally, sustainable relational capital refers to the company's image/reputation as socially responsible, and its environmental relations.

According to Chen (2008), the concept of green intellectual capital consists of three elements: green human capital, green structural capital and green relational capital. First, green human capital is focused on knowledge, skills, expertise, capabilities, experience, moral values, attitude, creativities of employees and organizational commitment about environmental management. Green structural capital includes organizational capabilities and competencies, knowledge management systems, IT systems, databases, processes, culture, company image and intellectual property related to green innovation. In addition, green relational capital highlights interactive relationships with customers, partners, suppliers and public about environmental protection and green innovation of the company.

Claver-Cortés et al. (2007) points out that environmental capital is a component of intellectual capital of the company and is based on the following elements:

- 1) Employees – environmental knowledge, skills and experience related to environmental policy and procedures in order to produce minimum impact on the environment,
- 2) Culture – reputation and image of a responsible and ecological company; environmental commitment of organization and individuals,
- 3) R&D – innovation capacity for environmental ideas; development of ecological products and cleaner technologies; intellectual property related to environmental issues; investments in ecological processes,

- 4) Production – products and processes in accordance with environmental regulations; alternative materials and adequate design; cost savings based on waste reduction, material and energy reduction; using clean materials and technology; recycling and reuse,
- 5) Marketing – possession of the knowledge and capabilities for creating “green consumer behavior”.

It can be concluded that the last concept explained is narrower than the previous two.

### **Eco-innovation in the structure of sustainable intellectual capital of the company**

There are various terms used in the literature to describe innovations that have a reduced negative or positive impact on the environment: “green”, “eco”, “ecological” and “sustainable”. The Brundtland report, initiated by the United Nations, used the term “sustainable innovation” for the first time, defining it as satisfying the needs of the present generations, without compromising the opportunity of future generations to meet their own needs. Namely, the concept of sustainable development implies not absolute limitations, but restrictions that impose the modern state of technology and social organization on environment, as well as the capacities of the biosphere to deal with the effects of human activity (Brundtland, 1987).

Eco-innovation can be defined as the production, assimilation or exploitation of a product, production process, service, management method or business method that is new to the organization and whose outcome is an mitigation in environmental risk, pollution and other negative impacts of resource use compared to relevant alternatives (Kemp & Pearson, 2007). It is any innovation that discourages the use of natural resources and the utilization of harmful substances throughout the life cycle. The growing number of eco-innovative services and products is proof of society’s turn towards a circular economy, and the key indicators that monitor progress are: eco-innovation index, investment in research and development, eco-labels and environmental management systems. It is a concept of creating value by spending fewer resources because resources are retained in the value system by producing more durable products, concepts of sharing (instead of owning), reusing. At the end of the product life cycle, materials are not disposed of but enter the recycling process and returned to the production cycle. This concept largely corresponds to the concept of sustainable production and for the purposes of its implementation, eco-innovations are necessary (Matešić, 2020).

The classification of eco-innovation is presented in Table 1 and indicates the structure of green innovations, in order to understand the relationship of these elements with the elements of sustainable intellectual capital of the company.

Table 1: Eco-innovation classification

<i>Environmental technologies</i>	<ul style="list-style-type: none"> <li>- Technologies for pollution control;</li> <li>- Cleaner technologies (innovative processes aimed at less polluting);</li> <li>- Waste management technologies;</li> <li>- Monitoring of environmental issues;</li> <li>- Technologies for green energy ;</li> <li>- Water supply;</li> <li>- Control of noise.</li> </ul>
<i>Organizational innovation</i>	<ul style="list-style-type: none"> <li>- Pollution prevention systems (substitution of inputs, efficient processes, changes in production plants);</li> <li>- Environmental management systems;</li> <li>- Environmental auditing systems;</li> <li>- Chain management (coordination between organizations to reduce environmental damage across the value chain).</li> </ul>
<i>Product/service innovation</i>	<ul style="list-style-type: none"> <li>- Environmentally friendly material products;</li> <li>- Green financial products;</li> <li>- Environmental services (water management, environmental consulting/testing/engineering);</li> <li>- Services focused on less pollution and resource usage.</li> </ul>
<i>Innovations of green system</i>	<ul style="list-style-type: none"> <li>- Systems of production and consumption that are more environmentally friendly.</li> </ul>

Source: Kemp & Pearson (2007)

Bearing in mind that sustainable human capital refers to the knowledge, skills and attitudes of employees considering environmental safety and proper management of environmental problems, the quality and number of green innovations in the company largely depend on the quality of this segment of sustainable intellectual capital. If a company invests in sustainable human capital, employees will be aware and will have enough knowledge/skills and to deal with environmental problems. One of the main factors influencing green human capital is the quality of employees' knowledge of the green economy. This means that skilled human capital will increase the organization's willingness to reap business benefits because a more conscious human resources will have more pronounced skills to deal with environmental issues and, thus, maintain economic performances (Pellegrini et al., 2018). A company with better quality sustainable human capital will have a better chance of success of green innovations (Singh et al., 2020). In addition, human resources are a dominant driver for eco-innovation (Paraschiv et al., 2012).

The connection between eco-innovation and sustainable structural capital can be observed through eco-design or "green" design, which is a type of eco-innovation but is also a segment of sustainable intellectual capital (structural capital) of the company. According to Lewis et al. (2001), designers should have knowledge of the materials characteristics, given that: they can decide on the number of various materials, that they can influence the number of components, that they are included in system design. They identified some main environmental issues that designers should consider when making decisions: problem of global warming; reduction of biodiversity; spending of resources;

water and air pollution; degradation of land; waste issues; the problem of acidification. To create eco-design, designers must strive to minimize material and energy consumption, extend the life cycle of as many products as possible, and provide conditions for the product to be recycled at the end of its useful life.

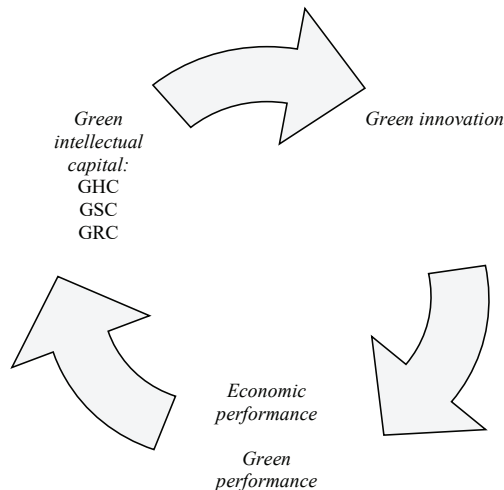
Dickel et al. (2018) consider that sustainable relational capital has a particularly important role in creating green innovations because it allows companies to enter different networks for the exchange of “green” ideas. However, on the other hand, the development of green innovations improves the company’s reputation and creates better relations between companies and their stakeholders - consumers, suppliers, partners, the state, public. This indicates the reciprocal impact of green innovation on the sustainable relational intellectual capital of enterprises.

### Eco-innovation in the function of company sustainability

The key drivers of eco-innovation in the company are: financial assets, human capital, R&D costs for the new technologies, current environmental policy, environmental management issues, market demand, competition situation, innovation cooperation, pressure of stakeholders, high-skilled human capital (Kemp & Pearson, 2007).

Figure 2 suggests that the elements of green intellectual capital – green human capital (GHC), green structural capital (GSC) and green relational capital (GRC) affect and create green innovations. On the other hand, green innovations have an influence on economic and green performances of a company. All this positively affects the overall green (sustainable) intellectual capital of the company. This indicates that eco-innovations not only affect the green business of the company - sustainable business in the long run, but also the financial goals of the company.

Figure 2: Green intellectual capital and performance of the company

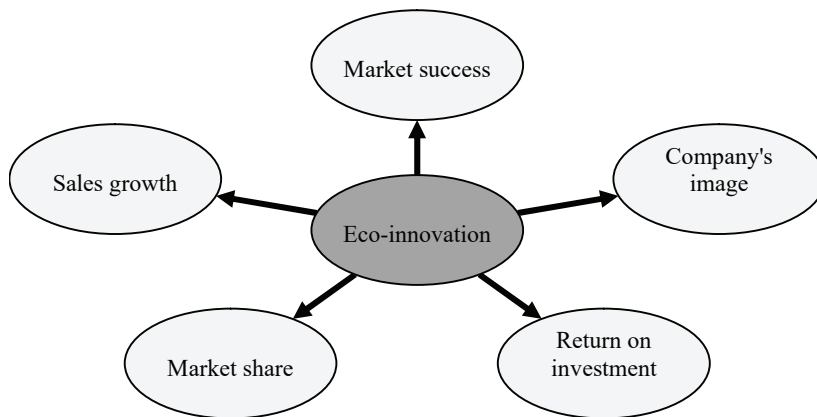


Source: Adapted to Wang & Juo (2021)

It can be concluded that eco-innovation enables innovation processes towards sustainable enterprise development, bearing in mind that it affect the most important areas/problems from the aspect of sustainable development - greenhouse effect, toxic effect on ecosystems, toxic influence on humans, loss of biodiversity, usage of soil, land, resource utilization (Rennings, 2000). It is related to any form of innovation aimed at making significant and visible progress towards the goal of sustainable development, through the reduction of environmental impact or the achievement of more efficient and responsible use of natural resources, including energy (European Commission, 2007).

Various studies (Lewis et al., 2001; Tseng et al., 2013; Bossle et al., 2016) indicate that the application of eco-innovation has a positive effect on certain business performance indicators, as shown in Figure 3.

Figure 3: Eco-innovation and business performance



Source: Adapted to Lewis et al. (2001); Tseng et al. (2013); Bossle et al. (2016)

Lewis et al. (2001) conclude that companies are investing in mitigating their environmental negative impact in order to achieve following sustainable performances:

- 1) to present themselves as market leaders, corporate responsible and innovators;
- 2) to avoid surprises in the future - they want to predict a change in the regulatory context and market environment, instead of reacting to changes when they happen;
- 3) take into account the existence of a new business paradigm and new areas of competition;
- 4) to have impact on the regulations and laws - in cooperation with governments, they want to ensure their investments;
- 5) to strengthen the current technical competence and conquer the new fields of technical competence;
- 6) to create the positive company's image in the market.

## Conclusion

Businesses today face a number of challenges related to environmental degradation, climate change, rising raw material prices and legal constraints. Therefore, it can be said that, environmental protection is an integral component of the business of modern companies, and the increasingly rigorous requirements regarding the way of doing business are a consequence of the fact that business activities negatively affect the quality of the environment.

The reasons for the introduction of environmental innovations in the company can be divided into internal and external factors. Internal factors refer to specific characteristics of the company - size of the company, the type of the industry, organizational culture, environmental policy of the company, environmental awareness and aspirations of managers. External factors, on the other hand, include environmental policy of the government, constantly rising prices of raw materials and energy, the growth of social awareness, institutional support, relationships with customers and other stakeholders.

Eco-innovations are widely accepted as a method of improving the environmental performance of companies, product improvements and progress towards a more sustainable business model, so their introduction into the company brings many benefits. First, eco-innovation discourages the use of natural resources and harmful substances throughout the product life cycle. They make the best use of all types of waste generated in industry, conserve energy and contribute to the preservation of biodiversity. Also, eco-innovations lead to the creation of products that are suitable for similar products offered on the market, but their production requires the consumption of a smaller amount of natural resources and energy. As such, eco-innovation is an integral part of a successful transition to a green economy.

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